The Cost of Suicide to Society

MINISTRY OF
HEALTH
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Preface

This report was commissioned in 2005 by the Ministry of Health to inform discussion on the proposed New Zealand all-ages suicide prevention strategy: *A Life Worth Living: New Zealand Suicide Prevention Strategy.*

The report updates and extends the work undertaken by Coggan et al (1995) on the cost of suicide and homicide in New Zealand. This report significantly extends the previous information by:

- constructing estimates of the 'production losses' resulting from victim and family members' absence from the workforce and estimating Disability-adjusted Life-Years (DALYS) lost as a result of suicide or attempted suicide

- undertaking a sensitivity analysis on any factors identified during the analysis that would appear to have a significant impact on the estimated cost of suicide, including the discount rate (3%, 5%, and 10%). A model using 8 percent was also constructed giving a direct comparison with the Coggan et al study

- comparing the Land Transport Safety Authority's 'Value of Statistical Life' approach to derive estimates of the 'Value of a Statistical Life-year', and applying these to the estimates of DALYs lost from suicide and attempted suicide

- discussing alternative valuations of human life.

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Executive Summary

The broad objective of this report is to calculate the 'cost of suicide' to New Zealand. This objective has arisen in the context of concern about the relatively high rate of suicide in New Zealand.

Detailed objectives include:

- updating the earlier work of Coggan, Fanslow and Norton (1995) on the costs of suicide, attempted suicide and self-harm to New Zealand

- cross-checking the results with the international literature

- inclusion of estimates of the costs of **lost production** and of the **Disability-adjusted Life Years** (DALYs) lost because of suicide and attempted suicide, and of the value of DALYs based on various assumptions.

Detailed estimates of **resource costs** or **economic costs**, given in Section D, are based on information provided by a range of agencies, and include estimates of the cost of lost production. Note that, in areas such as funeral and Victim Support costs, there are differences in the computation of some costs compared with those obtained by Coggan et al. Costs are classified, in our terminology, broadly:

- economic costs – services used in cases of suicide and attempted suicide

- economic costs – lost production from exit or absence from the workforce

- non-economic costs – lost years of disability-free life

- non-economic costs – grief of family, whānau and others.

The average economic cost of services used per suicide is, in 2004 dollars excluding GST, $10,200. The average economic cost of services used per attempted suicide is, in 2004 dollars excluding GST, $3,750.

These estimates are compared with those of Coggan et al, derived 10 years ago, in Table 3. There are reasonably substantial differences in some components.

Lost production costs are calculated by multiplying years lost from potential workforce participation by average market income. The average market income includes those with no market income. This means that, unlike the Coggan et al research and many other studies, zero economic value is given to 'unpaid activity'. An assumption built in is that future real income will increase as a result of productivity growth of 1 percent per year. This productivity growth increases lost production costs of suicide by 10 to 20 percent, depending on the discount rate.

For a discount rate of 8 percent per year, the **economic cost** of suicides and attempted suicides for the year 2002, in June 2004 dollars excluding GST, is estimated as follows:

- **Suicides** (n = 460)
  Total cost $206.2 million, of which the dominant component is lost production, valued at $201.5 million. The remaining $4.7 million includes such costs as police, coroners and Victim Support.

- **Attempted suicide and self-harm** (n = 5095)
  Total cost $32.3 million, of which $13.2 million is lost production. Most of the remaining $19.1 million consists of health care expenditure.

- **Total** ($238.5 million)
  This gives:
  – an economic cost per suicide of $448,250
  – an economic cost per attempted suicide of $6,350

Turning now to **non-economic costs** – that is, loss of life years and disability-free life years – life years and DALYs have been calculated (Section E). Overall an estimated 19,218 life years were lost in 2002 due to suicide. This is the estimate before discounting. An extra 1 percent approximately is added to this total to give the number of DALYs.

In Section F, the value of a life year is then calculated from the Value of a Statistical Life estimates of the Land Transport Safety Authority (currently about $2.725 million).

On this basis the average value of lost life years per suicide is about $2.25 million over most discount rates. The total for 2002 is estimated at about $1,150 million.

In other words, the value of the lost Disability-adjusted Life Years dominates all other components of the costs of suicide. Next most dominant are lost production costs. Costs such as emergency services, courts and funeral expenses are small by comparison.

The above conclusions are true also for other studies examined – though most did not go past estimating lost production costs.

The amounts above can be added together as in the summary on the following page. **The overall total for 2002 is about $1.4 billion.**

However, the appropriateness of adding together such different cost concepts should be questioned. The better course is to measure economic costs, including lost production, and then to measure other costs in terms of deaths or life years lost. Thus in this report, such other costs would relate to the 460 deaths by suicide in 2002, or the 19,218 undiscounted life years lost from suicide.

An extensive literature search was carried out for this project by Sarah Tucker, with the assistance of the Ministry of Health library. The results are summarised in Appendix A. A separate, more detailed compilation is also available.

Summary of results: costs of suicide in New Zealand 2002

The following are the estimated costs of the 460 suicides in 2002 and the 5095 attempted suicides in 2001/02.

Economic costs

- Suicides

Costs excluding lost production	=	$4,694,000
Costs of lost production (8% discount rate)[1]	=	$201,498,000
Total	=	$206,192,000
Cost per suicide	=	**$448,250**

- Attempted suicides

Costs excluding lost production	=	$19,092,000
Costs of lost production	=	$13,247,000
Total	=	$32,339,000
Cost per attempt	=	**$6,350**

Overall economic costs	=	**$238,531,000**

Non-economic costs (or willingness-to-pay or quality of life)

To the above totals, add the following non-economic (or intangible etc) values for lost life and quality of life. This calculation assumes that all life years are of equal value, despite the existence of some evidence to the contrary (O'Dea 2004).

At an 8% discount rate		
Value of years of disability-free life lost	=	$1,142,400,000
Cost per suicide	=	**$2,483,000**

Total economic plus non-economic costs[2]	=	**$1,381,492,000**

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[1] The use of an 8 percent discount rate is not an endorsement of that particular value. Its advantage here is that it was the rate used by Coggan et al (1995) and so makes comparisons easier.

[2] Assuming there is not double-counting between lost production and value of life.

Section A: Background

Approximately 500 New Zealanders commit suicide each year.[3] Over a quarter of these are young people – that is, aged younger than 25 years. The total number dying each year from suicide is about the same as the number killed annually in road accidents. That total equates to about one third of all deaths by injury (Table 1). A substantial additional number attempt suicide or to otherwise harm themselves; over 5000 such cases were hospitalised in 2001/02. Our suicide rates – both for youth and over all ages – are high by international standards.

Table 1: Deaths by injury over seven years, 1995–2001

	Seven-year total	Annual average
Road	4,249	607
Suicide	3,848	550
Other	3,783	540
Total	**11,880**	**1,697**

Source: Injury Prevention Research Unit (IPRU), University of Otago, using data from the Ministry of Health's Burden of Disease Study.

The costs of suicide to society are high. The direct economic costs of suicide are not insignificant, as we shall see. But they are small in comparison to the 'intangible costs'; the grief and bereavement of family and friends, and the lost potential of lives cut short.

Suicide rates were in general in the range 8 to 10 per 100,000 population (age-standardised), and generally below 8 per 100,000 for youth, up to about the year 1980.[4] They then climbed, especially from the late 1980s, to a peak all-ages rate of 14.3 in 1998. Youth suicide rates climbed even more dramatically, starting from about 1980 and accelerating from the late 1980s, reaching a peak of 28.7 in 1995 and 26.1 in 1998. Since 1998 the overall rate has declined to a provisional 10.7 per 100,000 in 2002 (the latest year available), the lowest rate since 1985. The provisional youth rate in 2002 was 17 per 100,000, the lowest since 1986.

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[3] Most general assertions, unless otherwise sourced, are based on statistics available from the Ministry of Health website, www.moh.govt.nz. See in particular the file Suicide2002stats.xls for the most recently available numbers at the time of writing this report.

[4] For further details and history, see Antoniadis (1988); for additional discussion of possible socioeconomic factors affecting suicide, see Ferguson et al (2003).

Figure 1: Trends in suicide rates – all ages, 1982–2002

Age standardised rate (per 100,000)
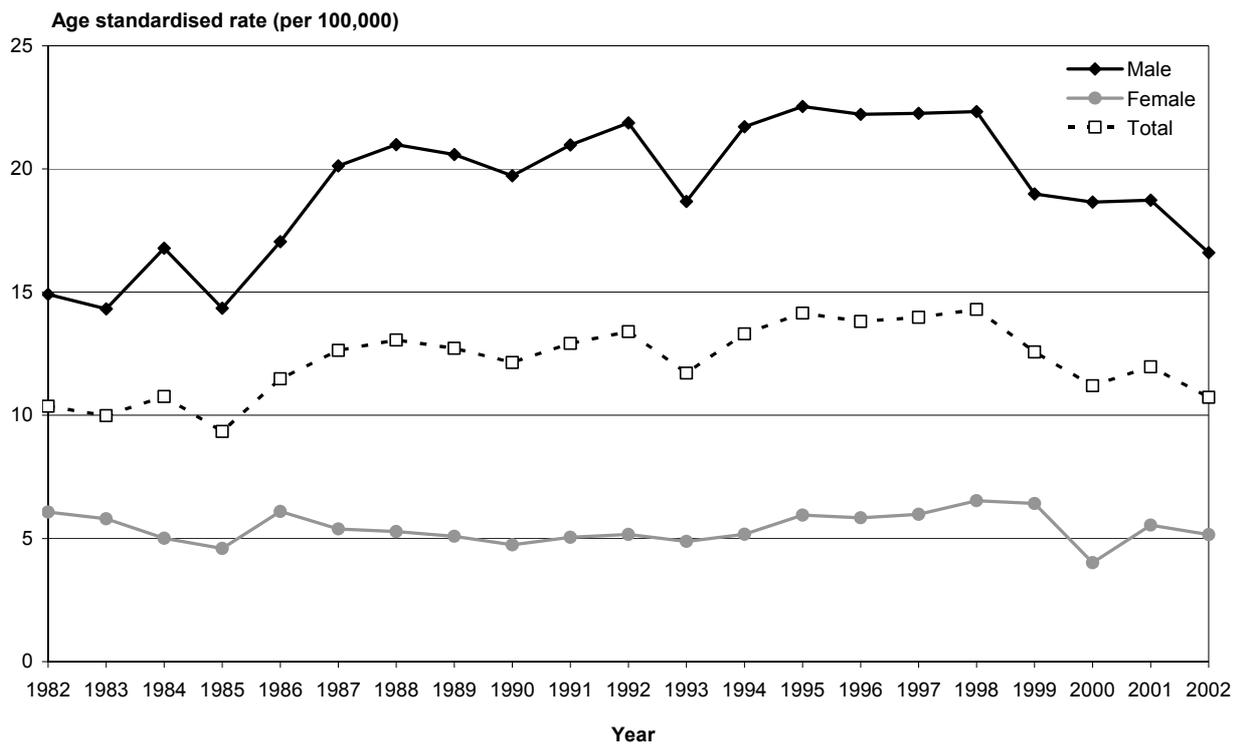
Figure 2: Trends in suicide rates – youth (under 25), 1982–2002

Age specific rate (per 100,000)
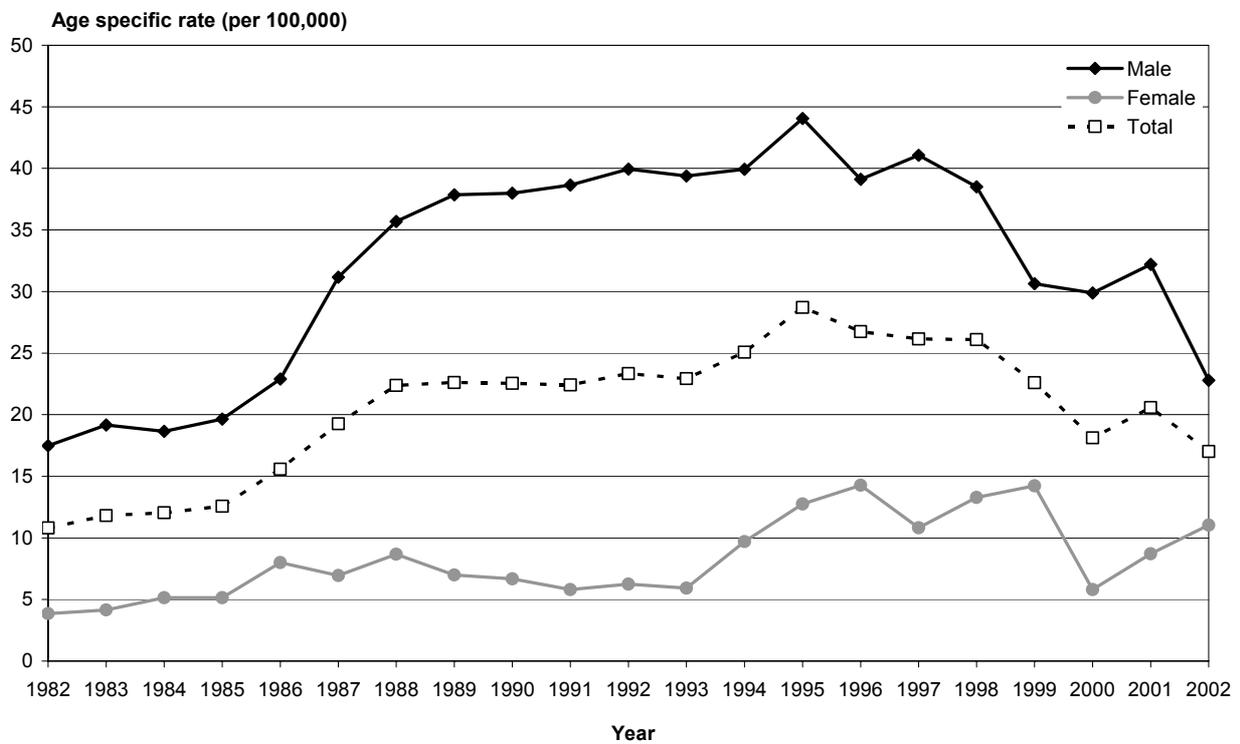
In recent years considerable effort has been put into trying to establish the causes of suicide, and into reducing the number of suicides, especially youth suicides.[5] Judging by the figures just noted, these efforts have had some success, though of course other, wider societal developments could also account for the decline. In any case the latest rates are still excessively high, whether compared with pre-1980 rates or with a country such as the United Kingdom with an overall rate (in 1999) well below 10 per 100,000.

