

**An Economic Evaluation
of the Quitline
Nicotine Replacement Therapy (NRT) Service**

June 28, 2004

For the New Zealand Ministry of Health

Written by:-
Des O'Dea, Health Economist

desodea@paradise.net.nz

Phone 04-293,2396

Acknowledgements

This report has required the obtaining of a substantial amount of financial and statistical information, and has required also a number of discussions with representatives of the Quit Group and the Ministry of Health on the material in the report.

It is my pleasure to acknowledge all the assistance I received in these matters from various quarters. I wish to mention in particular the following organisations and individuals:

The Quit Group.

In particular Leah Stretch for information on the Group's financial accounts, and Michele Grigg, for her very considerable expertise and interest in, and passion about, the issues involved.

Anaru Waa of the Health Sponsorship Council was another who provided comment of a high intellectual level.

BRC Marketing and Social Research.

Specifically Anne Dowden, for the information she supplied from the BRC surveys on those using the Quitline NRT (Nicotine Replacement Therapy) service, and her willingness to provide additional statistical detail when requested. I found the overall quality of BRC's work impressive.

Dr Nick Wilson for the good sense of his review.

The Ministry of Health

Several persons, but especially Francis Dickinson for our discussions on various points, direction to good references, and general guidance.

Des O'Dea

An Economic Evaluation of the Quitline Nicotine Replacement Therapy (NRT) Service

Contents

	<u>Page</u>
Executive Summary	7
Summary List of Assumptions and Variants	13
A: Purpose and Background	14
B: Preliminaries: Defining and Measuring “Quitting”	15
1. Defining “Quitting”	
Definition of ‘Quitting’ and ‘Quit-rates’	
Preferred rates for the analyses in this report	
2. Measuring the ‘latent’ or ‘spontaneous’ quit rate	
The Quitting Process	
Estimating ‘spontaneous’ or ‘natural’ quit-rates	
Estimating the Latent Quit Rate from Census and ongoing Prevalence Surveys	
Other sources	
3. Conclusion on 12-months continuous abstinence rate	
C: Client numbers – ‘pre’ and ‘post’ NRT	20
1. ‘Population’ or ‘Client’ approach?	
2. Client numbers – the Quit Service pre-NRT	
Source of information about the Quitline service	
3. Client numbers – the Quit Service post-NRT	
D: Measurement of Costs	22
1. List of cost components	
2. Quit Group Costs	
3. Other government costs. Quit packs and Post-NRT material	
4. Cost of NRT exchange cards	
5. Personal costs of smokers.	
6. Total cost of Quitline with NRT	
E: Numbers quitting smoking as a result of the Quitline service	33
1. Assumed Quit Rate for pre-NRT service	
2. Cost per quitter - pre-NRT service	
3. Estimating the Quit rate for the post-NRT service	
(a) Quit rates at 6 months and 12 months	
(b) Adjusting ‘continuous abstinence’ quit rates for survey attrition	
(c) Comparison with Australian results	
(d) Chosen ‘continuous abstinence’ quit rates	
4. Cost per quitter for NRT programme	
F: Estimates of the Health Benefits of Smoking Cessation	40
1. Life Expectancies – smokers and non-smokers	
2. ‘Quality of Life’ adjustments	

3.	Potential Years of Life Lost	
4.	Benefits of temporary abstinence?	
5.	Assumed rate of relapse	
6.	Discounting future health benefits	
G:	Cost-effectiveness – cost per Life-Year saved, and per QALY	46
	7. Cost-effectiveness ratios for the pre-NRT service	
	8. Increase in quits for the post-NRT service compared with ‘no service’	
	9. Cost-effectiveness of post-NRT service, assuming no Quitline pre-NRT	
	10. Incremental cost-effectiveness of the Quitline NRT programme, compared with the pre-NRT Quitline	
H:	Sensitivity Analyses	54
	1. Pre-NRT Quitline	
	2. Post-NRT Quitline	
I:	What is a QALY worth?	57
J:	Conclusions	58
	1. The pre-NRT Quitline service	
	2. The post-NRT Quitline service	
Appendix A:	Earlier Empirical New Zealand Data on Smoking Cessation. The 1996 NRB Survey.	59
Appendix B:	Estimating the ‘Natural’ Quit Rate from Census and ongoing Prevalence Surveys	62
Appendix C:	Results of Sensitivity Analyses of Cost-Effectiveness of post-NRT Quitline service	67
References		72

Tables and Charts

B: Quitting data

- B.1 Australian Survey Results – before/after National campaign
- B.2 Abstinence Rates reported in Cohen et al. (1989) paper.

D: Cost Data

- D.1 Quit Group Expenditures; 2000, 2001, and 2002
- D.2 Quit Group Fixed Asset Expenditures. 2000-2002
- D.3 Quit Group Costing Information
- D.4 Range of Costings: Quitline without and with NRT
- D.5 Quit Materials Funded directly by Ministry of Health
- D.6 Approximate additional costs derived from Folio Communications material
- D.7 Redemption Rates – NRT Exchange Cards
- D.8 Cost of NRT Cards
- D.9 Range of Costings: Quitline with NRT 2001/02

E: Numbers Quitting

- E.1 Cost per Additional Quitter. Pre-NRT Quitline Service
- E.2 Quit rates after survey attrition – BRC report.
- E.3 Estimated 6 months and 12 months Quit Rates. NRT programme.
(from BRC cohort survey)
- E.4 BRC 12 months cohort survey results. Continuous quit rates.
- E.5 Comparison of Australia – New Zealand Quit Rates
- E.6 Cost per quitter for Quitline NRT programme

F: Estimates of Health Benefits

- F.1 Difference in Life Expectancy
- F.2 Calculation of ‘Quality of Life’ Adjustment
- F.3 Table of Life-years, and QALYs, saved per Quitter:
from various studies cited in Woolacott et al. (2002)

G: Cost-effectiveness results

- G.1 Pre-NRT Quitline. Cost per Life-Year Saved, and per QALY saved.
- G.2 Cost per QALY saved: Post NRT (2001/02) compared with ‘No Quitline’
 - a) ‘Higher’ 11.6% continuous quit rate
 - b) ‘Lower’ 9.0 % “ “
- G.3 Monthly Costs and Numbers for different scenarios
- G.4 Cost per QALY saved: Post-NRT (2001/02) compared with Pre-NRT.
 - a) ‘Higher’ 11.6% continuous quit rate
 - b) ‘Lower’ 9.0 % “ “

Chart F.1 Base Case results. Higher Quit rates.

Chart F.2 Comparison of Higher and Lower Quit rates.

H: Sensitivity Analyses

- H.1 Pre-NRT Quitline. Gain in numbers quitting halved.
- H.2 Pre-NRT Quitline. Time till Health Gain increased from 10 to 15 years.
- H.3 Summary of Sensitivity Analyses: Health Gains from NRT Programme

Appendix Tables:

Appendix A:

App.1 Results from 1996 NRB survey on Quitting

App.2 Demographics of 1996 NRB survey

App.3 Former smokers as percentage of current smokers – or current plus recent smokers

App.4 1996 NRB information on Relapsed Smokers

Appendix B:

AppB.1 Prevalence of Smoking – from Neilsen surveys

AppB.2 Survival – Smokers and Others: 5-year age-groups

AppB.3 Smoking proportion, aged 25+ in initial census, surviving 5 years to 30+, compared with actual proportion at second census

AppB.4 Smoking proportion, aged 25+ in initial census, surviving 10 years to 35+, compared with actual proportion at second census

Appendix C: Results of Sensitivity Analyses. Post-NRT Service

Tables a and b are for quit rates of 11.6% and 9%, respectively.

AppC.11 a and b Halving health gains.

AppC.12 a and b Doubling health gains.

AppC.13 a and b Health gains lagged 15 years

AppC.14 a and b Relapse rate increased to 50% (from 40%)

AppC.15 a and b Relapse rate reduced to 30% (from 40%)

An Economic Evaluation of the Quitline Nicotine Replacement Therapy (NRT) Service

Executive Summary

Immediately following is a summary list of Assumptions and Variants.

Background

1. This report provides an economic evaluation of the Subsidised Nicotine Replacement Therapy (NRT) programme, funded by the Ministry of Health, and provided through the Quitline service of the Quit Group¹. It includes also an evaluation of the Quitline service prior to the introduction of the NRT programme in late 2000. At that time Quitline telephone advisors provided advice (verbal and written) and support to callers wanting to quit, but did not offer the nicotine replacement medications of the current programme.

Structure

2. The report contains, first, estimates of the ‘natural’ or ‘latent’ rate of quitting smoking in the New Zealand population. It then derives cost estimates for both the ‘pre-NRT’ and ‘post-NRT’ services. Additional numbers quitting as a result of the Quitline service are then estimated, followed by estimation of the benefits of quitting smoking. Next, cost-effectiveness ratios are derived. Sensitivity tests are carried out, and a conclusion reached.
3. A ‘client’ rather than ‘population’ approach’ has been taken for the evaluation. That is, it is made in terms of the number of would-be quitters actually contacting the Quitline, rather than of the whole population reached by Quit Group campaigns. This probably leads to somewhat conservative conclusions, as media activities, in particular, can both encourage calls to the Quitline and encourage non-callers to quit. Also, Quitline callers can influence other smokers in their households to quit. Some Australian evaluations have been couched in terms of total population quits. It is extremely difficult, however, to distinguish the impact of Quit Campaigns on population smoking prevalence from other effects.

Terminology

4. Rates of quitting smoking can be measured either as ‘point’ estimates of the proportion who are not smoking at a given point in time; or, more restrictively, as ‘period’ estimates. The latter are estimates of the proportion who have ceased smoking by a given past date and have remained non-smokers for the period since then until the present. The longer the period, the less likely those who have quit will subsequently relapse. The objective in this report is to estimate the number who become ‘permanent’ or ‘lifetime’ quitters as a consequence of the Quitline service. To achieve this it is necessary first to estimate from the available survey data the number who have succeeded in quitting for a six-months or 12-months period. Over the past year the market research company BRC Marketing and Social Research has carried out a cohort survey of a sample of those sent an NRT

¹ The Quit Group organisation is funded by the Ministry of Health.

exchange card by the Quit Group, and this information has proved invaluable for estimating these long-term period quit-rates.

Estimating long-term quit-rates

5. The most difficult part of this report has been in estimating the extent to which the Quitline increases the long-term quit-rate of callers. This, conceptually, requires estimates of –
 - The ‘spontaneous’ or ‘natural’ long-term quit-rate of the smoking population.
 - The extent to which Quitline callers are particularly motivated to quit and therefore could be expected to have anyway a higher ‘natural’ or ‘latent’ quit-rate.
 - The actual increase in long-term quit-rates as a result of using Quitline services.
6. Approaches to estimating these components of long-term quit-rates are discussed at length later in the report, and in Appendix B. They are read as implying a ‘latent’ 12-months period quit-rate for the New Zealand population as a whole of about 2.5 percent. The rate for callers to the Quitline is assumed higher by another 2.5 percent than the ‘population rate’, for a total of 5 percent, on the presumption such callers are more motivated to quit.
7. Information on quit-rates as a result of using the pre-NRT Quitline is almost totally absent. As a working assumption, the percent quitting is assumed to increase from 5 to 7.5 percent. That is, the **incremental** 12-months period quit rate for the pre-NRT Quitline is assumed to be 2.5 percent.
8. For the post-NRT programme a cohort survey of participants, carried out by BRC², shows a ‘continuous abstinence’ quit rate of 9.0% for the period 6 to 12 months after commencement.
9. This 9.0% quit rate, however, counted all survey non-respondents as non-quitters. For those still responding to the survey after 12 months, the rate was 20%. Assuming some success for non-respondents also, an overall 6 to 12 months period quit rate of 11.6% has been estimated. This is labelled, for subsequent analysis, as the ‘higher’ of two estimates of the ‘continuous abstinence’ to 12 month quit rate. For sensitivity analysis a ‘lower’ rate of 9.0 percent is also used subsequently. These rates are 4.1 percent and 1.5 percent higher, respectively, than the assumed rate of 7.5 percent for the pre-NRT Quitline service.
10. It should be noted that there is evidence³ that New Zealand’s NRT programme does in fact achieve significantly higher quit rates than the Australian Quitline programme. The latter is very similar to (in fact was the model for) New Zealand’s pre-NRT Quitline service.

² BRC report to Ministry of Health. 2004.

³ Grigg and Waa, 2003

11. A subsequent relapse rate of 40 percent is assumed for persons who have remained continuously abstinent up to 12 months.⁴

Numbers using Quitline services and estimated numbers quitting

12. The evaluation of the pre-NRT service is for the months prior to November 2000. The estimated average monthly number of smokers seeking Quitline assistance in that period was 2,750⁵. The increase in the number of long-term quitters each month (12-months period basis) as a result of Quitline assistance is consequently estimated at 68.75 (2.5 percent of 2,750).
13. The evaluation of the post-NRT service is for the financial year from July 2001 to June 2002⁶. This allowed some months subsequent to the provision of NRT from November 2000 for the initial surge in phone-calls to the Quit Group to die down. The average monthly number of smokers sent a first exchange card during 2001/02⁷, entitling them to subsidised dispensation of either a nicotine patch or gum, was 3,179.
14. The numbers of long-term quitters (12-months period estimate) per month, attributable to the post-NRT Quitline service, are therefore -
 - for the higher quit-rate of 11.6 percent 210 (6.6 percent of 3,179)
 - for the lower quit-rate of 9.0 percent 127 (4.0 percent of 3,179)

These exceed the pre-NRT numbers by 141 and 58 per month respectively.

15. The additional proportions quitting long-term may seem on casual inspection relatively small. It should be remarked that the Quitline service is trying to reduce consumption of a highly addictive product – tobacco. Other behaviour modification public health programmes such as exercise promotion and nutrition education, for example, also have a relatively large ‘number needed to treat’ to achieve one ‘cure’, compared with other areas of medicine. This does not mean such programmes are ineffective. If the benefits per ‘cure’ are substantial, and/or the cost per ‘cure’ low, the programme can still be very effective in economic terms.

Cost Estimates

16. Three cost ‘variants’ are analysed in this report. The Quit Group’s financial reports include a number of other programmes in addition to the Quit Line. Taking the pre-NRT situation first, the ‘low’ variant includes only those Quit Group expenditures specifically labelled as ‘Quitline’, excluding other Quit Group costs.

⁴ This assumption draws on the literature summarised in Woolacott et al (2002), for instance Cromwell et al (1997) and Fiscella and Franks (1996). See later table F.3.

⁵ This average includes a surge in phone-calls during May 2000, following a substantial increase in tobacco tax in that month. Excluding the nearly 8,000 calls during that month, the monthly average number was 1,908.

⁶ However the medication prices used in the analyses are those prevailing in late 2003, somewhat lower than in 2001/02. It is appropriate to substitute current prices for current policy decisions.

⁷ July 2001 to June 2002, after the initial surge in calls with the introduction of NRT in November 2000 had largely died down.

The 'high' variant includes most Quit Group costs; apart only from the District Health Board (DHB) 'hospitals' programme, the 'NRT programme' (supplying NRT through health providers), and World Smokefree Day expenditures (the focus of which was on second-hand smoking rather than quitting). The 'middle' variant includes 45 percent of the difference between 'low' and 'high' Quit Group costs, on the basis that the difference is largely expenditure on the media campaign, and approximately 45 percent of surveyed Quitline callers reported that the TV ads were their source of the Quitline number.

12. These three cost variants for the pre-NRT Quitline service give monthly costs ranging from \$96,672 to \$212,994, with a 'Middle' value of \$149,017.
13. For comparison the range of Quit Group monthly costs for the post-NRT Quitline service, calculated on the same basis, is from \$152,371 to \$375,236, with a 'middle' value of \$252,260. To these latter figures should be added NRT costs and other minor costs, amounting to \$2,850,000 for the year 2001-02 for all cost variants. The NRT costs include in addition to the subsidy cost paid by government the cost of smokers' own co-payment contributions - currently \$5 of a total of about \$41 per exchange card on average, excluding GST.

Cost per quitter

14. On the numbers above, the cost per quitter pre-NRT amounted to from \$1,406 per quitter to \$3,098. The 'middle' value is \$2,168. An assumed 40 percent subsequent relapse rate increases the cost per 'lifetime quitter' to \$3,613 for the 'middle' cost variant.
15. The cost per 12-months quitter of the post-NRT Quitline programme is estimated at \$4,272, for the 9% quit-rate; or \$2,099 for the 11.6% quit-rate. This is for the middle cost variant. Assuming a 40 percent subsequent relapse rate gives respective costs per 'lifetime quitter' of \$7,120 and \$3,198.

