

The Health of New Zealanders in Brief

Introduction

This report on the health of New Zealanders at the end of the 20th century is intended to contribute to better and more equitable health and independence outcomes, by strengthening the evidence base for health policy and social policies that impact on population health outcomes.

It is intended to be a resource for a wide range of users, including health planners and policy analysts, health service funders and providers, community groups, and others with an interest in population health outcomes. It also serves to identify gaps in health statistics that could lead to improvements in our health information infrastructure.

The focus of the report is on robust and high quality analysis of:

- levels, trends and inequalities in health and independence outcomes
- the burden of premature mortality and disability, and how this health loss is distributed
- the scope for health gain.

The report is in four parts. The first two parts, ‘Adding years to life’ and ‘Adding life to years’, provide a description of population health status in terms of the two dimensions of health: quantity of life (mortality) and quality of life (morbidity). The third part, ‘Integrated perspectives on population health’, combines these two dimensions using both health expectancy and health gap measures to achieve a more comprehensive picture of the state of health of New Zealanders. Part IV, ‘The scope for health gain’, analyses the potential we have for making further improvements in our health.

This section “The Health of New Zealanders in Brief” summarises the key findings of the report and their implications for health policy and population health monitoring.*

The principal source of data for this report is the New Zealand Health Information Service (NZHIS), which collects data on hospital discharges (public and private), mortality by cause, and cancer registrations. The most recent hospital discharge data available are for 1997 (provisional 1998 data are used for some analyses). Mortality data used are for 1996, although provisional 1997 mortality data are included in certain analyses. The latest available cancer registration data are for 1995. Data on the prevalence of chronic diseases, disabilities and risk factors are primarily based on three national population surveys carried out in 1996–97: the New Zealand Health Survey, the National Nutrition Survey and the New Zealand Disability Surveys. For some analyses, data were also extracted from other national or regional surveys or epidemiological studies. Population denominators used in calculating rates are derived from Statistics New Zealand censuses and vitals registration (births and deaths).

* For ease of reading, statements in this section are not referenced. Please consult relevant chapters for sources.

Box 1: New population health indicators

The report includes a number of analyses and indicators not previously available in New Zealand:*

- *independent life expectancy* as the key health expectancy measure
- the first *burden of disease study* in New Zealand to use the *disability adjusted life year* (DALY) as the health gap measure
- a systematic analysis of *population attributable risks* for eight major chronic disease risk factors
- an analysis of *avoidable mortality and morbidity*, including analyses by level of intervention
- a detailed description of years of life lost, which distinguishes *presenescent* from *premature mortality*
- the first comprehensive analysis of *cause deleted life expectancies*
- the first study of *socioeconomic gradients in life expectancy* and in *years of life lost*.

The focus of this report is on the total population of New Zealand and on comparisons across subgroups of the population (differentiated by age, gender, ethnicity and socioeconomic status) at the national level; geographical variations in health outcomes are not discussed.

Because definitions of ethnicity have changed over the past 30 years (from a concept of ethnic origin to one of cultural affiliation), reliable time series for Māori and Pacific health statistics are not available. In particular, changes to ethnicity information collected on birth and death registrations in 1995 and hospital admissions in 1996 mean that pre- and post 1996 ethnic specific mortality and morbidity rates are not comparable.

Health status and health policy

The following analysis of current levels and historical trends in population health status, and of the scope for health gain, is intended to provide an input into strategic health policy. As well as informing the strategic direction for population health, the setting of priorities and the allocation of resources, some key implications of this report relate to:

- population ageing and the future evolution of health status
- inequalities in health outcomes between ethnic and socioeconomic groups
- levels of intervention – diseases, risk factors or determinants
- the role of the health care sector itself in achieving improvements in the public's health and contributing to greater equity of health outcomes between subgroups of the population.

* See the Glossary for an explanation of the technical terms.

Population ageing

Over the next several decades the population of New Zealand will undergo rapid structural ageing, the result not only of earlier fertility trends, but also of the recent reduction in mortality at advanced ages. If this mortality trend reflects more rapid rates of decline in mortality from major fatal diseases than in their incidence, the result will be an expansion in the prevalence of these diseases. At the same time, unless the incidence or progression of non-fatal disabling conditions – such as mental illness, cognitive impairment, hearing and vision loss, and musculoskeletal disorders such as arthritis – can be reduced in tandem with the continuing reduction in mortality, the prevalence of these conditions must also increase. The result will inevitably be an expansion of disability, possibly leading to a deterioration in *independent* life expectancy (ILE)* even as total life expectancy improves. The impact of this uncoupling of morbidity from mortality will be felt more by women than by men, as mortality is already lower among women.

This suggests that a fundamental shift in our thinking may be required, from a traditional focus on the major fatal diseases to a more balanced concern with the prevention and mitigation of the chronic disabling but non-fatal conditions as well: a broader concern with population health gain rather than a narrow focus on life extension.

Health inequalities

The analyses reported here confirm that significant inequalities in health status persist between population groups:

- While self reported physical health declines with age, self reported mental health does not: in fact, the worst mental health is experienced by youth and young adults, especially young women.
- The lower life expectancy of males is not entirely biological (and therefore non-modifiable). The gender gap in life expectancy at birth varies from 6.5 years in the most to only 4.0 years in the least socioeconomically deprived areas. Resources allocated to reducing risky behaviour among males – particularly in more deprived communities – could yield good returns.
- Ethnic differences in mortality, disability and self rated health status are reduced, but not eliminated, by adjusting for socioeconomic status. Other explanations – cultural and behavioural – may therefore provide additional levers to help reduce ethnic inequalities in health outcomes, although cultural and socioeconomic factors interact in complex ways.
- The socioeconomic gradients in health outcomes – fatal and non-fatal – revealed in this report are both large and affect the entire population. These inequalities therefore represent an important point of intervention, whether the policy goal is to maximise ILE or to minimise inequalities in ILE among subgroups of the population.

* Independent life expectancy (ILE) is a health expectancy indicator, defined as the expectation of life free from disability needing assistance.

Levels of intervention

Interventions can be aimed at different levels in the causal chain: diseases, risk factors, or the underlying sociocultural and economic determinants of health themselves.

Disease trends

- Asthma and diabetes have increased in incidence and prevalence in recent decades, and this trend is likely to continue, at least for diabetes.
- By contrast, ischaemic heart disease (IHD) and stroke mortality have fallen among both males and females since the late 1960s. For IHD this is thought to reflect a reduction in both incidence and case fatality, while the latter is thought to be more important for stroke.
- Smoking related diseases including chronic obstructive respiratory disease (CORD) and lung cancer are declining among males, but not yet among females.
- Dementia and other neurological disorders, as well as hearing and vision loss, can be expected to increase in prevalence over the next several decades as a result of population ageing.
- Trends in the incidence and prevalence of mental illnesses and musculoskeletal disorders are difficult to discern due to lack of data, but the burden of disease analysis presented here clearly demonstrates the large impact of these conditions on the health of the population.
- Injury mortality is falling, mainly as a result of successful interventions to reduce road traffic injury and the case fatality of falls in older people. Suicide remains epidemic and now equals or exceeds road traffic injury as a cause of injury related death.

Risk factor trends

- As with diseases, risk factors are also trending in varying directions. Monitoring of these trends is critical, as the risk factors of today are the diseases of tomorrow.
- The population attributable risk analysis reported here confirms the importance of smoking as a major cause of health loss. In recent years the decline in smoking rates has slowed and even reversed in some age-gender groups (especially young women).
- While the impact of diet is more difficult to quantify, the universal adoption of a diet in accordance with New Zealand food and nutrition guidelines would probably have an impact equivalent to the total elimination of smoking.
- The prevalence of obesity has been rising rapidly over the past 1–2 decades, reflecting in part changing population physical activity patterns.
- Indeed, the diffusion of sedentary lifestyles and spread of overweight/obesity over just the last one or two generations could be emerging as a public health issue second in importance only to smoking. Now at least one third of New Zealand adults are insufficiently active, and it is estimated that over 2000 lives are lost each year as a result – about half the mortality attributable to smoking.

Achieving population health gain: role of the health sector

- Health behaviours are embedded within social contexts, and intersectoral strategies (for example, *Strengthening Families*) are necessary to address these causes.
- The analysis of physiological risk factors such as diabetes, high blood pressure and blood cholesterol, and the analysis of potentially avoidable deaths and hospitalisations, suggests that the health care sector itself could make a significant contribution to population health gain.
- This would require a reorientation of the health care system from one concerned primarily with acute, severe diseases and injuries to one focused on the prevention and management of chronic diseases and their disabling consequences, especially in primary and integrated care settings, and in the home (self management).

Summary of key indicators

Tables 1–3 summarise some of the most important indicators included in this report. Results are shown for all New Zealand and, where relevant or possible, are differentiated by age, gender and ethnicity. Differentiation by socioeconomic status has not been included in the summary tables because data were not available for many of the indicators.

Table 1: Summary of major all-cause indicators, 1996–97

Indicator	All New Zealand	Male	Female	Māori	Pacific	European/ Other ^a
Mortality						
All-cause mortality rate (per 100,000) ^b	493	612	397	888	722	451
Infant mortality rate (per 1000 live births) ^d	6.8	7.3	5.9	10.7	8.8	4.7
Risk of dying (%): <i>between exact ages</i>						
0–1	0.7	0.7	0.6	1.1		0.5
1–14	0.4	0.4	0.3	0.5		0.3
15–24	0.9	1.4	0.5	1.3		0.9
25–44	2.3	3.0	1.7	4.4		2.0
45–64	12.4	14.9	9.9	27.2		10.7
65–74	21.9	27.4	16.9	38.8		20.9
Median age at death (years)	76.2	73.4	79.6	60.3	60.8	77.8
Percentage of deaths below age 65	24	29	19	61	57	20
Life expectancy (years): <i>at exact age</i>						
0	76.9	74.3	79.6	69.4	72.7	78.0
1	76.5	73.8	79.1	69.2	72.3	77.3
15	62.7	60.1	65.4	55.5	58.6	63.6
45	34.3	32.1	36.4	27.8	30.4	35.0
65	17.2	15.5	19.0	13.3	15.0	17.6
85	5.5	4.9	6.1	4.5	5.0	5.7
Years of life lost (rate per 1000) ^{b,c}						
YLL _e	70	87	55	136	108	61
YLL ₆₅	25	31	20	47	38	21

Indicator	All New Zealand	Male	Female	Māori	Pacific	European/ Other ^a
Morbidity						
Self rated health (% rating health 'good' or better)	88	87	89	81	86	88
SF-36 summary scores:						
PCS		50.1	50.1			
MCS		51.2	48.9			
SF-36 profile scores:						
PF	86.0	87.1	85.0	81.2	79.7	87.0
RP	80.7	81.8	79.6	75.9	76.5	80.9
BP	77.9	78.7	77.1	76.6	77.9	77.6
GH	73.8	73.7	74.0	69.6	71.7	74.3
VT	65.6	67.9	63.4	63.9	66.7	65.3
SF	86.6	88.2	85.1	82.5	87.6	87.2
RE	85.0	87.3	82.7	77.9	80.1	85.6
MH	78.0	79.9	76.2	76.4	76.6	78.3
Disability prevalence (all ages, %)						
total	19.7	19.2	20.1	21.4		18.6
dependent	11.4	10.6	12.1	13.1		10.3
Dependent disability prevalence (%):						
<i>by age group</i>						
0–4	4.1	5.3	2.8	5.3		3.7
5–14	7.9	10.0	5.6	10.8		7.1
15–64	8.2	7.4	8.9	10.2		7.9
65–74	25.4	25.7	25.2			
75+	55.0	53.2	56.0			
Integrated measures						
Independent life expectancy (years):						
<i>at exact age</i>						
0	66.3	64.6	67.9	58.0		67.3
15	52.8	51.4	54.2	45.1		53.7
45	26.1	24.9	27.3	20.0		26.7
65	10.8	9.8	11.7	7.5		10.9
Life expectancy with dependency (years):						
<i>at exact age</i>						
0	10.6	9.7	11.7	11.4		10.7
15	9.9	8.7	11.2	10.4		9.9
45	8.2	7.2	9.1	7.8		8.3
65	6.4	5.7	7.3	5.8		6.7
ILE:LE ratio (%):						
<i>at exact age</i>						
0	86.2	86.9	85.3	83.6		86.3
15	84.2	85.5	82.9	81.3		84.4
45	76.1	77.6	75.0	71.9		76.3
65	62.8	63.2	61.6	56.4		61.9
All-cause DALY rate (per 1000) ^{b,c}						
DALY rates (per 1000): ^c						
<i>by age group</i>						
0–14	60	64	56	80		54
15–24	84	85	84	102		80
25–44	77	77	77	114		71
45–64	193	209	178	364		177
65+	543	590	507	793		533

Notes:

- a some indicators also include the Pacific ethnic group (ie, these indicators are for non-Māori rather than European/ Other)
- b age-standardised to Segi's world population
- c discounted at 3 percent per year
- d 1997 (provisional)

Table 2: Summary of major by-cause indicators, 1996–97

Indicator	All New Zealand	Male	Female	Māori	Pacific	European/Other ^a
Mortality						
<i>Years of life lost</i>						
YLL _e (rate per 1000): ^b						
chronic ^c	31	40	23	72	58	27
cancer	21	23	20	35	27	19
injury ^d	10	15	5	15	10	9
infant	5	6	5	8	6	4
YLL ₆₅ (rate per 1000): ^b						
chronic ^c	6	8	5	17	14	5
cancer	6	5	6	10	9	5
injury ^d	8	11	4	12	7	7
infant	5	5	4	8	5	4
Avoidable mortality (0–74) (rate per 100,000): ^b						
AM	223	270	175	477	374	192
PAM	116	150	83	254	179	100
SAM	56	63	48	125	110	48
TAM	50	57	44	98	85	44
Morbidity						
Avoidable hospitalisations (0–74) (rate per 1000): ^b						
AH	28	31	26	40	44	25
PH	4	5	3	5	6	4
ASH	19	19	18	29	34	16
IP	5	7	4	6	5	5
Integrated measures						
DALY (rate per 1000): ^b						
chronic ^e	48	53	42	94		44
neuropsychiatric	25	23	29	30		26
musculoskeletal	4	3	5	4		4
cancer	23	24	22	34		22
injury	13	19	8	19		12
infant	9	9	8	12		8
Risk factors						
Risk factor prevalences (all ages, %):						
smoking	24	25	23	44	30	21
hazardous drinking	16	24	8			
physical inactivity	42	38	46	38	43	43
inadequate fruit/vegetables	57	67	47			
obesity	17	16	18	27		16
diabetes	4	4	4	8	8	3
high blood pressure	15	17	12			
high blood cholesterol	24	23	24			
Attributable fractions (% of total deaths): ^f						
smoking	15	19	11	20	14	14
alcohol (net)	0	0	–1			
physical inactivity	8	8	8	10	11	7
inadequate fruit/vegetables	3	4	2			
obesity	4	3	4	8		4
diabetes	5	4	6	14	13	4
high blood pressure	9	9	9			
high blood cholesterol	6	6	5			

Notes:

- a some indicators also include the Pacific ethnic group (ie, these indicators are for non-Māori rather than European/Other)
- b age-standardised to Segi's world population; YLL and DALY discounted at 3 percent per year
- c includes all chronic diseases other than cancers
- d unintentional and intentional (includes suicide)
- e includes CVD, respiratory, endocrine, kidney and digestive disorders
- f YLL could be substituted for deaths (percentages would be different)

Table 3: Summary of major international comparative indicators, 1996–97

Indicator	New Zealand		Australia		English speaking countries ^a	
	Male	Female	Male	Female	Male	Female
Life expectancy at birth	74.3	79.6	75.6	81.3	74.6	80.5
All-cause mortality rate ^b	918	572	798	488	869	537
Infant mortality rate ^c	6.8		5.3		6.3	
YLL ₇₀ rate ^b	61	37	51	28	58	32
Cause specific mortality rates: ^b						
cancer (all sites)	251	168	229	138	236	125
IHD	244	124	194	103	205	105
stroke	73	65	63	56	59	51
injury	71	27	54	21	59	22

Notes: YLL₇₀ rate per 1000; infant mortality per 1000 live births; all other mortality rates per 100,000

a average of Australia, UK, Canada, US

b age standardised to OECD reference population

c genders pooled

From Tables 1 and 2, a subset of possible key health indicators has been selected as a basis for further discussion and debate (Table 4). These indicators – chosen for their impact on population health, their responsiveness to policy settings, and the availability of high quality monitoring data – could be selected for special attention and intensive monitoring.