Ten years ago Coggan, Fanslow and Norton (1995) produced a valuable report on the costs of intentional injury in New Zealand, including suicide and attempted suicide. That report is unavoidably now somewhat out of date. *The Cost of Suicide to Society* has been commissioned by the Ministry of Health, in part, to update the Coggan et al report and, in part, as a basis for further data compilation on and assessment of current government expenditure on suicide prevention.

It is frequently remarked in the health economics literature that the compilation of **costs of illness** or **burden of disease** estimates is not necessarily a useful exercise for policy-making purposes. Policy-makers need proposals for specific interventions, which can then be assessed in terms of their expected benefits and costs, relative to alternative interventions or to 'doing nothing'.

However, estimates such as those contained in this report can be useful in two ways.

1. The estimates do give some idea of the conditions and the populations for which the burden of disease is greatest, and can therefore give some guidance as to where research on developing new interventions might be focused to give greatest potential gain.

2. The detailed estimates of cost components can provide useful input to a cost-effectiveness analysis of a proposed specific intervention, and to its subsequent evaluation.

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[5] Substantial reviews of the literature have been completed by Annette Beautrais (1998, 2004).

Section B: Objectives

The objectives set by the Ministry of Health in commissioning this report[6] included the following:

(1a) Update the work of Coggan et al.[7] Measuring costs from a New Zealand 'societal' viewpoint.[8] This will include:

(1b) Checking the New Zealand sources listed in Tables 5.1 to 5.2 of Coggan et al (1995). Namely – Police, Fire Service, Funeral Directors, forensic costs, Coroners, ACC, Victim Support, health-care costs – for the latest available estimates (in general these would probably be in 2003/04 dollars).

(1c) Cross-checking these estimates with the more readily available material in the international literature.

(1d) The work will exclude costs of homicide.

(1e) Extension of the Coggan et al (1995) work by:

- constructing estimates of the 'production losses' resulting from victim and family members' absence from the workforce.
- estimating Disability-adjusted Life-Years (DALYs) lost as a result of suicide or attempted suicide; that is, inclusion of the life-years and also the effect on health-related quality of life of suicides and attempted suicides. The estimates would be broken down by the age-group of the victims.

(1f) A sensitivity analysis undertaken on any factors identified during the analysis that would appear to have a significant impact on the estimated cost of suicide, including the discount rate. The following range of real discount rates to be considered is: 3 percent, 5 percent and 10 percent, with 5 percent being the central rate. A model using 8% is also to be constructed to give a direct comparison with the Coggan et al study (page 89).

(1g) Using the Land Transport Safety Authority's estimates of the 'Value of Statistical Life' to derive estimates of the 'Value of a Statistical Life-year', and applying these to the estimates of DALYs lost from suicide and attempted suicide. It should be noted that that this is a controversial area, as the 'value of a statistical life' is probably not dependent solely on life-years lost, and also there is some evidence[9] that the community gives greater value to life-years lost by younger people. These issues will be discussed, and alternative valuations given if necessary.

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[6] Ministry of Health, 16 December 2004, Letter of agreement.

[7] Coggan C et al.1995.

[8] That is, all costs borne by any New Zealander – not just costs to government agencies.

[9] Seminar: Who should have health-care priority? Community preferences shown by 'ad hoc' surveys. Des O'Dea, Wellington School of Medicine. 29 October 2004.

Section C: Costs: Terminology and Definitions

Terminology

The terminology relating to costs in health sector economic analyses is in a state of flux.

We follow the recommendations of Drummond, O'Brien, Stoddart and Torrance (1997) in trying to avoid terminology such as 'direct' and 'indirect' costs, and 'tangible' and 'intangible' costs and benefits. However, this approach is not always possible when discussing the work of others. The word **direct** is commonly used to describe the costs of those services directly called on as a result of suicide or attempted suicide – for example, police investigations and hospital care. **Indirect** is commonly applied to the loss in productive activity that follows from a suicide or attempted suicide. Sometimes indirect costs are extended to measures of **years of life lost**: Quality-adjusted Life Years (QALYs) or Disability-adjusted Life Years (DALYs).

Cost in economics should mean 'opportunity cost' – that is, the use of resources (labour, capital, consumables, etc) that cannot therefore be used for some other purpose. The value of these resources is then the value when used in the next best alternative. **Economic costs** or **resource costs** are often used as synonyms for opportunity costs.

Drummond et al (1997) recommend the following terminology:

(a)   'Costs' should be identified. A 'Cost' involves the consumption of resources. It is then helpful to classify them by whether they fall on:
- the health care sector
- patient and family
- other sectors.

(b)   'Consequences' should be identified. These can be classified as one of the following:
- resources saved (ie, the negative of a cost)
- health state changed (change in years lived, quality of life, etc)
- other value created (eg, changes in justice or education sectors).

Resources saved can again usefully be classified by whether they accrue to the health care sector, or to patient and family, or to other sectors.

To compare the costs and benefits of a proposed intervention, therefore, it is proper practice to bring back the estimated value of **resources saved** to the costs component, subtracting it as a **negative cost**.

Perhaps the most important issues here concern **lost production**. First, it is indeed appropriate to treat it as a cost or, alternatively, an averted cost as a result of successful treatment. The second issue, however, is whether lost production has already been taken into account in any valuation of health state (eg, in terms of QALYs). This is a difficult question to answer. The pragmatic solution adopted here is to assume that when people value health states they are not taking account of the effect on workplace production, and so the value of the latter requires separate calculation.

Practices employed by various researchers

Coggan et al (1995) used the following classification (Table 5.1):

- **DCP**: direct costs – publicly funded

- **DCI**: direct costs – individual financial cost (including unsubsidised GP visits, counselling, drugs etc)

- **ICS**: indirect costs – societal (eg, time lost from work)[10]

- **ICI**: indirect costs – individual, family (eg, pain and suffering).

Approaches used by other authors are discussed in Section G.

Summing up the approach used in this report

In regard to terminology, we follow Drummond et al's (1997) recommendations.

- Section D covers those economic costs that result from suicide, attempted suicide or other attempts at self-harm. An equivalent way to think of these costs is as the resource costs that will be saved as a result of any reduction in the rate of suicide or attempted suicide.

- These economic costs include, first, the agency costs – that is, the costs directly caused by a suicide or attempted suicide, such as police, health care and coroner's inquest costs. They include, secondly, estimates of the value of lost production as a result of suicide. This lost value is taken as equivalent to the income (pre-tax) that would otherwise have been earned in the paid workforce. That is, we are talking about the lost contribution to gross domestic product (GDP). It does not include any estimate of the lost value of time not spent in paid employment. Such **non-paid** lost time is not an economic cost in our sense. Perhaps more to the point is that it can be reasonably assumed that this form of lost time is taken into account in the subsequent valuation of life years lost. However, most of the studies seen in the course of preparing this report do include this component in indirect costs.

The following sections cover the consequences in terms of changes in health state, and their valuation. That is, they deal with the measurement and valuation of years of life lost, plus DALYs lost from attempted suicide. There is also brief discussion of the impact of a suicide or attempted suicide on the lives of family and others.

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[10] In the original report, the wording of ICI appears to have been run together with that for ICS. This apparent error has been corrected here.

Section D: Estimates of the Resource Costs of Suicide and Attempted Suicide

This section follows closely the approach used by Coggan et al (1995), updating and extending their results where possible. Unless otherwise stated, financial costs exclude goods and services tax (GST). Most costs quoted by informants are for the June year 2003/04 or the calendar 2004 year, as identified in each case. Costs referring to other periods have been adjusted to June quarter 2004 values, using the Consumer Price Index (CPI).

Additional detail on sources and information is available in Appendix B.

The economic costs of suicide

Police involvement

Source: New Zealand Police

The average cost per hour for a police officer was approximately $79.00 (including GST) in the 2003/04 fiscal year.

- **Initial police attendance.** A total of 5602 sudden deaths required police attendance in 2003, at an average of 17.9 hours of attendance per sudden death. Assuming this average applies to suicides, the attendance cost was $1,414.10 per suicide, or $1,256.98 excluding GST.

- **Mortuary and inquest attendance.** One to 3.5 days' preparation and attendance was required – say, an average of 1.5 days or 12 hours. On this basis, the attendance cost was $948 per suicide, or $842.67 excluding GST.

- **Total of above.** Cost, excluding GST, was $2,099.64, which rounds to $2,100 per suicide.

Note that this total is considerably higher than the Coggan et al estimate of $150 per suicide for 1994, which assumed attendance of two constables and police officer for one hour.

Fire Service attendance

We are informed by the Fire Service that, since 1995, there has been an average of 1.5 suicides by fire per year. It appears fire appliances do not customarily attend non-fire suicides, though Coggan et al reported their attendance at 50 percent of such suicides.

Cost per fatality is approximately $600 for attendance by two appliances for one hour, plus $2,000 per fatality for investigation and reporting costs. That is, the estimates are $2,600 per fire suicide, $3,900 per year and, for overall suicides (assuming 500 per year), $7.80 per suicide.

Funeral directors' and funeral expenses

Source: Funeral Directors Association of New Zealand

It should be noted that these expenses would in any case have been incurred eventually. That future cost should theoretically be deducted when it occurs. This deduction has not been made in the calculations below. The adjustment will, for any reasonable discount rate, be small for young people because of the discounting, but will be more significant for older persons committing suicide.

- **Funeral director's transport to mortuary**. Cost depends on distance transported. An approximate $50 for time costs and $50 for transport costs, or a total value of $100, is assumed here.

- **Burial/cremation.** Burials – occurring for approximately 30 percent of funerals – cost $6,500 on average; and cremations – occurring for the remainder, approximately 70 percent of funerals – cost $5,000 on average. That amounts to an overall average of $5,450 per funeral.

- **Reception.** At $6.50 per attendee, assuming 100 attendees (though the number can be larger for youth suicides), the cost totals $650 per suicide.

Victim Support

Source: Victim Support

Victim Support provides support after most suicides, for perhaps 6.6 hours per incident at, say, $40 per hour. (Actual recorded costs could be lower because of the use of volunteers. Victim Support believes it is underfunded.). Added to this are travelling costs of an estimated $33.28 per incident, at $0.50 per kilometre. Estimated total cost is thus $297.28 per suicide.

Forensic costs

Source: Tribunals Unit, Ministry of Justice

According to the Tribunals Unit, coroners sometimes request simple toxicological tests but their cost is generally negligible. The police, however, sometimes request more complex tests in doubtful cases.

Post-mortems

Fees payable for post-mortems are set out in the Coroners (Fees) Regulations 1999. However, these are only a part of the total costs to District Health Boards (DHBs) of providing post-mortem services. Work by Grant Johnston (1994), adjusted to present-day values, suggests an overall cost of $1,100, excluding GST, per coroner-directed post-mortem. This figure is in close agreement with Ministry of Justice spending per inquest for 2003/04 (divided by 2001/02 inquest numbers). A cost of $1,100 per suicide is therefore our estimate. The assumption in these estimates is that averages over all inquests apply also to suicide inquests.

Inquests

An inquest is required for all suicides. The Tribunals Unit informs us that expenses amounted to $163,200 in 2003/04 for the 355 suicide inquests conducted outside of Auckland. (Auckland coroners are salaried, whereas coroners elsewhere are paid according to a specified schedule of fees and expenses.) This total breaks down to $460 per inquest, or $408.64 excluding GST, assuming the economic cost of Auckland inquests is the same. However, this estimate may take insufficient account of the use of Department of Courts court facilities and staff for most inquests. The amount has therefore been rounded up to $500.

Total

The sum of these estimates is $10,205 per suicide. For comparison, the corresponding estimate by Coggan et al (1995, p 89) was $4,840 in 1994. In 2004 dollars this amounts to $5,944. Our estimates differ in several components, as can be seen in Table 3. Specifically, we include funeral and funeral reception costs whereas Coggan et al did not. Their estimates of forensic costs and also of Victim Support costs are substantially higher.

Table 2: Economic costs of suicide, apart from lost production

Service	Unit of measurement	Estimated amount ($ GST exclusive)	Period	Cost per suicide (GST exclusive) mid-2004 approximately
Police	Suicide attendance	$1,256.98	2003/04	$1,256.98
	Mortuary/inquest attendance	$842.67	2003/04	$842.67
Fire Service				
Attendance	Per suicide by fire (1.5 per year)	$600		$1.80
Investigation/report	Per suicide by fire	$2,000		$6
Funeral Directors				
Transport to morgue	Per suicide	$100		$100
Burial	Per suicide	$6,500		$1,950
Cremation	Per suicide	$5,000		$3,500
Reception	Per suicide	$650		$650
Victim Support				
Contact	Per suicide	$264		$264
Travel	Per suicide	$33.28		$33.28
Coroner				
Forensic	Per suicide	Negligible		
Post-mortem	Per suicide	$1,100	2004	$1,100
Inquest	Per suicide	$408.64 (round to $500)	2004	$500
Total				**$10,204.73**

Sources: See Appendix B for details.