Estimates of Benefits

16. Health Benefits of quitting. These are the 'Years of Life gained' as a result of reduced premature mortality, and the gains in 'Quality of Life' from reduced morbidity prior to death. Estimates of health gains from smoking cessation have been obtained from the literature. These point to an average gain of about 2 QALYs (Quality-adjusted life-years) for 'lifetime quitters'. For this report, this has been assumed to occur ten years in the future⁸. As lifetime quitters are assumed to be 60 percent of those abstinent up to 12 months, the gain per '12-months period' quitter is 1.2 QALYs.
17. It has been assumed for this report that there are no health benefits from short-period abstinence or from a permanent reduction (short of quitting) in the rate of

⁸ A 15-year variation is tested in the sensitivity analyses

consumption⁹. This quite probably errs on the conservative side and also ignores the potential benefit to non-smokers exposed to less second-hand smoke.

18. The following possible benefits of quitting have also not been included in the analyses

- 'production' gains due to fewer days off work and higher work-force participation of quitters;
- 'consumption' gains for ex-smokers;
- lower health-care costs for ex-smokers.

These exclusions are because of difficulties in their estimation, and also because of controversies in the literature, at least for the last two¹⁰. Excluding the first two 'biases' the results in a conservative direction. The effect of the exclusion of the third is uncertain.

Cost-effectiveness ratios

19. Pulling this information together, the cost-effectiveness ratios are as follows. Benefits are discounted for the time lag before the health gains are reaped, at a real rate of five percent per annum¹¹.

Cost-Effectiveness ratios: Pre and Post-NRT Services 5 percent discount rate

	Low	<u>Cost Variant</u> Middle	High
Pre-NRT Service			
\$ per QALY gained	\$1,909	\$2,942	\$4,205
Post-NRT Service			
\$ per QALY gained			
- at higher quit rate of 11.6%	\$2,449	\$2,849	\$3,339
- at lower quit rate of 9.0%	\$4,983	\$5,798	\$6,794

Note: The calculations for the post-NRT service are based on increments in costs and benefits from the pre-NRT service.

17. These are acceptable cost-effectiveness ratios. Even at a 10 percent discount rate, the ratios remain acceptable. For the middle cost variant of the post-NRT service the ratios at a 10 percent discount rate are \$4,537 and \$9,233 per QALY, at the

⁹ The justification for this assumption is that a recent major Danish study (Godtfredsen et al. 2002) appears to show there is no significant long-term health benefit from a reduction in tobacco consumption as against quitting, at least for heavy smokers.

¹⁰ The arguments concerning health-care cost savings revolve around the question of whether the extra costs incurred in later life as a result of ex-smokers living longer out-weigh the savings in earlier years. Relevant papers are Bonneux et al (1998), Manning et al (1991), Max (2001). With sufficiently high discount rates the present value of shorter-term reductions will exceed that of longer-term increases.

¹¹ Results for a range of discount rates, up to 10%, are given in the body of the report and in tables in the Appendices.

higher and lower quit rates respectively. All of these ratios are considerably better (that is, lower) than estimated cost-effectiveness ratios quoted in the New Zealand literature for health-care interventions such as dialysis and mammography programmes¹².

Sensitivity analyses

18. Sensitivity Analyses. The effects of reducing the incremental quit-rate for the pre-NRT service, and more generally of reducing the expected health benefits, and increasing the average time lag until health gains are realised, have been tested, and tables of the results are included in the report. Similar analyses have been carried out for the 'post-NRT' service, including variation upwards of the rate of 'relapse' of quitters. Such changes of course increase the cost per QALY gained. Even so, the resulting values remain comparatively low, generally well below \$20,000 per QALY.

Conclusions

19. *Pre-NRT service:* The Quitline service, prior to the introduction of NRT in late 2000, was quite likely good 'value for money'. It is not possible to reach a more certain conclusion, because of the poor quality of the statistical evidence for an improved quit rate for Quitline callers in this pre-NRT period.
20. *Post-NRT service:* The Quitline NRT programme is almost certainly a highly cost-effective programme. The lack of complete certainty is because of the lack of sound statistical measures of the effectiveness of the pre-NRT Quitline, plus some uncertainty about the overall quit rate for the NRT programme including cohort survey non-respondents as well as respondents. The assumptions used on such matters have in general been conservative.
21. These conclusions are reached with the more confidence because the analysis is conservative in a number of respects. For example, it does not assume any health gains from temporarily quitting, nor production gains from fewer days off work, nor increased workforce participation for those successfully quitting. Nor does it include any population gains for people influenced indirectly by Quitline activities. In addition the analysis does not take into account survey evidence¹³ that those who are quitting with the aid of Quitline are heavier than average smokers. These smokers would be expected to have greater difficulty than the average smoker in quitting on their own account.

¹² Croxson and Ashton 1990; Szeto and Devlin 1996.

¹³ BRC report to Ministry of Health. 2004.

Summary List of Assumptions and Variants

Cost Variants (Including personal co-payments for NRT)

Low Direct Quitline costs only (plus NRT costs for post-NRT service)
 High Plus other Quit Group costs possibly supporting Quitline efforts
 Middle Low plus 45 percent of (High – Low)

Numbers receiving service

Pre-NRT	(2000)	2,750 per month ¹⁴	First-time callers
Post- NRT	(2001/02)	3,179 per month	First exchange Cards sent.

Quit rates (0-12 months period rate. That is, abstinent from start to 12 months)

‘Latent’ or ‘spontaneous’ population quit rate. 2.5% of smokers per annum.
 ‘Motivated’ quit rate (sufficiently to call Quitline). 5% “ “

Pre-NRT	Quitline callers	7.5% of callers
Post-NRT	Exchange cards	‘Higher’ 11.6% of those sent Exchange Cards
	‘Lower’	9.0% “ “ “

Relapse rate (% of continuously abstinent to 12 months who subsequently relapse)

That is, percent who fail to become ‘lifetime quitters’.

Base-case	40%
Sensitivity Analysis variants	30% and 50%

Health gains

Base-case	1.5 Life-Years, and 2.0 QALYs per Lifetime Quitter
	Relapsers – zero gain.
Variants	Halved and doubled

Time Lag	10 years to Health gain.	Variant 15 years.
----------	--------------------------	-------------------

Other assumptions

- i) No health-gain for those who quit only temporarily, and then relapse.
- ii) No gains in utility of consumption from switching expenditure from tobacco products to other goods and services.
- iii) No saving in health-care costs¹⁵, or output gains of healthier population.
- iv) No ‘benefits to others’ e.g. People not calling Quit group, but influenced by its activities, such as a family member quitting with Quit group assistance.
- v) Those calling the Quit group face the same difficulties in quitting as ‘motivated to quit’ smokers in general.¹⁶

¹⁴ Probably exaggerated by May 2000 tax-induced ‘spike’

¹⁵ Partly because of controversy in the literature about the effect of longer life on lifetime costs.

¹⁶ There is BRC survey evidence that Quitline callers have a higher representation of those who would be expected to have greater difficulty quitting

A Purpose and Background

This is a report, commissioned by the Ministry of Health, on the Quit Group's 'Quitline' intervention, before and after the introduction of subsidised supply of Nicotine Replacement Therapy (NRT) to Quitline callers. The purpose of the report overall is to assess the cost-effectiveness of the introduction of the NRT service, against the baseline of the initial Quitline service which provided, up until late 2000, only advice to callers wishing to quit smoking.

This report also includes, however, a cost-effectiveness analysis of the 'pre-NRT' service.

BRC Marketing and Social Research has completed in recent months an evaluation for the Ministry of Health of other aspects of the Quit Group NRT service. As part of that evaluation, it conducted a follow-up 'cohort survey' of persons sent the Quit Pack and an offer of subsidised NRT by the Quit Group. Data from that survey has been of considerable value for the analyses in this report.

Background

The Ministry of Health funds the Quit Group to receive 65,000 calls (per annum) from smokers wishing to quit, and to provide support, advice and to offer NRT exchange cards to 30,000 callers. In the year to 30 June 2002 the Quitline in fact received 146,000 calls, offered support and NRT Exchange Cards to 58,000 new callers and issued 38,000 first NRT Exchange Cards and a total of 70,321 NRT Exchange Cards (Report for year ended 30 June 2002; page 11).

NRT Exchange Cards were introduced as a component of the 'Quit' programme in late 2000. Prior to then, would-be quitters were encouraged to phone Quitline advisors for advice and support, but did not receive NRT Exchange Cards. NRT Exchange Cards enable recipients to access subsidised nicotine replacement therapies (gum and patches) for a minimal co-payment.

The Quit Group spent over \$6 million in 2001/02 (report for year ended 30 June 2002) on anti-smoking programmes. Not all of this, however, was directly related to Quitline activities. Approximately \$2 million was spent directly by the Quit Group on Quitline activities and on the NRT Exchange Card programme (not including the cost of the NRT medications, which is met by Government plus a contribution from users' co-payments, and amounted to \$2.775 million in 2001/02). Thirty-six Quit Advisors operate the Quitline.

B Preliminaries: Defining and Measuring “Quitting”

In brief, we wish to know –

- (i) how many people quit smoking as a result of the Quit Group’s activities (pre- and post-NRT) who would not have otherwise;
- (ii) the costs incurred in achieving this;
- (iii) and the benefits resulting from smokers quitting.

B.1 Defining “Quitting”

In this section we focus on “quitting”. How is “quitting” defined, and how is it to be measured for the purpose of this study?

Definition of ‘Quitting’ and ‘Quit-Rates’.

To compare different options for encouraging smoking cessation, consistent definitions of what is meant by ‘quitting’ are needed. We give here a summary of the discussion in the important Woolacott review; and also the definition used in the recent BRC survey of the outcomes of the New Zealand Quitline programme.

The review by Woolacott et al. (2002). ‘Point abstinence’ is distinguished from ‘continued abstinence’ (page 13). ‘Point abstinence’ was defined in a number of the studies reviewed as ‘no smoking in the previous 7 days’; for example after a period of 6 or 12 months. ‘Continued abstinence’ was defined as ‘no smoking in the period considered’, often 6 months or 12 months. To quote from this extensive review of trials of bupropion (Zyban) and nicotine replacement therapy –

“Assessment of smoking cessation may be based on self-report, with or without biochemical validation. In clinical trials, the definition of smoking cessation has often been continuous abstinence for 6-12 months. Since in clinical trials the duration of follow-up is generally up to 12 months, the long-term (lifetime) cessation has to be estimated based on limited data. The rate of lifetime relapse used in the existing studies of economic evaluation ranged from 0% to 50% (see appendix 10).“ (page 49)

For the work reported in this paper we are reliant on self-report.

To quote further –

“The spontaneous (background or natural) quit rate must be included when estimating the net effect of smoking-cessation interventions. In the existing economic evaluations, this ranged from 1% (most of the UK studies) to 8% per year. In one study, it was 1.5% (95% CI, 1.2 to 1.8%) based on data from the Office of National Statistics’ General Household Survey in the UK.” (page 50)

It is likely that the lower rates in this paragraph are ‘net’ rates, after relapse of ‘long-term quitters’, whereas the 8% is a measure of the quit-rate prior to deducting subsequent ‘relapsers’. Data on this point are discussed below.

Measures used in BRC cohort survey of New Zealand Quitline users

(For use in reporting the results of the cohort survey of 2000 users of Quitline’s NRT service)

“ The main measure - Quitline New Zealand definition 12 month point prevalence quit rate measure

- Quit =
 - Self reported quit (not smoked for two days)
- Not quit =
 - Smoking
 - No data (participant not interviewed at 12 month follow-up)

$$\text{12-month quit rate = (point prevalence)} = \frac{\text{N quit at 12 months}}{\text{N in the 3-week cohort survey}}$$

Quitline New Zealand proposed 12 month longer term quit rate measure (specifically to be used to provide information for the economic analysis)

- Continuously Quit =
 - Quit at 6 month survey and been quit all the period in between that and the 12 month survey (i.e. “not smoked more than one cigarettes on two consecutive days” in the period in between).
- Not continuously quit =
 - was smoking at the 6 month survey, and/or smoked for a period in between the surveys (i.e. smoked more than one cigarette on two consecutive days).
 - quit at 6 month survey but smoked for a period in between 3 week and 12 month survey.
 - currently smoking.

$$\text{12-month quit rate = (continuous)} = \frac{\text{N quit at 3 weeks, 6 months and 12 months, and period in between}}{\text{N in the 3-week cohort survey}}$$

At 12 months - only those spoken to at 6 months attempted to be re-contacted.”

Preferred definitions for the analyses in this report.

Continued abstinence quit-rates over a period of 6 or 12 months or longer are the preferred measures. They are more useful in that they will more closely approximate to 'permanent' abstinence for the remaining life-time of those concerned.

B.2 Measuring the 'latent' or 'spontaneous' quit rate

The Quitting Process

Most smokers wish to quit. Thus there is a 'natural' quitting process occurring among smokers. The success of any anti-smoking initiative has, therefore to be judged in terms of the increase in the 'quit-rate' over and above the 'natural' quit-rate. ('Spontaneous' or 'latent' are alternative labels.)

Estimating 'spontaneous' or 'natural' quit-rates

Some evidence for New Zealand on the 'natural' quit rate is provided by data from the 1996 NRB survey (n = 2,020). Numbers are given in Appendix A. Those who at the time of the survey had quit smoking, and had done this in the last year, were 12.5% of current smokers, or 11.1% of current plus recent ('quit in last year') smokers.

However, at least compared with the Australian evidence discussed just below, these NRB estimates appear to be on the high side.

Some estimates of the 'spontaneous' quit-rate are obtainable from the 'benchmark' and 'before' surveys carried out at the time of the initial Quit Campaigns in Australia.

Table B.1			
Australian survey results - before/after National Campaign			
Percent Quit in the last year			
18-40 year-olds. Whole population, excl. WA.			
	Benchmark	Follow-up 1	Follow-up 2
	May-97	Nov-97	Nov-98
	n = 1,192	n = 2,981	n = 1,646
	Percentage of smokers and recent quitters (within the last year)		
Quit in the last year	8%	11%	8%
Source: Australia's National Tobacco Campaign. Evaluation Report Volume One (1999) Page 45, Table 2.13 Volume Two (2000). Page 40, Table 2.14.			

Table B.1 shows an Australian 'benchmark' rate at the start of the National Tobacco Campaign of 8% for those currently quit who quit at some time in the past year, as a

proportion of current + recent smokers. After six months of the campaign this had increased to 11%, but fell back a year later, with less campaign activity, to 8%. However it is to be presumed the campaign did result in a permanent gain in terms of new lifetime quitters.

Unfortunately the Australian rates are for those aged 15-40 rather than smokers of all ages. Also we do not have comparable robust New Zealand estimates. A survey was carried out the Northland/Auckland region (09 dialling region) in 2000. However the sample numbers were quite small, and there were difficulties getting an adequate response rate to the survey.

The 'anti-smoking environment' of the time is relevant. In Australia, it appears there was a small real increase in prices in 1997-98, offset by discounting, and by smokers 'shopping around'. In New Zealand the story is different. There was a substantial tobacco tax increase in May 2000, leading to an increase of around 20 percent in retail prices. From recent New Zealand evidence on price elasticity of demand for cigarettes (O'Dea and Thomson, PHA conference, 2000), this could be expected to reduce the quantity of tobacco smoked by of the order of 12 to 16% (for an elasticity in the range -0.6 to -0.8). Some of this would be from people quitting, or not commencing, and some from continuing smokers smoking less. Some of the impact would only be short-term. The prevalence elasticity component (the percentage change in smoking prevalence in response to a price change) is difficult to estimate with any accuracy, but is likely to be small. But if only -0.05 this could elevate the quit rate by about one percent.

The quality of the available evidence is disappointing. It is difficult from the above to find an estimate of the 'natural' quit-rate consistent with all the evidence (even assuming that Australian survey data applies equally well to New Zealand). Also we require an estimate of the natural 'period' quit-rate for a 12-month period, rather than a point-estimate of those who have quit in the last year.

Estimating the Latent Quit Rate from Census and ongoing Prevalence Surveys:

A different approach to estimating the 'latent' quit-rate is to examine trends in the smoking prevalence of the New Zealand population as a whole. This line of investigation is followed up in Appendix B. The results depend on a number of demographic assumptions, and are clearly not very precise. The conclusion reached is that at least for populations aged 25 and over, a long-term latent quit-rate of the order of 1.5 percent per annum is probably 'in the ball-park'. Using again the assumed 40 percent relapse rate (the evidence for this is discussed elsewhere in this report) for those who have quit for 12 months, this would suggest a latent 12 month period quit rate of the order of 2.5 percent (ie the rate before allowing for long-term relapse).