The focus of the proposed set of key indicators is on health outcomes, but the prevalence of major risk factors has also been included because of its policy relevance; this could be extended to social, cultural and economic determinants of health. Although not included in the indicator set, information on the incidence and prevalence of major diseases and injuries is critical to measurement of several of the listed outcomes.

Table 4: Twenty key population health outcome indicators, 1996–97

Indicator	Male	Female
Mortality		
1. All-cause mortality rate	612	397
2. Infant mortality rate	7.3	5.9
3. Life expectancy at birth	74.3	79.6
4. Life expectancy at age 65	15.5	19.0
5. Probability of surviving middle age	85.1	90.1
6. Years of life lost before age 65	31	20
7. Years of life lost prematurely	87	55
8. Avoidable mortality rate	270	175
Morbidity		
9. Self rated health	87	89
10. SF-36: PCS	50.1	50.1
11. SF-36: MCS	51.2	48.9
12. Disability prevalence	19.2	20.1
13. Dependent disability prevalence	10.6	12.1
14. Avoidable hospitalisation rate	31	26

Table 4 continued

Indicator	Male	Female
Integrated measures		
15. Independent life expectancy at birth	64.6	67.9
16. Independent life expectancy at age 65	9.8	11.7
17. Life expectancy with dependency at birth	9.7	11.7
18. ILE/LE ratio at birth	86.9	85.3
19. All-cause DALY rate	136	120
Risk factors		
20. Risk factor prevalence:		
smoking	25	23
physical inactivity	38	46
obesity	16	18
diabetes	4	4
high blood pressure	17	12
high blood cholesterol	23	24

Note: all age standardised rates use Segi's world population as the reference.

Notes to indicators:

- 1 age standardised rate per 100,000
- 2 rate per 1000 live births
- 3 in years
- 4 in years
- 5 probability of reaching 65th birthday, having survived to 45th birthday (percent)
- 6 age standardised YLL₆₅ rate, discounted at 3 percent per year
- 7 age standardised YLL_e rate, discounted at 3 percent per year (using West level 26 model life table as the standard for both genders)
- 8 age standardised rate per 100,000 people aged 0–74 years
- 9 proportion rating health 'good' or better
- 10 mean score
- 11 mean score
- 12 percentage acknowledging any disability
- 13 percentage acknowledging functional or role limitation needing assistance
- 14 age standardised rate per 1000 people aged 0–74 years
- 15 in years
- 16 in years
- 17 in years
- 18 percent
- 19 age standardised rate per 1000
- 20 percentage of population aged 15+ years (except diabetes: 20+ years); smoking refers to current smokers only, not ex smokers

Key findings

Adding years to life

Although mortality measures do not provide a comprehensive description of a population's health, these indicators remain central to population health monitoring. Evidence-based health and social policy requires information on the quantitative dimension of life, including variations in mortality among population subgroups, over time, for all causes and for each major cause. Such information allows us to identify opportunities for further gains in survival and for reducing inequalities in the survival chances of different population groups.

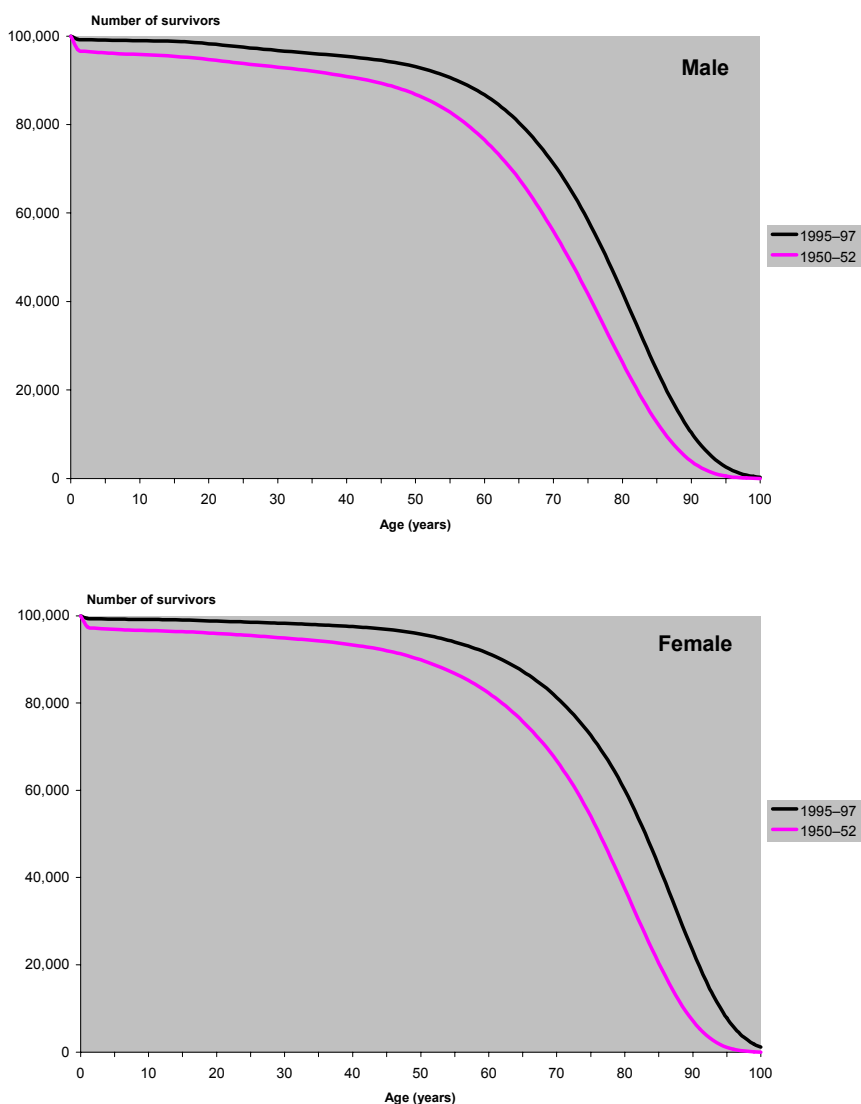
The social structure of mortality

Mortality declined dramatically over the past half century in New Zealand: the all-cause mortality rate, standardised for age and gender, fell from 855 per 100,000 in 1951 to 493 per 100,000 in 1996 – a reduction of 42 percent or approximately 1 percent per year. This achievement is impressive, but the improvement was even greater in many other OECD countries.

Over the past half century, mortality has become increasingly concentrated into old age: 76 percent of deaths now occur after age 65 years and 54 percent after age 75 years. The probability of survival to middle age (45 years) now exceeds 95 percent for the population as a whole; over 85 percent of people who survive to age 45 will reach their 65th birthday, and more than 75 percent of those reaching 65 will survive to 75 or beyond.

Concomitantly, life expectancy at birth has increased by almost eight years (Figure 1); in 1995–97 it was 74.3 years for males and 79.6 years for females. Although this increase has involved all ages, most of the improvement over the past decade has occurred at older ages.

Figure 1: Survival curves of the total population, by gender, 1950–52 and 1995–97

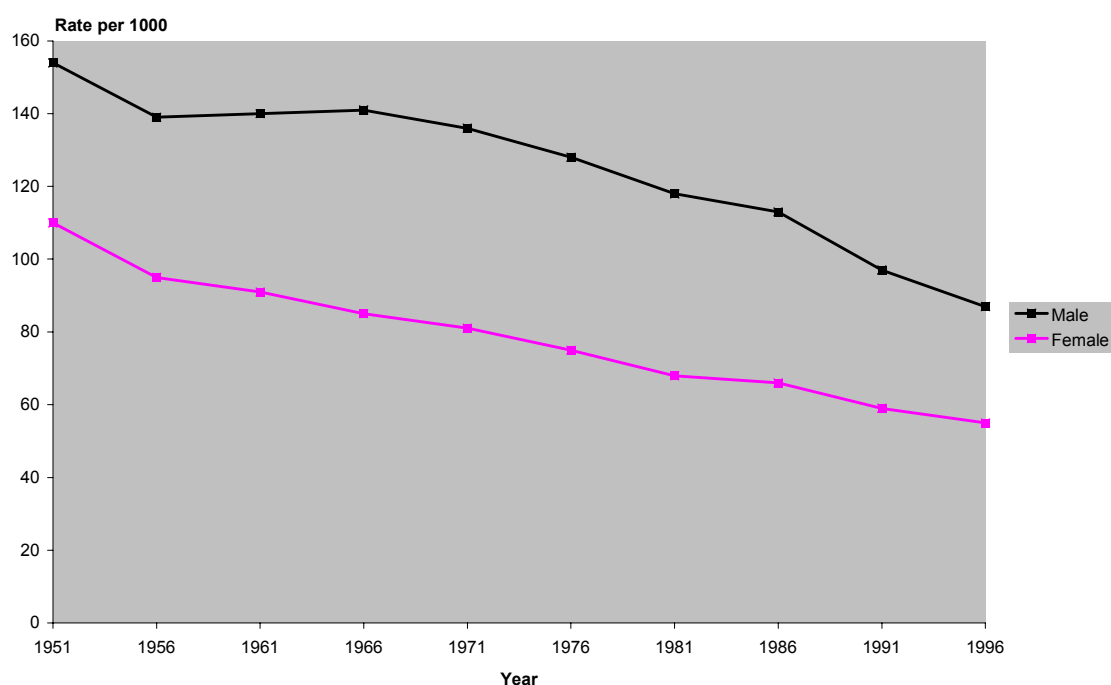


Source of base data: NZHIS

While life expectancy provides a useful summary of age specific mortality rates, a better indicator of the social impact of mortality is the *years of life lost*. This measure weights (values) each death by the age at death, so quantifying the gap between the mortality experience of the population and some idealised conception of what it could be. Two years of life lost (YLL) indicators are analysed in this report: premature and presenescent mortality. *Premature mortality* is defined as the gap between the age at death and the life expectancy remaining at that age.* *Presenescent mortality* uses an arbitrary cut off age (65 years in this report), and so quantifies the impact of child and adult mortality, unaffected by mortality in old age (defined here as 65 and older).

The concentration of mortality into older ages has had an even greater impact on presenescent and premature mortality than on life expectancy. Over the past half century, presenescent years of life lost fell from 58 per 1000 in 1951 to 25 per 1000 in 1996, while premature mortality fell from a rate of 132 per 1000 to 70 per 1000 – improvements of 57 percent and 47 percent respectively (Figures 2 and 3).

Figure 2: Trends in premature mortality, by gender, 1951–96

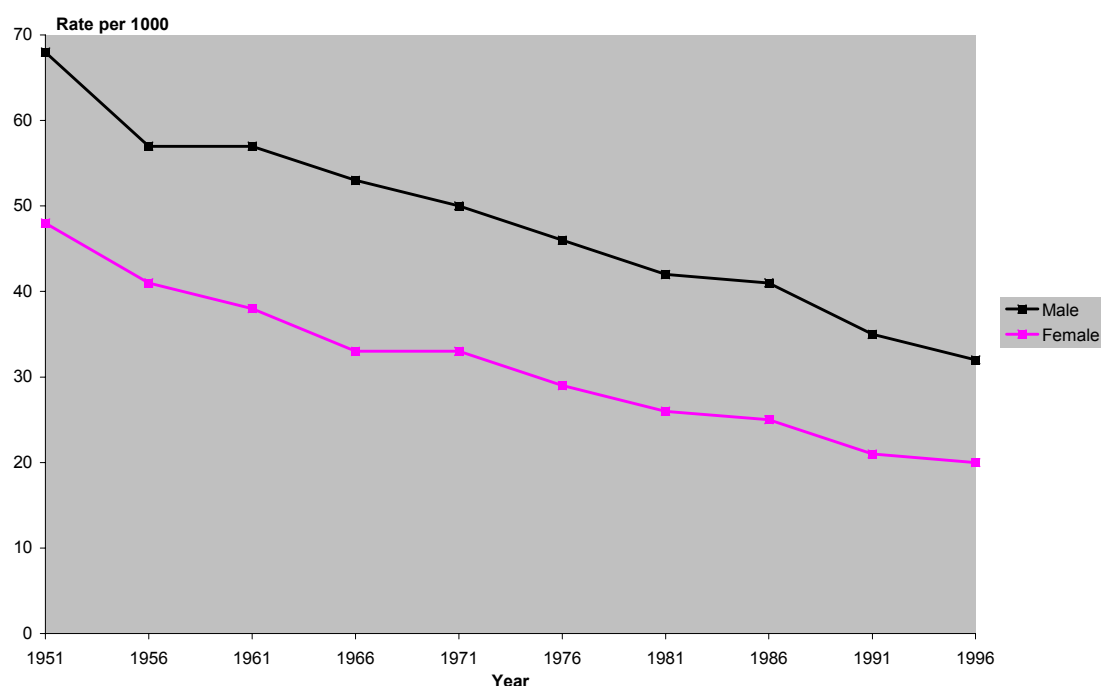


Source of base data: NZHIS

Note: rate is age standardised to Segi's world population and discounted at 3 percent per year.

* In this report, a 'model' life table prepared for the United Nations (West level 26) is used as the reference or standard.

Figure 3: Trends in presenescent mortality, by gender, 1951–96



Source of base data: NZHIS

Note: rate is age standardised to Segi's world population and discounted at 3 percent per year.

Male mortality continues to exceed female mortality at all ages, with the gap now greatest in the 15–24 and 25–44 age groups (due to higher male injury – including suicide – risks at these ages). Over the half century male mortality fell 37 percent (from 980 per 100,000 in 1951 to 612 per 100,000 in 1996) while female mortality fell 46 percent (from 736 per 100,000 to 397 per 100,000). The male mortality excess increased from 33 percent in 1951 to 54 percent in 1996.

The gender inequality in mortality is magnified if we look at presenescent and premature, rather than total, mortality: the age standardised rates for presenescent years of life lost are currently 31 per 1000 for males and 20 per 1000 for females, and the corresponding premature mortality rates are 87 per 1000 and 55 per 1000 – a male excess of approximately 60 percent for both indicators.

Although the ethnic mortality time series is unreliable, the current situation can be reliably contrasted: in 1996 the age standardised mortality rate for Māori was 888 per 100,000 – almost twice the European/Other rate of 451 per 100,000; the rate for Pacific people was 1.6 times the European/Other rate. Māori mortality exceeds European/Other mortality at all ages in both genders (for example, the Māori infant mortality rate is currently more than twice that of European/Other New Zealanders, at 9.5 and 4.2 per 1000 live births respectively (provisional 1998 data). The largest difference in ethnic mortality rates occurs in middle age (45–64 years), reflecting the earlier age of onset of chronic diseases such as IHD and diabetes among Māori. Mortality rates for Pacific people fall between the corresponding Māori and European/Other rates.

The premature mortality rates in 1996 were 136 per 1000 for Māori and 61 per 1000 for European/Others; the corresponding presenescent mortality rates were 47 per 1000 and 21 per 1000. This is a Māori excess of 120 percent for both indicators. Rates for Pacific people were intermediate between the other two groups. For males in 1996, Māori life expectancy at birth was

67.2 years, eight years less than that for non-Māori males; for females the corresponding value was 71.6 years, an even larger gap of nine years. Similar inequalities are seen at other ages, in each case about twice as large as the corresponding gender gap (Table 5).