Table 3: Cost estimates in this study compared with Coggan et al (1995)

$ per case	Coggan et al 1995		Our estimates GST exclusive 2004 $
	Original	**Approximately 2004 $**	
Suicide			
Police	$150	$184	$2,100
Fire Service	$145	$178	$8
Funeral director	$1	$1	$6,200
Forensic	$2,499	$3,069	$0
Coroner's post-mortem	$270	$332	$1,100
Coroner's inquest	$275	$338	$500
Counselling of family	$1,500	$1,842	$297
Total	**$4,840**	**$5,944**	**$10,205**
Attempted suicide			
Emergency Response teams	$0	$0	$100
Police	$150	$184	$401
Fire Service	$145	$178	$0
Counselling of family	$1,500	$1,842	$100
Ambulance	$0	$0	$383
Hospital treatment costs	$2,043	$2,509	$2,513
Emergency Department	$361	$443	$250
Total	**$4,199**	**$5,156**	**$3,747**

Note: Coggan et al estimates from pages 89–90. Treatment of GST is not explained.

The economic costs of attempted suicide

It should be noted that demarcation lines that distinguish attempted suicide from suicide and self-harm can be somewhat blurred. For instance, an attempted suicide case may be admitted to hospital, and then the person may die in hospital. Also, the available statistics include both attempted suicide and self-harm, although not all cases of self-harm are attempts at suicide.

It is well known that the number of attempted suicides is considerably higher than the number of successful suicides. Total public hospital discharges for intentional self-harm numbered 5059 in 2000/01 and 5095 in 2001/02 (ICD10 classification) – that is, amounting to approximately 10 times the number of suicides. Female discharges outnumber male discharges by about two to one.

These numbers for 2000/01 and 2001/02 include admissions to psychiatric hospitals (FAC type = 03), unlike the data for earlier years. Discharges in 1999/2000 numbered 3722. This implies that psychiatric hospital admissions added about 1350 admissions. For the calculations in this report these admissions have been included. An overall average treatment cost, including FAC = 03, has been used in the calculations described below.

The costs of attempted suicide have been compiled under the following headings.

- **Emergency Response Teams** are teams responding to a psychiatric emergency in the community. It has proved difficult to obtain information on the costs of their responses to suicide attempts. In default of such information we have assumed a cost of $100 per suicide attempt on average, excluding GST. This estimate could be on the low side.

- **Police involvement** costs an estimated $401, excluding GST. This estimate is based on an average of 5.71 hours in attendance per case, at $79 per hour, less GST.

- **Ambulance costs**, based on information from the Wellington Free Ambulance, are an estimated $383.27.

- **Emergency Department costs** have been estimated with information obtained from Capital and Coast DHB. The expected number of Emergency Department admissions for 2004/05 is 41,199 for Wellington and Kenepuru combined, including 'inter-district flows' of 3850 admission of patients from other DHBs. Budgeted revenue for this is $8,072,637, excluding GST, which breaks down to an average of $195.94 per admission. This figure includes an allocation of internal costs for operation type costs, cars, information services, laundry, rent of space, etc. It does not include hospital overheads that cannot be directly allocated; we assume these costs to be an extra $55 approximately. Thus the estimated total cost is $250, excluding GST. (Coggan et al had a 1994 value of $361.) The assumptions made here are that all attempted suicides are admitted through the Emergency Department, and that such cases have the same average cost as all admissions.

- **Hospital health care** costs were estimated drawing on a tabulation obtained from the New Zealand Health Information Service (NZHIS) of attempted suicide and self-harm discharges by diagnostic-related category (DRG) for the five years from 1999/2000 to 2003/04. The data included discharges from all facilities – that is, the main public hospitals (FAC code = 1), psychiatric units (FAC code = 3) and a couple of other minor codes. The resulting average case-weights from these data are shown in Table 4 for the whole five years and then the last two years.

Table 4:   Average case-weights for attempted suicide/self-harm discharges X60–X84

Period	Facility		
	1	2	All
Five years 1999/2004	0.791	2.871	0.983
Two years 2002/04	0.781	2.271	0.921

Source: NZHIS tabulation.

Total discharges numbered 25,604 for the whole five-year period (Facility 1 with 23,275, Facility 3 with 2256, others with 73). For the last two years, total discharges numbered 11,032 (Facility 1 with 10,013, Facility 3 with 983, others with 36).

That is, Facility 3 discharges numbered a little under 10 percent of the total, but its higher case-weight pulled up the average, though less so in the last two years. We take the average case-weight for the last two years – 0.921 – as being the appropriate value to use.

Overall average values per case-weighted discharge for recent years 1999/2000 to 2004/05 have been given by NZHIS as follows (personal communication Chris Lewis).

1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05
$2,399.22	$2,487.16	$2,479.01	$2,617.72	$2,728.55	$2,854.88

These values are GST-exclusive (NZHIS 2004, Appendix 3).

Applying 0.921 to the 2003/04 average of $2,728.55 gives an average value in 2003/04 dollars, excluding GST, of $2,512.97.

We use $2,513 as the average economic cost of hospital health care (excluding Emergency Department costs) per attempted suicide or self-harm discharge. Note that Coggan et al used a value of $2,043, equivalent to about $2,500 in 2004 dollars.

- **Victim Support**. Not all cases of attempted suicide and self-harm would require Victim Support, or would require it to the same level as for a suicide. We assume an average Victim Support cost of $100 per attempted suicide or self-harm discharge.

Total

The total of the above estimates, summarised in Table 5, comes to $3,747 per attempted suicide and self-harm discharge. For comparison, Coggan et al estimated $4,199 in 1994, or $5,166 in 2004 dollars. Most of the difference is accounted for by the estimated $1,500 attributed by Coggan et al to Victim Support services, compared with the estimated $60 used here.

Table 5:   Economic costs of attempted suicide, apart from lost production

Service	Unit of measurement	Period	Cost per suicide (GST exclusive)
Police	Attempted suicide	2003/04	$400.97
Emergency Response team	Attempted suicide		$100
Ambulance	Ambulance attendance		$383.27
Emergency Department	Admission	2004/05	$250
Hospital health care	Discharge		$2,513
Victim Support	Attempted suicide		$100
Total			$3,747.24

Overall economic costs, excluding lost production costs

We have from the above calculations, in 2004 dollars, excluding GST, the following total estimates:

Cost per suicide	=	$10,205
Cost per attempted suicide	=	$3,747

Applying these figures to the numbers of suicides and attempted suicides recorded in 2002, we reach the following totals in 2004 dollars:

460 suicides at $10,205	=	$4,694,000
5095 attempted suicides at $3,747	=	$19,092,000
Total, not including lost production costs	=	$23,786,000

For comparison, Coggan et al estimated a total of $13,308,000 for the year 1992 in 1994 dollars. This amounts to $16,342,000 in 2004 dollars. (It is not clear whether Coggan et al excluded GST.) Suicide numbers were similar – 493 in 1992 – but attempted suicides numbered only 2601 in 1992, explaining much of the difference.

Lost production values

One approach to measuring lost production is to use the yardstick of lost gross earnings. This approach is used here for costing short-term absences from work as a result of attempted suicide, or for attendance by family or friends. Average earnings in the June quarter of 2004 were $20.30 per hour, $162.40 for a standard eight-hour day and $42,224 per year (Reserve Bank Statistical Indicators, Historical Tables). The hourly rate has increased by 34.4 percent increase from $15.10 as reported for the June quarter of 1994, representing a real increase of about 9.4 percent over the 22.8 percent increase in CPI prices over the same period. (Coggan et al used an average daily gross wage of $148, and an average hourly rate of $14.73.)

For valuing lifetime lost production resulting from suicide, however, we use a different approach. The gross earnings cited in the previous paragraph are for those whose income is from wages and salaries from full-time work. In their place we use **market income**, which includes in addition income from self-employment, investments and rent. Like average gross earnings, market income is measured pre-tax and excludes any 'transfer' income from benefits or publicly funded superannuation. Unlike gross earnings, however, market income is averaged over the whole population, including part-time workers and those receiving no market income at all. Wages and salaries are the largest component of market income, but self-employment income and investment income increase in importance on average in the later years of working life.

An important point in this regard is that we are measuring lost production here in terms of the average actual reduction in income earned in the market. The average reduction is made smaller by the smaller income reductions of part-time workers (and the zero reduction for those who would not otherwise receive market income). A number of the studies reviewed in the course of preparing this report use a different approach. In those studies, lost production is equated to the lost earnings of a full-time worker. This approach obviously enlarges the estimated loss. A rationale for this approach (though it is not always explicitly stated) is that there is lost production additional to that measured in terms of market remuneration; for example, unpaid contributions to the family and to society in general. There is sometimes also a feeling that to take any other approach is unfair to those on lower incomes, in particular females, so that sometimes average full-time male earnings are used as the measure.

We prefer to use lost **market-reimbursed production** rather than a broader, but vaguer concept of lost social contribution. The latter is not necessarily wrong. It is, however, less easily measured without dispute, and brings in costs that are not economic costs or resource costs in the standard sense. Later we discuss the valuation of years of life lost or years disabled. In these instances, we do go beyond resource costs to try to measure intangible costs in ways that do not

rate any one individual as more valuable than another[11] (or, more precisely, that rate a life year gained as of equal value no matter by whom it is gained).

The source for market income data used here is the Statistics New Zealand Income Survey for the June quarter of 2004. Table 6 summarises this material and its use.

Table 6: Average market incomes, by age group and gender: population with market income, and total population, June quarter 2004

Age group	Males	Females	Total
I. Average market income: those with any market income			
15–24	$23,404	$16,381	$20,183
25–44	$47,616	$30,230	$39,492
45–64	$50,885	$29,913	$40,982
65 and over	$15,267	$7,625	$11,407
Total 15+	**$41,830**	**$25,526**	**$34,135**
II. Ratio of population with market income to total estimated resident population			
15–24	0.591	0.524	0.558
25–44	0.889	0.736	0.810
45–64	0.882	0.781	0.831
65 and over	0.606	0.515	0.555
Total	**0.610**	**0.534**	**0.572**
III. Market income averaged over total estimated resident population			
15–24	$13,828	$8,581	$11,268
25–44	$42,350	$22,250	$31,996
45–64	$44,890	$23,367	$34,071
65 and over	$9,254	$3,926	$6,334
Total	**$25,515**	**$13,639**	**$19,511**

Source: New Zealand Income Survey, June 2004. Special tabulation.

Note: The population sampled in the income survey excludes several categories of the usually resident population. In particular, members of the armed forces, inmates of penal institutions, persons living in non-private dwellings, and residents of old people's homes, hospitals and psychiatric institutions. These exclusions bias downwards the ratios in Part II above, and hence the averages in Part III.

The first part of Table 6 gives average market income for the June quarter of 2004, by broad age group and gender, for those individuals surveyed who received any market income at all. Not all receive such income, and the second part of the table gives the ratio of those in each subgroup who received market income to the total estimated resident population of that age group at June 2004. The populations in the two sources are not quite identical, as noted in the footnote to the table. This biases the ratios downwards, though not by any large amount except possibly for the 65+ age group, which is not important for our subsequent calculations.

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[11] More precisely, a life-year gained is in general considered of equal value no matter by whom it is gained.

The third part of the table multiplies together the first two, to give average market income for the total resident population, including those not receiving market income. These are the numbers used in subsequent calculations of lost lifetime production as a result of suicide.[12] For both females and males the averages show the characteristic tendency to rise to a peak in middle age, falling away in later years. Figure 3 illustrates this.

Figure 3: Market income, averaged over total resident population, June 2004
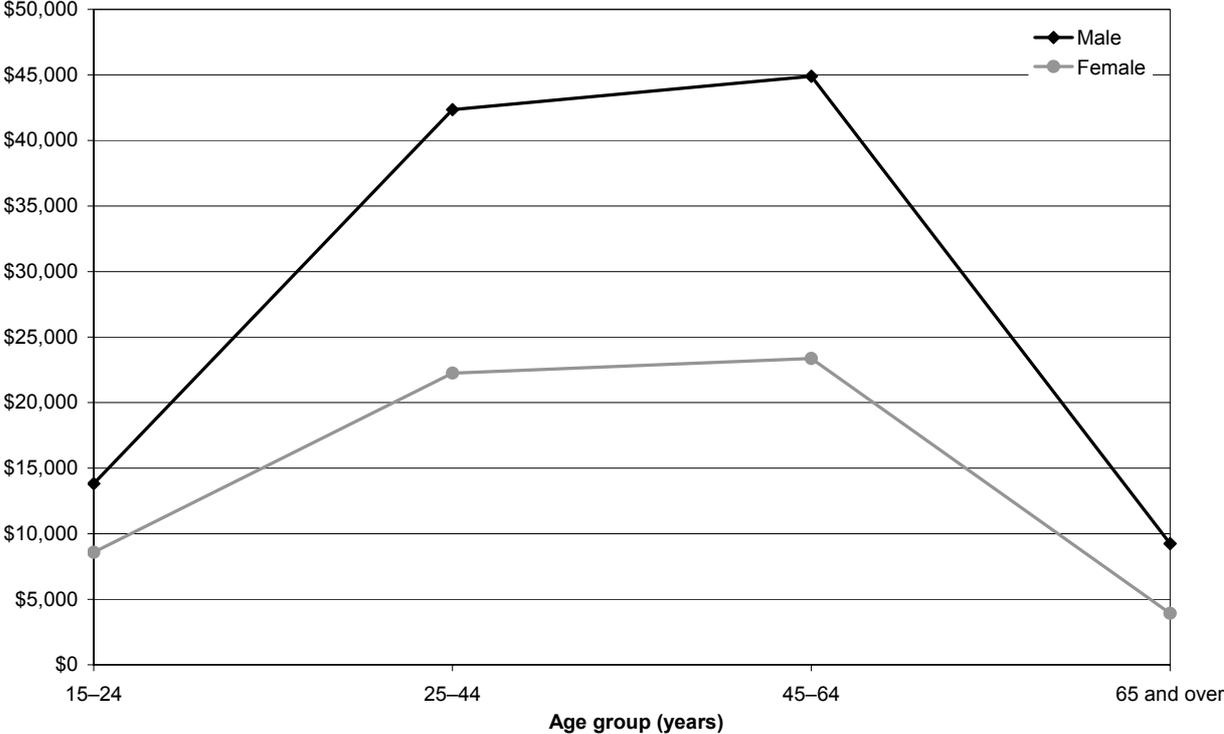
Income losses arise from:

- suicides through:
  – lost years of earning and other income to the person committing suicide
  – lost earnings by family, friends, etc at the time of the suicide
- attempted suicides through:
  – lost earnings to the person attempting suicide whilst in hospital and recuperating
  – lost earnings by family, friends, etc at the time of the attempted suicide.