Other Sources:

An interesting and relevant, if relatively old paper, is that by Cohen et al (1989). Data were collected for 10 long-term prospective studies on persons (5000+) attempting to quit smoking by themselves or with minimal (self-quit manual) assistance (page

1356). There appeared to be no significant difference between those receiving self-quit manual assistance and those attempting to quit by themselves. The ‘continuous abstinence’ rates (‘not a puff’) are the more conservative of two definitions used. (Rates for the other definition – ‘abstinent at all panels’ – were 6.0 and 4.3 percent for six-months and 12-months, respectively.)

Some key results are summarised in the table below. Those who enrolled for the studies would appear likely to be those at least thinking about quitting, and can probably therefore be labelled in general as ‘motivated to quit’. To be on the conservative side, one might read them as implying a continuous abstinence rate at 12 months for ‘motivated’ quitters of 5 percent (rounding up the 4.2% in the table).

Table B.2		
Abstinence Rates reported in Cohen et al. (1989) paper		
Median results from 8 studies (six-month) and 6 studies (twelve-month)		
	Point-prevalence abstinence	Continuous abstinence (Not a puff)
Six-month	13.2%	4.9%
Twelve-month	13.9%	4.2%

The paper also contains information on relapse rates. Percentages were calculated for four studies for those continuously abstinent at 6 months who relapsed before 12 months. The range was from 7 to 35 percent, with a median relapse rate of 24 percent. The paper notes, however, that quitting smoking is a dynamic process, not a discrete event and that significant numbers initiate successful long-term quitting subsequently (page 1363), at least partly offsetting relapses.

B.3 Conclusion on 12-months continuous abstinence rate:

The above somewhat scanty sources are consistent, in the author’s view, with a latent 12-months continuous abstinence quit-rate of about 2.5 percent for the population as a whole, or at least that portion of it aged 25 and over. For those sufficiently motivated to quitting to seek assistance, one would expect a higher quit-rate, perhaps of the order of a continuous abstinence quit-rate for 12 months of 5 percent.

C Client numbers – ‘pre’ and ‘post’ NRT

C.1 ‘Population’ or ‘Client’ approach?

There are two broad ways of measuring the success of a specific anti-smoking initiative. The first is to measure the reduction in smoking prevalence for the population as a whole. The second is to measure the reduction in smoking prevalence for identified ‘clients’ having personal contact with the anti-smoking initiative.

Both have their disadvantages.

The ‘population’ approach is applicable only for large-scale programmes reaching a significant proportion of the general population of smokers or potential smokers. The difficulties with it are –

- (i) Measuring with sufficient statistical accuracy any change in the prevalence of smoking for the general population.
- (ii) Disentangling the effects of a specific anti-smoking initiative from the effects of other factors; such as changes in taxes on tobacco, other anti-smoking legislation, changes in social attitudes towards smoking, population ageing (prevalence falls with age past middle-age), etc.

The main difficulty with the ‘client’ approach is that the clients are unlikely to be representative of the smoking population from which they come. They will be more motivated to quit than smokers in general, and so their success rate can be expected to be higher.

On the other hand, a focus on ‘client success’ alone will mean ignoring any general population effects of an anti-smoking initiative. There are certainly many people who will have become aware of the Quit campaign, and may have been encouraged by it to quit, even though they did not contact the Quit group.

None of the above points make it impossible to evaluate the success of the Quit Group in reducing smoking. They do make the task more difficult, and will widen the range of uncertainty about the results of an evaluation.

In this report preference is given to the “client” approach to measuring success. This approach, however, might well understate the overall success of anti-smoking initiatives by ignoring the help that Quit Group publicity gives would-be quitters even though they do not choose to personally make use of the services the Quit Group offers.

C.2 Client numbers – the Quit Service pre-NRT

New clients phoning Quitline would speak first to the Call Centre. They would then optionally be put through to a Quit Advisor. In either case they would be sent a Quit Pack.

The number of calls rose by 10 times in November 2000 with the introduction of NRT services. This increase also affected October numbers (the last week of October extending into November). March-September statistics are used, therefore, to calculate monthly averages for the pre-NRT period. It should be noted that the tobacco tax rise in May 2000 led to a surge in calls during that month.

During the March-September period, there were 2,745 ‘captured new callers’.

For the purposes of this report, 2,750 ‘clients’ per month is assumed.

Source of client information about the Quitline service

From information supplied by the Quit Group, approximately 45% of “captured” callers indicated they had got the Quitline number from television.

C.3 Client numbers – the Quit Service post-NRT

An average of 3,179 persons per month were sent a first NRT exchange card during 2001/02, entitling them to subsidised dispensation of either a nicotine patch, or gum.

D Measurement of Costs

D.1 List of cost components

The cost components are –

(i) Quit Group Costs

The largest part of these are the costs of the Quitline part of the Quit Group's activities, including Quit Group 'overheads' allocated to the Quitline programme.

In addition, some other of the Quit Group's programmes contribute to the Quitline's work. For example, the TV advertising would play a part in encouraging smokers to phone the Quitline. A suitable share of the costs of these other programmes should therefore be included with Quitline costs.

(ii) Other government financing of 'quit' programmes.

- Costs of leaflets, brochures, etc., purchased by the government for the Quit Group's use.
- The subsidy cost of NRT pharmaceuticals.
- The subsidy cost of GP consultations, if required before embarking on nicotine replacement therapy.

(iii) Personal costs of smokers.

- The 'out-of-pocket' cost of GP consultations, if required.
- NRT co-payments.

All of the above – (i) to (iii) - are clearly part of the resource costs or 'opportunity costs', from society's perspective, of the Quit initiative. More debatable are the following three items, which in some analyses are credited to smoking cessation initiatives as 'averted costs'.

(iv) Savings from reduced loss in production, in its most general sense, because of lesser absence from work, higher productivity, etc., of non-smokers.

(v) Savings to smokers from reduced spending on tobacco products.

(vi) Savings in health expenditures on smoking caused illnesses.

We deal first with these final three items. Of them, there is certainly a case for item (iv), but the estimates are problematic. For instance smokers have lower rates of labour force participation, but this is partly because of the association of smoking with other socio-economic factors influencing labour force participation. It would be

difficult to identify separately the effects of the different determinants, and the attempt is not made here.

On item (v), smokers' savings would be spent on other goods and services, at approximately the same overall resource cost to society, so there is no saving in terms of total resource costs. However, it is often argued that there is extensive evidence that most tobacco consumption results from nicotine dependency, rather than because of any pleasure received from consumption, and therefore a switch to consumption of other commodities results in an increase in consumption utility. We do not pursue this argument any further, however.

Item (vi), the putative savings on health-care expenditure from lower smoking prevalence, has received some debate in the literature. A current estimate of the increased health-care spending caused by smokers is of the order of \$300 million per year¹⁷. It has been argued, however, that these additional costs caused by smokers are out-weighted by the cost savings from smokers dying younger on average. Evidence that preventing fatal diseases in general can increase health-care costs is given in Bonneux et al. (1998). For smoking-caused illnesses a detailed analysis is given in Manning et al. (1991). Against this, are claims in the opposite direction by Hodgson (1992), and in a recent World Bank report the following remarks –

“In any given year, on average, a smoker’s health care is likely to cost more than that of a non smoker of the same age and sex. However, because smokers tend to die earlier than non smokers, the lifetime health care costs of smokers and non smokers in high-income countries may be fairly similar. Studies that measure the lifetime health care costs of smokers and non smokers in high-income countries have reached conflicting conclusions. In the Netherlands and Switzerland, for example, smokers and non smokers have been found to have similar costs, while in the United Kingdom and the United States some studies have concluded that smoker’s lifetime costs are in fact higher. Recent reviews that take account of the growing number of tobacco-attributable diseases and other factors conclude that, overall, smoker’s lifetime costs in high-income countries are somewhat greater than those of non smokers, despite their earlier deaths. There are no such reliable studies on lifetime costs in low-income and middle-income countries. “
(World Bank, 1999, p33)

See also Max (2001). It should be added that the net effect is influenced by the discount rate chosen. The decision in this report is to exclude consideration of the health-care costs of smoking-caused disease.

The report returns now to items (i) to (iii) above.

¹⁷ Unpublished estimates, O’Dea. Details can be supplied on request. See also Phillips et al. 1992 for a similar earlier estimate.

D.2 Quit Group Costs

Table D.1 summarises financial information from recent published annual reports of the Quit Group. The focus is on the information for the 'pre-NRT' nine months up to November 2000, and for the 'post-NRT' 12 months ending June 2002. Table D.2 gives information on capital outlays.

Quitline and Quit Media are the dominant components of the Quit Group's activities in the first period. In the later period there is also substantial expenditure on Quit Group overheads, the DHB programme for NRT in hospitals, and World Smokefree Day. The question is what proportion of these 'non-Quitline' activities have an effect on the number of people making use of Quitline services?

\$(thous.) GST excl.	9 months to 30/11/00	7 months to 30/06/01	12 months to 30/06/02
Cost of Services:			
Quit Group	0.0	346.0	768.4
Quitline	870.0	1,230.6	1,828.4
Quit Media	1,046.7	366.5	2,084.9
DHB Programme	17.9	519.3	993.1
NRT Programme	19.6	27.5	74.9
World Smokefree Day	45.6	585.8	353.0
Total	2,000.0	3,075.7	6,102.7
(DHB, NRT, & WSD)/total	4.2%	36.8%	23.3%
Source:	Reports of <i>The Quit Group Charitable Trust</i> :-		
	- Seven-month period ended 30 June 2001		
	- Year ended 30 June 2002		

Table D.2**Quit Group Fixed Asset Expenditures ; 2000-02**

\$(thous.) GST excl.	9 months to 30/11/00	7 months to 30/06/01	12 months to 30/06/02
Fixed Asset Expenditures:			
Building Fit Out		82.6	114.1
Computers	76.9	145.9	212.4
Furniture and Fittings	14.6	22.8	62.5
Office Equipment	72.8	64.3	66.8
Total	164.2	315.5	455.8
Depreciation:			
Cumulated	46.7	44.7	150.7
Net	46.7		106.0
Annual Depreciation rates are -			
- Building Fit Out	33% + Straight Line	To zero 31/12/03	
- Computers	33% Declining Balance		
- Office Equipment	20% Declining Balance		
- Furniture and Fittings	20% Declining Balance		
Source:	Reports of <i>The Quit Group Charitable Trust</i> :-		
	- Seven-month period ended 30 June 2001		
	- Year ended 30 June 2002		

Capital expenditure by the group is not high – consisting mainly of office fit-out and office equipment, including computers, and with high depreciation rates. Rather than follow the standard approach in cost-benefit analyses of treating investment as a cost in the years in which it occurs, it seems better to include annual depreciation costs with other annual costs. This is done in the tables that follow.

Table D.3 gives a breakdown of costs by type – depreciation, fixed costs, and variable costs – so far as the latter two can be split – and by the different Quit Group programmes.

Table D.3		Quit Group Costing Information		
	Quitline Activities without NRT	Quitline Activities with NRT	Other Quit Group Activities	
GST exclusive	Mar-Nov. 2000 incl.	Y.e. 30/6/02	Y.e. 30/6/02	
A: Depreciation				
Fixed assets & building fit-out	\$46,577	\$70,661	\$35,331	Total \$105,992 for '01/02. Allocated 2:1 Q-L: Other
B: Fixed Cost/Overheads				
Not varying directly with people helped Includes Depreciation from above.	\$130,507	\$274,267	\$115,261	Quit Group
			\$312,735	Quit Media
			\$148,962	DHB Programme
			\$11,242	NRT Programme
			\$52,944	World Smokefree Day
			<u>\$641,144</u>	Total
C: Variable Costs				
Varying directly with people helped	\$739,541	\$1,554,181	\$653,147	Quit Group
Varying directly with people helped			\$1,772,165	Quit Media
Excludes Quit Group Book, & also also NRT Exchange Vouchers (paid for by Ministry)			\$844,119	DHB Programme
			\$63,704	NRT Programme
			\$300,018	World Smokefree Day
Includes Quit Packs			<u>\$3,633,153</u>	Total
Total Costs, excl. depreciation	\$870,048	\$1,828,448	\$4,274,297	
All Quit Group, incl. QuitLine	\$2,000,000		\$6,102,745	
Source: Quit Group staff				

Three possible cost variants are given in Table D.4. The first 'Low cost' variant includes only costs directly related to the Quitline itself, excluding other Quit Group activities.

However at least some other of Quit Group programmes contribute to Quitline outcomes, including obviously the 'Quit group' as a whole, and also 'Quit Media'. On the other hand, the DHB programme and the NRT programme (NRT supplied to other providers for them to administer) do not contribute, or only in a small way, to Quitline outcomes. The 'World Smokefree Day' (WSD) programme was focussed on second-hand smoke, so also would have probably little effect on Quitline calls.

The 'High Cost' variant therefore includes all Quit Group costs, with the exception of DHB, NRT, and WSD costs.

However, the Quit Media programme benefits not only Quitline clients but also smokers in general, and some deduction should be made to allow for this. As mentioned earlier, in 2000 some 45% of those contacting Quitline were made aware of the Quitline number by television (and smaller proportions by radio and newspapers). A 'Middle Cost' variant is given, therefore, being the Low cost variant plus 45% of the difference between the Low and High cost variants.

The pre-NRT and post-NRT costs cover time periods of different lengths – 9 and 12 months respectively – so for comparison the results are expressed as monthly

costings. For the “Middle Cost” case, the monthly average cost pre-NRT is \$149,017; and post-NRT \$252,660. Changes in the general price level were relatively insignificant over the period.

Table D.4		
Range of Costings: Quitline without and with NRT.		
GST exclusive	Quitline Activities without NRT	Quitline Activities with NRT
	Mar-Nov. 2000 incl.	Year to 30/6/02
Low Variant: Quitline alone		
Overheads (incl. Depreciati	\$130,507	\$274,267
Variable Costs	\$739,541	\$1,554,181
Total - Low	\$870,048	\$1,828,448
Annualised	\$1,160,064	\$1,828,448
Per month	\$96,672	\$152,371
High Variant: All Quit Group less DHB, NRT & WSD programmes		
Overheads (incl. Depreciati	\$130,507	\$675,425
Variable Costs	\$1,869,541	\$3,827,409
less DHB, NRT & WSD p	-\$83,100	
Total - high	\$1,916,948	\$4,502,834
Annualised	\$2,555,931	\$4,502,834
Per month	\$212,994	\$375,236
Middle Variant: Low plus 45% of (High less Low)		
Overheads (incl. Depreciati	\$130,507	\$454,788
Variable Costs	\$1,210,646	\$2,577,134
Total - middle	\$1,341,153	\$3,031,922
Annualised	\$1,788,204	\$3,031,922
Per month	\$149,017	\$252,660
Note:	'NRT programme' excluded from 'High' option refers to exchange cards supplied through health providers. DHB is programme in hospitals WSD is World Smokefree Day expenditure	

D.3 Other government costs. Quit Packs and Post-NRT material

- Quit Packs. From Folio Communications a recent print run of Quit Packs averaged 38 cents per copy.
- Printed materials. Folio Communications has supplied details of post-NRT materials commissioned from them by the Ministry of Health. This information is given in Table D.5, and approximate cost estimates drawn from it are given in Table D.6. The costs are not major additions to the overall total.

Table D.5					
Quit Materials funded directly by Ministry of Health.					
(I.e. not from Quit Group budget)					
Date completed	Numbered Exchange Cards (A6)	Unnumbered Exchange Cards (A6)	A5 flyer in pads of 25 'Want Help to Quit Smoking?'	Print Cost excluding GST Invoiced to MoH or General Smokefree Budget	
Aug-01	100,000			\$4,721.17	SF
Sep/Oct 2001	20,000			\$3,028.99	SF
Sep/Oct 2001		50,000		\$3,604.79	SF
May-02	20,000			\$2,425.24	SF
Jun-02		30,000		\$2,555.04	Inv
Jun-02			5,000 pads of 25	\$5492 (including plus \$650 FCL management)	Inv
Total	140,000	80,000	125,000	\$22,737.23	
In addition in November 2000					
Professionals' Information Packs					
Sent to all pharmacists & smokefree cessation service providers - approx 7745 addresses					
Total 8,000 packs -					
	8,000 sample cards		87,000 pads of 25		
	+ example exchange card		+ 5,000 single sheets		
	+ MoH letter		and 25,000 A5 pamphlet		
			'Information for Health Professionals'		
In addition -	95,000				
	plus 5,000 pilot exchange cards				
Total				\$60,201	
<i>Source: Information provided by Folio Communications Ltd (FCL)</i>					

Table D.6			
Approximate Additional Costs derived from Folio Communications material			
Professionals' Information Packs			
	Cost in November 2000	\$60,201	
	<i>less</i> 100,000 exchange cards		
	@ assumed 5 cents each	-\$5,000	
	8000 packs	\$55,201	\$27,601 per year
			Assume repeated every two years
Quit materials for smokers - 2001/02 year			
Overheads	Design & management	\$1,402	
Unit costs	A5 flyer - 5000 pads, 25 sheets	\$5,000	4 cents per sheet
	Numbered exchange cards		15 cents per card
			Assume Range \$0.047-\$0.151 /card
Summarising -			
	Overheads		\$29,003 per year
	Quit materials in 2001/02		
	- Cards redeemed (Aug '01 to Jul '02)	88,640	
	of which 76.2% QL (ex. H'lth Provider)	67,578	
	- Cards despatched, at 77% redemption	87,764 @ 15 cents	\$13,165 per year
	- Flyers despatched - assume 1.5 per voucher	131,645 @ 5 cents	\$6,582 per year
	Total (excl. Health Providers programme)		\$48,749 per year
Plus Quit Pack printing costs		\$0.38 per copy	\$25,680 per year

The 76.2 percent of cards allocated to the Quitline programme, as against the remaining 23.8% issued directly by Health Providers, is from information provided by HealthPac.