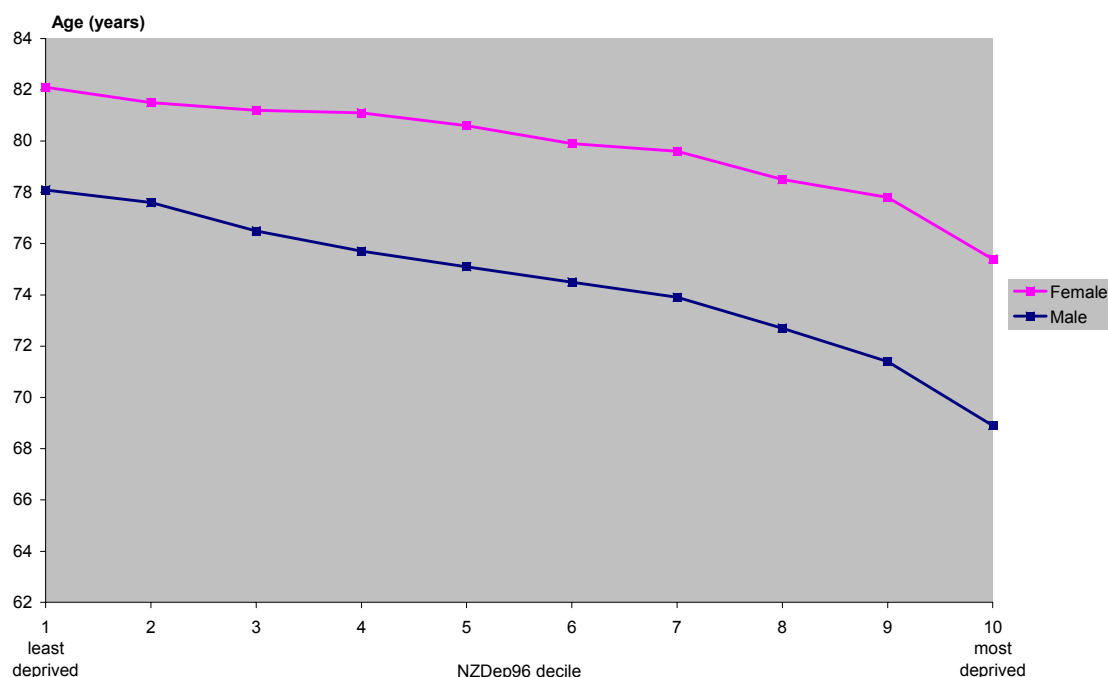
Table 5: Life expectancy at selected ages, by gender and ethnicity, 1995–97

Age (years)	Non-Māori			Māori			Ethnic difference	
	Male	Female	Difference	Male	Female	Difference	Male	Female
0	75.31	80.60	5.29	67.23	71.64	4.41	8.08	8.96
1	74.73	79.98	5.25	66.99	71.38	4.39	7.74	8.51
15	61.00	66.20	5.20	53.37	57.69	4.32	7.63	8.51
45	32.81	37.13	4.32	26.16	29.36	3.20	6.65	7.77
65	15.79	19.33	3.54	12.23	14.54	2.31	3.56	4.79
85	5.06	6.16	1.10	3.94	5.19	1.25	1.12	0.97

Source of base data: Statistics New Zealand (SNZ)

Socioeconomic gradients in mortality (measured by means of a census-based small area deprivation index, the NZDep96) are approximately as large as the ethnic inequalities. The gradient is steeper for males: in 1996, there was a gap of 9.2 years in life expectancy at birth between males living in the least and the most deprived areas; the corresponding difference for females was 6.7 years. The gender gap in life expectancy at birth narrowed from 6.5 years for the most to 4.0 years for the least deprived deciles (Figure 4).

Figure 4: Life expectancy at birth, by gender and socioeconomic group, 1996–97



Source of base data: SNZ
Note: broken axis.

A similar gradient is seen if premature or presenescent rather than total mortality is examined (Figure 5). The gradient is similar for both Māori and non-Māori.

Figure 5a: Premature mortality rates (YLL_e), by gender and NZDep96 quintile, 1996

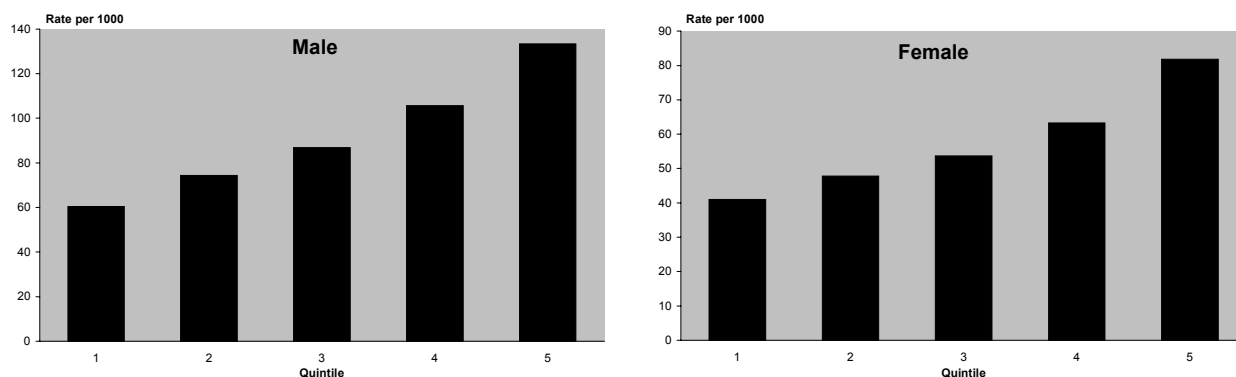
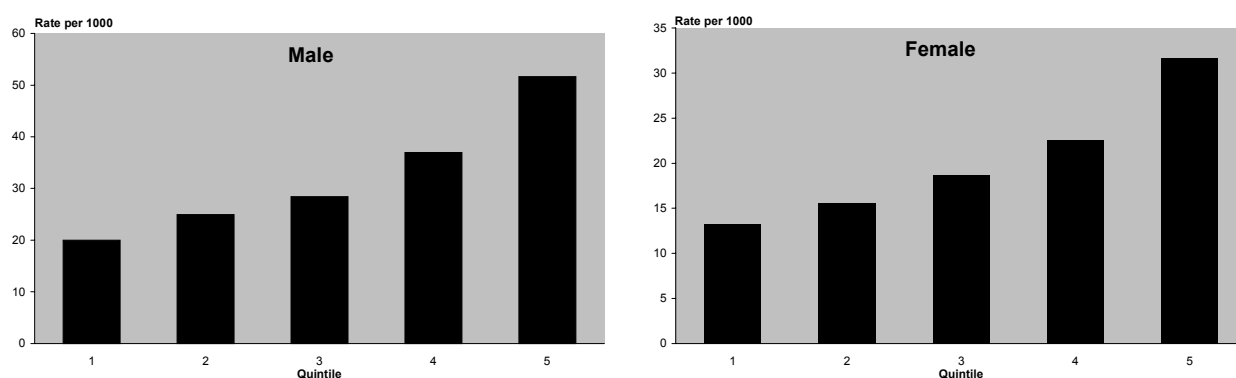


Figure 5b: Presenescent mortality rates (YLL₆₅), by gender and NZDep96 quintile, 1996



Source of base data: NZHIS and SNZ

Notes: quintile 1 = least deprived; quintile 5 = most deprived; rate is age standardised to Segi's world population and discounted at 3 percent per year; scale varies between charts.

Causes of mortality

Mortality has become compressed into a relatively small number of causes: since the 1980s, over 80 percent of all deaths have resulted from chronic diseases. Despite the rapid decline in rates of cardiovascular diseases (mainly ischaemic heart disease (IHD) and stroke) over the past two to three decades, these diseases still accounted for 40 percent of all deaths in 1996. At the individual disease level, IHD remains by far the major cause of death for the population as a whole (23 percent of all deaths), with stroke the second leading individual cause (9 percent) (Figure 6).

Figure 6: Leading causes of death, by age and gender, 1996

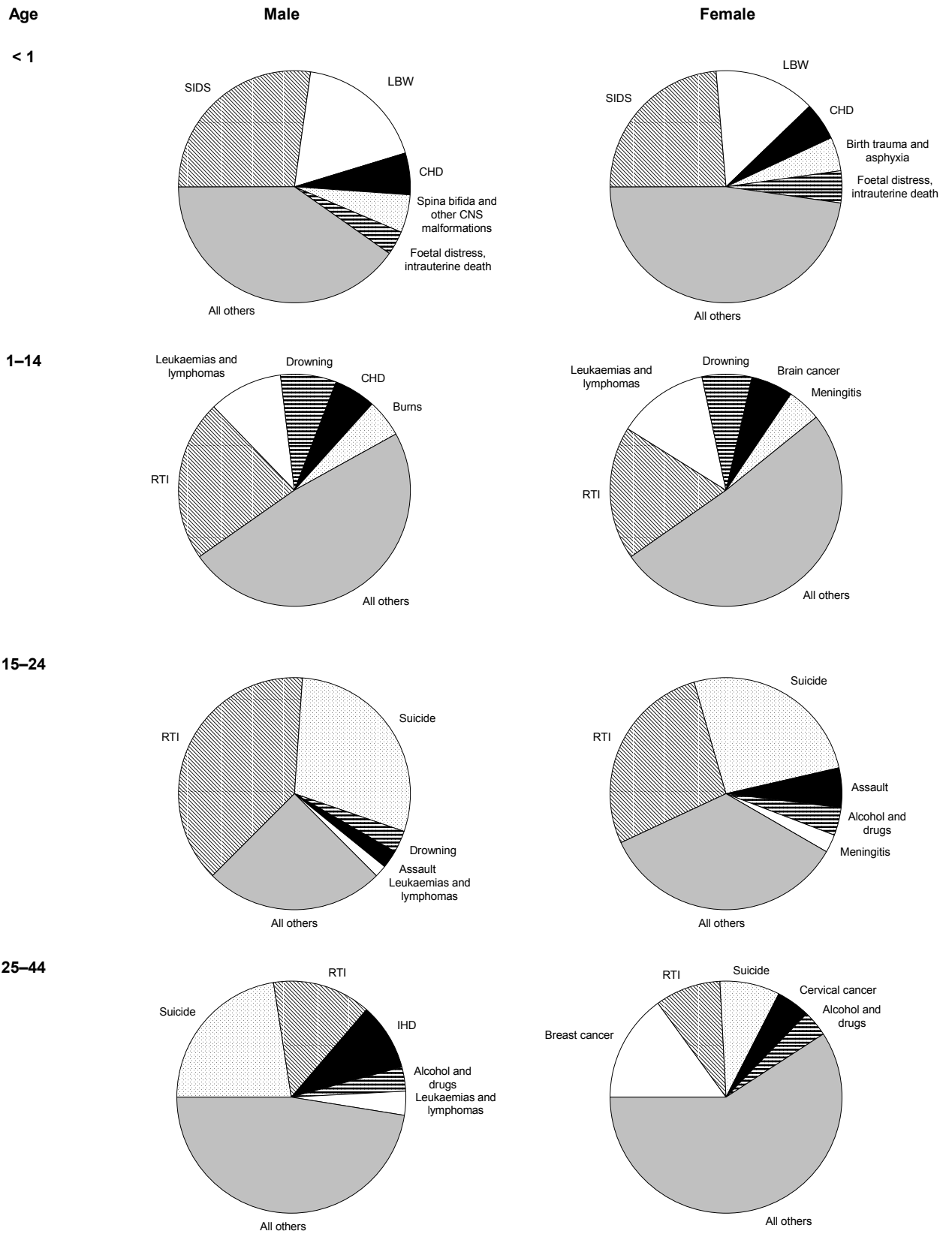


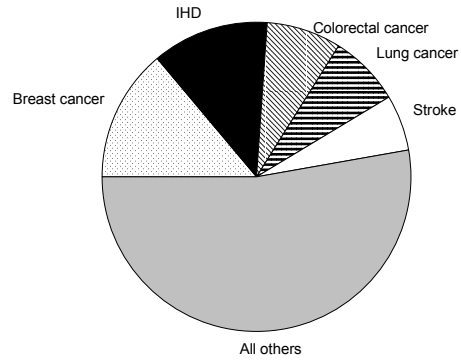
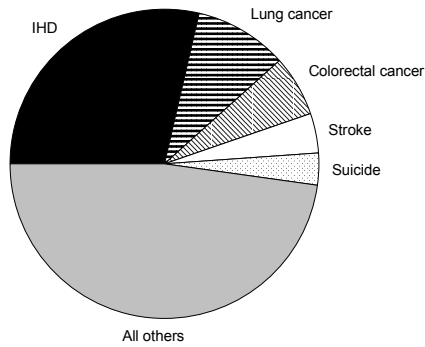
Figure 6 continued

Age

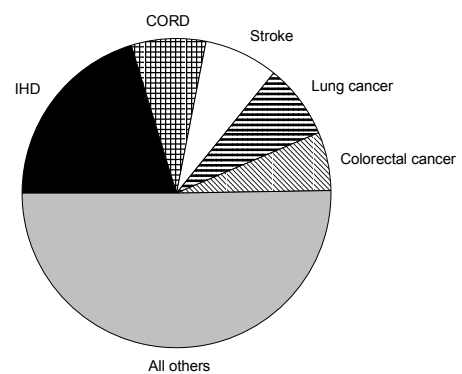
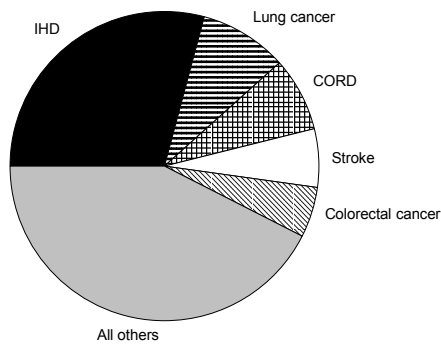
Male

Female

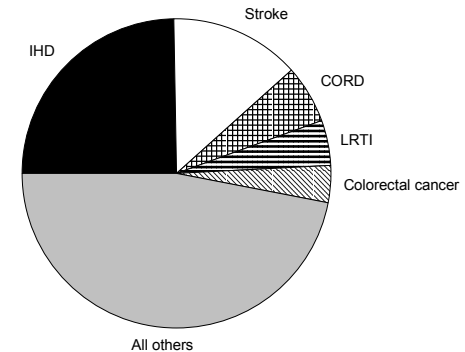
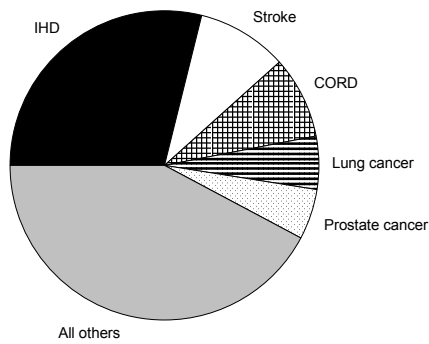
45-64



65-74



75-84



85+

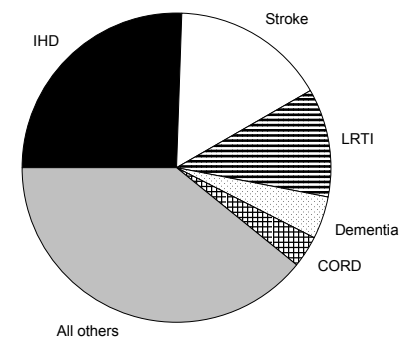
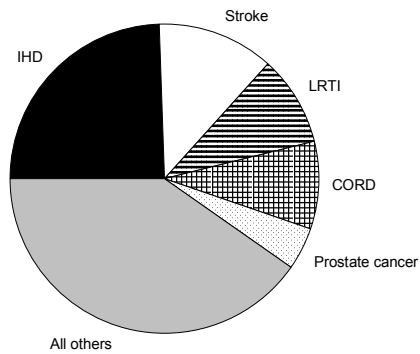
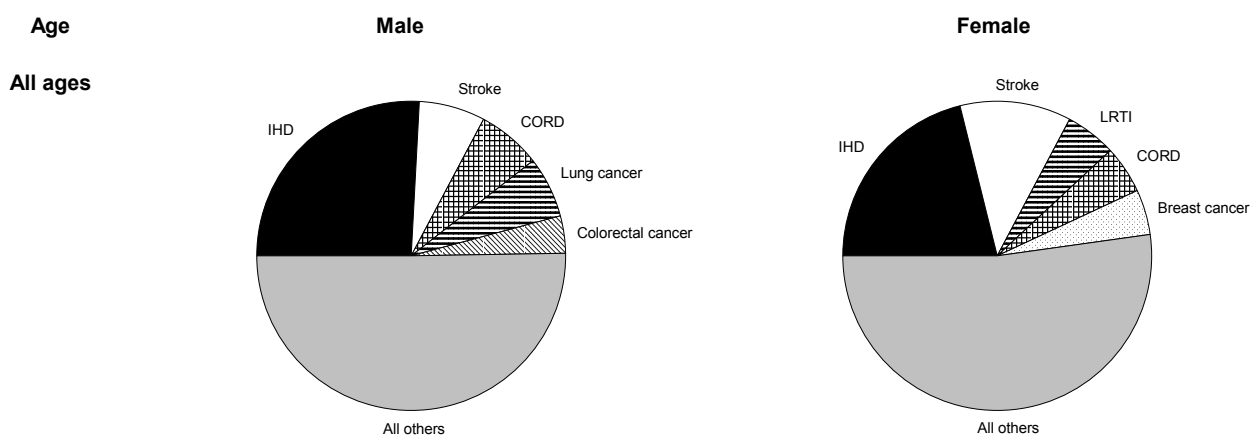


Figure 6 continued



Source of base data: NZHIS
 Note: CHD = congenital heart disease, LBW = low birth weight.