The overall proportion receiving some market income (Table 6) is of the order of 80 percent for the middle age-groups. As an approximation for short-term lost earnings, this proportion is applied to the average earnings of $162.40 per day discussed at the start of this subsection, to give an average of $129.92 – say, $130.

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[12] Participation rates, however, might well be lower than average for persons who commit suicide or attempt to do so. For further discussion, see Ostamo et al (2001) on suicide attempters in Helsinki from 1989–94: 'Unemployment rates among suicide attempters were higher than in the general population' (p 1741).

Short spells off work

The following assumptions are made about the costs related to short absences from work.

A person attempting suicide off work for 10 days	$1,300
Two family members, etc of an attempted suicide off work five days each	$1,300
Family, etc of person committing suicide off work 20 days in all	$2,600

Lifetime's lost earnings

From the data in Table 6, discounted lost future market income can be calculated for age group at time of suicide by gender. The results are weighted together to give an overall average for suicides in the age range 10 to 64 years, using proportions over the seven years 1995 to 2001 (Otago data). They are presented in Table 7.

The first part of the table assumes no future productivity growth. In other words, average incomes are expected to remain unchanged in real terms from the June quarter 2004 averages in Table 6. The undiscounted lost lifetime market income, averaged over males and females, is $1,166,300 and, at an 8 percent discount rate, is $393,300.

However, these numbers do not take account of potential productivity gains. On past trends we can certainly expect productivity to increase, and real income per head to increase as well. The second part of the table builds in a reasonably modest long-term annual productivity gain of 1 percent per year. This increases the amount of lost lifetime earnings to $1,413,900 undiscounted and to $438,000 at an 8 percent per year discount rate.

We take these last amounts as our central values for the long-term loss in market income that persons committing suicide would otherwise have earned – based on June 2004 average market incomes, and allowing also for future long-term productivity growth of 1 percent per year.

Table 7: Lost lifetime market income of suicides, averaged over all ages

$ 000s	Discounted at rate of:						
	0%	**3%**	**5%**	**6%**	**7%**	**8%**	**10%**
	Assuming average June 2004 market income – no productivity gain						
Females	681.5	412.5	315.4	280.2	251.3	227.2	189.8
Males	1306.0	797.7	611.4	543.6	487.8	441.2	368.6
Both	1166.3	711.5	545.2	484.7	434.9	393.3	328.6
	Assuming average June 2004 market income – plus 1% per year productivity gain						
Females	829.8	482.1	360.5	317.3	282.1	253.1	208.7
Males	1582.2	930.3	698.2	615.1	547.3	491.3	405.2
Both	1413.9	830.0	622.6	548.5	488.0	438.0	361.2

Note: Age and gender proportions from Otago data for suicides over seven years, 1995–2001. Age range 10–64 years.

Summary of lost production estimates for 2002

- Suicides
460 × $1,413,900 (0% discount rate)	= $650,389,000
460 × $438,000 (8% discount rate)	= $201,498,000
Family etc 460 × $2,600	= $1,196,000

- Attempted suicides
5095 × $1,300	= $6,623,500
Family etc 5095 × $1,300	= $6,623,500

The following are some comments on these results.

- The lost production as the result of a completed suicide dominates all other amounts listed in this section of the report.

- The calculated amount at a discount rate of 8 percent per year is approximately $201 million. Coggan et al's corresponding value (for 493 rather than 460 suicides), also discounted at 8 percent, was $154 million, which is equivalent to about $189 million in present-day dollars. Real income growth of about 10 percent (see above) over the 10-year period would lift their estimate to approximately $210 million.

- The differences in our estimates are accounted for by a number of offsetting factors: the higher number of suicides (by 7 percent) in Coggan et al's calculations; the use of different income profiles; Coggan et al's use of 100 percent workforce participation; our assumed 1 percent per year productivity growth; and our different income measures. It appears coincidental that the estimates from the two reports are so similar overall.

- Arguments can be made for Coggan et al's approach in terms of valuing the contribution of those not actively employed as equal to full-time employees. In that case, however, it could be appropriate to also value years past 65 on the same basis. Our argument is that while persons not participating in the paid workforce still make or will make a contribution to society, the loss of this contribution is not an economic cost in the sense of reducing GDP.

Summary of all economic costs for 2002 – in 2004 dollars, excl GST

We have the following estimates of the economic costs of the 460 suicides in 2002 and the 5095 attempted suicides in 2001/02.

- **Suicides**
Costs excluding lost production	= $4,694,000
Costs of lost production (8% discount rate)[13]	= $201,498,000
Total	= $206,192,000

- **Attempted suicides**
Costs excluding lost production	= $19,092,000
Costs of lost production	= $13,247,000
Total	= $32,339,000

- **Overall** = **$238,531,000**

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[13] The use of an 8 percent discount rate is not an endorsement of that particular value. Its advantage here is that it was the rate used by Coggan et al (1995) and so makes comparisons easier.

Section E: Life Years and Disability-adjusted Life Years Lost from Suicide and Attempted Suicide

An overview of QALYs and DALYs

The purpose of health care interventions is, in most cases, not to save money but to restore or maintain health.[14] We wish to fund those interventions that provide the most health gain from the available resources.

How, then, do we measure **health gain**? As an equivalent issue, how do we measure the health loss associated with a particular disease or condition – such as suicide and attempted suicide – so that we can estimate the gain from reducing the prevalence of that disease or condition?

Lives saved is one useful measure of health gain. Better still is **life years saved**. However, both these measures are applicable only to those interventions that save lives. Most health care interventions are not life-saving but do improve the patient's **quality of life**. This has led to the development of concepts such as Quality-adjusted Life Years, which take into account reductions in both mortality and morbidity. Extra years lived are counted as part of health gain; so too is any improvement in the health-related quality of life of the years lived. QALYs are widely used now in cost-effectiveness studies, with cost per QALY gained contributing to decisions as to which interventions should receive priority for funding.

A variant on QALYs is the concept of **Disability-adjusted Life Years**. These were developed by the World Bank and World Health Organization (WHO), and used extensively in *The Global Burden of Disease* (WHO 2000). They have been used also by New Zealand's Ministry of Health in *Our Health: Our Future* (1999) and subsequent reports to measure the burden of disease.

In a sense, DALYs are the negative of QALYs. In brief, one DALY represents the loss of one year of disability-free life. It is a health gap measure that incorporates both loss of life years (years of life lost, YLL) and years lost to disability (YLD). YLD is calculated by assigning disability weights for different states of being; in other words, by allowing for differences in quality of life in different states. The disability weights are based on social preferences typically derived from focus group discussions.

The total number of DALYs in a given period is then the sum of years of life lost and years lost to disability. Symbolically:

DALYs   =   YLL + YLD

Where YLL and YLD refer to future years, they are discounted to give equivalent 'present value' life years.

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[14] In some cases, a new procedure or drug will produce the same health outcome as current procedures but more cheaply. The new procedure or drug should of course be adopted.

Discount rates

Unfortunately there is little agreement on what discount rate should be used for economic evaluations of New Zealand health care. The rate should, of course, be 'real'; that is, applied to cost and benefit data from which the effects of price and cost inflation have been removed. High discount rates tend to penalise interventions whose benefits are well in the future, compared with interventions whose benefits are more immediate. Traditionally (or at least since the mid-1980s) it has been widely believed that The Treasury requires the use of a real discount rate of 10 percent per year for public sector investments, in order to prevent the 'crowding out' of private sector investment by low-return public sector investment.[15] A Treasury official at a recent workshop (New Zealand Health Economists, November 2004) maintained, however, that no case for a lower discount rate had been put to Treasury.

Nevertheless the Pharmaceutical Management Agency (PHARMAC) uses a 10 percent discount rate for its evaluation of new pharmaceuticals proposed for subsidy. Most countries prefer a health sector discount rate of about 5 or 6 percent. A few years ago, a panel of leading United States health economists proposed that 3 percent should be used in that country (Gold, Siegel, Russell and Weinstein 1996) and that, even if this were not the preferred rate, any evaluation should include the results of using a 3 percent discount rate as well as the preferred rate, to allow comparisons between different evaluations using a common rate. The New Zealand Ministry of Health gives results for a 3 percent discount rate in *Our Health: Our Future* (1999).

Given the lack of consensus, a range of discount rates is used in this report: 0, 3, 5, 6, 7, 8 and 10 percent. Eight percent is included as the rate used by Coggan et al (1995, p 89).

Estimation of years of life lost

Years of life lost from death at a given age are calculated using normal life expectancy at that age. For this report we have used the New Zealand 2000–2002 Life Tables for Non-Māori, male and female separately (Statistics New Zealand 2004). This approach gives a greater potential gain for Māori than using separate Māori and non-Māori Life Tables. The use of Non-Māori rather than Total Population Life Tables also in effect allows for some future gain in life expectancy over current life expectancies.

These life expectancies are applied to the breakdown of suicides by age group in recent years. Table 8 gives this age breakdown. (Three reported suicides at ages 0 and 1 are discarded as presumed coding errors.)

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[15]   For further, if inconclusive, discussion see The Treasury Working Paper 02/21 (Young 2002).

Table 8: Life expectancies, non-Māori, 2000–02

	Females	Males
10<14	70.0	65.2
15<19	65.0	60.4
20<24	60.2	55.7
25<29	55.3	51.0
30<34	50.4	46.2
35<39	45.5	41.5
40<44	40.7	36.7
45<49	35.9	32.0
50<54	31.2	27.5
55<59	26.7	23.0
60<65	22.3	18.9
65<69	18.2	15.0
70<74	14.3	11.6
75<79	10.8	8.7
80<84	7.8	6.2
85<89	5.4	4.3
90<95	3.6	3.0
95+	2.5	2.2

Table 9: Age breakdown of suicides, by gender, 1995–2001

	Females	Males
10<15	2.4%	0.9%
15<20	14.5%	9.1%
20<24	10.8%	15.2%
25<29	10.7%	14.2%
30<34	10.5%	12.1%
35<39	9.0%	10.3%
40<44	10.2%	7.9%
45<49	8.0%	6.2%
50<54	6.4%	5.0%
55<59	3.6%	4.9%
60<65	2.8%	3.3%
65+	11.0%	11.1%
Total	100.0%	100.0%

Source: Injury Prevention Research Unit (IPRU), University of Otago, using data from the Ministry of Health's Burden of Disease Study.

Average years of life lost per suicide are then calculated for a given year's data, assuming a constant age-group composition, for a range of discount rates. The results are given in Table 10. The table also shows the proportion of YLL that accrues to those aged under 25 at the time of suicide. Finally the total number of YLL is calculated for the year 2001. Undiscounted, 21,646 life years are lost. At the other extreme, using a 10 percent discount rate, the sum of discounted life years is 4618.

Table 10: Calculation of years of life lost from suicide

Discount rate	0%	3%	5%	6%	7%	8%	10%
	Average years of life lost (YLL) per suicide						
Female	44.9	22.9	16.4	14.2	12.5	11.1	9.0
Male	40.8	21.8	15.8	13.8	12.2	10.9	8.9
	Percent of YLL lost to those aged under 25 at time of suicide						
Female	39.4%	33.8%	31.7%	30.9%	30.4%	30.0%	29.3%
Male	35.7%	31.1%	29.2%	28.5%	28.0%	27.6%	27.0%
	Total YLL lost in 2002						
110 females	4,937.2	2,518.0	1,798.7	1,559.1	1,370.0	1,218.0	990.8
350 males	14,280.8	7,638.5	5,547.0	4,834.6	4,266.3	3,805.6	3,110.4
Total	**19,218.0**	**10,156.5**	**7,345.7**	**6,393.6**	**5,636.3**	**5,023.6**	**4,101.2**

Estimation of years lost to disability

The YLD component of the DALY measure is harder to estimate than the YLL component. Fortunately the task is made easier by the relatively negligible size of the YLD component for suicide and self-harm. Table 11 shows the YLL and YLD components of the 1996 estimates in *Our Health: Our Future* (Ministry of Health 1999). YLD is only 1.6 percent of YLL for females, and even less at 0.5 percent for males. These figures are for the 3 percent discount rate used in the Ministry's publication. They can be expected to vary with the discount rate but, given the relative insignificance of YLD, it is not worth making any adjustment for this. Applying these percentages gives the DALY estimates in Table 11.