The redemption rate in table D.6 is derived from the following table from a BRC survey. An average lag of about one month from issue of an exchange card to redemption is assumed, hence the use of the total from August 2001 to July 2002.

D.4 Cost of NRT exchange cards

The current situation is set out in the table below, supplied by the Ministry of Health. A card can be exchanged for four weeks supply of one of the five given options. The 'Reimbursement Cost' is the refund the pharmacist obtains from HealthPac, excluding the \$5 co-payment paid by the person exchanging the card.

Table D.7
Redemption Rates - NRT Exchange Cards

All cards	77.0%
1st cards	79.0%
2nd cards	69.0%

Source: *Redemption Rates - BRC (August 2002).*

Percent of Redemptions which were Quitline Aug'01/Jul'02 76.2%

Source: *Data supplied by HealthPac*

Redemptions - number of cards

Card	Sample during May 2002		
1	1057		
2	608		
3	198	Average =	1.715
4	123		
5	14		
	2000		

Source: *BRC Report to Ministry of Health*

Table D.8 **Cost of NRT Cards**
As of 1 October

	Dru \$ excl.	Patc 5	Patc 10	Patc 15	Gu 2	Gu 4
Schedule						
1 weeks		\$7.8	\$7.9	\$8.0	\$10.0	\$13.4
4 weeks		\$31.5	\$31.8	\$32.1	\$40.1	\$53.6
Mark up		\$1.5	\$1.5	\$1.6	\$2.0	\$2.6
Dispensing		\$5.7	\$5.7	\$5.7	\$5.7	\$5.7
less Co-		\$5.0	\$5.0	\$5.0	\$5.0	\$5.0
Reimbursement		\$33.8	\$34.1	\$34.4	\$42.8	\$57.0
Total Cost - 8 weeks						
Incl. Co-		\$77.7	\$78.3	\$78.9	\$95.6	\$124.0
Excl. Co-		\$67.7	\$68.3	\$68.9	\$85.6	\$114.0
Weighte		290	430	1082	67	131
Total (4	\$36.0	\$4.9	\$7.3	\$18.6	\$1.4	\$3.7

NRT prices have changed over time, those given in the table being lower than in earlier years. It is appropriate to use current prices rather than those ruling in 2001/02 for an evaluation to be used in present-day policy-making. (On the earlier schedule, the average cost of redeeming a card was \$50.34. This includes the co-payment by the card recipient.)

The weights at the bottom of the table show the relative use of each of the five options (from the BRC report to the Ministry). They are used to calculate the overall average reimbursement cost of \$36.09 per card. This amount does not include the \$5 co-payment.

D.5 Personal costs of smokers.

Mainly the 'redemption fee' for NRT exchange cards, currently \$5 per card. Also the average cost of a GP consultation for those whose medical condition requires this. This last amount is not included in Table D.8. Offsetting this is the saving from private purchases of NRT, now subsidised.

D.6 Total Cost of Quitline with NRT.

Card redemption numbers totalled 88,640 for the year to July 2002, at an average cost of \$41.09. (This cost, excluding GST, is derived just above. The price is based on the current price schedule, from 1 October 2003, rather than the earlier price schedule.) However these numbers also include redemptions of cards issued separately by health providers under the 'NRT Programme'. Deducting these, estimated as mentioned above at 23.8% of the annual total, leaves a total of 67,544. This equates to a monthly average of 5,630 card redemptions.

Bringing this information together provides the 'post-NRT' costings in Table D.9. These include all publicly funded costs of the NRT scheme (with the relatively minor exception of the subsidy cost of GP consultations, where required prior to the use of NRT, and where the person had a Community Services Card), and also the card recipients' co-payments.

Table D.9			
Range of Costings: Quitline with NRT 2001/2002			
\$ excl. GST	Cost Variants		
	Low Quitline Only	Middle Low + 45% of extra 'High' costs	High All Quit Group except DHB, NRT & WSD programmes
Included in Quit Group Budgets			
Overheads	\$274,267	\$454,788	\$675,425
<u>Variable Costs</u>	<u>\$1,554,181</u>	<u>\$2,577,134</u>	<u>\$3,827,409</u>
Total	\$1,828,448	\$3,031,922	\$4,502,834
Quit Materials paid for by Ministry of Health			
Overheads	\$29,003	\$29,003	\$29,003
<u>Variable Costs (2001/02)</u>	<u>\$45,426</u>	<u>\$45,426</u>	<u>\$45,426</u>
Total	\$74,429	\$74,429	\$74,429
Total Cost of NRT Exchange Cards			
67,544 cards redeemed Aug '01 to Jul '02 inclusive. At average \$41.09 per pack. Excluding packs redeemed through Health Provider Programme Including smokers' own part-fee contribution to NRT costs			
Variable Costs (2001/02)	\$2,775,383	\$2,775,383	\$2,775,383
Overall total			
Overheads	\$303,270	\$483,791	\$704,428
<u>Variable Costs (2001/02)</u>	<u>\$4,374,990</u>	<u>\$5,397,943</u>	<u>\$6,648,219</u>
Total	\$4,678,260	\$5,881,734	\$7,352,646
Monthly average	\$389,855	\$490,145	\$612,721
Notes:			
a	'NRT programme' excluded from 'High' option refers to exchange cards supplied through health providers.		
b	Above estimates exclude - - cost of any GP consultation required (patient cost + GMS subsidy) - any reduction of smokers' own independent NRT purchases		

For the Quitline with NRT programme, the average total monthly cost for 2001/02 ranges from \$390,000 to \$613,000, with a 'Middle' value of \$490,000.

E Numbers quitting smoking as a result of the Quitline service.

E.1 Assumed Quit Rate for pre-NRT service

As a working assumption, it is assumed here that the effect of the Quitline service (pre-NRT) is to increase the 12-month period abstinence rate by 2.5 percent, from 5 to 7.5 percent.

This assumption means that there are an extra 2.5% of 2,750, or 68.25, persons calling per month who manage to quit as a result of the original Quitline service.

E.2 Cost per quitter - pre-NRT service

A range of estimated monthly costs for the pre-NRT Quitline service were given earlier. This information provides the following table on cost per quitter.

\$	Assuming 2,750 callers per month		
	Low	Middle	High
Monthly Quitline cost	\$96,672	\$149,017	\$212,994
Quitters	68.75	68.75	68.75
Cost per quitter	\$1,406	\$2,168	\$3,098

Cost per quitter ranges from \$1,406 to \$3,098; with a 'mid' value of \$2,168. These costs are very much dependent on the assumption about the number of quits likely to have been achieved by the Quitline service.

E.3 Estimating the Quit Rate for the post-NRT service

The firm of BRC Marketing & Social Research has carried out over the past year a follow-up telephone survey of just over 2,000 people (of whom 1,000 were Maori, deliberately over-sampled in relation to programme proportion of about 20 percent) who used the Quitline NRT programme. The sample was from those assessed by Quitline as appropriate to receive NRT, and thus sent out their first Exchange card, to be used for obtaining Nicotine Replacement Therapies (patches or gum) at community pharmacies. The numbers quoted in this section are in general from BRC's report on their evaluation of the NRT programme.

Those surveyed initially consented to be interviewed at times three weeks, six months, and 12 months after initial contact. However, the main focus in the BRC report was

on those who were quit at six and 12 months, and in between, for the reasons set out in the following comments from BRC (e-mail of 22/4/04) –

“As the Quitline service is operating in a real world situation, we needed to consider this when in doing the Evaluation. Unlike some studies on Smoking cessation, the Quitline programme participants did not set a specific quit date. We were not able to survey them at the set quit date, or even at a particular time after this. We surveyed them instead at the time that was 3 weeks (actually ranging from 2 to 4 weeks) after they had been sent the Exchange Card to use to get NRT Patches or Gum (This timing would mean that all programme participants would have received a Quit Pack and an NRT Pack and would (probably) have had time to redeem their Exchange Card. We determined that it is likely that many programme participants would not have quit until they received their Exchange Card i.e. they may see the Exchange Card as fundamental to their quitting). We discussed the options of using the 3 week data and using a continuous quit measure. We decide not to focus on this early period or use continuous quit for a number of reasons

- We did not use continuous quit mainly because the collection of a continuous quit rate would only ever be an approximation of the data reported in the international literature because the data collection methods used in the evaluation would not be as rigorous (i.e. quit status could not be measured from a pre-designated “quit day” and quit status could not easily be confirmed by verification testing)
- We did not focus on the early (3 week) data, as it does not allow for the typical ‘real-life’ quit attempt-relapse-quit attempt cycle of smoking cessation, that data at later points can allow for (i.e. quit behaviour 6 months is more likely to reflect longer-term sustained quit behaviour).”

However, BRC has supplied additional material, further commented on below.

(a) Quit rates at 6 months and 12 months

BRC report that, of the 2002 in total in the cohort survey, they were able to interview 1,280 at 6 months, and 841 at 12 months. This sort of attrition is unfortunately common in these surveys. Table E.2 gives the quit rate estimates from the BRC report.

It is important to note that the estimated quit rates are conservative, in counting all non-respondents as non-quitters.

Table E.2		
Quit Rates, after survey attrition - BRC Report.		
Total Population	Point Prevalence Quit-Rate	Continuous Quit-Rate
Quit at 6 months	22.0%	
Quit 3 weeks to 6 months		13.0%
Quit at 12 months	13.0%	
Quit 3 weeks to 12 months		7.0%
Quit 6 months to 12 months		9.0%
Source:	BRC	
Definitions:	Point Prevalence rate.	"Not smoked for 2 days".
	Continuous Quit rate.	Quit at start, end, and in between.
	For both, non-respondents are counted as 'non-quitters'.	

Table E.3 gives more detail on the six months to twelve months 'continuous abstinence' rate.

Table E.3 Estimated 6 and 12 months Quit Rates NRT programme			
Obtained from BRC 2002/03 cohort survey of 2002 persons			
	Point Prevalence Quit rates; at		Longer Term Quit rate
	6 months	12 months	6 to 12 months
Estimated rate	21.6%	13.5%	9.0%
(95% CI)	(± 2.9%)	(± 3.6%)	
Source:	BRC report.		
Definitions:	Point Prevalence rate.	"not smoked for 2 days".	
	Longer Term Quit rate.	Quit at 6 months, 12 months, and in between.	
	For both these, non-respondents are counted as 'non-quitters'.		

(b) Adjusting 'continuous abstinence' quit rates for survey attrition

Of most importance for this report are the 'period', or 'continuous abstinence', quit rates – particularly for the 3 weeks to 12 months and 6 month to 12 month periods - as these are closest to the 'permanent' or 'lifetime' quit rate. Most of the health gains from quitting accrue to those who quit permanently.

The rates in the tables above are, however, undoubtedly on the conservative side, because of the assumption that all persons not contacted have failed in their attempt to quit. We attempt therefore to adjust for this, starting with the 6 to 12 month period.

Of the 845 interviewed at 12 months, 169 had quit 'long-term'. This, expressed as a proportion of the initial 2002, gives a quit rate of 8.4 percent. However these are 'unweighted' numbers, not allowing for the additional sampling of Maori. On a weighted basis, the quit rate is the 9.0 percent¹⁸ given in the tables.

Note that:

- 'Quits' are defined as those who were quit at 6 months, and remained quit at 12 months, and also remained quit in between (not smoked more than 1 cigarette on 2 consecutive days).
- 'Not quit' includes 'No data' (no 6 month or no 12 month response), as well as smoking at 6 months, or at 12 months, or in between.

These criteria mean that the definition of the quit rate is a stringent one. It should be regarded as in effect a lower bound to the quit rate, rather than the actual quit-rate. (Not quite the theoretical lower bound, perhaps, as some respondents might not care to report failure. But almost certainly below the actual rate.)

In particular:

- (a) There is some suggestion, from e.g. Australian data, that 'lapsers' do succeed in quitting on a second or subsequent attempt.
- (b) Some of the non-respondents may also have successfully quit.

Focusing on the second point, of those responding at 12 months, the successful quit rate was exactly 20 percent. It would be too optimistic of course to assume the same success rate applied to all non-respondents. But it is not unreasonable to assume that a proportion of non-respondents also succeeded in quitting as a result of NRT treatment (in addition to those who would have managed to quit anyway).

BRC have provided some relevant information. First, the number of respondents fell from the original 2002 at 3 weeks to about 1,280 at 6 months, and then to 845 at 12 months. The personal characteristics of those who continued to respond have been compared with those dropping out at each stage. The different groups are reported to be virtually identical on all characteristics (personal communication. A Dowden (BRC)).

Secondly, the number of those refusing to be interviewed, as against those 'unavailable during survey period / no such number / no answer / moved', is relatively small. At the 12 month survey, 55 refused, whereas 313 fell into the other categories (some others were not interviewed for other reasons – for example saying at the end of their six-month interview that they would not be available for interview at 12 months). It seems likely that the first category would include more of those who have failed to quit and feel bad about it, and that the second category would include a

¹⁸ See footnote 3.

proportion of successful quitters. Based on these assumptions, quit-rates are estimated in Table E.4.

Table E.4		12 months BRC cohort survey results	
		Continuous Quit-Rates	
Original n=2,002			
Quit 6 months to 12 months			
Interviewed		845	
of whom	Quit	169	20% of 845; 8.4% of 2002
	Not quit	676	
Not interviewed		368	
of whom	Refused	55	
	Other	313	
Suppose quit rate of 20% applies also to 'Other'			
	Additional quits	62.6	
	Total quits	231.6	11.6% quit rate of 2002

If we assume that the quit rate of 20% found for those 845 interviewed applies also to the 313 in the 'not contactable, etc' category, the overall successful quit rate in terms of the original cohort numbering 2002 would be 11.6%. If the actual quit rate for this group should be somewhat lower than 20%, this would be offset by a proportion of those not contacted at 6 months, who can also be expected to have successfully quit.

Note that this calculation is based on 'unweighted' numbers. On a 'weighted' basis the proportion could be of the order of 12%.

The same procedure could be applied to the 3 weeks to 12 month period, but becomes more dubious over a full 12 months. Instead it could be assumed that the rate for this period should be scaled up proportionately, that is by a factor (11.6 / 9), from 7.0 to 9.0 percent.

(c) Comparison with Australian results

Table E.5		
Comparison of Australia - New Zealand Quit Rates		
Grigg and Waa, 2003		
	New Zealand	Australia
Six-months point prevalence	34.1%	23.0%
Six-months sustained cessation	20.5%	7.0%

The pre-NRT New Zealand Quitline service was modelled on the Australian Quitline. Evaluations of the Australian programme might therefore provide useful information

for our purposes. Grigg and Waa used initial results from the BRC cohort survey, including most of those surveyed at 6 months, to make the following comparisons with the outcomes of the Australian Quitline.

The quit rates used in this comparison are less stringently defined than those from the BRC report. Non-respondents are not automatically counted as non-quitters. The Australia-New Zealand differences are clearly significant. They provide pretty convincing evidence that adding NRT to a standard smoking cessation telephone support programme does improve the success rate.

(d) Chosen ‘continuous abstinence’ quit rates

From the discussion above, two estimates of the 3 weeks to 12 month ‘continuous abstinence’ quit rate are chosen for subsequent use. They are –

- A ‘lower’ rate of 9.0 percent
- A ‘higher’ rate of 11.6 percent.

These calculations are intended to provide estimates of the extra quits achieved by the Quitline programmes, compared with what would have been achieved had there been no Quitline programme.

There is another factor that should also be mentioned here. From the BRC cohort survey, it is now possible to examine differences in the characteristics of those smokers calling Quitline, and the general smoking population. The draft BRC report notes that success in smoking cessation is, according to the literature, more likely with older age, higher education, higher socioeconomic status, lower nicotine dependence/tobacco consumption, and non-cohabitation with another smoker. The report also notes that participants in the Quitline NRT programme tend, from the cohort survey, to be younger, of lower educational and socioeconomic status, heavier smokers than the general smoking population (29% smoking over 20 cigarettes per day, compared with 13% for all smokers), and to be co-habiting with other smokers.