The proportion of deaths from cancer (27 percent in 1996) is second only to cardiovascular disease at the disease group level and is increasing; this does not reflect a rise in cancer mortality overall but rather the dramatic decline in deaths from IHD and stroke over the past quarter century. In absolute terms, mortality rates from most cancers have remained stable or, in the case of the tobacco related cancers (such as lung cancer), have begun to decline among males, while still increasing among females (at least in most age groups). A significant contributor to cardiovascular and other mortality is diabetes, which is estimated to contribute to approximately 1200 deaths per year, or 4 percent of total mortality. The prevalence of type 2 diabetes has been rising, and this trend is projected to continue.

Injury of all types accounts for 6 percent of all deaths and in absolute terms has declined since 1950. Injury deaths peak in the 15–24 and 25–44 age groups. Injury (mainly road traffic crashes and suicide) dominates the cause of death structure in these age groups. Falls in older people are also a major cause of injury deaths, reflecting increased vulnerability due to osteoporosis.

The burden arising from deaths attributable to specific causes (diseases or injuries) was estimated by constructing ‘cause deleted’ life tables (Table 6): these are life tables calculated in the conventional way but with the specific cause of death removed from the probability of dying at every age.*

* The residual probabilities in turn increase slightly as a result of reduced competition between causes for the pool of survivors.

Table 6: Increases in life expectancy of the total population from eliminating causes of death, for groups of causes, by gender, 1995–97

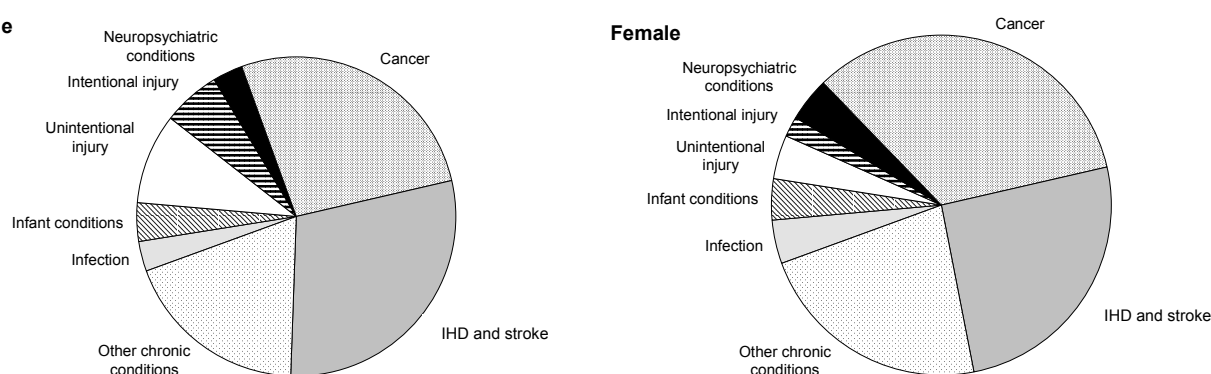
	Infectious diseases	Maternal and infant	Unintentional injury	Intentional injury	Neuro-sensory and psychiatric	Cancers	Cardio-vascular diseases		Other chronic diseases
							Total	IHD	
Males (increase in number of years)									
At birth	0.5	0.6	1.1	0.7	0.4	3.7	4.4	3.6	2.8
At 65	0.4	0.0	0.1	0.1	0.2	2.6	3.8	3.3	2.5
Females (increase in number of years)									
At birth	0.6	0.6	0.5	0.3	0.5	3.9	4.0	2.7	3.0
At 65	0.6	0.0	0.1	0.0	0.3	2.2	3.9	2.6	2.6

Source of base data: SNZ and NZHIS

Eliminating IHD alone would add 3.6 years to male and 2.7 years to female life expectancy at birth, and eliminating all cancers would have about the same impact on males (3.7 years) but a greater effect on females (3.9 years). The potential gains from eliminating injury (including suicides) are smaller: 1.8 years added to life expectancy at birth for males but only 0.8 years for females.

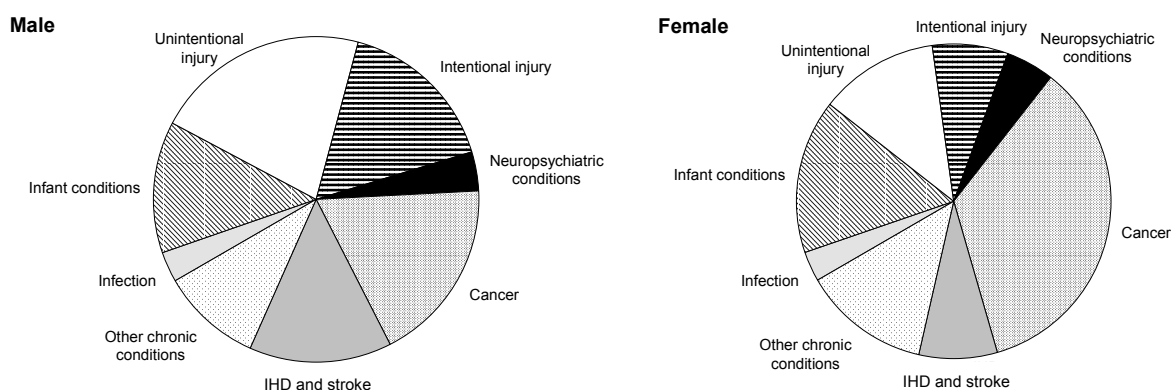
Another insight into where health gains might be made comes from causal analysis of premature and presenescent mortality (Figures 7a and 7b). In 1996, over the population as a whole, premature mortality – like total mortality – was dominated by chronic diseases, but with cancer (30 percent) overtaking the major cardiovascular diseases (ischaemic heart disease and stroke) (27 percent) when analysed in terms of years of life lost rather than numbers of deaths.* Injury and perinatal and infant conditions remain major and potentially modifiable causes of presenescent mortality: in 1996, unintentional injury accounted for 18 percent, suicide for 13 percent, and perinatal and infant causes for 14 percent of years of life lost before the age of 65.

Figure 7a: Premature mortality, by cause group and gender, 1996



* Years of life lost weights deaths by the age at death, whereas mortality rates or life expectancy do not.

Figure 7b: Presenescent mortality, by cause group and gender, 1996



Source of base data: NZHIS

Adding life to years

With the majority of the population living into old age, and so increasingly at risk of chronic disease and disability, the need for information on the quality as well as length of life has become more pressing.

Self reported health status measures

Data on health-related quality of life can be collected using health profile survey instruments such as the Medical Outcomes Study Short Form 36 (SF-36), which measures health in terms of a profile of eight dimensions and two summary scales (for physical and mental health). The population mean scores derived from the SF-36 fielded in the 1996–97 New Zealand Health Survey were generally slightly higher than those reported from national surveys in similar countries. This applied to all eight profile scales and the two summary scales.

The major factor influencing self reported physical health is age, with the scores on those scales relating to physical aspects of health, and the physical health summary score, all declining sharply with increasing age. For mental health, the relevant scale scores and the mental health summary score remained stable throughout adult life or even improved in old age (Figures 8a and 8b).

Although females live longer than males, males self report better health-related quality of life. The gender inequality was significant across all SF-36 scales (except the ‘general health’ scale) at all ages, but was more pronounced for the scales relating to mental health (and the mental health summary score) and among younger age groups, reflecting the relatively poor self reported mental health of young women (Figures 8a and 8b).

Figure 8a: Physical component summary score, by age and gender, 1996–97

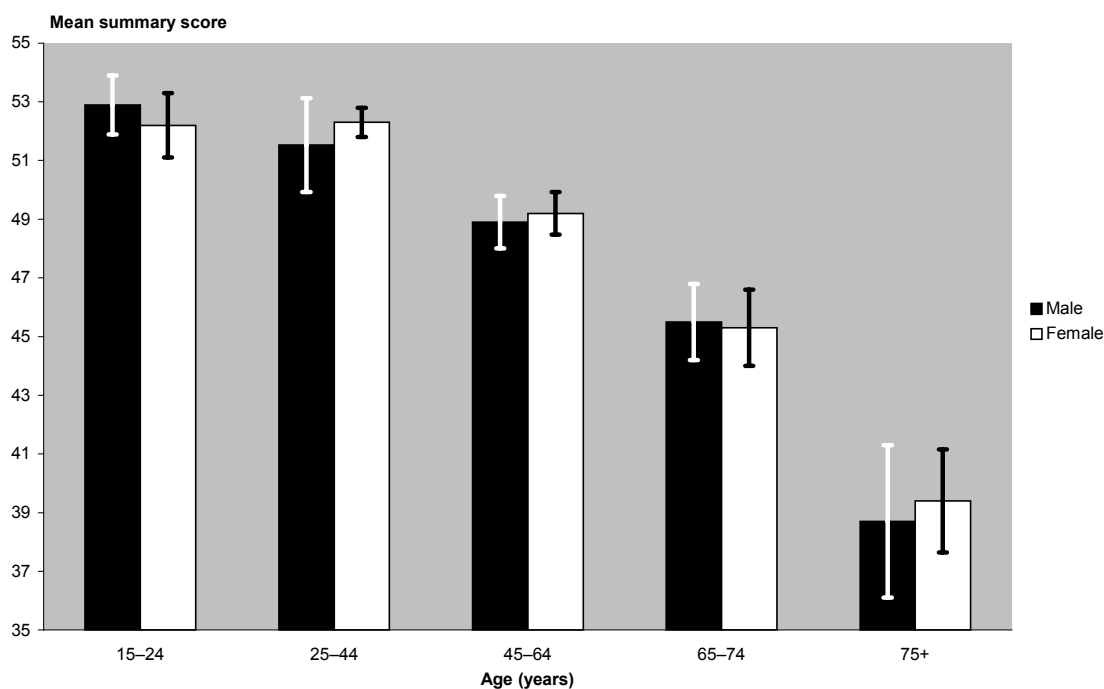
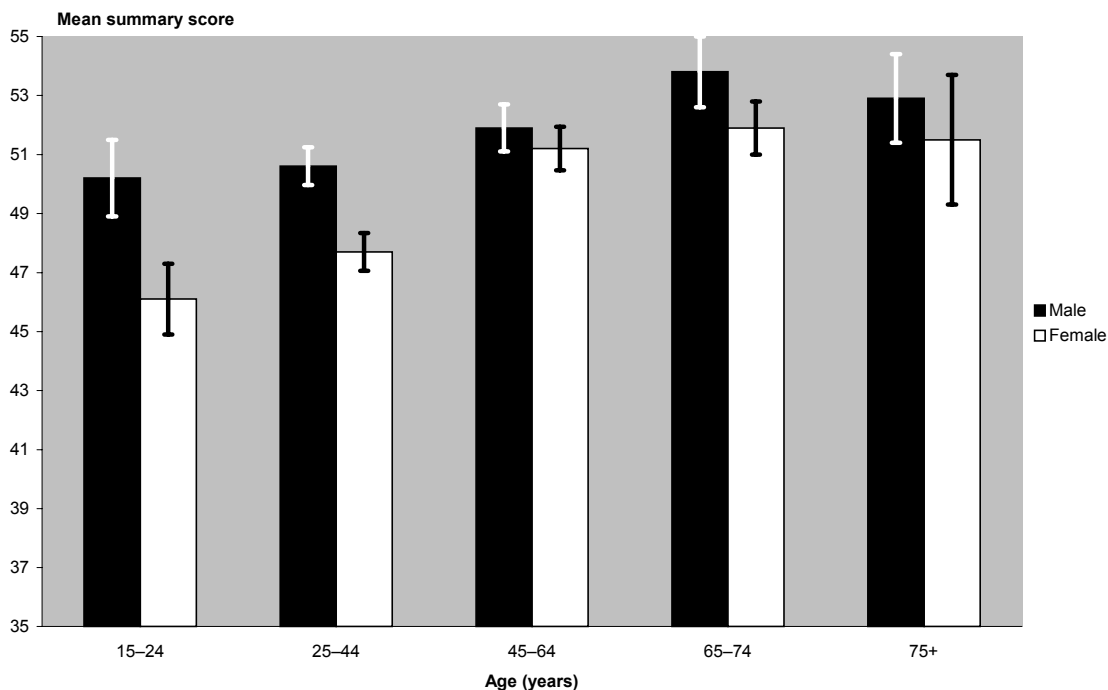


Figure 8b: Mental component summary score, by age and gender, 1996–97

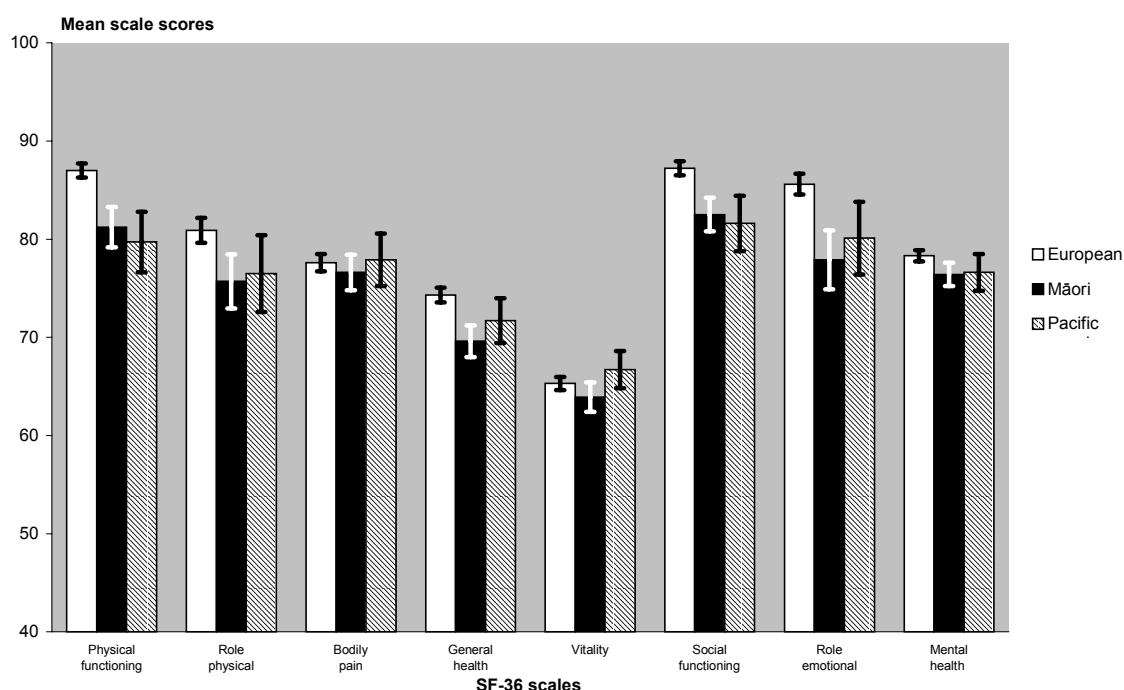


Source of base data: 1996–97 NZHS

Note: error bars indicate 95 percent confidence intervals; broken axes.