The relative insignificance of the disability component is supported by evidence from the University of Otago's Injury Prevention Research Unit. Its recent report on developing Injury Outcome Indicators (Cryer, Langley and Stephenson 2004) identifies statistical indicators that are sufficiently robust to correctly identify trends in mortality and injury over time, without being affected by changes in referral patterns or in reporting integrity. For this purpose the researchers found it necessary to adopt a severity threshold; that is, to restrict the count of injuries to those sufficiently serious that the estimated survival probability is 94.1 percent or less. Although, as noted in the chapter 'Estimates of the Resource Costs of Suicide and Attempted Suicide', there are over 5000 public hospital discharges per year for attempted suicide and self-harm, the number meeting this severity threshold amounted to approximately 180 in 2001 (chart on p 56 of Cryer et al 2004). Most admissions for attempted suicide and self-harm would appear to be not particularly serious in this sense.

Table 11: Calculation of DALYs lost from suicide and self-harm

Discount rate	0%	3%	5%	6%	7%	8%	10%
	Average DALYs lost per suicide						
Female	45.6	23.3	16.6	14.4	12.7	11.3	9.2
Male	41.0	21.9	15.9	13.9	12.3	10.9	8.9
	Total DALYs lost in 2002						
110 females	5,017.3	2,558.8	1,827.9	1,584.4	1,392.2	1,237.8	1,006.9
350 males	14,355.5	7,678.4	5,576.0	4,859.8	4,288.6	3,825.5	3,126.7
Sum	**19,372.8**	**10,237.3**	**7,403.9**	**6,444.2**	**5,680.8**	**5,063.3**	**4,133.5**

Section F: Putting a Value on DALYs

To put a dollar value based on **willingness-to-pay** on the worth of an extra **year of life**, or on a QALY or DALY, the following steps are usually taken.

1. Obtain an estimate of the Value of a Statistical Life (VoSL).[16] In New Zealand this means using the results of research carried out for the transport sector by the former Land Transport Safety Authority (LTSA; now Transit New Zealand).

2. From the VoSL estimate, derive an estimate of the Value of a Statistical Life Year (VoSLY), for appropriate discount rates.

3. Consider whether some life years should be given greater weight than other life years – for instance, those years early in a person's life as against those late in life.

The value of a statistical life

The LTSA estimated in the early 1990s that the Value of a Statistical Life for New Zealand was $2 million. That value was adopted for investment decisions in the transport sector. The estimate is based on willingness-to-pay, using survey data on the amount that members of the community are prepared to pay for reductions in the risk of a fatal road accident. Its value has subsequently been updated in line with changes in average earnings; by June 2004 it amounted to approximately $2,725,000.[17]

It should be noted that the value is based on willingness-to-pay rather than the old-fashioned and inadequate human capital approach, used in some of the papers examined in preparing this report. The willingness-to-pay approach accords more closely with the standard economic theory of value. It also gives considerably higher values for the Value of a Statistical Life, thus giving mortality reduction a greater weight in investment decisions.

The value of a statistical life year

Assuming the Value of a Statistical Life is for an 'average' person, it refers to a person of average age. In 2001 this average age was 35.6 years (female 36.5 years, male 34.7 years), with a life expectancy at that age of 44.2 years (female 45.4 years, male 43.0 years). The sum of the value of future life years should amount to the Value of a Statistical Life. Thus:

VoSLY = VoSL/Life Expectancy

For the estimates in this report, this formula gives the Value of a Statistical Life Year as $61,600. However this is the result before discounting future gains in life years. Introducing discounting we have:

$$\text{Sum } (\text{VoSLY}/(1 + d)^n) = \text{VoSL}$$

where the **sum** is from average age to L, the life expectancy, and **d** is the discount rate.

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[16] 'Statistical' here means that the value is not for some specified individual but instead represents the average amount that members of the community are willing to pay to save a life at random.

[17] Further LTSA research in the late 1990s led to a recommendation that the VoSL be increased to $4 million. This recommendation has not, however, been accepted by policy-makers.

Then from standard compound interest formulae:

$$VoSLY = VoSL/d * [1-(1+d)^{-L}]$$

This formula gives, for the range of discount rates used in this report, the estimated Values of a Statistical Life Year shown in Table 12.

Table 12: Value per statistical life year

Discount rate	Males	Females	Total
0%	$63,351	$59,990	$61,603
3%	$113,627	$111,140	$112,351
5%	$155,307	$153,313	$154,279
6%	$178,033	$176,309	$177,142
7%	$201,748	$200,286	$200,990
8%	$226,268	$225,050	$225,634
10%	$277,100	$276,290	$276,675

Results applied to the DALYs lost by suicide

Applying these values to Table 11 (DALY estimates) gives the health loss costs of DALYs as reported in Table 13.

Table 13: Valuation of DALYs lost from suicide and self-harm

Discount rate	0%	3%	5%	6%	7%	8%	10%
	Valuation of DALYs lost per suicide ($)						
Female	$2,809,847	$2,613,532	$2,563,666	$2,551,438	$2,543,820	$2,538,927	$2,532,579
Male	$2,526,695	$2,464,807	$2,457,896	$2,459,648	$2,462,748	$2,466,177	$2,471,620
Both	$2,594,405	$2,500,372	$2,483,189	$2,481,598	$2,482,135	$2,483,574	$2,486,197
	Valuation of total DALYs lost in 2002 ($ million)						
110 females	309.1	287.5	282.0	280.7	279.8	279.3	278.6
350 males	884.3	862.7	860.3	860.9	862.0	863.2	865.1
Sum	**1,193.4**	**1,150.2**	**1,142.3**	**1,141.5**	**1,141.8**	**1,142.4**	**1,143.7**

It will be noted that the effect of higher discount rates in reducing the sum of discounted future life years or DALYs is offset by the higher value given a discounted life year or DALY. Thus the valuation of the DALYs lost per suicide is reasonably stable over the range of discount rates, at about $2.25 million. The total DALY cost, for the specimen year 2002, is correspondingly stable over the range of discount rates, at a total of nearly $1,150 million.

These amounts are huge, underlining the fact that by far the most important cost of suicide is the loss of life.

Is enough weight given to the loss of 'young' life years?

Almost certainly the answer is no. The formulae above implicitly assume that all DALYs (or QALYs) are of equal importance, regardless of the characteristics of the person to whom they accrue or by whom they are lost. Community surveys show otherwise – see, for instance, O'Dea (2004). Most people give more weight to providing an extra life year to a young person than to an old person.

It is possible to apply weights to life years, QALYs or DALYs according to the characteristics of the person involved. It is difficult to know what these weights should be, and any set of weights is unlikely to receive universal support. Giving greater weight to young life years would clearly, because of the age structure of suicide, increase the overall cost of suicide.

Can the 'burden of grief' be measured?

Some level of grief on the part of relatives and friends is associated with most deaths. A death in later life, however, is part of the natural course of events, and it is not appropriate to add an extra bereavement cost to any cost-benefit calculations.

Should weight be given, however, to the greater grief caused by the death of young people, and even more weight when the premature death results from suicide?

As discussed in the previous subsection, it is conceptually possible to give greater weight to the loss of young life years and to some extent – perhaps inadequately – this differential weighting allows for the greater grief associated with death of children and young people. It might be possible also to allow for the extra burden on family and friends created when the death is a result of suicide rather than other causes.

It appears, however, that such an adjustment would be highly subjective, and perhaps a matter that is better handled as a non-quantitative matter. In some of the papers reviewed for this report there was discussion of the impact on family and friends, but no substantial attempt was made to put any quantitative value on that impact.[18]

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[18] Perhaps the one to come closest to a quantitative estimate was Annette Beautrais (2004). In the summary in Appendix I, she comments: 'The usual pattern of bereavement involves a recovery period of about two years, however, this can be longer with bereavement by suicide and there may be different emotional experiences linked to bereavement by suicide including feelings of guilt, stigmatisation, poor family relations and increased risk of suicide attempt. For a small number, the bereavement process can be complicated by physical and psychiatric disorders including anxiety, depression, panic disorder and post-traumatic stress disorder.'

Section G: Summing Up and Comparisons with Other Studies

Summing up

Economic costs

We take, from the end of the earlier Section D, the following estimates of the **economic costs** of the 460 suicides in 2002 and the 5095 attempted suicides in 2001/02.

- **Suicides**
Costs excluding lost production	=	$4,694,000
Costs of lost production (8% discount rate)[19]	=	$201,498,000
Total	=	$206,192,000
Cost per suicide	=	$448,250

- **Attempted suicides**
Costs excluding lost production	=	$19,092,000
Costs of lost production	=	$13,247,000
Total	=	$32,339,000
Cost per attempt	=	$6,350

- **Overall economic costs**   **=**   **$238,531,000**

Non-economic costs (or willingness-to-pay or quality of life)

To the above amount add the following non-economic (or intangible etc) values for lost life and quality of life, from the tables in Section F. This calculation assumes that all life years are of equal value, despite the existence of some evidence to the contrary (O'Dea 2004).

At an 8% discount rate		
Value of years of disability-free life lost	=	$1,142,400,000
Cost per suicide	=	$2,483,000
Total economic plus non-economic costs[20]	=	$1,380,931,000

Clearly on these calculations it is the **value of life** component that dominates all others.

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[19] The use of an 8 percent discount rate is not an endorsement of that particular value. Its advantage here is that it was the rate used by Coggan et al (1995) and so makes comparisons easier.

[20] Assuming there is not double counting between lost production and value of life.

Results and methods of other researchers on the cost of suicide

In addition to the earlier work for New Zealand by Coggan et al (1995), there have been a number of other studies carried out overseas. These are summarised in Appendix I, which contains the results of the literature search for this report. Material from selected papers in Appendix A is also given in Table 14 below. The selected studies focus on Australia (state of Victoria), the United States, England and Canada. The New Brunswick study (Clayton and Barcelo 1999) is particularly clear and useful. In addition, the Finnish study (Ostamo et al 2001) has a useful discussion on the employment experience of suicide attempters and on the complex issue of the links, or lack thereof, between unemployment and suicide or attempted suicide.[21]

Methods

The main issues in the different studies are:

- the **use of a human capital approach** to valuing lost life years, rather than a willingness-to-pay approach

- the **extension of the human capital approach** to valuing the lost life years even for those years in which the person would not be in paid employment – for instance, for those years past the age of retirement (usually assumed to be 65 years), or for the ages 15 to 64 when not actually in paid employment. This brings up the question of the value of **time not in paid employment**

- the **use of a cut-off** of 75 years of age, beyond which lost years of life are not counted

- the **discount rate** used for discounting future earnings or life years.

The studies considered here (not all of which are specifically concerned with suicide) are:

- Clayton and Barcelo (1999) on the cost of suicide in New Brunswick, Canada, 1996

- as cited in Clayton and Barcelo (1999):
    - Hanvelt et al (1994) on indirect costs of suicides of men aged 25–64 in Canada
    - Miller[22] (1995) on costs associated with gunshot wounds in Canada
    - Palmer et al (1995) on the cost of suicide and attempted suicide in the United States

- Rice and Miller (1998) on the cost implications of anxiety and other mental disorders in the United States

- Thomas and Morris (2003) on the cost of depression among adults in England, 2000

- Watson and Ozanne-Smith (1997) on the cost of injury to Victoria, Australia.

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[21] Also, for New Zealand, Ferguson et al (2003) examined the association of suicide with unemployment, noting that, 'Ecological studies have generally identified weak correlations between unemployment and suicide. In New Zealand the increase in unemployment in the late 1980s and early 1990s coincided with rapidly increasing youth suicide rates. … However, the associations were not statistically significant in a time series analysis …' This was true also for fluctuations in GDP.

[22] It is noted that Ted Miller advised the LTSA when the Authority was developing, in the early 1990s, a willingness-to-pay value of NZ$2 million for a Statistical Life.

Results for New Zealand from Coggan et al (1995) are also included at the top of the table, and results from this report at its foot.