In other words, it appears that those contacting the Quitline are those who would have particular difficulty in quitting from their own efforts. Their ‘latent’ quit rate would therefore be lower. This potentially important factor has not been taken into account in the calculations for this report.

E.4 Cost per quitter for NRT programme

From the preceding material on costs and quit rates, the ‘cost per quitter’ can be calculated, on the various definitions of ‘quitting’. The results are given in Table E.6. Thus the cost for the ‘Middle’ costing variant is \$714 per person quit at 6 months. For the overall long-term quit rate of 9 percent, the cost is \$1,713 per quitter, or, if the rate is increased to 11.6% as discussed earlier, the cost is \$1,329 per quitter.

	Cost per quitter for Quitline NRT programme			
	Middle' cost variant		Various 'Quit' definitions	
	Point Prevalence rates; at		Longer Term Quit rate - 12 mos	
	6 months	12 months	Unadjusted	Adjusted for non-respondent quitters
Quit rate	21.6%	13.5%	9.0%	11.6%
Quitters per month	687	429	286	369
NRT Programme cost per month ('Middle' variant)	\$490,145	\$490,145	\$490,145	\$490,145
Cost per Quitter	\$714	\$1,142	\$1,713	\$1,329
Source:	Previous tables			
Notes:	Based on 3,179 persons per month sent first exchange card during 2001/02			

F: Estimates of the Health Benefits of Smoking Cessation

The next step is to calculate the average life-years gained per permanent quitter, plus, if possible, extra quality of life gained prior to death.

F.1 Life Expectancies – smokers and non-smokers

An upper limit on potential life-years gained is given by the difference in life expectancy between ‘smokers’ and ‘non-smokers’. For New Zealand an estimate of this is provided by the abridged life tables in Tobias and Cheung (2001). For males the difference is 8.4 years at age 15, and for females 5.5 years. As shown in Table F.1 these differences remain relatively constant to around age 45 to 50.

Exact age	Males	Females
15	8.4	5.5
20	8.5	5.5
25	8.5	5.5
30	8.5	5.6
35	8.3	5.5
40	8.2	5.5
45	8	5.4
50	7.6	5.2
55	7.1	4.8
60	6.4	4.4
65	5.6	3.7
70	4.5	2.9
75	3.3	2
80	2.1	1
85	1.3	0.2

Source: Inhaling Inequality (Tobias and Cheung, 2001)

Actual years gained on average by a quitter at a given age will be less than these differences, because of the damage already done.

F.2 ‘Quality of Life’ adjustments

‘Quality of life’ gains are less easily estimated than years of life gained. In this section we develop an approximate method for calculating them, before returning to the measurement of life-years gained. The starting point is the Ministry of Health publication *Our Health, Our Future*. (1999). Estimates are given in this publication of the Disability-Adjusted Life-Years (DALYs) associated with various causes of injury and death. That is, the sum of ‘Years of Life Lost’ (YLL) because of premature mortality, and ‘Equivalent Years Lost due to Disability’ (YLD) because of lessened quality of life prior to death.

$$\text{Thus DALYs} = \text{YLD} + \text{YLL}$$

We seek here to establish, for smoking-caused diseases, the approximate ratio of YLD to YLL, so that given estimates of YLL, approximate measures of YLD can then be added.

Part A of Table F.2 shows, for four major disease groups for which smoking is an important causative factor (the four headings account for around 70 to 75 percent of smoking-caused deaths – *Our Health, Our Future* page 360), total population estimates of YLL and YLD for 1996. (YLD are obtained here as the difference between DALYs and YLL.) As the table shows, the ‘morbidity’ component of the total for lung cancer is relatively small, because of the quick progress of that disease once diagnosed, and for CORD is relatively high. Cardiovascular diseases lie in between.

Table F.2 Calculation of 'Quality of Life' Adjustment						
1996 New Zealand Data						
A: DALYS lost from selected causes, by gender.						
Cause	Males			Females		
	YLL	YLD	DALY =YLL+YLD	YLL	YLD	DALY =YLL+YLD
IHD	38,570	5,412	43,982	25,526	4,296	29,822
Lung Cancer	10,245	789	11,034	6,413	472	6,885
Stroke	8,915	3,882	12,797	13,425	3,893	17,318
CORD	8,337	7,570	15,907	7,093	4,848	11,941
Total	66,067	17,653	83,720	52,457	13,509	65,966
Source: <i>Our Health, Our Future</i> Table 66, Page 260; & Table 73, Page 269						
YLL = Years of Life lost YLD = Equivalent Years lost due to Disability						
B: Ratio of 'Quality of Life' loss in excess of Years of Life Lost						
Cause	Males		Females			
	DALY/YLL	YLL smoking-attributable	DALY/YLL	YLL smoking-attributable		
IHD	1.14	13,625	1.17	5,208		
Lung Cancer	1.08	12,801	1.07	6,289		
Stroke	1.44	2,506	1.29	2,124		
CORD	1.91	8,790	1.68	5,368		
Total	1.27	37,722	1.26	18,989		
Total, YLL-weighted		1.32		1.30		
Source: <i>Our Health, Our Future</i> Table 105b, Page 360						
IHD Ischaemic Heart Disease						
CORD Chronic Obstructive Respiratory Disease						

Part B of the table shows the extent to which the inclusion of YLD increases the DALY total. Overall the increase is just over 25 percent for both males and females. However, weighting by the smoking-attributable YLL for the various causes of death

increases the ratio to 30 percent or over for both. If in addition one allows for discounting, with YLD occurring before YLL, an appropriate ratio can be taken as being about 1.33 when future benefits are being discounted.

Thus a simple adjustment to lost life-years to include 'quality of life' aspects as well is to increase the former by about a third.

F.3 Potential Years of Life Lost

The construction of detailed New Zealand estimates for Potential Years of Life saved per smoker quitting would be a sizeable task. In principle one should take account of the age of the quitter, number of years smoking, and how heavy a smoker the person has been.

The short-cut taken here is to rely on estimates from overseas studies. These are tested subsequently in sensitivity analyses. A very useful source is the Woolacott et al. review (2002). See in particular pages 50-51, and Appendix 10 (pages 205ff).

The table following details the key results.

In brief, Years of Life saved do not exceed 2 per quitter, with the exception of the Doll et al. study of British doctors. The gain is greater per 'permanent' or 'life-time' quitter, than per 'quitter at 12 months'; by an amount depending on the assumed or actual relapse rate.

As a reasonable summary of the tabulated values, a gain of 1.5 Life-Years on average per lifetime quitter could be assumed, at a zero discount rate. The equivalent QALY gains would be 2.0 QALYs.

To quote Woolacott et al:

“An assessment of the results from the range of studies (see Appendix 10) and consideration of the results obtained by Doll and co-workers suggests that a figure of 1.0-3.0 life-years saved per long-term quitter seems reasonable.”
(page 51)

And

“It appears that the number of QALYs per quitter should be around one-third greater than the number of life-years saved per quitter, but this requires further work and may well be sensitive to the discount rate (short-term losses and longer term gains in quality of life due to quitting).” (page 51)

Table F.3

**Table of Life-years and QALYs, saved per Quitter:
from various studies cited in Woolacott et al. (2002)**

Study	Type of Quitter	Discount Rate	Life-years saved per quitter	Notes
Parrott et al. (1998)	Quitter	Zero 1.5%	1.54 0.99	PREVENT Model
Cromwell et al. (1997)	Long-term quitter	3%	1.46	Age-gradient 25-29 to 65-69. Males. 1.31 to 0.47. Females 1.43 to 1.41.
“	Quitter at 12 months	3%	0.8	Relapse rate of 45%
Orme et al. (2001)	Quitter	Zero	0.4	HECOS model. Doesn't include gain after 20 years. Therefore underestimate?
Doll et al. (1976, 1994)	Lifetime quitter	Zero	Age-groups ≤ 35 7.1 35-44 5.5 45-54 3.5 55-64 2.1	Male British doctors 40-year follow-up. Quitters lighter smokers. Socio-economic factors?
“	“	1.5%	≤ 35 4.0 35-45 3.4 45-55 2.4 55-64 1.6	“
Croghan et al. (1997)	Quitter	3% 5%	0.80 to 1.37 0.51 to 0.85	Mayo Clinic Relapse rate 21.8% after 1 year; 12.2% after 2 years, etc.
			QALYs saved per quitter	
Fiscella and Franks (1996)	Lifetime quitters	3%	1.98	Range 0.69 to 2.38
“	Quitters at 12 months	3%	1.29	Range 0.45 to 1.55 Relapse rate of 35%
Cromwell et al. (1997)	Long-term quitter	3%	1.97	Cf. 1.46 above for PYLL
“	Quitter at 12 months	3%	1.08	Cf. 0.8 above for PYLL

F.4 Benefits of temporary abstinence?

Quite a large proportion of callers achieve at least ‘temporary abstinence’, some for months or even years, or a reduction in consumption levels. It would seem evident that there should be some health gain for these persons also. Unfortunately a recent study (Godtfredsen et al. 2002) suggests this does not necessarily follow. This study pooled information from three large cohort studies conducted in Copenhagen. The study found that smoking cessation does indeed reduce mortality risk (those dying in the first two years from quitting are excluded from the analysis). Disconcertingly, however, the study found that heavy smokers who reduced their daily tobacco intake by at least 50% without quitting did not reduce their mortality risk significantly compared with persons who continued to smoke heavily. This result was found even though continuing light smokers did have a lower mortality risk. The authors speculate that there is some mechanism for heavy smokers which requires complete cessation in order for the mortality risk to be reduced.

Probably a substantial proportion of Quitline callers are relatively heavy smokers. The Copenhagen results suggest a need for caution in claiming health gains from temporary abstinence for this class of smoker. Accordingly, no attempt is made to include such gains in the analysis in this report. This is, of course, a conservative assumption.

F.5 Assumed rate of relapse

Drawing again on the literature summarised in Table F.4, particularly that in Fiscella and Franks, and Cromwell et al., a reasonable estimate of the subsequent relapse rate for those who have succeeded in quitting for 12 months is 40 percent.

This gives, from the calculations above for ‘lifetime quitters’, estimated health gains for those who have quit for 12 months of 0.9 life-years on average, and 1.2 QALYs.

F.6 Discounting future health benefits

It has been argued that future health benefits should not be discounted, but that future costs should. That argument leads to problems, however, e.g. the “paralysing paradox” that it is always better to defer action, and is not accepted here.

It will be seen that in the table of health gains from overseas studies that the discount rates are often low – typically the ‘standard’ 3% per annum recommended by the USA expert panel; or 5% at most.

A range of discount rates, from 3% to 10% is used in this report.

To calculate discounted values of health gains, it is necessary to specify how long they are deferred into the future. The simplifying assumption made here is that the average length of time before health gains appear is 10 years. Some premature deaths will be prevented almost immediately, more especially from cardiovascular disease,

but most are a considerable number of years into the future, particularly for young and middle-aged people. Ideally one should make use of an actual distribution over time of expected premature deaths prevented, but that information is not readily calculated.

Assuming a 10-year time-period, the discount factors are as follows, for the given discount rates –

1.5% per annum	0.862
3% per annum	0.744
5% “	0.614
7% “	0.508
10% “	0.386

That is, for a 1.5 % discount rate, future benefits are scaled down by 13.8 percent; for 3% by 25.6 percent and so on.

The 5% discount rate is taken here as being the ‘standard’ value, for comparability with Australian results (as for example in Carter et al. 2003).

G Cost-effectiveness – cost per Life-Year saved, and per QALY

G.1 Cost-effectiveness ratios for the pre-NRT service

Table G.1 displays cost-effectiveness results in terms of ‘cost per life-year gained’ and ‘cost per QALY gained’. These are given for the three cost variants, and for a range of discount rates from zero to 10% per annum. The assumed gains in life-years and QALYs for lifetime quitters (assessed above at 1.5 and 2.0 years respectively) are scaled down 40 percent to allow for subsequent relapse of those who have succeeded in quitting for 12 months.

Cost variants		Low	Middle	High
Av. Quitters per month		68.75	68.75	68.75
Cost per Quitter	\$	\$1,406	\$2,168	\$3,098
Life-Year gain per Quitter		0.9	0.9	0.9
QALY gain per Quitter		1.2	1.2	1.2
Cost per Life-Year gained				
Discounted at	0% p.a.	\$1,562	\$2,408	\$3,442
	1.5% p.a.	\$1,813	\$2,795	\$3,995
	3.0% p.a.	\$2,100	\$3,237	\$4,626
	5.0% p.a.	\$2,545	\$3,923	\$5,607
	7.0% p.a.	\$3,073	\$4,738	\$6,772
	10.0% p.a.	\$4,052	\$6,247	\$8,929
Cost per QALY gained				
Discounted at	0% p.a.	\$1,172	\$1,806	\$2,582
	1.5% p.a.	\$1,360	\$2,096	\$2,996
	3.0% p.a.	\$1,575	\$2,427	\$3,470
	5.0% p.a.	\$1,909	\$2,942	\$4,205
	7.0% p.a.	\$2,305	\$3,553	\$5,079
	10.0% p.a.	\$3,039	\$4,685	\$6,696

The ‘cost per QALY’ measure is the better overall yardstick. At a 5% discount rate it gives a range from \$1,909 to \$4,205 for cost per QALY gained, with a ‘middle’ value of \$2,942.

These values are relatively low, and if they are accurate, the Quitline intervention (without NRT) would be judged as good purchasing value by any health funding agency.

We discuss this further in Section I later, after carrying out some sensitivity analyses of the above results.

G.2 Increase in quits for the post-NRT service compared with ‘no service’

It would be expected, in advance, that Quitline plus NRT would be more helpful to would-be quitters than Quitline alone. In addition, it is apparent that the attraction of NRT encouraged substantially larger numbers of smokers to contact the Quit Group. Thus NRT presumably increased the chances of quitting for those smokers who would have contacted Quitline even without NRT, and also increased quit rates for those who contacted Quitline because of the promise of subsidised NRT.

We assume as for the pre-NRT service a natural quit-rate of 5 percent for users of the post-NRT service. Assuming also an NRT success rate of 11.6% (the ‘higher’ value) as argued above, then, of the 3,179 callers per month during 2001/02 who were sent a first Exchange card, an estimated additional 6.6% would have achieved ‘continuously abstinent to 12 months’ status. That is an estimated 210 per month, or 2,518 per year.

For the lower success rate of 9.0 percent an additional 4.0 percent, or 127 per month, would have achieved ‘continuously abstinent to 12 months’ status.

G.3 Cost-effectiveness, assuming no Quitline pre-NRT

As a starting point, the cost-effectiveness of the NRT programme is assessed as if it, and the Quitline, were totally new, that is, as if there had been no 'pre-NRT' Quitline. This is, of course, not the actual situation. The comparison with the 'pre-NRT' Quitline comes in the following section.

Table G.2a gives the results, for Low, Middle, and High cost variants, for the 'higher' quit-rate of 11.6 percent, and for discount rates ranging from 0 to 10 percent per annum.

		Table G.2a Cost per QALY Saved:		
		Post-NRT (2001/02) compared with 'No Quitline'		
Assuming		11.6%	continuous to 12 months quit-rate	
Cost variants		Low	Middle	High
Av. extra Quitters per month		209.8	209.8	209.8
Total cost per month	\$	\$389,855	\$490,145	\$612,721
Cost per extra Quitter	\$	\$1,858	\$2,336	\$2,920
Life-Year gain per Quitter	years	0.9	0.9	0.9
QALY gain per Quitter	years	1.2	1.2	1.2
Cost per Life-Year gained				
Discounted at	0% p.a.	\$2,065	\$2,596	\$3,245
	1.5% p.a.	\$2,396	\$3,012	\$3,766
	3.0% p.a.	\$2,775	\$3,488	\$4,361
	5.0% p.a.	\$3,363	\$4,228	\$5,285
	7.0% p.a.	\$4,061	\$5,106	\$6,383
	10.0% p.a.	\$5,355	\$6,732	\$8,416
Cost per QALY gained				
Discounted at	0% p.a.	\$1,548	\$1,947	\$2,434
	1.5% p.a.	\$1,797	\$2,259	\$2,824
	3.0% p.a.	\$2,081	\$2,616	\$3,271
	5.0% p.a.	\$2,522	\$3,171	\$3,964
	7.0% p.a.	\$3,046	\$3,830	\$4,787
	10.0% p.a.	\$4,016	\$5,049	\$6,312

All the cost-effectiveness ratios in this table are sufficiently low to justify the Quitline NRT programme, if it were being considered *de novo*. For example, for the Middle cost variant, at a discount rate of 5% per annum, the cost per QALY is \$3,171, and at a discount rate of 10% the cost per QALY is \$5,049. These are very acceptable ratios.¹⁹

Table G.2b presents the results for the 'lower' 12-months prevalence rate of 9 percent. The cost per QALY results are of course higher, but would still be acceptable.