Ethnic variations in health-related quality of life were significant across almost all scales, with European/Others generally reporting better health than Māori or Pacific people (Figure 9). Adjustment for socioeconomic status reduced, but did not eliminate, these ethnic differences.

Figure 9: SF-36 profiles, by ethnicity, 1996–97



Source of base data: 1996–97 NZHS

Note: error bars indicate 95 percent confidence intervals; broken axis.

Across all ethnic groups, health-related quality of life was significantly better among higher socioeconomic groups, irrespective of which socioeconomic status indicator was used. The differences were smaller than might have been expected on the basis of the socioeconomic gradients in objective indicators of health (for example, mortality); a similar situation was found for ethnic differences.

Levels of disability

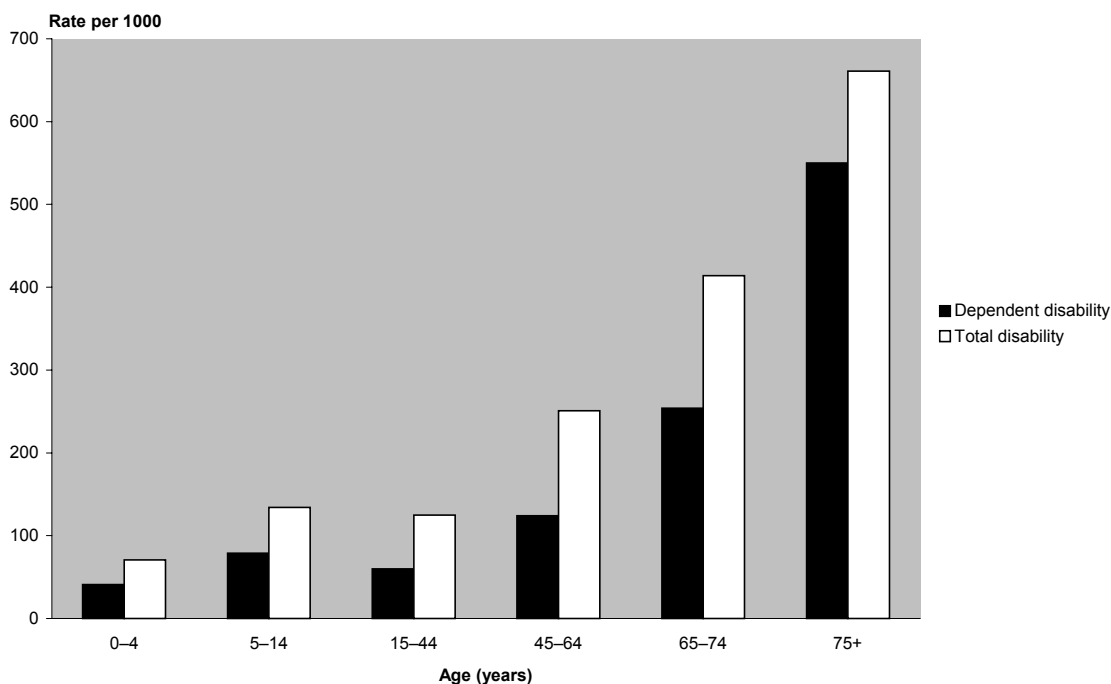
From a population health perspective, ‘disability’ may be defined as functional and/or role limitation that results from a health condition and is expected to last for six months or more. The key characteristic of disability as a (non-fatal) health outcome is its severity – that is, its impact on the quality of life. Three levels of disability were distinguished:

- Level 1: functional or role limitation but no need for assistance
- Level 2: functional or role limitation needing assistance, but not on a daily basis
- Level 3: functional or role limitation needing daily or continuous assistance, typically in the self care domain.

‘Dependent disability’ was defined for the purposes of this report as disability needing assistance to carry out everyday activities, tasks or roles (Levels 2 and 3 combined).

Analysis of the 1996–97 New Zealand Disability Surveys indicates that one out of five people live with one or more disability, one out of nine are dependent (need assistance to live independently), and one out of 32 need continuous or daily assistance.

Figure 10: Prevalence of disability, by age and severity level, 1996–97

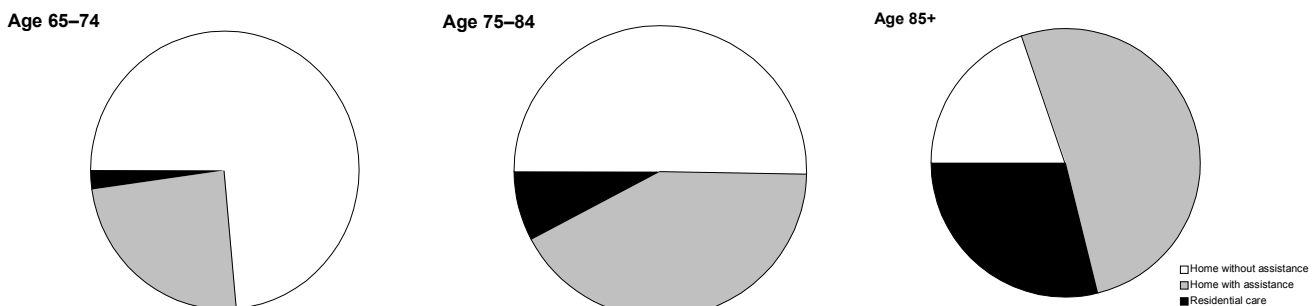


Source of base data: New Zealand Disability Surveys 1996–97

Approximately 6 percent of people aged 0–44 are dependently disabled (Figure 10). The proportion doubles in middle age (45–64 years) to approximately 12 percent, then doubles again so that approximately one quarter of older people aged 65–74 are dependently disabled. For people aged 75 and over, just over half are dependently disabled, or, looked at another way, almost half of people at advanced ages are still living independently at home without any need for assistance.

At any given time, 15 percent of people aged 65 and over with dependent disability live in residential facilities (approximately 23,000 people out of a total institutionalised population estimated at 28,000). The institutionalised population makes up about 2 percent of people aged 65–74, less than 8 percent of those aged 75–84, but a much higher 29 percent of those aged 85 and over (Figure 11).

Figure 11: Residential distribution of people aged 65 and over, by disability status, 1997



Source of base data: New Zealand Disability Surveys 1996–97, SNZ

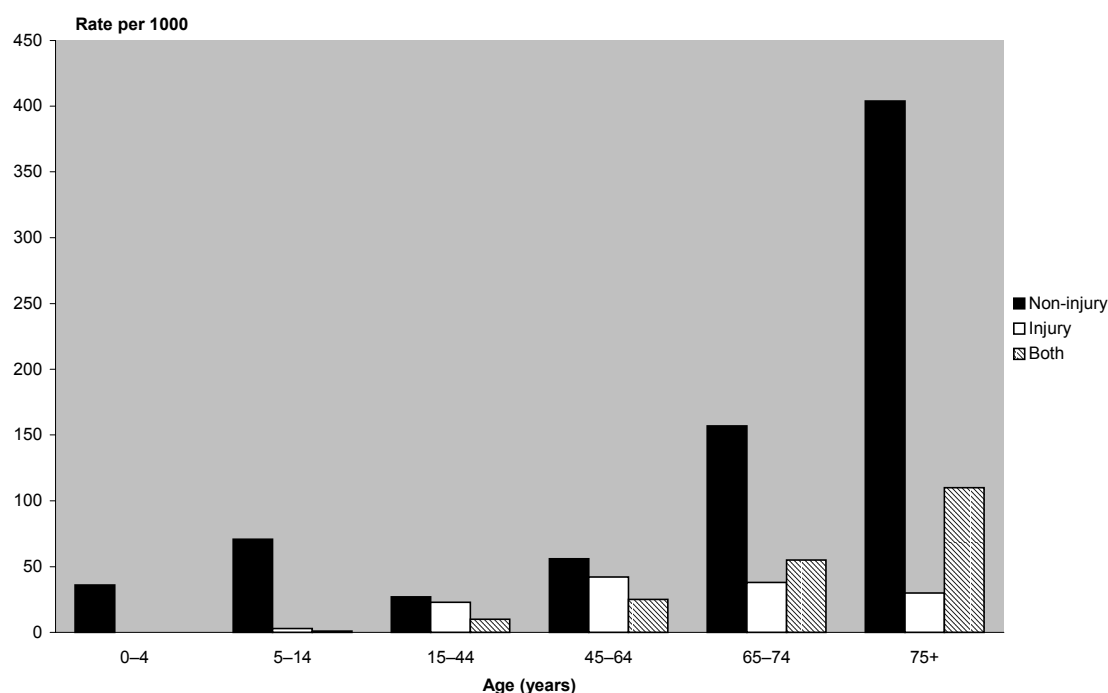
Boys were more likely to be disabled than girls, but there was no significant gender difference in disability at any level of severity among adults until advanced ages: only in the 75 and older age group were women more likely to be disabled – the consequence not of higher incidence of disability among females but of longer survival once disabled. Adjusting for age and gender, Māori had a rate of dependent disability one third higher than non-Māori, although this gap was reduced when differences in socioeconomic status were taken into account. A gradient in the prevalence of disability was found across socioeconomic groups, at all levels of severity, and persisted after adjustment for many potentially confounding variables. Socioeconomic disability gradients were seen with income, education, labour force status and with a census-based small area deprivation index (NZDep96).

The high prevalence of co-morbidity and co-disability with advancing age makes it difficult to quantify the type and cause distribution of disability. Physical disability (including mobility and agility subtypes) is the most prevalent type across all levels of severity. Sensory and cognitive disabilities are also common, increasing in prevalence with age, as is the case with physical disability. Intellectual and speech disabilities are much less prevalent: the former is predominantly a lifelong disability, and the latter shows two peaks – in childhood and old age. Mental disability shows little relationship with age.

The disease and injury processes contributing to premature death differ from those contributing to disability. Based largely on overseas studies, musculoskeletal conditions, mental illnesses and conditions associated with cognitive impairment and with hearing and vision loss in older people are thought to be major causes of disability, but not of premature mortality. By contrast, IHD, stroke and CORD are major causes of both disability and premature mortality.

Data available from the 1996–97 New Zealand Disability Surveys only allowed the relative contributions of injury and non-injury causes to disability to be analysed (Figure 12).

Figure 12: Injury and non-injury causes of dependent disability, by age, 1996–97



Source of base data: New Zealand Disability Surveys 1996–97

One fifth to one third of the burden of dependent disability may be attributable to the late effects of injury, especially road traffic injury in younger people and osteoporotic fractures following falls in older people. The two thirds to four fifths of dependent disability resulting from non-injury related causes includes both pathological and physiological causes; the former range from birth defects to chronic diseases, the latter from ageing (loss of physiologic reserve and homeostatic feedback) to disuse.

In the New Zealand Disability Surveys, 6 percent of disabled people aged 65 and over experienced onset of their disability at birth or in childhood (early onset or lifelong disability). The majority reported mid life or (especially) late life onset of disability, reflecting the overwhelming impact of the chronic diseases of middle and old age on disability outcomes. Over half of disabled older people have been disabled for less than 10 years. The majority of disabled people have more than one disability, and this proportion increases with age: from two thirds of dependently disabled adults aged 15–64 years, to 96 percent of disabled older people living in long stay residential facilities.

Patterns of morbidity

About three quarters of the population will experience illness or injury in any two week period. The majority of these episodes are transient, not life threatening, not disabling (although they may cause temporary restriction of usual activities) and resolve spontaneously or with over the counter or home remedies. Fewer than 1 in 10 results in consultation with a GP or other primary health care provider. About 80 percent of the population will visit a GP at least once in a year, with the median number of visits being four (more for young children and older people, and far more for people with a chronic disease or disability).

Young children and older people are the most frequent users of GP services: children are especially likely to consult for respiratory problems and ear problems (such as otitis media), and older people for cardiovascular and musculoskeletal problems.

Overall, the most frequent reasons for GP consultation (Table 7) are respiratory problems (relating to acute upper respiratory tract infection or chronic lung diseases such as asthma), musculoskeletal disorders (including arthritis and back problems), skin diseases, management of chronic diseases (including cardiovascular diseases, diabetes and risk factors such as high blood pressure), reproductive health, advice for minor psychological and psychosocial problems (including depressive states, anxiety states and alcohol use disorders) and treatment of minor injuries.

Some chronic and potentially disabling diseases affect a significant proportion of the population. For example, the 1996–97 New Zealand Health Survey found that in one year about one in seven people aged 15–44 experience symptoms of asthma, and the 1986 Christchurch Psychiatric Epidemiology Study found that in a six month period more than one quarter of adults experience some kind of psychiatric disorder, albeit not necessarily disabling.

Table 7: Main diagnoses and problems managed in GP–patient encounters, Waikato region, 1991–92

Disorder group	Percentage of all health problems	Specific disorders	Percentage of all health problems
Respiratory	18.6	Hypertension	4.2
Musculoskeletal	13.1	Upper respiratory tract infection	3.9
Skin	11.3	Acute bronchitis	3.8
General	10.0	Pre and postnatal care	3.7
Cardiovascular	8.8	Otitis media	3.5
Reproductive	6.7	Asthma	3.2
Ear	5.9	Tonsillitis	2.8
Digestive	5.8	Eczema	2.0
Female genital	3.7	Sprain/strain	2.0
Psychological	3.4	Presumed infections	1.8
Endocrine	3.0	Sinusitis	1.3
Eye	2.2	Hayfever	1.3
Neurological	2.0	Viral infection	1.2
Urological	1.7	Laceration	1.2
Blood	0.6	Conjunctivitis	1.1
Male genital	0.4	Dermatophytosis	1.1
		Urinary tract infection	1.1
		Diabetes	1.1
		Osteoarthritis	1.1

Source: McAvoy et al 1994

Note: coding based on chapter headings of the *International Classification of Primary Care*.

Fewer than 1 in 100 GP–patient encounters results in referral to hospital: over the course of a year about 15 percent of adults and 11 percent of children are admitted to hospital as day or inpatients (Table 8).

Excluding normal pregnancy and childbirth, the leading reason for hospitalisation is management of chronic diseases. Cardiovascular disease is the leading chronic disease cause of hospitalisation, accounting for 11 percent of public hospital discharges in 1997. Diabetes is a related major cause of hospitalisation, both for cardiovascular and non-cardiovascular complications: it is estimated that at least 6 percent of all discharges can be attributed to this condition. Cancer accounted for almost 7 percent of total hospitalisations. Chronic lung diseases, including chronic obstructive respiratory disease (CORD) and asthma, and digestive disorders (including diseases of the liver) also accounted for over 6 percent of hospitalisations each.