Table 14: Comparison of selected studies

Study topic (and researchers)	Valuation of lost production	Valuation of lost life years or QALYs	Discount rate used (% per year)	Cost per suicide
New Zealand 1994 (Coggan et al 1995)	Human capital 15–24 and 25–64 age groups dealt with separately Average gross wage of $30,628 (1994) assumed for all ages to 65 and genders	Nothing additional to previous column	8 'the approximate market rate'	NZ$ (1994) (Scale up 22.8% to get 2004 dollars) Direct: $4,840 Indirect: < 24 years $400,656; 25–64 years $324,874
New Brunswick, 1996, 94 suicides (Clayton and Barcelo 1999)	Human capital Mean earnings of employed, plus mean value of 'homemaking services' for others Plus productivity growth	Nothing additional to previous column	4 plus sensitivity analyses 2, 6, 8, 10	C$ (1996) Direct: $5,693 Discounted future earnings: $844,185 Total: $849,878
Canadian men aged 25–64 years, 1987–1991 (Hanvelt et al 1994)	Apparently human capital as above	Nothing additional to previous column	Not known	C$ (1996) Adjusted to 1996 values by Clayton and Barcelo Direct: Not done Indirect: $684,525 Note exclusion of < 25 age group
Canadian suicides by gunshot 1991 (Miller 1995)	Human capital, apparently as above	Apparently had an estimate of lost quality of life, implying willingness-to-pay approach	Not known	C$ (1996) Adjusted to 1996 values by Clayton and Barcelo Total: $1,078,239 Not including lost quality of life
United States 1994 (Palmer et al 1995)	Not known for sure		Not known	US$ (1994) Total: $397,066
Anxiety and other mental disorders in the United States 1990 (Rice and Miller 1998) Note: Of the approximately 30,900 deaths due to suicide in 1990, about 75% were due to mental disorders.	Human capital. Said to be 'still most often used' Includes value of hours spent on household work, 'valued on the basis of annual wage rates'		6% 'to conform with earlier studies'	US$1990 National aggregate Direct: $67 billion Indirect: Morbidity $63 billion; mortality $12 billion; other: $6 billion Total: $148 billion

Study topic (and researchers)	Valuation of lost production	Valuation of lost life years or QALYs	Discount rate used (% per year)	Cost per suicide
Depression among adults in England 2000 (Thomas and Morris 2003) 'Seventy per cent of suicides are estimated to be related to depression.'	Human capital, using average weekly earnings applied to number lost of working life years Men up to 65 and women up to 60 years of age	Nothing additional to previous column: 'The intangible elements of pain and suffering of people with depressive disorders and their families and the effects on quality of life cannot be quantified in monetary terms.'	6%	GBP (2000) National aggregate Direct: £370 million Morbidity: £8,123 million; mortality: £562 million Total: £9,055 million
Cost of injury to Victoria 1993–1994 (Watson and Ozanne-Smith 1997) 466,191 injuries, and 1629 deaths, including 142 later year deaths	'Ex-post human capital method' Using 'incidence' approach Up to age 75 years	'since the willingness-to-pay approach … is becoming more common, estimates of this … were also developed for reference purposes'		A$ Mortality cost: 'an average cost of $499,378 per death'
New Zealand 2004, suicides in 2002 (O'Dea and Tucker 2005)	Human capital approach But taking account only of actual employment income lost Productivity gain of 1% per year assumed		Range tested 3% to 10% 8% rate used for comparability with Coggan et al	NZ$ (2004) excluding GST per suicide (excluding attempts) Direct: $10,205 Indirect: (human capital approach): discount rate of: 0% $1,413,900 8% $438,000 (Willingness-to-pay approach): discount rate of: 0% $2,594,000 8% $2,484,000

Comments

- **Human capital versus willingness-to-pay approaches**
    - Almost all studies used a human capital approach to calculate foregone earnings, lost productivity etc. In general, earnings were calculated up to age 65 years. Also, some studies attempted to assign a value to the lost life years of those who would not be in paid employment. Sometimes this was simply equal to average paid employment income; sometimes an attempt was made to value it separately – for example, the worth of homemakers' time.
    - Some authors realised that, although the human capital approach gives an estimate of the economic cost of lost production, it does not cover all aspects of the value of a human life, and the willingness-to-pay approach is more likely to capture the worth of these extra aspects. See, for example, Rice and Miller (1998, p 4); also Clayton and Barcelo –

'willingness-to-pay reflects the societal value of life by estimating the amount of money people would be willing to pay to avoid a suicide death' (1999, p 93).

– The use of the willingness-to-pay approach requires the availability of estimates of what a given society is willing to pay to save a Statistical Life or Statistical Life Year. Developing such estimates in turn requires special techniques. We are fortunate in New Zealand to have the estimates calculated by the LTSA.

- **Discount rates**
  – A range of discount rates was used for discounting potential future life years lost, and the associated lost earnings or production. If there is a consensus it is probably at about 6 percent per year.

- **Magnitudes**
  – In all the suicide studies, direct costs were massively dominated by indirect costs. Typically the latter were of the order of $400,000 per suicide and upwards.
  – Direct costs were relatively more important in the total costs of depression, anxiety and mental disorders in general. Also, in the make-up of indirect costs, the morbidity costs tended to become more important than the mortality costs – the opposite of the case for suicide.

Note, importantly, that the use of a willingness-to-pay approach in this study produces much higher estimates of the indirect costs of suicide. Specifically, the estimate made is about $2.5 million, which is almost constant across the range of discount rates.

Section H: Likely Error Ranges of Cost Estimates

Costs of services associated with suicide

As demonstrated by the previous sections, the more detailed appendices and this report's divergence from components of the estimates by Coggan et al (1995), there is clearly a range of uncertainty about cost estimates of services associated with suicide. The possible error range is, subjectively, approximately ±25 percent.

Lost production

At present, there are several sources of uncertainty about lost production estimates, of which two are particularly significant. First, future productivity growth affects the value of lost production as a result of suicide. A value of 1 percent per year has been assumed for this report. Compared with an assumption of zero productivity, this increases the lost production cost per suicide from $1,166,000 to $1,414,000 (Table 6), or by about 21 percent, undiscounted. Applying a discount rate of 8 percent per year, the corresponding increase is from $393,000 to $438,000, or about 11 percent. Clearly estimates of this component of the cost of suicide are reasonably sensitive to the accuracy of forecasts of future productivity growth.

The second significant source of uncertainty is the assumption that persons committing suicide would otherwise have the same future income path as the average member of the community. In reality, it is likely that their incomes would on average be lower: in part because lack of success relative to others in the community could be one of the factors contributing to suicide; in part because the factors predisposing a person to suicide will, at least for some, tend to make them less effective in the community and workforce. These comments do not apply to all suicides, but are likely to apply to some. In other words, the estimates given in this report, at least in relation to lost production costs, are likely to be biased upwards, to an uncertain extent.

At present, an error margin of perhaps 20 percent downwards, 5 percent upwards, seems appropriate.

Life years lost

Life years lost are reasonably precisely estimated, using present non-Māori life expectancies. Life expectancies are expected to increase, however, which in turn increases the number of years of life lost per suicide. Against this, it might be argued again that, if they had not committed suicide, persons who committed suicide would be likely to have a shorter life expectancy in any case.

Possible error margins could be approximately ±10 percent.

Value of life years and DALYs

Adding in the valuation of life years introduces an extra source of potential error.

Discount rates

It should be noted that a range of discount rates is used in this report for calculating lost production costs, lost life years and DALYs. From the previous chapter, indeed, it is evident that the overall cost is not especially sensitive to changes in the discount rate.

Overall, likely error margins to be used in any cost-effectiveness analyses are of the order of ±25 percent. These estimates are of course fairly subjective.

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Appendix A: Method and Key Results of Literature Search

Sarah Tucker
(Note that the detailed results of the literature search are available as a separate file.)

A literature search was carried out by the Ministry of Health Library using key databases. These databases included Medline, cinahl, psychinfo and econlit. In addition, WHO and OECD publication catalogues and the Internet were used. Search terms include the following:

> 'suicide'
> 'attempted suicide'
> 'suicidal ideation'
> 'suicide prevention'
> 'economics'
> 'cost of illness'
> 'quality of life'
> 'value of life'
> 'costs and cost analysis'
> 'cost benefit analysis'
> 'cost control'
> 'health care costs'
> 'economic aspects of illness'
> 'economic value of life'
> 'postvention'
> 'burden of grief'
> 'burden of illness'.

The importance of the issue of suicide and attempted suicide is evidenced by the large amounts of literature on the topic produced by government agencies, accident and injury research units and other research teams. Work tends to focus on the epidemiology of suicide, the risk factors associated with it and prevention strategies. While the impact of suicide on society is often mentioned, there is less information relating to the economic cost estimates of this tragedy. Estimates of the cost of suicide are often contained in broader studies on accident and injury or the burden of mental health disorders. The burden of grief for survivors of suicide and the impact of suicide and attempted suicide on their psychological, social and economic functioning are alluded to in a number of articles. However, these experiences have yet to be quantified and measured in terms of direct costs of health care, counselling and other postvention strategies or indirect costs associated with lost productivity.

The following are outlines of some of the more relevant material that was found.

Coggan, C, Fanslow J, Miller B, Norton R. 1997. *Economic Costs Associated with Suicide and Attempted Suicide in New Zealand.* Auckland: Injury Prevention Research Centre, Department of Community Health, University of Auckland.

This report is based on the 'Economic Costs' chapter from Coggan et al's (1995) report, *Intentional Injury in New Zealand.* Direct costs included emergency services, funeral services, coronial services and health care services. Indirect costs were assessed as potential working life lost, taking a mean age across four age groups. National average gross wage was calculated and included a 5 percent discount rate. Loss productivity for attempted suicide was calculated as the product of the average number of days in hospital and the average hourly rate of pay.

The estimated annual costs to New Zealand society were $202,841,343 for completed suicide and $11,811,449 for attempted suicide. The costs were associated only with immediate attendance of the victim, not with ongoing health care and social services costs for those who have attempted suicide. Limitations of the study were discussed, including the underestimation of suicides and attempted suicides due to coroners not identifying deaths as such, and non-coding of short-stays in hospital. Hospital care costs were underestimated as they did not include critical care and consumables costs. Loss of educational investment was not assessed. An average national wage assumes that those who commit suicide are employed at the time of the event. A human capital rather than a willingness-to-pay approach affects the results obtained.

Beautrais AL. 2004. *Suicide Postvention: Support for families, whānau and significant others after a suicide: A literature review and synthesis of evidence.* Canterbury Suicide Project.

The report assesses current knowledge relating to bereavement by suicide, including support services available for the bereaved. The full report provides a literature review of current evidence, findings from the Canterbury Suicide Project and policy recommendations and strategies to address issues surrounding bereavement by suicide.

The literature review details the grief process, features of bereavement by suicide, support needs for the bereaved, the coronial process, international thinking in relation to support services and best practice models in New Zealand. Information in the report that is useful in the context of costs associated with suicide relates to the impact of grief on cognitive, emotional, somatic, social and occupational functioning. The usual pattern of bereavement involves a recovery period of about two years; however, this period can be longer with bereavement by suicide. There may also be different emotional experiences linked to bereavement by suicide including feelings of guilt, stigmatisation, poor family relations and increased risk of suicide attempt. For a small number, the bereavement process can be complicated by physical and psychiatric disorders, including anxiety, depression, panic disorder and post-traumatic stress disorder.

The report discusses support services available to the bereaved following suicide and the acceptability and adequacy of these services. Generally, people bereaved by suicide require information, support and help with practical matters. Details are provided of services available in New Zealand, including: immediate services such as Victim Support; short-term support and services such as school postvention programmes; and longer-term services such as support in the primary care setting. The review notes the need for evaluation of services and better-designed research studies into the outcomes of bereavement support services. International comparisons also highlight the lack of research-based evidence about the efficacy and effectiveness of support programmes. In regard to a service that could fit the New Zealand situation, Beautrais points to the Australian Coronial Counselling Service, which is in effect a 'one-stop-shop' offering bereavement counselling, information regarding the coronial process and support groups, information packages and newsletters.

The report provides a tentative series of best practice recommendations for providing support to those bereaved by suicide in a number of situations. These recommendations include: the immediate aftermath, short- and long-term counselling and support; rural support services; and institutional guidelines recognising grief and bereavement following a suicide.

Following the review of literature, the report highlights implications for policy-makers relating to support for those bereaved by suicide. It advocates that the approach to establishing programmes should be cautious because of the lack of research into their efficacy and effectiveness. Beautrais supports strengthening current networks and service providers to improve their knowledge and training.

Information on grief and bereavement processes may assist in future burden of grief and cost of grief studies. Implications for policy-makers will have an impact on cost-effectiveness studies and evaluations of future support programmes.

Commonwealth Department of Health and Aged Care. 2000. *National Youth Suicide Prevention Strategy: Setting the evidence-based research agenda for Australia (literature review).* **Commonwealth of Australia.**

This is a detailed literature analysis incorporating a WHO analytical framework centred on burden of disease.

There are three parts to the review:
1. the epidemiology of suicide and attempted suicide among young Australians
2. risk factors for suicide and attempted suicide among young Australians
3. preventive interventions for youth suicide.

There is a section on the economic costs of suicide. These costs are taken to include premature loss of life, health services costs, bereavement and the psychological impact on the survivors, and lost productivity. Studies are cited that have used various methods to estimate the cost to society of youth suicides, including adjusted income methods, opportunity cost methods and willingness-to-pay methods. In these studies, the estimated costs to suicide based on 1987 suicide rates were $219,326,850, $257,326,850 and $805,087,248 respectively.

More recent estimates provided by Raphael and Martinek (1994) are included, for all ages, as $460 million for suicides and a similar amount for attempted suicides. It is noted that their estimates did not take into account substantial community costs related to the impact on family and peers, the need for community services, welfare responses and policy and coronial work. The background monograph on youth suicide in Australia (Mental Health Branch 1997: see below) is also referred to; a cost of $114 million per year excluding lost productivity was the estimated cost for suicide in 15–24-year-olds. Similarly, potential life lost as calculated in the 1997 monograph was estimated at 230,000 years for the 15–24-year age group.

An important note in the economic costs section refers to the cost of bereavement. Both Australian and international research has neglected the study of the impact of suicide on the wellbeing of those close to the victim. There are descriptive accounts available, but no cost analyses. A youth suicide has the potential to affect three to four generations of family members – siblings, parents, grandparents and possibly children. Other relatives, friends, carers and peers may be affected as well.

Gaps in knowledge and further research priorities are discussed. In relation to costs, the report advocates using uniform methodology and assessing suicide in relation to other deaths in a similarly aged population. Cost-effectiveness of interventions and prevention strategies should be examined in economic and human terms.

The report discusses risk factors for suicidal behaviour. One section discusses the burden of disease in survivors of suicide and risk of suicidal behaviour in survivors of suicide. There are increased risks of social, personal and psychological dysfunctioning, including the development of major depression, anxiety disorders and post-traumatic stress disorder within the first six months following a suicide. This report also notes that more evaluation and research are needed with regard to the effectiveness of suicide support groups, individual counselling and community and family support.