¹⁹ Section H later in this report discusses 'acceptable' values of the cost/QALY ratio, and concludes that values up to \$20,000, and probably considerably higher, are certainly acceptable.

Table G.2b		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with 'No Quitline'		
Assuming		9.0%	continuous to 12 months quit-rate	
Cost variants		Low	Middle	High
Av. extra Quitters per month		127.2	127.2	127.2
Total cost per month	\$	\$389,855	\$490,145	\$612,721
Cost per extra Quitter	\$	\$3,066	\$3,855	\$4,819
Life-Year gain per Quitter	years	0.9	0.9	0.9
QALY gain per Quitter	years	1.2	1.2	1.2
Cost per Life-Year gained				
Discounted at	0% p.a.	\$3,407	\$4,283	\$5,354
	1.5% p.a.	\$3,953	\$4,970	\$6,213
	3.0% p.a.	\$4,578	\$5,756	\$7,195
	5.0% p.a.	\$5,549	\$6,976	\$8,721
	7.0% p.a.	\$6,701	\$8,425	\$10,532
	10.0% p.a.	\$8,836	\$11,109	\$13,887
Cost per QALY gained				
Discounted at	0% p.a.	\$2,555	\$3,212	\$4,015
	1.5% p.a.	\$2,965	\$3,728	\$4,660
	3.0% p.a.	\$3,434	\$4,317	\$5,396
	5.0% p.a.	\$4,162	\$5,232	\$6,541
	7.0% p.a.	\$5,026	\$6,319	\$7,899
	10.0% p.a.	\$6,627	\$8,331	\$10,415

G.4 Incremental cost-effectiveness of the Quitline NRT programme, compared with the pre-NRT Quitline.

The actual situation being considered, however, is one of an ‘incremental’ programme – the supply of subsidised NRT – being added to an already existing Quitline programme providing telephone support and advice. In this situation, the costs and benefits must also be measured in incremental terms, that is the additional costs of the new programme compared with the additional ‘quits’ achieved, and Life Years and QALYs gained, from the new programme.

For the pre-NRT programme, the estimated number of quits gained per month in 2000 amounted to 68.75; and the estimated monthly cost of the programme ranged from \$96,672 through \$149,017 to \$212,994. These benefits and costs have to be deducted from those for the NRT programme given in the previous section.

It is convenient to summarise here, in Table G.3, the incremental changes in monthly costs, and in persons ‘continuously abstinent’ to 12 months.

	Low	Middle	High
Costs			
	\$		
Quitline pre-NRT - Monthly costs	\$96,672	\$149,017	\$212,994
Quitline with NRT - Monthly costs	\$389,855	\$490,145	\$612,721
Increase	\$293,183	\$341,128	\$399,726
Numbers quit per month			
pre-NRT (7.5% of 2750)	206.3	206.3	206.3
pre-NRT increase (2.5% of 2750)	68.8	68.8	68.8
post-NRT 'higher' rate 11.6%	368.8	368.8	368.8
post-NRT 'lower' rate 9.0%	286.1	286.1	286.1
Increase in post-NRT numbers from pre-NRT service			
'higher rate'	162.5	162.5	162.5
'lower rate'	79.9	79.9	79.9

Tables G.4a and b give the results from using these incremental values, with the same layout as in Tables G.2a and b, for 12-months quit rates of 11.6 and 9.0 percent respectively. The costs of gaining an extra QALY differ little from the values in Tables G.2. Table G.4a provides the results for the ‘higher’ continuous abstinence rate of 11.6 percent. The cost per QALY gained is \$2,849 at a 5% discount rate for the Middle cost variant, and \$4,537 at a 10% discount rate.

Table G.4a		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
Assuming		11.6%	continuous to 12 months quit-rate	
Cost variants		Low	Middle	High
Av. extra Quitters per month		162.5	162.5	162.5
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$1,804	\$2,099	\$2,460
Life-Year gain per Quitter	years	0.9	0.9	0.9
QALY gain per Quitter	years	1.2	1.2	1.2
Cost per QALY gained				
Discounted at	0% p.a.	\$1,503	\$1,749	\$2,050
	1.5% p.a.	\$1,745	\$2,030	\$2,379
	3.0% p.a.	\$2,020	\$2,351	\$2,755
	5.0% p.a.	\$2,449	\$2,849	\$3,339
	7.0% p.a.	\$2,957	\$3,441	\$4,032
	10.0% p.a.	\$3,899	\$4,537	\$5,316

These incremental values are of course also very satisfactory. As noted elsewhere in this report, in New Zealand a QALY saved is worth certainly at least \$20,000, and quite likely substantially more.

On this basis the numbers in Table G.4a justify the NRT programme.

The following chart displays the results for the three cost options.

**Chart F.1. Cost per QALY. NRT Programme. Three Cost Options.
Continuous Abstinence rate of 11.6 percent.**

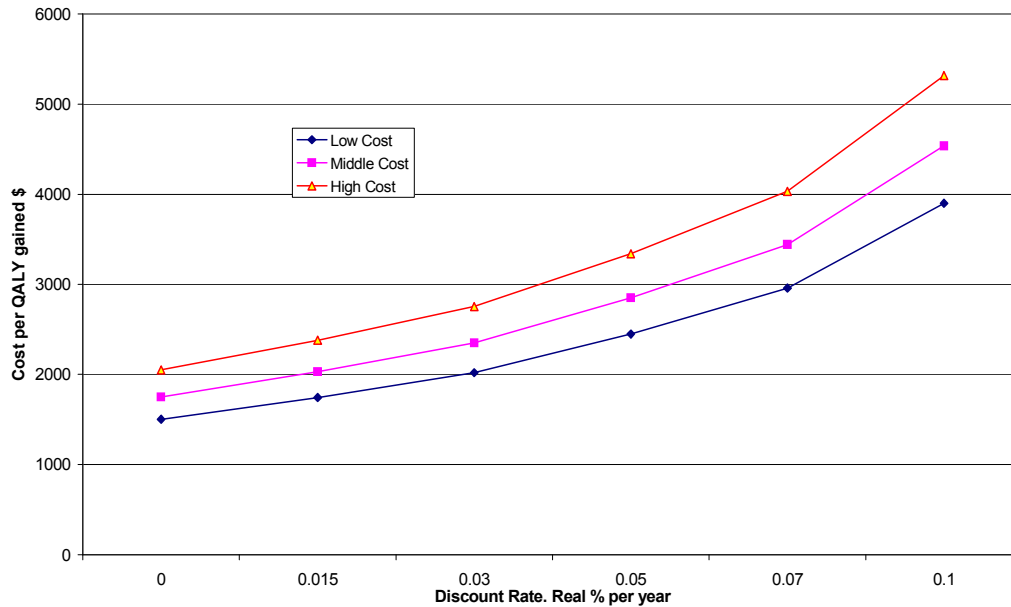
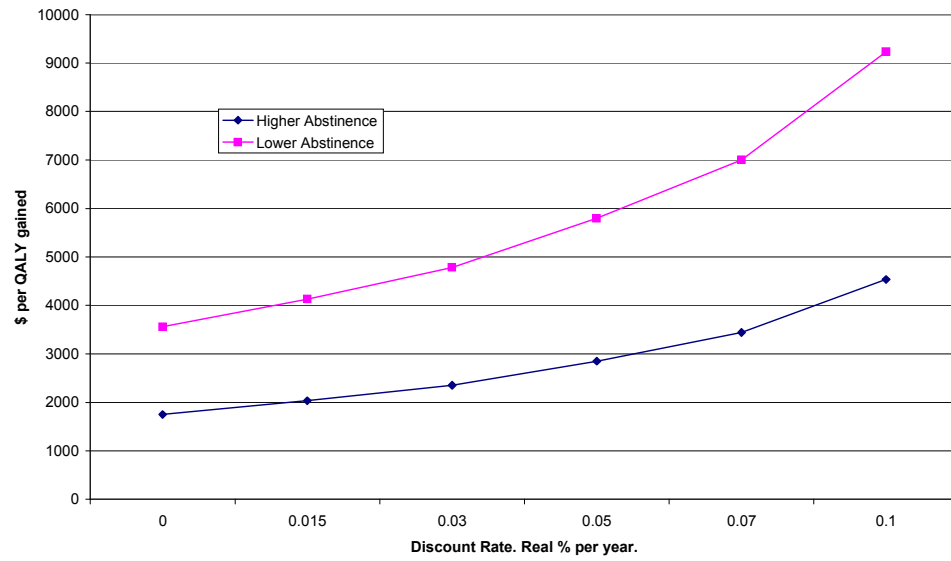


Table G.4b following tests the results in Table G.4a by taking the 'lower' continuous abstinence rate of 9.0 percent. Again the costs per QALY of \$5,798 at a 5 percent discount rate, and \$9,233 are satisfactory.

Table G.4b Cost per QALY Saved:				
Post-NRT (2001/02) compared with Pre-NRT				
Assuming 9.0% continuous to 12 months quit-rate				
Cost variants		Low	Middle	High
Av. extra Quitters per month		79.9	79.9	79.9
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$3,671	\$4,272	\$5,005
Life-Year gain per Quitter	years	0.9	0.9	0.9
QALY gain per Quitter	years	1.2	1.2	1.2
Cost per QALY gained				
Discounted at	0% p.a.	\$3,059	\$3,560	\$4,171
	1.5% p.a.	\$3,550	\$4,131	\$4,841
	3.0% p.a.	\$4,112	\$4,784	\$5,606
	5.0% p.a.	\$4,983	\$5,798	\$6,794
	7.0% p.a.	\$6,018	\$7,002	\$8,205
	10.0% p.a.	\$7,935	\$9,233	\$10,819

The following chart plots the Middle cost option from Tables G.4a and G.4b.

**Chart F.2 Cost per QALY gained. NRT compared with pre-NRT.
Middle Cost Case. Higher and Lower 12-months abstinence rates.**



H Sensitivity Analyses

To avoid unnecessary repetition of information, the tables in this section give results for QALYs only, excluding Life-Years Saved.

H.1 Pre-NRT Quitline

If quit-rates are lower than estimated above, or health gains less, the cost per QALY will rise. Table H.1 shows the results of halving the net monthly gain in numbers quitting. The equivalent effect is also obtained by halving the health gain (life-years or QALYs gained). Either variation simply multiplies the numbers in the previous table by 2. (Conversely doubling either of these parameters has the effect of halving the cost per QALY gained.)

Table H.1		Pre-NRT Quitline (2000)		
		Calculation of Cost per QALY Saved		
Variant:		Gain in numbers quitting halved		
Cost variants		Low	Middle	High
Av. Quitters per month		34.375	34.375	34.375
Cost per Quitter	\$	2,812	4,335	6,196
Life-Year gain per Quitter		0.9	0.9	0.9
QALY gain per Quitter		1.2	1.2	1.2
Cost per QALY gained				
Discounted at	0% p.a.	\$2,344	\$3,613	\$5,163
	1.5% p.a.	\$2,720	\$4,192	\$5,992
	3.0% p.a.	\$3,150	\$4,855	\$6,939
	5.0% p.a.	\$3,817	\$5,884	\$8,411
	7.0% p.a.	\$4,610	\$7,106	\$10,157
	10.0% p.a.	\$6,079	\$9,370	\$13,393

The cost per QALY saved is still below \$10,000 for the 'central' value ('middle' cost variant; 5% discount rate); and below \$20,000 for all cases.

Another test on the results is to assume a longer period on average – 15 years rather than 10 years - before health benefits accrue. Table H.2 shows the results, for the base case.

Table H.2		Pre-NRT Quitline (2000)		
		Calculation of Cost per QALY Saved		
Variant:		Time till Health gain increased from 10 to 15 years		
Cost variants		Low	Middle	High
Av. Quitters per month		68.75	68.75	68.75
Cost per Quitter	\$	\$1,406	\$2,168	\$3,098
Life-Year gain per Quitter		0.9	0.9	0.9
QALY gain per Quitter		1.2	1.2	1.2
Cost per QALY gained				
Discounted at	0% p.a.	\$1,172	\$1,806	\$2,582
	1.5% p.a.	\$1,465	\$2,258	\$3,228
	3.0% p.a.	\$1,826	\$2,814	\$4,022
	5.0% p.a.	\$2,436	\$3,755	\$5,367
	7.0% p.a.	\$3,233	\$4,984	\$7,123
	10.0% p.a.	\$4,895	\$7,545	\$10,785

The higher the discount rate, the more the cost per QALY is increased by estimating a longer average time period before health benefits are gained. At a 5% discount rate, the cost per QALY increases by 28 percent; at a 10% discount rate by 61 percent. The cost per QALY can still, however, be regarded as relatively low even with this change.

H.2 Post-NRT Quitline

The results in the previous section already contain an element of sensitivity testing of the results. Costs per QALY are tabulated by –

- Three cost options: Low, Middle, and High. The Low option for the NRT programme costs 20 percent less, and the High option 25 percent more than the preferred Middle option.
- Two rates of ‘continuous abstinence’ to 12 months from starting the programme: a ‘Higher’ quit rate of 11.6 percent, and a ‘Lower’ quit rate of 9.0 percent.
- A range of discount rates.

Also the results in the earlier section compared the NRT programme with a ‘no Quitline’ situation. The results, in effect, are testing a variation of the ‘pre-NRT’ situation. ‘No Quitline’ is equivalent to assuming that no gain in quits is generated by the pre-NRT Quitline, as compared with the baseline assumption that the pre-NRT service increased the quit rate by 2.5 percent. The outcomes appear to have little sensitivity to this variation.

In this section, the sensitivity of the results to other variations is tested. These include:

- Variations in the health gains. Currently assumed 2 QALYs per ‘lifetime quitter’.
- Changing the time-lag in the health gains. Currently assumed 10 years.
- Changing the ‘relapse’ rate of those abstinent to 12 months. Currently assumed 40 percent.

Detailed results of these analyses are given in Appendix C to this report. Summary results are discussed below.

Table H.3 Summary of Sensitivity Analyses: Health Gains from NRT Programme						
	Middle Cost variant.					
\$ per QALY gained	Base	Health Gains		Gains Lagged	Relapse Rate	
	Case	Halved	Doubled	15 years	50%	30%
12 -months quit rate of 11.6%						
Discount rate						
5.0%	\$2,849	\$5,699	\$1,425	\$3,637	\$3,419	\$2,442
7.0%	\$3,441	\$6,882	\$1,720	\$4,826	\$4,129	\$2,949
10.0%	\$4,537	\$9,074	\$2,269	\$7,307	\$5,444	\$3,889
12 -months quit rate of 9.0%						
Discount rate						
5.0%	\$5,798	\$11,597	\$2,899	\$7,400	\$6,958	\$4,970
7.0%	\$7,002	\$14,005	\$3,501	\$9,821	\$8,403	\$6,002
10.0%	\$9,233	\$18,466	\$4,616	\$14,870	\$11,079	\$7,914

The results in the Summary Table are generally reassuring. None of the given results exceeds \$20,000 per QALY, even at a 10 percent discount rate.

I What is a QALY worth?

The results in the preceding sections give a range of cost-effectiveness values for the Quitline intervention. The different measures are the cost per (lifetime) quitter, the cost per life-year gained, and the cost per quality-adjusted life-year (QALY) gained. It is best to focus on the last of these, which includes gains in the quality of life from reduced morbidity in addition to gains in life expectancy.

The issue now is how one assesses whether a given '\$ per QALY' result is good 'value for money' or not. The first approach is to take established results from work by the Land Transport Safety Authority (Miller and Guria; 1991. Guria et al. 1999), estimating what the general public is prepared to spend to save a 'statistical life'. The estimated \$2 million value in 1991 has increased with inflation to a current value of about \$2.7 million (the later 1999 report suggested this should be increased to \$4 million). The next step is to derive a 'value per life-year' from this 'value of statistical life' (VoSL). There is no agreed standard value for this, but on plausible assumptions about remaining duration of life at the time of a fatal road accident, and assuming a year of life is valued the same in all circumstances, estimates can be made for a range of discount rates. The calculations are not given here, but the resulting values per life-year exceed \$50,000 for any discount rate from zero upwards, and are considerably higher for higher discount rates. Even if society is less willing to pay these amounts to save years of life later in life, as seems to be the case (and as would apply to most of the health gains from quitting smoking), the values still seem likely to comfortably exceed the \$/QALY numbers given above for the Quitline intervention.