Table 8: Disorders diagnosed in hospitals, 1997

	Percentage of all public hospital day and inpatient discharges
Infectious diseases	9.6
Maternal and infant conditions^a	12.3
Complications of pregnancy, childbirth and the puerperium	6.6
Perinatal conditions	4.3
Congenital anomalies, chromosomal abnormalities, and hereditary disorders	1.4
Injuries	19.2
Unintentional injuries	12.8
Intentional injuries	5.1
Adverse effects	1.3
Chronic diseases	45.3
Cancer (all sites)	6.6
Endocrine disorders (including diabetes) ^b	1.3
Cardiovascular diseases	11.0
Respiratory diseases	6.1
Digestive diseases	7.4
Diseases of the blood and lymphoid tissues	0.7
Kidney diseases	1.8
Reproductive system diseases	3.9
Disorders of the musculoskeletal system	4.4
Skin diseases	0.9
Dental disorders	1.2
Neuropsychiatric conditions^c	6.1
Vision disorders	2.2
Hearing and balance disorders	1.6
Neurological disorders	1.6
Organic brain syndromes	0.6
Ill defined disorders	7.4
Total	100.0

Source of base data: NZHIS

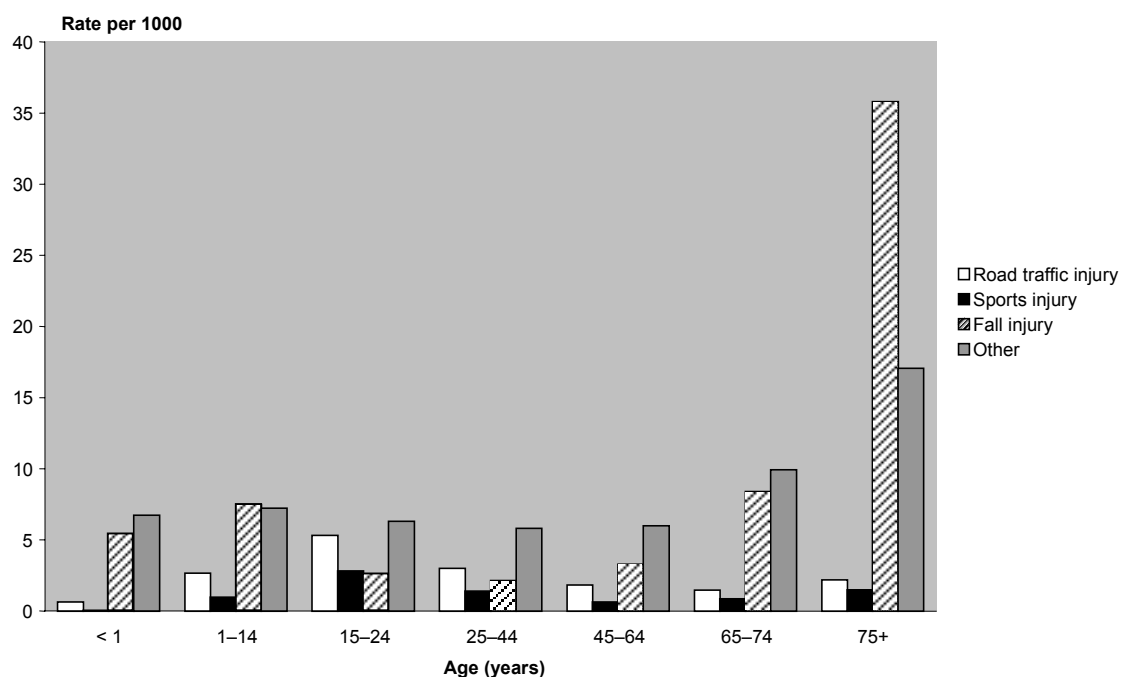
a Excludes normal pregnancy and childbirth

b Excludes hospitalisations for diabetes as a secondary diagnosis (5.0 percent)

c Excludes admissions to psychiatric institutions other than hospitals

Injuries, including unintentional and intentional injuries and adverse effects of health care, make up approximately 20 percent of discharges. The highest rates of injury related hospitalisation are found among older people (Figure 13), who are more likely to be seriously injured in falls and to experience adverse effects or complications from medical procedures such as surgery. The younger age groups also have high injury hospitalisation rates, with road traffic injuries being especially significant among males aged 15–24. For every injury admission, approximately 40 injury victims are treated in emergency departments, with domestic and sports injuries (mainly strains, sprains, lacerations and minor fractures) predominant.

Figure 13: Hospitalisations for unintentional injury, by age and injury type, 1997



Source of base data: NZHIS

Most (but not all) of the diseases and injuries leading to hospitalisation show higher rates for Māori and Pacific people than for European/Others. Māori and Pacific people are more likely to be hospitalised for infectious disease, cardiovascular disease, asthma, COD, and diabetes, reflecting either a greater prevalence or severity of these diseases, or a greater tendency to be hospitalised with these diseases than non-Māori. Overall, however, age adjusted hospitalisation rates for Māori and Pacific people are only approximately 20 percent higher than those of European/Others, and would be lower if adjusted for socioeconomic status.

Hospitalisation rates show a clear gradient with socioeconomic status: people living in the most deprived areas of the country have rates almost three times as high as those living in the least deprived areas.* A similar gradient is seen for both Māori and non-Māori ethnic groups, but within each socioeconomic group Māori have similar or lower hospitalisation rates than non-Māori (Figure 14).

* It should be noted that this analysis refers to publicly funded hospital patients; the variation might be even greater if privately funded hospital patients were included as well.

Figure 14a: Hospitalisation rates for males, by NZDep96 decile and ethnicity, 1996–97

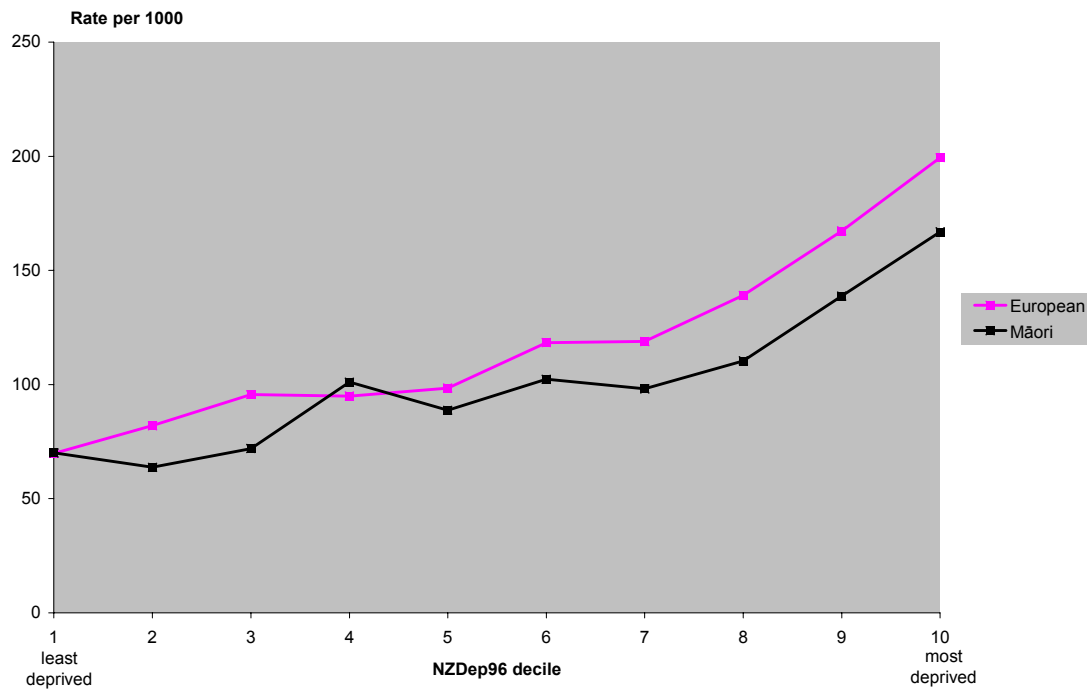
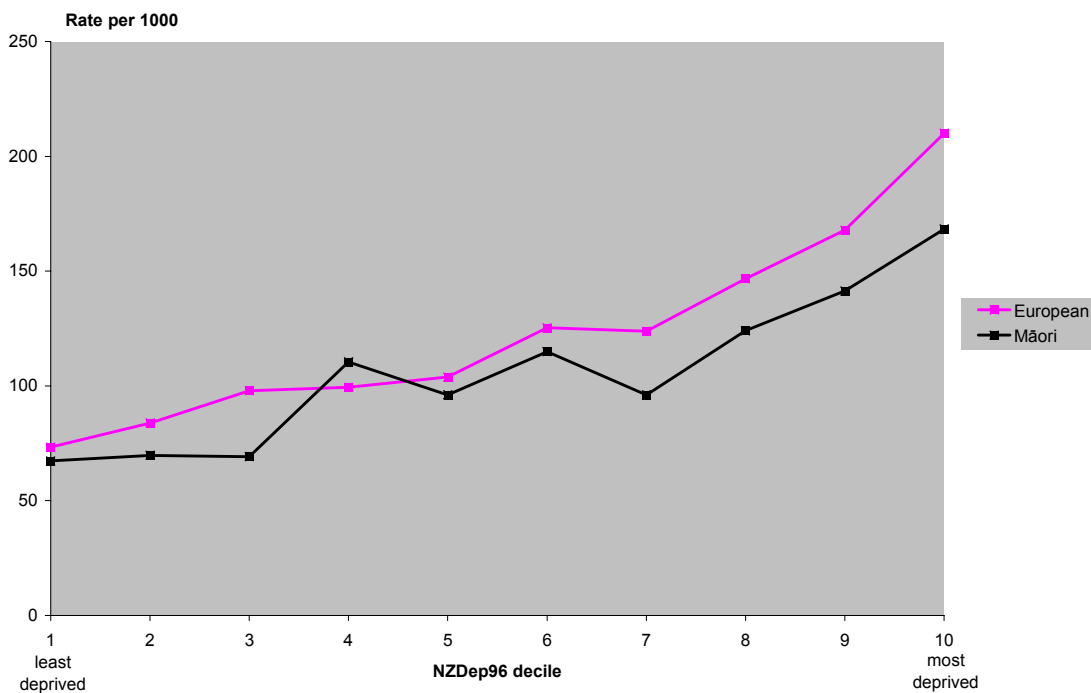


Figure 14b: Hospitalisation rates for females, by NZDep96 decile and ethnicity, 1996–97



Source of base data: NZHIS
 Note: rate is age standardised to Segi's world population.

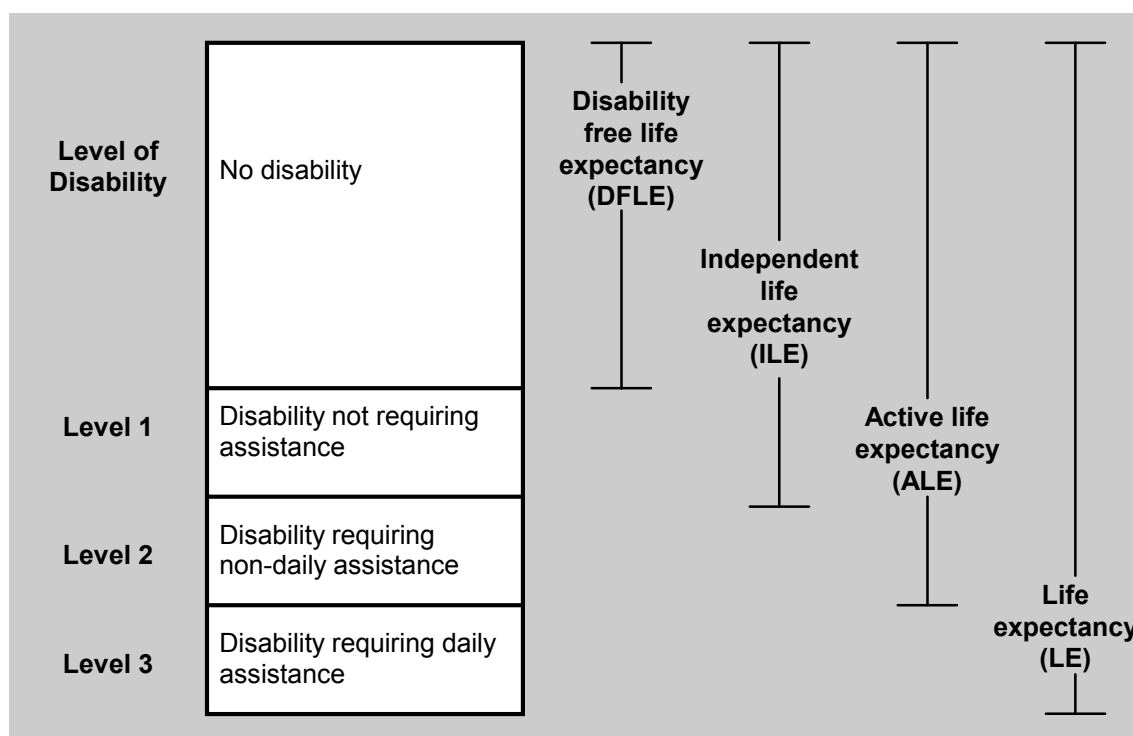
Integrated perspectives on population health status

Although morbidity analyses add greatly to our understanding of health outcomes, the separate profiling of mortality and morbidity of the population fails to account for the interactions between these two dimensions of health. Integrated measures, combining both quantity and quality of life into a single index, are therefore useful for evidence-based decision making.

Independent life expectancy (ILE)

Independent life expectancy (ILE) measures *health* expectancy, and is based on generalising life expectancy to include (dependent) disability. It is defined as the number of years a person can expect to live *independently*, without any self reported functional limitation requiring the assistance of another person or a complex assistive device. Together, ILE and its complement, LED (expectation of life with dependent disability), add up to total life expectancy ($LE = ILE + LED$). Other health expectancy measures can also be monitored (Figure 15).

Figure 15: Relationship between disability based health expectancies



ILE at birth in 1996 was estimated to be 64.6 years for males and 67.9 years for females, representing 87 percent and 85 percent of life expectancy at birth respectively. Thus, LED at birth in 1996 was 9.7 years for males (74.3 minus 64.6) and 11.7 years for females (79.6 minus 67.9). The ratio of ILE to life expectancy decreases with increasing age. From around age 40, the decline in ILE begins a sharp downward trend – the impact of disability greatly intensifies at the middle to older ages. Nevertheless, at age 65 almost two thirds of remaining life expectancy will still be spent independently. At each age, the gender gap in ILE is less than the corresponding gap in life expectancy. In other words, females live longer than males but spend a higher proportion of their longer lives in disabled states. In absolute years, females can expect to live longer both independently and in states of dependency than their male counterparts.

Ethnic differences in health expectancy are more marked than the corresponding differences in life expectancy: Māori have a significantly lower life expectancy and ILE than non-Māori at every age, and the ethnic gap in health status tends to widen further once a measure of disability is introduced. Māori not only live shorter lives than non-Māori, but spend more years (dependently) disabled, both in absolute years (females) and as a proportion of their shorter lives (both genders). Māori males in 1996 had an ILE at birth of 57.3 years, 8.3 years less than non-Māori males. ILE at birth for Māori females was 58.7 years, a gap of 10.2 years (compared with 9.0 years for life expectancy) (Table 9).

Table 9a: ILE, LED and ILE:LE ratio for Māori, by gender, 1996–97

Age (years)	LE (years)		ILE (years)		LED (years)		ILE:LE (ratio) (%)	
	Male	Female	Male	Female	Male	Female	Male	Female
0	67.2	71.6	57.3	58.7	9.9	12.9	85.3	82.0
15	53.4	57.7	44.8	45.4	8.6	12.3	83.9	78.7
45	26.2	29.4	20.0	20.0	6.2	9.4	76.3	68.0
65	12.2	14.5	7.4	7.5	4.8	7.0	60.7	51.7

Table 9b: ILE, LED and ILE:LE ratio for non-Māori, by gender, 1996–97

Age (years)	LE (years)		ILE (years)		LED (years)		ILE:LE (ratio) (%)	
	Male	Female	Male	Female	Male	Female	Male	Female
0	75.3	80.6	65.6	68.9	9.7	11.7	87.1	85.5
15	61.0	66.2	52.3	55.1	8.7	11.1	85.7	83.2
45	32.8	37.1	25.4	28.0	7.4	9.1	77.4	75.5
65	15.8	19.3	9.9	11.9	5.9	7.4	62.7	61.7

Source of base data: New Zealand Disability Surveys 1996–97 and SNZ

At all ages, the ratio of ILE to life expectancy is less for Māori than for non-Māori. Although the gap between Māori and non-Māori males remains stable across all age groups, the ethnic gap for females widens with age, reflecting a more rapid rate of decline in independence with age for Māori than for non-Māori females.