Mental Health Branch, Commonwealth Department of Health and Family Services. 1997. *Youth Suicide in Australia: A background monograph* (2nd edition). Commonwealth Department of Health and Family Services.

This report highlights the serious public health issue of youth suicide. It deals with the epidemiology of the issue, detailing rates, causes and risk factors; makes international comparisons; and discusses prevention strategies.

There is a short section on the cost of suicide measured in terms of years of potential life lost. From 1983 to 1992 it estimates that more than 230,000 years of potential life were lost due to suicide in the 15–24 age group – increasing from 12 percent of years lost at all ages, in 1983, to 23 percent in 1992. The report cites the Raphael and Martinek study (1994) noted above, which estimated that health costs and lost earnings for all suicides for the 1989/90 financial year were $460 million. It notes that estimates present only part of the picture and that community costs, including impact on family and peers and the need for community service and welfare responses and coronial work, were not included.

Watson W, Ozanne-Smith J. 1997. *The Cost of Injury to Victoria*. Monash University Accident Research Centre.

This report discusses unintentional and intentional injury epidemiology in Victoria, Australia with data on causation and outcomes (deaths, hospitalisation, medical treatment only) for 1993/94. The aim of the study was to estimate the total lifetime cost of injury to the Victorian community for cases incident in a given year.

Costs included direct and indirect costs. Direct costs of injury were associated with treatment, including hospital and medical costs, rehabilitation, pharmaceuticals, ambulance, and treatment by other health care professionals. Indirect costs were associated with reduced productivity due to injury and disability (morbidity) and losses due to premature death (mortality). Estimates for production losses included lost earnings, household and community work and time spent caring for child injury-victims. A human capital approach was used. Suicide followed by road traffic accidents was the leading cause for injury deaths. Falls were the lead cause for non-fatal injury.

- Direct costs: $759 million
- Morbidity costs: $1010.5 million
- Premature mortality costs: $813.5 million.

'Self-inflicted injury ranks third in economic cost, amounting to $428.4 million, or 16.5 percent of the total cost. Although self-inflicted injury accounts for only 1.8 percent of all injuries, fatalities at young ages are high (the suicide rate is highest in the 15–24 year-old age group), resulting in high costs.'

WHO. 2001. *The World Health Report, 2001*. World Health Organization.

In this report, Chapter 2 in particular assesses the burden of mental and behavioural disorders. The report is concerned with the increasing prevalence of mental and behavioural disorders, noting that these disorders were the cause of 12 percent of total DALYs lost in 2000 and that this percentage was expected to increase to 15 percent in 2020. The burden of mental and behavioural disorders is felt by the individual and family/caregivers. The report notes that the burden of caring for a family member with a mental or behavioural disorder has not been adequately studied, but is likely to be substantial. Often there is a burden of lost opportunities for families of sufferers of mental and behavioural disorders.

Economic costs of the burden of mental and behavioural disorders include costs of health and social services, lost employment and reduced productivity, impact on families and caregivers, levels of crime and public safety and the negative impact of premature mortality. The report notes that most estimates of economic costs are underestimates, as lost opportunity costs to individuals and families are not taken into account.

The report touches on suicide, the magnitude of the problem, international comparisons and risk factors leading to suicide. It notes the high rates of suicide amongst youth (15–24 age group) and the massive loss to societies in terms of productive years of life. According to the global burden of disease study in 2000, self-inflicted injury including suicide accounted for 1.3 percent of all DALYs.

Clayton D, Barcelo A. 1999. The cost of suicide mortality in New Brunswick, 1996, *Chronic Diseases in Canada* 20(2): 89–95.

This study estimated the economic impact of the 94 reported suicide deaths that occurred in New Brunswick in 1996.

The study used an incidence-based human capital approach to estimate the total economic burden. Direct costs included ambulance services, hospital services, physician services, autopsy services, funeral/cremation services and police investigations.

Indirect costs were estimates of the value of future productivity losses. Potential years of life lost were calculated using an upper age limit of 75 years. The authors used an Ontario Ministry of Transport model to estimate total future earnings lost as a result of premature death for both labour force work and unpaid work. A discount rate of 4 percent was used.

The total cost of suicide deaths in New Brunswick in 1996 was calculated to be $79,888,513.17, giving a total estimate per suicide of $849,877.80 and a per capita cost of $104.84. The authors note that this sum excluded the emotional and psychological burden experienced by friends and family members of suicide victims and did not encompass the value of that part of a person's life that cannot be estimated by loss in productivity.

Discounted future earnings were the largest contributing factor to the overall cost of suicide deaths and were calculated at $79,353,354.56 for all 94 deaths. The authors discuss the choice of a human capital approach to estimating lost productivity and justify this choice based on the availability of relevant data and reproducibility of the study's results. They discuss the merits of the willingness-to-pay approach and its tendency to assign greater economic value to a lost life by encompassing the psychological and physical burden of pain, suffering and lost quality of life.

The authors note that future studies should include the cost of mental health services for friends and family members of suicide victims and an estimation of lost productivity values for those grieving a suicide death. Estimates of costs associated with attempted suicides could also be included in future studies.

Rice DP, Miller LS. 1998. Health economics and cost implications of anxiety and other mental disorders in the United States. *British Journal of Psychiatry* 173 (suppl. 34): 4–9.

The study presents estimates of the economic burden of all mental health illnesses, including anxiety, affective, schizophrenia and other mental disorders, in 1990. People who commit suicide were classified as having a mental disorder. The economic costs associated with mental disorders were measured in terms of direct costs for medical treatment and indirect costs associated with loss of earnings due to reduced or lost productivity, premature death and other related costs.

Direct costs included hospital and nursing home care; physician and other professional services; drugs; and support costs such as research, staff training, programme administration and the net cost of private insurance.

Morbidity costs were estimated as a product of population size, prevalence rates for affective disorders, impairment rates/percentage of income lost and average income.

Mortality costs were estimated as the product of the number of deaths and the expected value of an individual's future earnings accounting for age and gender. An imputed value for housekeeping services was included and a 6 percent discount rate was used.

Other indirect costs estimated in this study included productivity losses of those imprisoned on a conviction for a crime related to mental disorder and also the value of time spent by caregivers looking after those with mental disorders.

The burden of mental illness in the United States is huge, with the total economic cost estimated at $147.8 billion. There were approximately 40,000 deaths due to mental disorders, assuming that all deaths due to suicide are classified as mental disorders. A total of 30,900 deaths were due to suicide in 1990. Mortality costs totalled $11.8 billion.

Thomas CM, Morris S. Cost of depression among adults in England in 2000. *British Journal of Psychiatry* 183: 514–19.

This study estimated the total cost of depression in adults in England in 2000 at over GBP 9 million. A prevalence-based approach was used to measure the burden of depression among adults aged 15 years and over. Direct costs included treatment costs at primary and secondary care level, and indirect costs included lost working days and lost life years due to premature death.

Direct costs borne by the National Health Service were found to total GBP 369,865,000. They included inpatient, day patient and outpatient care, general practitioner consultations and medication.

Morbidity costs were calculated using total number of days of incapacity benefit paid for a diagnosis of depression and recurrent depression, and were apportioned according to age and sex. Average weekly earnings according to age bands were then applied to find costs due to lost earnings. In all, 109.7 million working days were lost as a result of depression and total lost earnings were estimated at over GBP 8 billion.

Based on former studies that estimated that 70 percent of suicides were due to depression, the number of suicides attributable to depression was calculated. The number of working life years lost was multiplied by the average weekly earnings, by age group and gender, to estimate the cost of life years lost due to depression. The estimated loss was GBP 562 million.

Lester D, Yang B. 1997. *The Economy and Suicide: Economic perspectives on suicide.* New York: Nova Science Publishers.

This book details theories of suicide and the economy, economic models of suicide and empirical studies of suicide and the economy. There is an introductory section on the economic costs of suicide that reflects mainly on the work of Stoudemire et al (1986). Details of direct costs and indirect costs associated with morbidity and premature mortality are given from the estimates by Stoudemire et al for 1980 data. This section also mentions the high costs of attempted suicides, of which there are at least eight for every completed suicide. Alternative views on the cost of suicide to society are mentioned particularly with respect to savings on health care costs and the marginal employment outcomes for many people suffering from depression and other mental disorders that are risk factors for suicide.

Zaloshnja E, Miller TR, Galbraith MS, et al. 2003. Reducing injuries among Native Americans: five cost-outcome analyses. *Accident Analysis and Prevention* **35: 631–9.**

This study focused on cost–outcome analyses of five injury prevention efforts in Native American jurisdictions, including a suicide prevention and intervention programme.

Cost effectiveness was calculated by analysing the net cost per QALY. Cost–benefit was found by giving QALYs a dollar value and comparing total cost savings with total project costs. A willingness-to-pay approach was used to value risk reductions in mortality and morbidity. Review of other injury prevention studies allowed a mean value of $88,600 to be assigned per QALY. A societal approach was used to calculate cost–benefits, including savings to individuals, local governments, insurance companies, employers and the general public. Direct payments included medical care costs, emergency services, legal and administration costs, lost work and reduced quality of life. Years of life lost were also measured.

Direct cost savings totalled $123,000 and quality of life savings totalled $1.7 million annually. The benefit : cost ratio was 43 and cost per QALY saved was $419.

Appendix B: Details on Cost Estimates and on Information Sources

The material in this appendix was compiled by Sarah Tucker, with the exception of the discussion of coroners' costs, which was written by Des O'Dea.

Office of the Commissioner for Police

Source: Meeting with Rob Veale and Cameron Dewe, 8 February 2005.

Police time is recorded by activity codes, not on a case basis.

The average cost per hour for a police officer was approximately $79.00 (including GST) for the 2003/04 fiscal year.[23]

Police record sudden deaths but not suicides. A determination of suicide can only be made by the coroner following an inquest.

Police attend all sudden deaths where the death is violent or unnatural or where a doctor will not issue a death certificate. The minimum response to a sudden death is two staff plus car and one non-commissioned officer plus car. On average, this represents three to six hours per person attending the sudden death. Figures provided by Cameron Dewe indicate that there were 5602 sudden deaths in 2003, with an average of 17.9 hours spent associated with each. This gives a total of 100,275.8 hours associated with sudden deaths.

Attempted suicides are recorded as a separate activity code. In 2003 police responded to 4246 incidents recorded as suicide attempts and spent a total of 24,299.93 hours on them. Therefore, on average, the number of hours attending each attempted suicide incident was 5.71 hours. Anecdotal evidence from Rob Veale indicates that the average may actually be higher: it is possible that two officers will be required at such incidents for eight hours each.

Additional costs associated with suicides relate to mortuary procedures and the coroner's inquest. Both activities are recorded independently of the sudden death. Rob Veale anticipated that time spent preparing for and attending the coroner's inquest might vary between one and 3.5 days. Generally, up to two days (16 hours) would be required to prepare files, documents etc prior to attending court. Up to one day (eight hours) would be spent at the inquest and possibly another four hours of follow-up time following the inquest. An inquest officer is responsible for this work.

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[23] Parliamentary Question 5790 (2004).

An important point that arose at the meeting was the difficulty in extracting the true amount of time spent attending sudden deaths and attempted suicides. It is likely that the hours spent attending such incidents are underestimated, mainly due to variability in data recording. In addition, Rob Veale raised issues concerning the police position in the context of suicide intervention and prevention. He discussed issues surrounding suicide attempts in relation to family violence, the need to raise awareness and challenge institutional structures in relation to policies and practice associated with suicide and attempted suicide, and the benefits of improving information systems and using information across sectors.

Funeral Directors Association of New Zealand[24]

Source: Robyn Grooby, Executive Officer, Funeral Directors Association of New Zealand, 11 January 2005.

Coggan et al (1995) report that funeral directors' costs associated with suicide relate to transporting the deceased to the morgue. The Coroners' Office gave the cost of this service an historical value of $1 (Coggan et al 1995, p 86).

As reported by Robyn Grooby, the average cost of a funeral depends on whether the deceased is buried or cremated. The cost includes disbursements such as funeral notices, service sheets and flowers.

Robyn Grooby noted that with regard to burial, the cost depends on where the death occurs. For example, in Auckland the cost of a burial plot is $3,000 + GST plus the cost of opening the plot and the ongoing cost of upkeep. Robyn states that it is too difficult to work out the average cost of a burial plot. The most recent figures as to this cost come from a survey of Funeral Directors Association of New Zealand members in the late 1990s, which was conducted in order to lobby Work and Income to increase funeral grants. At that time, the average cost of a plot was $633.06 and the cost of opening the plot and ongoing maintenance was $452.56. Since then, local councils have increased these costs considerably – by 100 percent in some cases. On this basis, the following estimates have been made.

- Burial: $6,500 + GST
- Cremation: $5,000 + GST

Previously, records were kept by the Registrar General as to the numbers of cremations and burials. This no longer occurs. Anecdotally, it appears that 70 percent of funerals are cremations and 30 percent are burials. It should be noted that cultural background influences whether the deceased is cremated or buried; Māori and Pacific Islanders opt for burial in almost 100 percent of cases.

In addition to these funeral costs, there is an optional additional cost for the reception. As noted by Robyn Grooby, anecdotal evidence suggests that in the case of a sudden death, especially of a young person, there is a larger attendance at the reception and therefore higher costs. Generally, catering charges are $6.50 + GST per attendee, and include tea/coffee, one savoury and one cake per person. Robyn Grooby was unable to give an average number of attendees.