The second approach is to find how much health funding authorities are currently prepared to pay, or are paying, for selected interventions whose benefit in terms of life-years or QALYs gained can be estimated. Some examples are –

- Croxson and Ashton (1990) – for kidney transplantation, and dialysis – the costs per life year saved (at a 10% discount rate) were \$18,463 for transplantation, and \$25,000 to \$35,000 for dialysis. In present-day dollars these would be of the order of \$25,000 and \$35,000 to \$50,000.
- Szeto and Devlin (1995) obtained for a mammography screening model (at a discount rate of 5%) values which adjusted from their 1991 dollars would be of the order \$20,000 to \$30,000. A New Zealand-wide mammography screening programme has since been implemented.

These should be considered as lower bounds, as society might be prepared to pay more than these amounts per life-year saved. They suggest a life-year (or QALY) saved is worth certainly at least \$20,000, and quite likely substantially more.

J Conclusions

J.1 The pre-NRT Quitline service

On the basis of the results in Section G, and the sensitivity analyses in Section H, the health funding authorities were justified in purchasing this intervention. This is dependent, however, on the core assumption that the Quitline was successful in increasing the quit-rate for Quitline callers, and that the increase in the '12-months period' quit rate for these callers amounted to 2.5 percent. The assumption seems reasonable, however, and is tested in the sensitivity analyses by halving the increase to 1.25 percent.

J.2 The post-NRT Quitline service

From the results in Sections G and H the Quitline NRT programme is almost certainly a cost-effective programme. The lack of complete certainty is because of the absence of sound statistical measures of the effectiveness of the pre-NRT Quitline, plus uncertainty about the overall quit rate for the NRT programme, including cohort survey non-respondents as well as respondents. For what are thought to be plausible, but conservative, values for the key variables, however, the cost-effectiveness ratios are satisfactory.

In reaching this conclusion, it is worth stressing that the results in this report have had to be based on a number of assumptions, some of which are deliberately conservative. For instance:

- The 'natural' or 'latent' 12-months period quit-rate, for persons motivated to quit, without any Quitline intervention, has been assumed to be 5 percent. This is possibly on the high side.
- In addition, the evidence from the BRC cohort survey is that those making use of Quitline are more than proportionally those categories of smokers who are known to have particular difficulty in quitting – for instance heavy smokers.
- Zero gain has been assumed for those who quit only temporarily. There is justification in the literature for this assumption, but it is hard to believe there is absolutely no health gain.
- No account has been taken of possible output gains for a healthier population.
- No account is taken of possible benefits to non-Quitline users; that is possible quits caused by Quitline activities, but not directly. For example through a family member quitting with Quit Group help.
- No account is taken of possible benefits to non-smokers from any reduced exposure to second-hand smoke and of the reduced harm to the fetuses of pregnant women who quit due to this intervention.

Less conservative assumptions on these points would of course lead to lower cost-effectiveness ratios.

Appendix A

Earlier Empirical New Zealand Data on Smoking Cessation: the 1996 NRB Survey

As there is considerable mention of relapse in this material, it is perhaps worth quoting from the Official Statement of the American Thoracic Society (1996. Page 864).

“ ... relapse appears to be an important part of the cessation process. Smokers who have been successful in achieving long-term abstinence report having previously stopped and relapsed multiple times. Therefore, relapse should not be considered failure.”

The 1996 NRB Survey

The 1996 NRB survey (n = 2,020) provides evidence for New Zealand on the ‘natural’ quit rate. Of ‘former smokers’ in the survey, 12% had quit in the previous 12 months. The same percentage held in an earlier survey in 1991. This proportion falls, naturally enough, with age, so that of those aged 45-54 and 55+, only 2 and 3 percent respectively had quit in the previous year. Table App.1 summarises the survey estimates.

Table App.1 Results from 1996 NRB survey on Quitting

		Length of time since stopped smoking (former smokers)						Total All Ages
		15-19	20-24	By age - 1996		45-54	55+	
		25-34	35-44					
Proportion of former smokers quit -								
A year or less	%	65	41	22	7	2	3	12
Over a year to 5 years	%	30	44	31	22	15	11	19
Former smokers	number	19	15	94	118	94	237	577
Numbers of former smokers quit -								
A year or less	number	12	6	21	8	2	7	56
Over a year - 5 years	number	6	7	29	26	14	26	108

These numbers need to be expressed in terms of a more convenient denominator – either ‘current smokers’ or ‘current + recent smokers’ where ‘recent’ is taken as having been in the past year. Unfortunately there are inconsistencies in the numbers reported from the NRB survey (at least those so far sighted), in particular for the number of ‘smokers’ broken down by age-group. Table App.2 delves into this. Table App.3 calculates point quit-rates in terms of either the number of current smokers, or current + recent smokers.

It should be noted that 1996 was a relatively uneventful year in terms of anti-smoking initiatives.

Table App.2 Demographics of 1996 NRB survey

		Base statistics by age-group. NRB Survey 1996						Total	Page in
		15-19	20-24	25-34	35-44	45-54	55+	All Ages	source
All persons:									
Total	%	11	10	21	19	13	26	100	page 41
Applied to 2,020	number	222	202	424	384	263	525	2020	page 2
Current smokers (1+/day)									
Prop'n of age-group	%	17	32	30	21	25	10		page 6
Calculated number	number	38	65	127	81	66	53	428	
scaled to total 453 - A	number	40	68	135	85	69	56	453	page 10
Tabulated number - B	number	25	45	139	102	80	62	453	page 13
Former smokers									
Number on page 8 table	number	19	15	94	118	94	237	577	page 8
Non- & former smokers									
Number on page 9 table	number	110	77	294	337	224	552	1594	page 9
scaled to total 1567	number	108	76	289	331	220	543	1567	
Non-smokers									
- by subtraction	number	89	61	195	213	126	306	990	

Source: NRB Research Report.(1996). *Environmental Tobacco Smoke Study*. For Ministry of Health.

Table App.3 Former smokers as %age of current smokers - or current + recent smokers

		By age - 1996						Total
		15-19	20-24	25-34	35-44	45-54	55+	All Ages
Former smokers as a percentage of current -								
Quit a year or less - A	%	30.9%	9.0%	15.4%	9.7%	2.7%	12.8%	12.5%
Quit a year or less - B	%	49.4%	13.7%	14.9%	8.1%	2.4%	11.5%	12.5%
Quit >1 year to 5 years - A	%	14.3%	9.7%	21.7%	30.5%	20.3%	46.9%	23.7%
Quit >1 year to 5 years - B	%	22.8%	14.7%	21.0%	25.5%	17.6%	42.0%	23.7%
Former smokers as a percentage of current, + recent (<=12 months) quitters -								
Quit a year or less - A	%	23.6%	8.3%	13.3%	8.8%	2.6%	11.4%	11.1%
Quit a year or less - B	%	40.2%	11.9%	12.3%	6.5%	2.0%	8.1%	11.1%

Source: NRB Research Report.(1996). *Environmental Tobacco Smoke Study*. For Ministry of Health.

The alternative population estimates in Table App.2 result in alternative estimates of quit-rate by age-group in Table App.3, but it is perhaps unnecessary to dwell on this. In the older age-groups the differences are not that large, and over all age-groups they wash out. As shown in Table App.3 those who at the time of the survey had quit smoking, and had done this in the last year, were 12.5% of current smokers, or 11.1% of current + recent (quit in last year) smokers.

Thus at a given point in time a reasonably substantial proportion of the population has recently moved from ‘smoker’ to ‘ex-smoker’ status. In fact the given numbers understate the amount of ‘spontaneous’ quitting that is going on. Other information from the 1996 survey (Table App.4) shows that 38% of current smokers had stopped for a week or more in the past year, and 43% for less than a week but more than a day. (The questions put to respondents allow for being counted in both categories.) Thus relapse rates are, unfortunately, high.

Table App.4 1996 NRB Information on Relapsed smokers

		By age - 1996						Total All Ages
		15-19	20-24	25-34	35-44	45-54	55+	
Current smokers:-								
Who have in past stopped for -								
- a year or more	%	8	9	30	36	39	32	27
Who have stopped in last year for -								
- a week or more	%	60	40	43	30	31	33	38
- > 1 day & < 1 week	%	51	62	46	33	32	38	43

Source: NRB Research Report.(1996). *Environmental Tobacco Smoke Study*. For Ministry of Health.

Note: Different categories can overlap.

To quote Laugesen and McClellan (1999) – “The main problem is not getting smokers to quit, but to stay quit.”

Appendix B:

Estimating the 'Natural' Quit Rate from Census and ongoing Prevalence Surveys

Trends in the prevalence of smoking for the New Zealand population as a whole provide some clues to the 'latent' rate of quitting. The table below shows that smoking prevalence rates declined during the 1990's, though at a slower rate than in the late 1970s and the 1980s.

Table App.B.1

	Prevalence of Smoking - from Nielsen Surveys		
	By Gender.		1991. 1996, 2001
	1991	%age 1996	2001
Males			
15-24	28	27	31
25-34	35	33	33
35-54	27	26	26
55+	18	19	13
Total 15+	27	26	25
Females			
15-24	33	36	32
25-34	30	35	34
35-54	24	26	25
55+	16	13	13
Total 15+	26	26	25

Source: AC Nielsen (NZ) Ltd surveys, as reported on Ministry of Health web-site.

Notes: Annual rate of decline in Total Adult Prevalence 1991 to 2001
- Males -0.8%
- Females -0.4%

The calculations at the foot of the table show calculated 'net' rates of decline in overall prevalence during the decade (though unfortunately based on survey results to only two significant figures). For males the annual rate of decline was 0.8% per year, and for females 0.4% per year.

Elsewhere in this report it is argued that the relapse rate of those who succeed in quitting for twelve months is perhaps of the order of 40 percent. In which case the annual rate of quitting for 12 months, but not necessarily for the long-term, would be of the order of 1.3% and 0.7% respectively.

The above calculations implicitly assume population stability, both in total size and in structure. Against this, it could for instance be argued that the decline in prevalence simply reflects an ageing population, and the fact that smokers have a shorter life

expectancy, and so will be less well represented in an older population. (See for instance Easton 1995.)

As a check on these sorts of speculation, survivorship factors were derived for smokers and non-smokers from abridged life tables used in recent Ministry of Health work (Tobias and Cheung, 2001), applied to the 1991 census population aged 25 and over (the age-group in which there are probably few never-smokers who commence smoking) to produce ‘survived populations’ 5 and 10 years later. The prevalence in these survived populations can then be compared with actual prevalence rates at those dates, applying Neilsen prevalence rates to census populations. The difference represents long-term ‘latent’ quit-rates for the population aged 25+.

An assumption in this is that any net migrant flows have the same smoking prevalence rates as the continually resident population. (A check on this assumption would involve investigating both nationality and ethnic differences, and also the socio-economic composition of migrant flows.)

A second assumption is that not much else was happening in the 1991-2001 period to reduce smoking prevalence. In a general sense, this is true. Tax on loose tobacco (‘roll-your-own’ and pipe tobacco) was increased in 1995 to rates equivalent to those on ‘tailor-made’ cigarettes. Otherwise there was little increase in real tobacco prices from the beginning of 1992 until 1998.

The following table gives, for reference, ‘survivorship ratios’ for 5 and 10 years for ‘smoking-deleted’ and ‘derived smokers’²⁰. Significant differences start to appear in middle age.

²⁰ The term ‘smoking-deleted’ is used by Tobias and Cheung as a label for their life tables excluding smokers. ‘Derived smokers’ refers to the life tables derived by the author of this report from the original ‘all population’ abridged life tables and the Tobias and Cheung ‘smoking-deleted’ tables.

Table AppB.2

Survival - Smokers and Others: 5-year age-groups

1995-97

	5 years			10 years		
	All	Smoking-Deleted	Derived Smokers	All	Smoking-Deleted	Derived Smokers
	Males			Males		
15-19	0.993	0.993	0.993	0.986	0.987	0.985
20-24	0.993	0.993	0.992	0.986	0.987	0.982
25-29	0.993	0.994	0.991	0.986	0.989	0.981
30-34	0.993	0.995	0.990	0.985	0.989	0.976
35-39	0.992	0.994	0.986	0.980	0.985	0.964
40-44	0.988	0.991	0.978	0.967	0.977	0.939
45-49	0.979	0.985	0.961	0.946	0.961	0.897
50-54	0.966	0.975	0.933	0.911	0.934	0.828
55-59	0.943	0.957	0.887	0.856	0.887	0.724
60-64	0.907	0.926	0.816	0.776	0.814	0.589
65-69	0.856	0.878	0.721	0.667	0.705	0.434
70-74	0.780	0.803	0.601	0.524	0.554	0.287
75-79	0.671	0.690	0.478	0.493	0.524	0.201
80-84	0.734	0.759	0.421			
	All	Smoking-Deleted	Derived Smokers	All	Smoking-Deleted	Derived Smokers
	Females			Females		
15-19	0.997	0.997	0.997	0.995	0.995	0.995
20-24	0.997	0.997	0.997	0.994	0.995	0.994
25-29	0.997	0.997	0.997	0.993	0.994	0.992
30-34	0.996	0.997	0.995	0.991	0.992	0.988
35-39	0.995	0.996	0.993	0.986	0.988	0.979
40-44	0.991	0.993	0.986	0.976	0.980	0.962
45-49	0.985	0.988	0.976	0.962	0.969	0.937
50-54	0.977	0.981	0.960	0.942	0.951	0.898
55-59	0.964	0.970	0.935	0.910	0.923	0.840
60-64	0.944	0.951	0.898	0.862	0.877	0.759
65-69	0.913	0.922	0.845	0.788	0.804	0.653
70-74	0.863	0.872	0.773	0.671	0.684	0.527
75-79	0.777	0.784	0.682	0.789	0.801	0.620
80-84	1.015	1.021	0.909			

Source: Abridged Life Tables, 1995-97, for Total, and 'Smoking-Deleted' populations
 As used in Ministry of Health publication *Inhaling Inequality* (Tobias and Cheung, 2001)
 'Smokers' tables derived from these.

The following two tables are the results of carrying through the calculations outlined above.

Table AppB.3

**Smoking proportion, 25+ in initial census,
surviving 5 years to 30+, compared with
actual proportion at second census**

		Smoking Prevalence 30+	
1991 to 1996			
	1991 cohort 25+, aged 5 years	Actual 1996 Census %	% change per year
Males	26.00%	24.63%	-1.07%
Females	22.80%	22.42%	-0.34%
		Smoking Prevalence 30+	
1996 to 2001			
	1996 cohort 25+, aged 5 years	Actual 2001 Census %	% change per year
Males	25.11%	22.27%	-2.37%
Females	24.14%	21.64%	-2.16%

Table AppB.4

**Smoking proportion, 25+ in initial census,
surviving 10 years to 35+, compared with
actual proportion at second census**

		Smoking Prevalence 35+	
1991 to 2001			
	1991 cohort 25+, aged 10 years	Actual 2001 Census %	% change per year
Males	25.75%	20.67%	-4.30%
Females	22.84%	19.77%	-2.84%

Summarising the tables above, the long-term latent quit-rate over a period of five years ranges from 1.1 to 2.4 percent per year for males, and 0.3 to 2.2 percent per year for females. The estimated rates over a period of ten years are higher, at 4.3 and 2.8 percent per year for males and females, respectively.

The higher rates for the periods ending in 2001 could reflect in part the impact of the substantial tax increases in May 2000, and perhaps also the impact of the Quit media campaign at about that time.

None of these calculations give, unfortunately, very precise results. More elaborate models are clearly needed to follow this research trail further. Nevertheless the calculations do suggest that at least for populations aged 25 and over, a long-term latent quit-rate of the order of 1.5 percent per annum is probably “in the ball-park”. Using again the assumed 40 percent relapse rate for those who have quit for 12 months, this would suggest a latent quit rate for those who have managed to quit for 12 months of the order of 2.5 percent.