The ratio of Māori to non-Māori ILE at birth provides a single, whole of population indicator of the inequality in health status between the two groups: in 1996, this ratio stood at 85.2 percent for females and 87.3 percent for males (or approximately 86 percent overall). That is, Māori health in 1996–97 can be assessed as being 14 percent below that of non-Māori overall.

An analysis was carried out to assess the sensitivity of ILE to possible future changes in mortality and disability rates – the ‘elasticity’ of ILE (Table 10).

Table 10: Proportion of ILE gained/lost from changes in mortality and disability, 1996–97

Percentage change in LE and ILE	1% reduction in both mortality and disability		1% reduction in mortality and 1% increase in disability	
	Male (%)	Female (%)	Male (%)	Female (%)
At birth				
Life expectancy	0.17	0.15	0.17	0.15
ILE	0.27	0.26	-0.03	-0.08
At age 15				
Life expectancy	0.20	0.17	0.20	0.17
ILE	0.31	0.31	-0.03	-0.10
At age 45				
Life expectancy	0.33	0.29	0.33	0.29
ILE	0.52	0.51	-0.07	-0.16
At age 65				
Life expectancy	0.56	0.46	0.56	0.46
ILE	0.99	0.92	-0.19	-0.33

Source of base data: SNZ and New Zealand Disability Surveys 1996–97

A 1 percent reduction in mortality combined with a 1 percent increase in disability – a realistic future scenario – produces a net *decline* in ILE at all ages for both genders. The decline is particularly marked among females.

The burden of disease

Burden of disease analysis combines premature mortality and disability outcomes, and also allows the two classes of outcome to be examined separately. This is achieved by extending the concept of years of life lost to years of *healthy* life lost. It requires that non-fatal health states be assigned values (disability weights) based on social preferences for these states. The burden of non-fatal outcomes (equivalent years lost due to disability, or YLD) can then be added to the burden of fatal outcomes (years of life lost, or YLL) to yield an integrated health gap measure: disability adjusted life years, or DALYs (DALY = YLD + YLL).

The burden of disease method does have limitations: it is extremely demanding of epidemiological data, and also requires that social preferences (disability weights) be calculated for the different non-fatal health states. If the burden of disease approach is considered to be useful, investment will be needed to close important data gaps (especially in the areas of mental illness and musculoskeletal disorders), and possibly to undertake a New Zealand-specific valuation exercise to obtain social preferences for health states that truly reflect the values of New Zealanders. These would be substantial, but potentially worthwhile, tasks.

Bearing in mind these data and indicator limitations, the total health loss sustained by the New Zealand population in 1996 was estimated to have been approximately 563,000 DALYs, or approximately 128 DALYs per 1000 persons.* Of this total loss, fatal outcomes accounted for approximately 56 percent, and non-fatal outcomes for 44 percent.

The distribution of DALYs was heavily concentrated into older age groups. Children lost 9 percent of total DALYs, young people (15–24) accounted for 8 percent, the 25–44 age group for 16 percent, the middle aged (45–64 years) for 26 percent, and the remaining 41 percent occurred in old age (65 years and over). Males lost DALYs at a higher rate than females at all

* Age standardised to Segi's world population and discounted at 3 percent per year.

ages, with the highest ratios occurring in the 15–24 and 45–64 age groups. Standardising for age, males lost 136 DALYs per 1000 and females 120 per 1000, a male excess of 13 percent. Māori bear a heavier burden of disease and injury than non-Māori: in 1996–97 Māori experienced a 70 percent excess rate of DALYs lost relative to non-Māori (age standardised rates of 200 per 1000 and 120 per 1000 respectively) (Table 11).

Table 11: DALYs lost, by age, gender and ethnicity, 1996

	Age (years)					Gender		Ethnicity		
	0–14	15–24	25–44	45–64	65+	Male	Female	Māori	Non-Māori	All persons
Number	50,820	46,415	88,303	144,033	233,612	282,144	281,040	81,738	481,446	563,184
Percentage	9	8	16	26	41	50	50	15	85	100
Rate	60	84	77	194	543	136	120	200	120	128

Source of base data: compiled from multiple sources

Note: rates are age specific or age standardised (Segi's) rates per 1000; all DALY rates shown are discounted at 3 percent per year

The burden of disease and injury was analysed in terms of 11 major cause groups (Table 12).

Table 12: DALYs lost, by cause group and gender, 1996

Cause group	Male			Female			Persons (all)		
	Number	%	Rate	Number	%	Rate	Number	%	Rate
Infection	8215	3	4	10,055	4	4	18,270	3	4
Infant	11,615	4	9	10,127	4	8	21,743	4	9
Injury	34,905	12	19	14,679	5	8	49,584	9	13
Cancer	54,198	19	24	55,941	20	22	110,138	20	23
Endocrine	13,483	5	6	13,285	5	5	26,767	5	6
CVD	73,444	26	31	62,946	22	19	136,391	24	25
Respiratory	25,999	9	13	23,699	8	11	49,697	9	12
Other chronic	9637	3	4	16,562	6	7	26,199	5	5
Musculoskeletal	6886	2	3	11,361	4	5	18,247	3	4
Neurosensory	19,101	7	9	22,121	8	8	41,223	7	8
Mental	24,665	9	14	40,305	14	21	64,970	12	17
Total	282,148	100	137	281,081	100	118	563,229	100	127

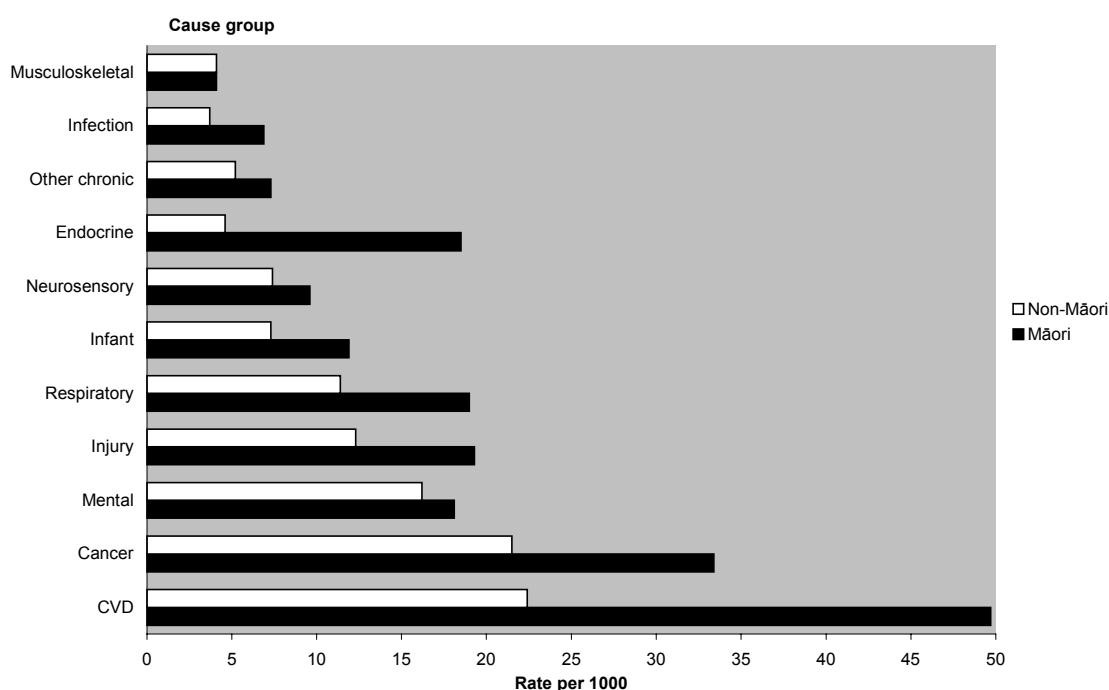
Source of base data: compiled from multiple sources

Note: infant = maternal disorders, perinatal and infant conditions, birth defects, chromosomal disorders and hereditary conditions; injury = intentional and unintentional injuries; other chronic = kidney, bladder, reproductive, gastrointestinal and liver conditions; endocrine = hormonal, metabolic, nutritional, haematological and immunological conditions; rate per 1000 age standardised to Segi's world population.

At the cause group level, cardiovascular disease accounted for 24 percent of total DALYs, followed by cancers (20 percent) and mental disorders (12 percent). Injury accounted for 9 percent of the burden and musculoskeletal disorders for just over 3 percent. This highlights the major contribution to the burden of disease of mental disorders and (to a lesser extent) musculoskeletal conditions, which are rarely fatal but have major disabling consequences.

Once standardised for age and gender, Māori had higher rates of DALY loss than non-Māori for most cause groups, especially infectious diseases, endocrine disorders (mainly diabetes), cardiovascular disorders and respiratory diseases (Figure 16).

Figure 16: DALYs lost, by cause group and ethnicity, 1996



Source of base data: compiled from multiple sources

Notes: rates are age standardised to Segi's world population; ethnic difference in musculoskeletal and mental conditions may be underestimated due to lack of data.

In the population as a whole, 15 specific conditions* each caused the loss of more than 10,000 DALYs in 1996 (Table 13).

Table 13: Conditions causing at least 10,000 DALYs, 1996

Condition	DALY	Percentage of total DALYs	Major modifiable risk factors
CVD			
IHD	73,804	13.1	Smoking, high blood pressure, high blood cholesterol, physical inactivity, obesity, high fat low vegetable diet, diabetes
Stroke	30,115	5.4	High blood pressure, diabetes, smoking, physical inactivity
Respiratory			
CORD	27,848	4.9	Smoking
Asthma	18,800	3.3	Passive smoking, allergen avoidance
LRTI	11,621	2.1	Lack of vaccination (pneumonia, influenza)
Diabetes			
	21,263	3.8	Physical inactivity, obesity
Cancers			
Colorectal	16,262	2.9	Low vegetable diet, physical inactivity
Lung	17,919	3.2	Smoking, low vegetable diet, physical inactivity
Breast	13,522	2.4	Lack of mammography screening

* 'Specific conditions' are a lower level classification of conditions than 'cause groups' – they are subsets within cause groups.

Table 13 continued

Condition	DALY	Percentage of total DALYs	Major modifiable risk factors
Neuropsychiatric			
Depression	20,497	3.6	Stress, physical inactivity
Anxiety disorder	17,930	3.2	Stress
Dementia	14,710	2.6	Physical inactivity, other stroke risk factors
Injury			
Road traffic injury	17,634	3.1	Speed, alcohol, non-seat belt use
Suicide	12,940	2.3	Depression, stress
Osteoarthritis	11,264	2.0	Obesity, physical inactivity

Source of base data: compiled from multiple sources

At the individual disease level (Table 13), IHD ranks first as a cause of health loss for both genders, accounting for approximately 13 percent of the total burden overall. Stroke ranks second overall and among females, accounting for over 5 percent of the total burden. Somewhat surprising is the high ranking of CORD, reflecting its significant contribution to both mortality and disability. Depression accounts for over one third of the total burden of mental disorders, and ranks within the top five individual causes for the population as a whole. Diabetes ranks highly both as a cause of years lost to premature mortality and to disability (especially among Māori and Pacific people), and in the whole population is ranked within the top five individual causes, even without including its role as a risk factor for IHD and stroke. Cancers cause relatively few years lost to disability, yet several cancers – including lung cancer in males, breast cancer in females, and colorectal cancer in both genders – rank relatively highly in terms of DALYs because of their major impact on premature mortality. Injuries rank more highly as a cause of health loss among males than females, accounting for 12 percent and 5 percent of DALYs lost respectively. Road traffic injury and suicide are the only types of injury that rank within the major causes of DALYs for the whole population.

The ranking of causes depends both on the level of cause aggregation applied, and on whether the total burden, or only the fatal or the non-fatal burden, is considered (Table 14).

Table 14a: Top 10 conditions for males, ranked by YLL, YLD and DALYs, 1996

Rank	YLL	YLD	DALY
1	IHD	Asthma	IHD
2	Road traffic injury	CORD	CORD
3	Lung cancer	Diabetes	Road traffic injury
4	Suicide	Anxiety disorder	Stroke
5	Stroke	Depression	Lung cancer
6	CORD	Hearing loss	Diabetes
7	Colorectal cancer	IHD	Suicide and self harm
8	Prostate cancer	Osteoarthritis	Asthma
9	Diabetes	Dementia	Colorectal cancer
10	LRTI	Stroke	Prostate cancer

Table 14b: Top 10 conditions for females, ranked by YLL, YLD and DALYs, 1996

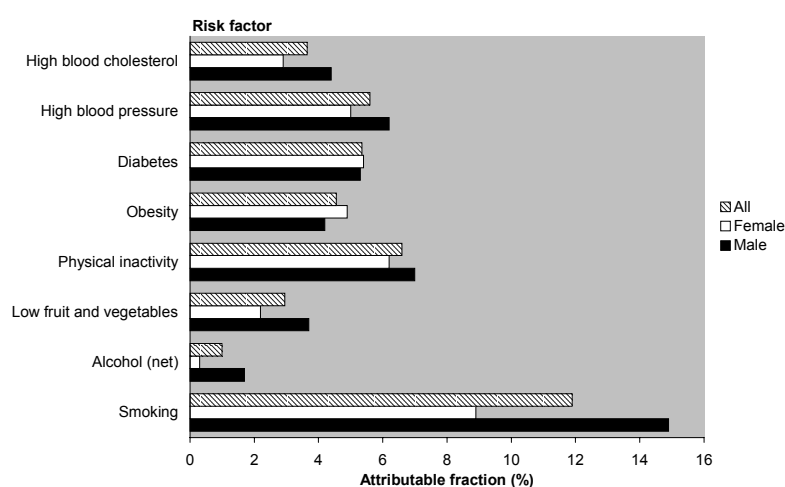
Rank	YLL	YLD	DALY
1	IHD	Depression	IHD
2	Stroke	Anxiety disorder	Stroke
3	Breast cancer	Asthma	Depression
4	CORD	Diabetes	Breast cancer
5	Colorectal cancer	Dementia	CORD
6	Lung cancer	Osteoarthritis	Anxiety disorder
7	LRTI	CORD	Diabetes
8	Road traffic injury	IHD	Asthma
9	Diabetes	Stroke	Dementia
10	Suicide	Breast cancer	Colorectal cancer

Source of base data: compiled from multiple sources

Notes: YLL calculated by RLE method using West level 26 as the reference; all indicators discounted at 3 percent per year.

Much of the total burden of disease – and much of the inequality in the burden falling on different population subgroups – can be attributed to modifiable risk factors, including lifestyle behaviours (tobacco consumption, alcohol consumption, diet, physical activity) and physiological risk factors (diabetes, obesity, high blood pressure, high blood cholesterol). Among those risk factors for which prevalence and relative risk data were available (Figure 17) (so allowing the DALYs to be partitioned using population attributable risk analysis), smoking ranked highest, accounting for approximately 12 percent of total DALYs. Physical inactivity ranked second, accounting for approximately 7 percent of DALYs lost. When diabetes is considered as a risk factor rather than a disease, it is found to account for over 5 percent of total DALYs, and an even higher proportion in the case of the Māori and Pacific ethnic groups. Obesity, high blood pressure and raised blood cholesterol each account for 3–6 percent of total DALYs lost in 1996 by the population as a whole. Alcohol causes significant harm, especially among males and young people, but this is partially offset by the protective effect of low to moderate alcohol consumption against IHD among older males in particular. The net impact of alcohol is thus smaller than those of the other risk factors considered (accounting for under 2 percent of total DALYs lost by the whole population in 1996).

Figure 17: DALYs attributable to major risk factors, 1996



Source of base data: compiled from multiple sources

Note: these estimates should be considered approximate only, both because of uncertainties in the estimation of the YLD component of the DALYs, and in the estimation of relative risks for disease incidence as opposed to mortality.