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[24] PO Box 10888, The Terrace, Wellington, tel: 473 7475, email: fdanz@xtra.co.nz

The cost of transporting the deceased to the morgue is considerably higher than that mentioned by Coggan et al (1995). In the case of a sudden death, a funeral director is contracted by the police as agent for the coroner to take the deceased to the morgue for a post-mortem and return the body to the place from where it was uplifted, generally a funeral home. The cost for this procedure is the responsibility of the coroner, although there are sometimes issues as to who bears the cost for the return of the deceased. The average charges for this service are as follows.

- Hourly rate: $100 + GST
- Mileage: $1 per kilometre

If there is a question as to whether the death is homicide as opposed to suicide, a forensic post-mortem may have to be carried out. Only a limited number of places perform this type of post-mortem, which affects travelling times, distances and thus costs.

Note: The Coroners' Bill, which is currently before select committee, contains provisions stating that in certain suicide cases, the certifying doctor may not be obliged to have the body sent for post-mortem examination. These provisions may impact on costs in the future.

Ambulance service costs (Wellington Free Ambulance)

Source: Erina Clayton, Planning and Performance Manager, Wellington Free Ambulance.

The Wellington Free Ambulance database records information about incidents responded to and incidents attended. The service also maintains patient reports that detail each case, which are not stored electronically.

Table 15:   Attempted suicides (and suicides) attended by Wellington Free Ambulance

	Year			
	2001	**2002**	**2003**	**2004**
Number of patients	472	386	362	397

The figures in Table 15 relate to the Wellington Free Ambulance region, which extends from the Peka Peka turnoff (north of Waikanae), eastwards across the Rimutaka Hills and south to the south coast of the North Island.

It is important to note that data for reported cases and patients may differ slightly as two ambulances may attend one patient and each ambulance records the response with a different case number.

Wellington Free Ambulance responds to any life-threatening emergency by sending the nearest available ambulance. This vehicle will be backed up by a second if the first ambulance's equipment or personnel are insufficient to deal with the case. The preferred response to an attempted suicide (assuming the person has caused themselves serious harm) comprises two paramedics in a fully equipped ambulance. If the patient goes into cardiac arrest, a third paramedic may be responded from the nearest ambulance, or the Fire Service may be called on if a paramedic is not available.

The cost of attending cases was quoted in terms of Wellington Free Ambulance's contract for services with the Accident Compensation Corporation. The prices, which are GST inclusive, are given in Table 16.

Table 16: Average costs of a response by Wellington Free Ambulance

	Crew type		
	Advanced	**Intermediate**	**Basic**
Amount per attendance (GST inclusive)	$574.91	$574.91	$461.81

Note:

Advanced crew: two crew who hold recognised ambulance qualifications including one with a National Diploma in Ambulance Paramedics and one with at least a National Certificate in Ambulance.

Intermediate crew: two crew who hold recognised ambulance qualifications including one with a National Certificate in Ambulance and one with at least a National Diploma in IV/Cardiac.

Basic crew: at least one crew member qualified to a National Certificate in Ambulance (primary care) or equivalent.

No data were given allocating costs per attempted suicide. However, given the preferred response of Wellington Free Ambulance in these cases, it may be assumed that an intermediate crew at least would attend if available.

New Zealand Fire Service[25]

Source: Neil Challands, Information Analyst, Fire Service.

Coggan et al (1995) note that the Fire Service was involved in approximately 50 percent of suicides and attempted suicides. The cost of attendance relates to deploying a fully equipped appliance and staff for one hour.

One appliance x 1 hour x 50% = $145 (Coggan et al 1995, p 86).

The Fire Service no longer records incidents involving suicide or attempted suicide except where the coroner makes a ruling that a suicide by fire has occurred.

On average, since 1995, the Fire Service has attended just over one (1.5) suicide by fire incident each year as confirmed by the coroner.

There is no hourly 'charge out rate' determined by the Fire Service. The Fire Service is considered a standing army and the majority of costs are allocated to maintaining a functioning, responsive service. In comparison, the cost of attending an incident is minimal. However, when questioned again, Neil Challands indicated that the average cost per incident, where two fully equipped and staffed appliances attend for one hour, was $600.

If there is a fatality from a fire, the fire inspector must investigate the cause of the fire and submit a report to the coroner. On average, this report takes one week to complete and costs the Fire Service approximately $2,000.

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[25] National Headquarters, PO Box 2133, Wellington, tel: 496 3600, email: Queries@fire.org.nz

Coroners' costs for inquest on suicide

Source: Largely from the Tribunals Unit, Ministry of Justice; specifically Clifford Slade (letter of 20 January 2005 and phone discussion) and Katherine Baird (phone discussion). Their assistance is gratefully acknowledged.

Act and regulations

- Coroners Act 1988

    4(1)   The following deaths shall be reported:
      (a)   Every death that appears to have been –
        (ii)   Suicide;

    17   ... a coroner to whom a death is reported shall hold an inquest into it –
      (a)   If it appears to have been –
      (i)   Suicide;

- The Coroners (Fees) Regulations 1989 were replaced by 1992 regulations, which were subsequently amended in 1997, 1999 and 2003.

Questions put to Tribunals Unit

(Based on estimates in Coggan et al 1995.)

1.   Forensic costs:
    – In what proportion of suicides is forensic testing requested by the coroner?
    – What is the average cost of forensic testing when requested?

2.   Post-mortem expenses:
    – Typical amounts
    – Histology
    – Autopsy
    – Typing

3.   Inquest expenses:
    – Typical or average amounts
    – Notification of death
    – Inquiry
    – Inquest

Information supplied by Tribunals Unit

1.   **Forensic costs**

    'Information as to the proportion of suicides where forensic testing is requested by a coroner is not readily available.'

    'As to the costs of the forensic testing, we have no information recorded.'

    In practice, coroners will sometimes order a toxicological test for substances present in the person's blood. These tests cost little. The 1997 amendments to the Coroners (Fees)

Regulations added a fee 'For every laboratory test associated with a post-mortem examination, ...' of $20.25, which increased in 2003 to $22.34.

More complex tests are sometimes ordered by the police.

2. **Post-mortem expenses**

See The Coroners (Fees) Regulations 1992, and subsequent amendments. The amounts given here are from the 2003 amendments. The principal regulations were amended in 1997 to say that the 'the fees prescribed by these regulations are inclusive of goods and services tax'.

(3) The following fees shall be payable to doctors:

    (a) For every post-mortem examination ... $750.00

    (b) For preparing and examining any histological specimens in connection with a post-mortem examination ... $67.33

    (c) For typing, and any other secretarial work, associated with a post-mortem examination, ... $27.33

    (f) For a post-mortem examination (in addition to the fee described in paragraph (a) ...) –

        (i) Where a coroner has directed that it should be performed forthwith; or

        (ii) Where it or any work associated with it is done outside normal working hours – $180.00

Also:

(4) Where a doctor who has performed a post-mortem examination gives evidence at an inquest, the doctor shall be paid an additional fee equal to the fee for the time being payable to an expert witness under the Witnesses and Interpreters Fees Regulations 1974.

Comment: These amounts appear to make up a basic amount of $777.33, including GST, plus variable amounts under 3(b) and (f), and 4.

Other sources on post-mortem costs are as follows.

- Ministry of Justice Annual Report

  Coroner-directed post-mortems in 2003/04 cost in total $4,734,000, including GST. Findings registered in 2001/02 numbered 3824. Assuming this number applied also in 2003/04, the average cost was $1,238 including GST, or $1,100 excluding GST. This cost, of course, is the average of all such post-mortems, not just suicides.

- Cost estimate made in 1994

  A report by Grant Johnston of the Ministry of Health in June 1994, using data supplied by Crown Health Enterprises and schools of medicine for 3886 post-mortems, found an average cost (excluding 'outliers') of $894 per forensic post-mortem (excluding GST) for the period 1 July 1993 to 31 May 1994. This included both direct and indirect (overhead) costs incurred by the mortuary operator, as well as the typical fee of $270 at

that date paid by the police for the doctor/pathologist and for histological and secretarial costs – in other words, the amounts listed in the Coroners (Fees) Regulations 1992 above under subsection (3) (a), (b) and (c).

Assuming that the average cost for a suicide post-mortem is the same as for other forensic post-mortems, this estimate suggests the fees paid according to the Coroners (Fees) Regulations 1992 understate considerably the true economic costs of post-mortems.[26]

The CPI increased 23.2 percent from the December 1993 to June 2004 quarters. (Average earnings increased 36.2 percent over the same period, but presumably with some productivity offset.) This rate of inflation would make the $894 above equivalent to $1,102.82 in June 2004 dollars.

These two sources agree closely. An amount of $1,100, excluding GST, is an appropriate estimate of overall post-mortem costs, assuming suicide post-mortems have the same average cost as other coroner-directed post-mortems.

3. **Inquest expenses**

Coroners are paid fees in accordance with the Act and regulations identified above, with the exception of the two Auckland coroners who are salaried judicial officers. Of the 493 cases of suicide reported for fiscal year 2003/04, 138 were reported from the Auckland coroners. Fees for the other 355 cases reported from elsewhere amounted to $163,200, including GST. This amount was paid from the Crown Account.

Notification of death, and inquiry fees do not apply to suicides, for which an inquest is always obligatory.

- Inquest fees

See the Coroners (Fees) Regulations 1992, and subsequent amendments, for provisions for inquest fees. The amounts given here are from the 1999 amendments, and were still current in 2004. The principal regulations were amended in 1997 to say that the 'the fees prescribed by these regulations are inclusive of goods and services tax'. The 1999 amendments substituted the two hours, as set out below, for the three hours that had been provided for formerly.

> (2) The following fees shall be paid to coroners ...
>
> (c) For completing an inquest lasting less than two hours, ... $250.00
>
> (d) For completing an inquest lasting for two hours or more, a fee calculated at the rate of $50.00 for every hour or part thereof the inquest lasted:

The majority of inquests are said by the Tribunals Unit to last less than two hours. The 'normal' fee would therefore be $250, including GST. However, the above amount of $163,200 for 355 cases gives an average of $459.72 including GST, or $408.64 excluding GST. No doubt inquests that are longer than normal increase the overall average. These amounts are 'non-Auckland' averages, but can reasonably be assumed to apply for New Zealand overall.

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[26] Coroners' fees are currently under review, not having increased since 1999.

The amounts do not include any amount for the provision of court facilities by the Department of Courts. Some coroners do not use court facilities or and many do not use Ministry of Justice staff (which sometimes incur further expenses). Still, the $408.64 is an under-estimate in not including all resource costs. As a correction the amount is, for our calculations, rounded up to $500 excluding GST.

Summary: coroner-associated costs of a suicide

	Excluding GST; 2004 dollars
Post-mortem	$1,100.00
Inquest	$500.00
Total	$1,600.00

Victim Support[27]

Source: Steve Caldwell, Chief Executive of Victim Support.

Coggan et al (1995) report that between 10 and 100 hours of counselling are given by Victim Support per referral, reflecting the level of community-based support services involved after a suicide or homicide. They note however, that there is no information on how many people (family, friends, acquaintances) present for counselling after such an event. Given this, an arbitrary figure of 50 hours is assumed by Coggan et al and the following cost calculated.

50 hours @ $30 = $1500 (1995, p 87)

Table 17: Victim Support associated with suicides and attempted suicides, for the year ending 30 June 2004

Type of incident	Number of incidents	Number of victims	Multiple victims groups	Contacts	Kilometres travelled	Total support hours
Suicide	452	1692	45	2972	15,037	3003
Attempted suicide	629	952	19	1232	6020	855

As Table 17 shows, in the 12-month period ending 30 June 2004, victims associated with 452 suicides and 629 attempted suicides, or 1081 incidents in total, were referred to Victim Support.

The range of people who seek support following a suicide or attempted suicide include family, friends, work colleagues and school mates. Multiple victim groups are most often focused on classrooms and the workplace.

On average, 3.7 and 1.5 people respectively seek support following a suicide or attempted suicide. This average does not include multiple victims groups.

Victim Support offers the following services to those bereaved or traumatised by suicide or attempted suicide:

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[27] Ground floor, 180 Molesworth St, PO Box 3017, Wellington, tel: 474 8862, email: Victim@xtra.co.nz

- immediate crisis call-out service, which is usually instigated by the police
- follow-up emotional and practical assistance
- establishing a support plan with each individual referred
- making referrals to specialist services for those needing additional support.

People who need additional support are generally referred to church social service groups or the mental health service. There is no funding available for counselling services for these people.

No information was given about an hourly 'charge out rate' for Victim Support volunteers.

Victim Support volunteers are reimbursed for travelling costs at a rate of $0.5 per kilometre.

The average number of hours that Victim Support provides per incident is 6.6 hours for suicides and 1.36 hours for attempted suicides.

The average number of hours per victim per suicide is 1.77. The average number of hours per victim per attempted suicide is 0.9.

Victim Support is funded in the following manner.
- Ministry of Justice   60%
- Other central/local government   5%
- Sponsorship   5%
- Donations   10%
- Grants   20%

Appendix C: List of Abbreviations

CPI	Consumer Price Index
DALYs	Disability-adjusted Life Years
DHB	District Health Board
DRG	Diagnostic-related grouping
GDP	Gross domestic product
GST	Goods and services tax
IPRU	Injury Prevention Research Unit, University of Otago
LTSA	Land Transport Safety Authority
NZHIS	New Zealand Health Information Service
PHARMAC	Pharmaceutical Management Agency
QALYs	Quality-adjusted Life Years
VoSL	Value of a Statistical Life
VoSLY	Value of a Statistical Life Year
WHO	World Health Organization
YLD	years lost to disability
YLL	years of life lost