Appendix C
Results of Sensitivity Analyses of Cost-Effectiveness
of post-NRT Quitline service
(Cost per Life-Year part of output hidden)

Varying Health gains – halving

Table AppC.1a		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
		Assuming 11.6% continuous to 12 months quit-rate		
		Health Gains Halved		
Cost variants		Low	Middle	High
Av. extra Quitters per month		162.5	162.5	162.5
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$1,804	\$2,099	\$2,460
Life-Year gain per Quitter	years	0.45	0.45	0.45
QALY gain per Quitter	years	0.6	0.6	0.6
Cost per QALY gained				
Discounted at	0% p.a.	\$3,007	\$3,498	\$4,099
	1.5% p.a.	\$3,489	\$4,060	\$4,758
	3.0% p.a.	\$4,041	\$4,702	\$5,509
	5.0% p.a.	\$4,898	\$5,699	\$6,677
	7.0% p.a.	\$5,915	\$6,882	\$8,064
	10.0% p.a.	\$7,799	\$9,074	\$10,633

Table AppC.1b		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
		Assuming 9.0% continuous to 12 months quit-rate		
		Health Gains Halved		
Cost variants		Low	Middle	High
Av. extra Quitters per month		79.9	79.9	79.9
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$3,671	\$4,272	\$5,005
Life-Year gain per Quitter	years	0.45	0.45	0.45
QALY gain per Quitter	years	0.6	0.6	0.6
Cost per QALY gained				
Discounted at	0% p.a.	\$6,119	\$7,119	\$8,342
	1.5% p.a.	\$7,101	\$8,262	\$9,681
	3.0% p.a.	\$8,223	\$9,568	\$11,211
	5.0% p.a.	\$9,967	\$11,597	\$13,589
	7.0% p.a.	\$12,036	\$14,005	\$16,410
	10.0% p.a.	\$15,870	\$18,466	\$21,638

Varying Health gains – doubling

Table AppC.2a		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
Assuming		11.6%	continuous to 12 months quit-rate	
		Health Gains Doubled		
Cost variants		Low	Middle	High
Av. extra Quitters per month		162.5	162.5	162.5
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$1,804	\$2,099	\$2,460
Life-Year gain per Quitter	years	1.8	1.8	1.8
QALY gain per Quitter	years	2.4	2.4	2.4
Cost per QALY gained				
Discounted at	0% p.a.	\$752	\$875	\$1,025
	1.5% p.a.	\$872	\$1,015	\$1,189
	3.0% p.a.	\$1,010	\$1,175	\$1,377
	5.0% p.a.	\$1,224	\$1,425	\$1,669
	7.0% p.a.	\$1,479	\$1,720	\$2,016
	10.0% p.a.	\$1,950	\$2,269	\$2,658

Table AppC.2b		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
Assuming		9.0%	continuous to 12 months quit-rate	
		Health Gains Doubled		
Cost variants		Low	Middle	High
Av. extra Quitters per month		79.9	79.9	79.9
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$3,671	\$4,272	\$5,005
Life-Year gain per Quitter	years	1.8	1.8	1.8
QALY gain per Quitter	years	2.4	2.4	2.4
Cost per QALY gained				
Discounted at	0% p.a.	\$1,530	\$1,780	\$2,086
	1.5% p.a.	\$1,775	\$2,066	\$2,420
	3.0% p.a.	\$2,056	\$2,392	\$2,803
	5.0% p.a.	\$2,492	\$2,899	\$3,397
	7.0% p.a.	\$3,009	\$3,501	\$4,103
	10.0% p.a.	\$3,968	\$4,616	\$5,409

Health Gains lagged 15 years (rather than 10 years)

Table AppC.3a		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
Assuming		11.6% continuous to 12 months quit-rate		
		Health Gains Lagged 15 years		
Cost variants		Low	Middle	High
Av. extra Quitters per month		162.5	162.5	162.5
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$1,804	\$2,099	\$2,460
Life-Year gain per Quitter	years	0.9	0.9	0.9
QALY gain per Quitter	years	1.2	1.2	1.2
Cost per QALY gained				
Discounted at	0% p.a.	\$1,503	\$1,749	\$2,050
	1.5% p.a.	\$1,880	\$2,187	\$2,563
	3.0% p.a.	\$2,342	\$2,725	\$3,193
	5.0% p.a.	\$3,125	\$3,637	\$4,261
	7.0% p.a.	\$4,148	\$4,826	\$5,655
	10.0% p.a.	\$6,280	\$7,307	\$8,562

Table AppC.3b		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
Assuming		9.0% continuous to 12 months quit-rate		
		Health Gains Lagged 15 years		
Cost variants		Low	Middle	High
Av. extra Quitters per month		79.9	79.9	79.9
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$3,671	\$4,272	\$5,005
Life-Year gain per Quitter	years	0.9	0.9	0.9
QALY gain per Quitter	years	1.2	1.2	1.2
Cost per QALY gained				
Discounted at	0% p.a.	\$3,059	\$3,560	\$4,171
	1.5% p.a.	\$3,825	\$4,450	\$5,215
	3.0% p.a.	\$4,766	\$5,546	\$6,498
	5.0% p.a.	\$6,360	\$7,400	\$8,671
	7.0% p.a.	\$8,441	\$9,821	\$11,508
	10.0% p.a.	\$12,780	\$14,870	\$17,424

Relapse rate increased to 50 percent (from 40 percent)

Table AppC.4a		Cost per QALY Saved:			
		Post-NRT (2001/02) compared with Pre-NRT			
Assuming		11.6% continuous to 12 months quit-rate			
		Relapse rate 50 percent			
Cost variants		Low	Middle	High	
Av. extra Quitters per month		162.5	162.5	162.5	
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726	
Cost per extra Quitter	\$	\$1,804	\$2,099	\$2,460	
Life-Year gain per Quitter	years	0.75	0.75	0.75	
QALY gain per Quitter	years	1.0	1.0	1.0	
Cost per QALY gained					
Discounted at	0% p.a.	\$1,804	\$2,099	\$2,460	
	1.5% p.a.	\$2,094	\$2,436	\$2,855	
	3.0% p.a.	\$2,424	\$2,821	\$3,306	
	5.0% p.a.	\$2,939	\$3,419	\$4,006	
	7.0% p.a.	\$3,549	\$4,129	\$4,838	
	10.0% p.a.	\$4,679	\$5,444	\$6,380	

Table AppC.4b		Cost per QALY Saved:			
		Post-NRT (2001/02) compared with Pre-NRT			
Assuming		9.0% continuous to 12 months quit-rate			
		Relapse rate 50 percent			
Cost variants		Low	Middle	High	
Av. extra Quitters per month		79.9	79.9	79.9	
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726	
Cost per extra Quitter	\$	\$3,671	\$4,272	\$5,005	
Life-Year gain per Quitter	years	0.75	0.75	0.75	
QALY gain per Quitter	years	1.0	1.0	1.0	
Cost per QALY gained					
Discounted at	0% p.a.	\$3,671	\$4,272	\$5,005	
	1.5% p.a.	\$4,261	\$4,957	\$5,809	
	3.0% p.a.	\$4,934	\$5,741	\$6,727	
	5.0% p.a.	\$5,980	\$6,958	\$8,153	
	7.0% p.a.	\$7,222	\$8,403	\$9,846	
	10.0% p.a.	\$9,522	\$11,079	\$12,983	

Relapse rate reduced to 30 percent (from 40 percent)

Table AppC.5a		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
Assuming		11.6%	continuous to 12 months quit-rate	
		Relapse rate 30 percent		
Cost variants		Low	Middle	High
Av. extra Quitters per month		162.5	162.5	162.5
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$1,804	\$2,099	\$2,460
Life-Year gain per Quitter	years	1.05	1.05	1.05
QALY gain per Quitter	years	1.4	1.4	1.4
Cost per QALY gained				
Discounted at	0% p.a.	\$1,289	\$1,499	\$1,757
	1.5% p.a.	\$1,495	\$1,740	\$2,039
	3.0% p.a.	\$1,732	\$2,015	\$2,361
	5.0% p.a.	\$2,099	\$2,442	\$2,862
	7.0% p.a.	\$2,535	\$2,949	\$3,456
	10.0% p.a.	\$3,342	\$3,889	\$4,557

Table AppC.5b		Cost per QALY Saved:		
		Post-NRT (2001/02) compared with Pre-NRT		
Assuming		9.0%	continuous to 12 months quit-rate	
		Relapse rate 30 percent		
Cost variants		Low	Middle	High
Av. extra Quitters per month		79.9	79.9	79.9
Total extra cost per month	\$	\$293,183	\$341,128	\$399,726
Cost per extra Quitter	\$	\$3,671	\$4,272	\$5,005
Life-Year gain per Quitter	years	1.05	1.05	1.05
QALY gain per Quitter	years	1.4	1.4	1.4
Cost per QALY gained				
Discounted at	0% p.a.	\$2,622	\$3,051	\$3,575
	1.5% p.a.	\$3,043	\$3,541	\$4,149
	3.0% p.a.	\$3,524	\$4,100	\$4,805
	5.0% p.a.	\$4,271	\$4,970	\$5,824
	7.0% p.a.	\$5,158	\$6,002	\$7,033
	10.0% p.a.	\$6,802	\$7,914	\$9,273

References

- American Thoracic Society. (1996). 'Cigarette Smoking and Health.' *American Journal of Respiratory and Critical Care Medicine*. Vol. 153. Pp. 861-65. 1996. The Official Statement of The American Thoracic Society.
- Australia's National Tobacco Campaign. (1999). *Australia's National Tobacco Campaign. Evaluation Report Volume One*. Commonwealth Department of Health and Aged Care. Canberra.
- Australia's National Tobacco Campaign. (2000). *Australia's National Tobacco Campaign. Evaluation Report Volume Two*. Commonwealth Department of Health and Aged Care. Canberra.
- Bonneux L, Barendregt J J, Nusselder W J, and Van der Maas P J. (1998). "Preventing fatal diseases increases healthcare costs: cause elimination life table approach." *BMJ* 1998;316: 26-29 (3 January).
- BRC Marketing and Social Research*. (August 2002a). 'Subsidised Nicotine Replacement Therapy Scheme. Exchange Card Redemption.' Unpublished report to Ministry of Health.
- BRC Marketing and Social Research*. (August 2002b). 'Health Provider Exchange Card Redemption.' Unpublished report to Ministry of Health.
- BRC Marketing and Social Research*. (October 2002). 'Review of Evaluation October 17 2002'. Unpublished report to Ministry of Health.
- BRC Marketing and Social Research*. (April 2003). 'Quitline Subsidised Nicotine Replacement Therapy Programme – Cohort 3 week follow-up survey.' Unpublished report to Ministry of Health.
- BRC Marketing and Social Research*. (2004). 'Evaluation of Subsidised NRT Exchange card Scheme and the Quitline Subsidised NRT Exchange Card Programme'. With Appendices. Report to the Ministry of Health.
- Carter R, Younie S, and Scollo M. (2003). 'Economic Evaluation of the Australian National Tobacco Campaign'. *Tobacco Control*. Forthcoming.
- Cohen S, Lichtenstein E, Prochaska J O, Rossi J S, et al. (1989). 'Debunking Myths about Self-Quitting'. *American Psychologist*. Vol 44, No 11, 1355-1365.
- Cromwell J, Bartosch WJ, Fiore MC, Hasselblad V, Baker T. (1997). Cost-effectiveness of the clinical practice recommendations in the AHCPR guideline for smoking cessation. *JAMA* 1997; **278** (21): 1759-66.
- Croxson B E, and Ashton T (25 April 1990), "A cost effectiveness analysis of the treatment of end stage renal failure", *NZ Med J*, Vol. 103, No. 888, pp. 171-4.

- Easton B (1995). 'Smoking in New Zealand: a census investigation.' *Australian Journal of Public Health*. Vol 19;2: 125-129.
- Fiscella K, Franks P. (1996). Cost-effectiveness of the transdermal nicotine patch as an adjunct to physicians' smoking cessation counselling. *JAMA* 1996; **275** (16): 1247-51.
- Godtfredsen N S, Holst C, Prescott E, Vestbo J, and Osler M. (2002). 'Smoking Reduction, Smoking Cessation, and Mortality: A 16-year Follow-up of 19,732 Men and Women from the Copenhagen Centre for Prospective Population Studies.' *American Journal of Epidemiology*. 2002; 156:994-1001. <http://aje.oupjournals.org>
- Grigg M, Waa A. (2003). *Improving Effectiveness of Smoking Cessation Helplines through the Provision of Subsidised Nicotine replacement Therapy. A longitudinal study*. Conference presentation. The Quit Group, and Health Sponsorship Council. Wellington, New Zealand.
- Gregg J V, Hossell C H, Richardson J T. (1964). *Mathematical Trend Curves. An Aid to Forecasting*. I.C.I Monograph No. 1. Oliver and Boyd.
- Guria J, Jones W, Jones-Lee M, Keall M, Leung J, and Loomes G. (November 1999). *The Values of Statistical Life and Prevention of Injuries in New Zealand*. Draft report, New Zealand Land Transport Safety Authority.
- Hill SE, Blakely TA, Kawachi I, & Woodward A. (2004). Mortality among "never smokers" living with smokers: two cohort studies, 1981-4 and 1996-9. *British Medical Journal*, 328(7446), 988-989.
- Hodgson TA. (1992). 'Cigarette smoking and lifetime medical expenditures.' *The Milbank Quarterly* 1992; 70:81-125.
- Hughes J R, Gulliver S B, Fenwick J W, Valliere W A, Cruser K, Pepper S, Shea P, Solomon L J, Flynn B S. (1992). 'Smoking cessation among self-quitters'. *Health Psychol* 1992; 11(5):331-4
- Kirk R. (February 1998). *Smokescreen for the 1990's. Smoking Cessation Programme. North Canterbury Region. Final Report on Pilot Programme*. Report to Canterbury Respiratory Services, and Pegasus Medical Group.
- Lancaster T, Stead L, Silagy C, and Sowden A. (2000). 'Effectiveness of interventions to help people stop smoking: findings from the Cochrane Library.' *BMJ* 2000;321:355-358 (5 August).
- Laugesen M, and McClellan V. (1999). *Cigarette Smoking, Quitting and Relapsing. New Zealand 1996*. Unpublished paper based on 1996 NRB Survey for Ministry of Health.
- Laugesen M. (2001). *Surveys of Current and Former Smokers Before During and After the QUIT / ME MUTU Campaign in 2000*. Unpublished report on behalf of NIHS to Ministry of Health. 30 September 2001.

- Laugesen M. (2002). *The Television Advertising Component of the QUIT / ME MUTU Campaign in 2000*. Unpublished report on behalf of NIHS to Ministry of Health. September 2002.
- Manning W G, Keeler E B, Newhouse J P, Sloss E M, and Wasserman J. (1991). *The Costs of Poor Health Habits. A RAND Study*. Harvard University Press.
- Max W. (2001). The financial impact of smoking on health-related costs: a review of the literature. *American Journal of Health Promotion* 15(5), 321-31
- Miller T, and Guria J. (May 1991). "The Value of Statistical Life in New Zealand", Land Transport Division, Ministry of Transport, Wellington.
- Ministry of Health. (1999). *Our Health, Our Future*. Wellington, NZ.
www.moh.govt.nz
- NIHS (National Institutes of Health and Safety Ltd). (2001). *Interim Report. Evaluation of the National Mass Media Campaign for Smoking Cessation and Quitline*. Contracted report to Ministry of Health.
- NRB (July 1996). *Environmental Tobacco Smoke Study*. Research Report prepared for the Ministry of Health.
- Phillips D, Kawachi I, and Tilyard M. (1992). 'The Costs of Smoking Revisited'. *NZ Med J* 1992; Jun 24, 105:240-2.
- Rasmussen S R, Prescott E, Sorensen T I A, Sogaard J (2004). 'The total lifetime costs of smoking.' *European Journal of Public Health*. 2004;14: 95-100.
- Szeto, K L, and Devlin, N (1996), "The cost effectiveness of mammography screening: evidence from a microsimulation model for New Zealand". *Health Policy*. 38 (1996) 101-115.
- Thomson GW, Wilson NA, O'Dea D, Reid PJ, & Howden-Chapman P. (2002). Tobacco spending and children in low income households. *Tobacco Control*, 11(4), 372-5.
- Tobias M, and Cheung J. (2001). *Inhaling Inequality. Tobacco's contribution to health inequality in New Zealand*. Public Health Intelligence Occasional Bulletin No 7. Ministry of Health, Wellington. August 2001.
- Town G I, Fraser P, Graham S, McSweeney W, Brockway K, Kirk R. (14 April 2000). 'Establishment of a smoking cessation programme in primary and secondary care in Canterbury.' *NZ Med J*. 14 April 2000.
- Wakefield M & Miller C. (Oct. 1997). *National Tobacco Campaign. First Report on the Evaluation of the National Quitline service*. Report to the Ministerial Tobacco Advisory Group.

Wakefield M & Miller C. (Mar. 1998). *National Tobacco Campaign. Third Report on the Evaluation of the National Quitline service*. Report to the Ministerial Tobacco Advisory Group.

Warner KE. (2000). The economics of tobacco: myths and realities. *Tobacco Control*, 9(1), 78-89.

Wilson N. (2003). Review of the Evidence for Major Tobacco Control Interventions. Wellington: Ministry of Health. [www.ndp.govt.nz/tobacco/ReviewofEvidence.pdf] ISBN [0-478-25884-4]

Woolacott NF, Jones L, et al. (2002). 'The clinical effectiveness and cost-effectiveness of bupropion and nicotine replacement therapy for smoking cessation: a systematic review and economic evaluation.' *Health Technology Assessment*. 6:16. September 2002. Pages1-251.

World Bank. *Development in Practice: Curbing the Epidemic: Governments and the Economics of Tobacco Control*. Washington: The World Bank, 1999.