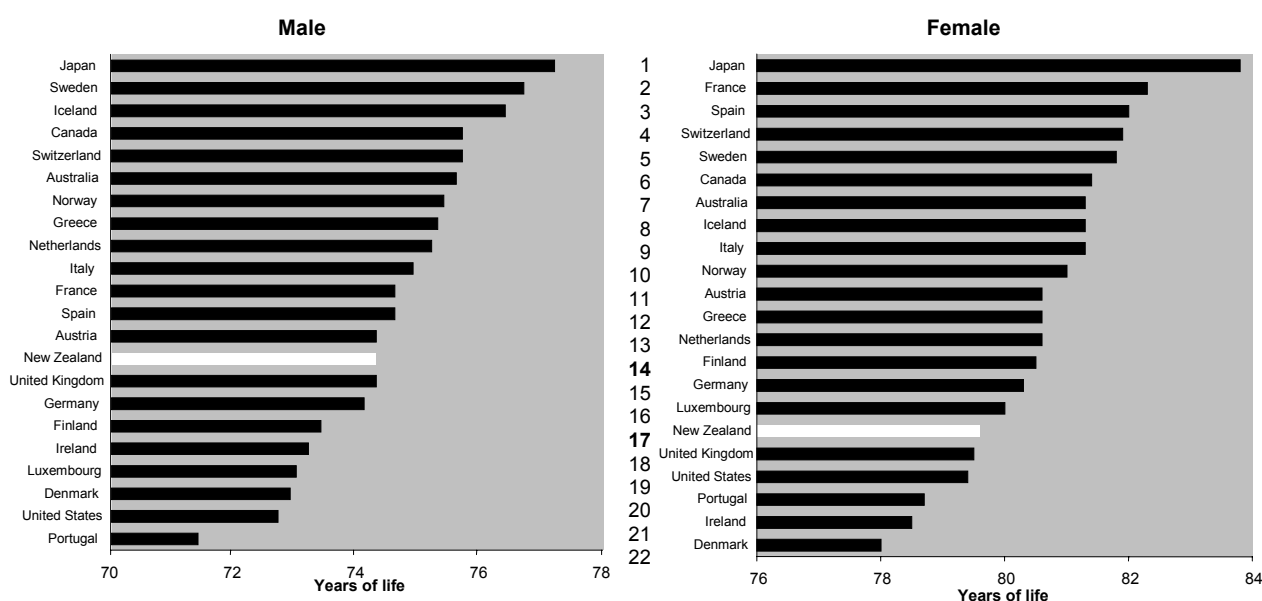
The scope for health gain

Three different yet complementary approaches are used to examine the scope that still remains to improve on current levels of health, as measured using the indicators outlined above. This provides a context within which detailed analyses of the costs, benefits and risks of different specific interventions can be undertaken, and decisions made about targeting resources to different population groups.

Benchmarking

Comparison of the current levels of New Zealanders' health with those of populations in other economically advanced countries has been restricted to mortality outcomes because the measurement of health-related quality of life, disability or morbidity is poorly standardised. Within this limited frame, New Zealand appears below average on most indicators in comparison with other OECD* countries. Although exact rankings vary, depending on the indicator and also from year to year, New Zealand males fare somewhat better in the OECD rankings than do their female counterparts. For mortality, the relatively narrow gender gap in New Zealand compared with other countries thus reflects poor female – rather than good male – performance. The rankings are similar whichever mortality indicators are examined (Figures 18 to 20).

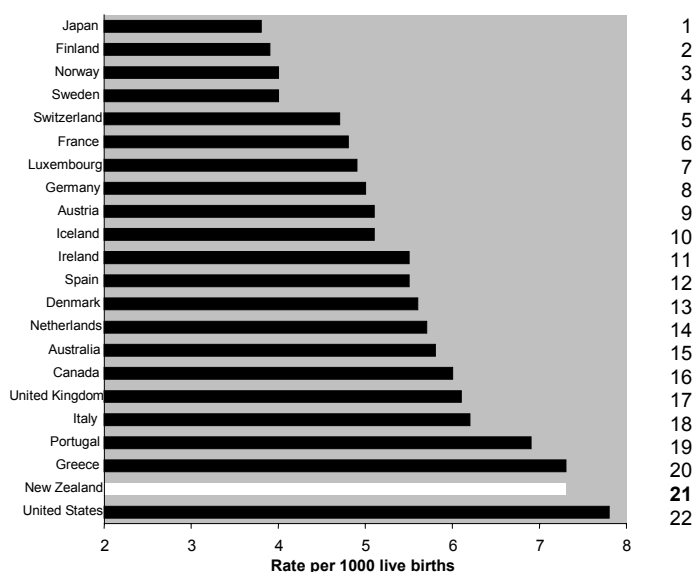
Figure 18: Life expectancy at birth, New Zealand and selected OECD countries, 1995–97



Source of base data: OECD
Note: broken axes.

* It should be noted that population health outcomes are highly sensitive to the level of economic development of a country, but this relationship attenuates rapidly as the level of economic development increases. Thus comparison of population health status in New Zealand with that in non-industrialised countries would be of little interest. On the other hand, when comparing New Zealand's health outcomes with those of other industrialised countries, differences cannot simply be attributed to (the relatively small) differences in per capita GDP between these industrialised economies.

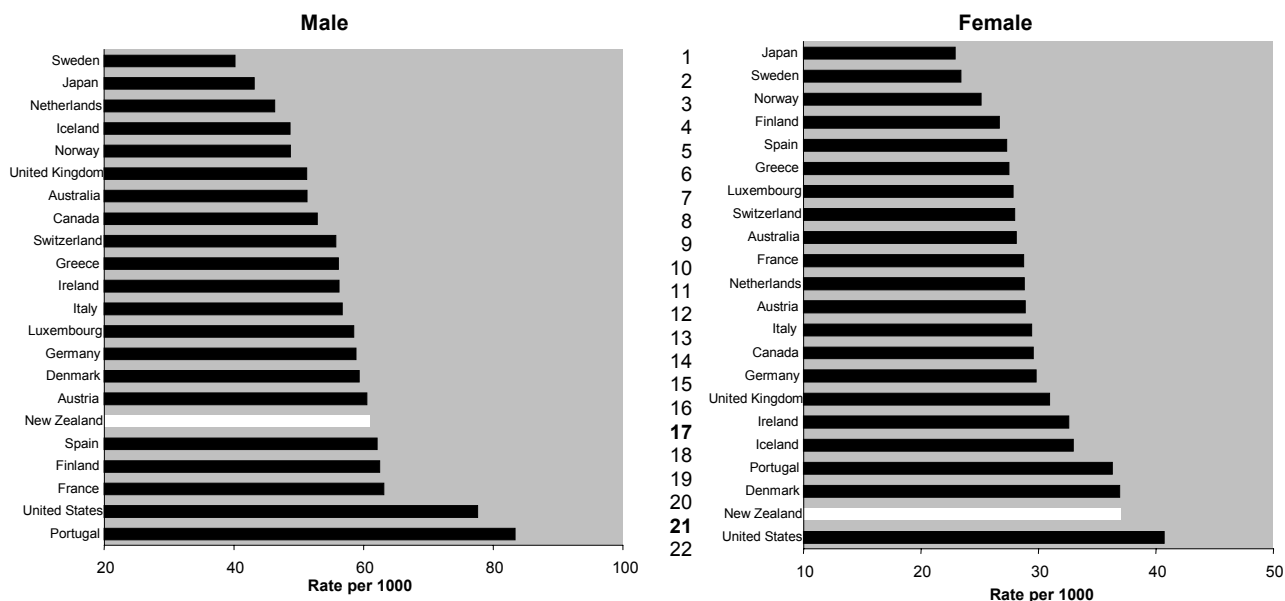
Figure 19: Infant mortality in New Zealand and selected OECD countries, genders pooled, 1996



Source of base data: OECD

Note: since 1996, New Zealand's infant mortality rate has improved sharply, to 6.7 per 1000 in 1997 and 5.7 per 1000 in 1998 (provisional data); broken axis.

Figure 20: Potential years of life lost before age 70 (YLL₇₀), from all causes, New Zealand and selected OECD countries, 1996



Source of base data: OECD

Note: YLL₇₀ is similar to YLL₆₅ but uses age 70 years rather than 65 years as the arbitrary upper age limit; scale varies between charts; broken axis.

Since 1950, New Zealanders, like people in virtually all other OECD countries, have experienced substantial improvements in life expectancy and marked reductions in rates of all-cause mortality and potential years of life lost. This has included significant reductions in mortality from perinatal and infant conditions, stroke and IHD, and road traffic injuries. However, many other OECD countries have improved even more rapidly, with the result that New Zealand has fallen from near the top in the early 1970s to below the middle of the comparison group in the mid

1990s. For example Australia, which had life expectancies below those of New Zealand in the early 1970s, now has a life expectancy at birth approximately 1.5 years greater than ours.

The Māori population, despite marked improvements in life expectancy since the 1950s, still experiences levels of survival significantly below those enjoyed by most people in the OECD. Similar low levels of health are found among other indigenous peoples in comparison countries.

Avoidable mortality

Another way to estimate the potential for improvement in health (and in equity of health outcomes) is by classifying disease and injury codes (as causes of death or hospitalisation) into 'avoidable' and 'unavoidable' categories – the concept of avoidability meaning responsiveness to health sector interventions (through prevention, early diagnosis or treatment). When first developed, only causes amenable to medical or surgical treatment were included, and a low cut off age of 65 years was applied, above which no deaths (or hospitalisations) were considered avoidable. For this report the concept of avoidability has been extended to include all those conditions potentially preventable through population-based interventions (health promotion) as well as those responsive to preventive and curative intervention at the level of the individual, and the upper age limit has been raised to 75 years.

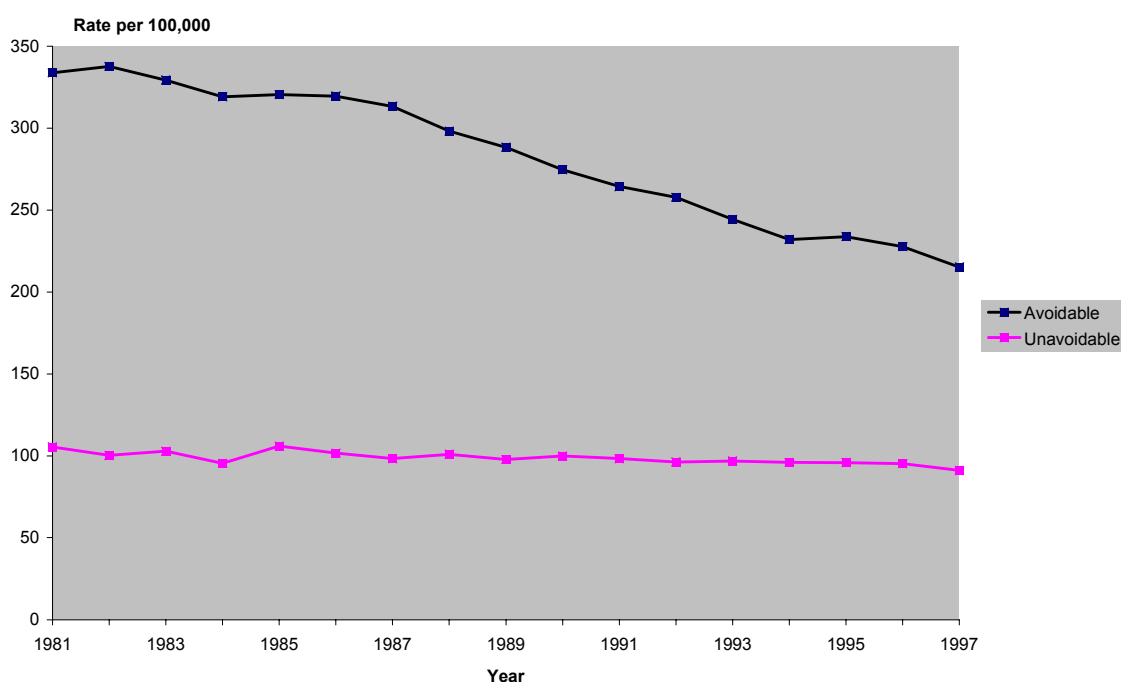
For mortality, avoidable causes have been further subdivided into three subcategories reflecting the level of intervention to which they are responsive:

- *primary avoidable mortality* (PAM) – conditions that are preventable, whether through individual behaviour change or population level intervention
- *secondary avoidable mortality* (SAM) – conditions that respond to early detection and treatment, typically in a primary health care setting
- *tertiary avoidable mortality* (TAM) – conditions whose case fatality rate can be significantly reduced by existing medical or surgical treatments (typically but not necessarily in a hospital setting) even when the condition is fully developed.

Categorising causes as avoidable and unavoidable clearly oversimplifies reality and there is substantial overlap between subcategories. However, a decline in the rate of one category does not necessarily imply an inevitable increase in that of the other, since deaths may of course be postponed to later than 75 years of age (the upper age limit for avoidability).

Avoidable mortality in the 0–74 age range declined by 38 percent from 1981 to 1997 (Figure 21) compared with a decline of only 9 percent in unavoidable mortality. The decline in avoidable mortality thus amounted to approximately 5000 fewer deaths in 1997 than expected, based on 1981 mortality rates.

Figure 21: Avoidable and unavoidable mortality, ages 0–74, 1981–97



Source of base data: NZHIS

Note: rate is age standardised to Segi's world population.

Yet in 1996–97 almost 70 percent of deaths in the 0–74 age range (approximately 9000) were still assessed as being potentially avoidable (Table 15).

Table 15: Avoidable deaths, ages 0–74, average of 1996 and 1997

	Number of deaths	Rate per 100,000	Percentage of all deaths (0–74)	Percentage of total avoidable deaths
Avoidable mortality	9025	223	70	100
PAM	4741	116	37	53
SAM	2302	56	18	26
TAM	1982	50	15	22
Unavoidable mortality	3861	94	30	
Total mortality	12,886	316	100	

Source of base data: NZHIS

Note: rates age standardised to Segi's world population; PAM = primary avoidable mortality; SAM = secondary avoidable mortality; TAM = tertiary avoidable mortality.

About half of these deaths are considered to be potentially responsive to primary prevention strategies (primary avoidable mortality), almost one quarter could be avoided by effective medical and surgical treatment of established disease (tertiary avoidable mortality), and the remaining quarter (approximately) are sensitive to early intervention (for example, screening and effective chronic disease management), typically in the primary health care setting (secondary avoidable mortality).

The exponential rise in mortality with age means that almost 80 percent of all avoidable deaths occur in the 45–74 age group. These deaths are dominated by the emergence of chronic diseases such as IHD, diabetes and smoking related cancers. Among younger age groups, most avoidable deaths are injury related (Table 16).

Table 16: Major causes of avoidable mortality, by age, 1996–97

Age	Condition	Deaths per year	Percentage
<1	SIDS	89	22
	Low birthweight	67	17
	Congenital anomalies	43	11
	Birth trauma and asphyxia	35	9
1–14	Road traffic injury	44	20
	Leukaemia	16	7
	Congenital anomalies	12	5
	Fire	11	5
15–24	Road traffic injury	169	33
	Suicide	147	29
	Drowning	16	3
25–44	Suicide	242	18
	Road traffic injury	171	13
	IHD	108	8
	Breast cancer	63	5
45–64	IHD	947	22
	Lung cancer	383	9
	Colorectal cancer	296	7
	Breast cancer	253	6
65–74	IHD	1513	25
	Lung cancer	545	9
	CORD	459	8
	Colorectal cancer	351	6

Source of base data: NZHIS (1997 data are provisional)

Notes: percentage is of all deaths (including unavoidable deaths) in that age group.

Males bear a greater burden of avoidable mortality than females – a relative excess of 54 percent (corresponding to approximately 2000 excess avoidable deaths) in 1996–97. The gender difference is largely attributable to diseases and injuries amenable to primary prevention, with the largest single contribution coming from IHD. Avoidable mortality rates for Māori and Pacific people were 2.5 times and twice as high as European/Other rates in 1996–97 respectively. Similar gradients are seen with socioeconomic status (measured by the NZDep96 index).

Although primary avoidable mortality accounts for the largest share of avoidable mortality, indicating that primary prevention will have the biggest impact on this indicator, the highest inequalities are found in secondary avoidable mortality rates. Improving access to and quality of primary health care services, and effective integration of services across levels of care, are therefore of particular importance.

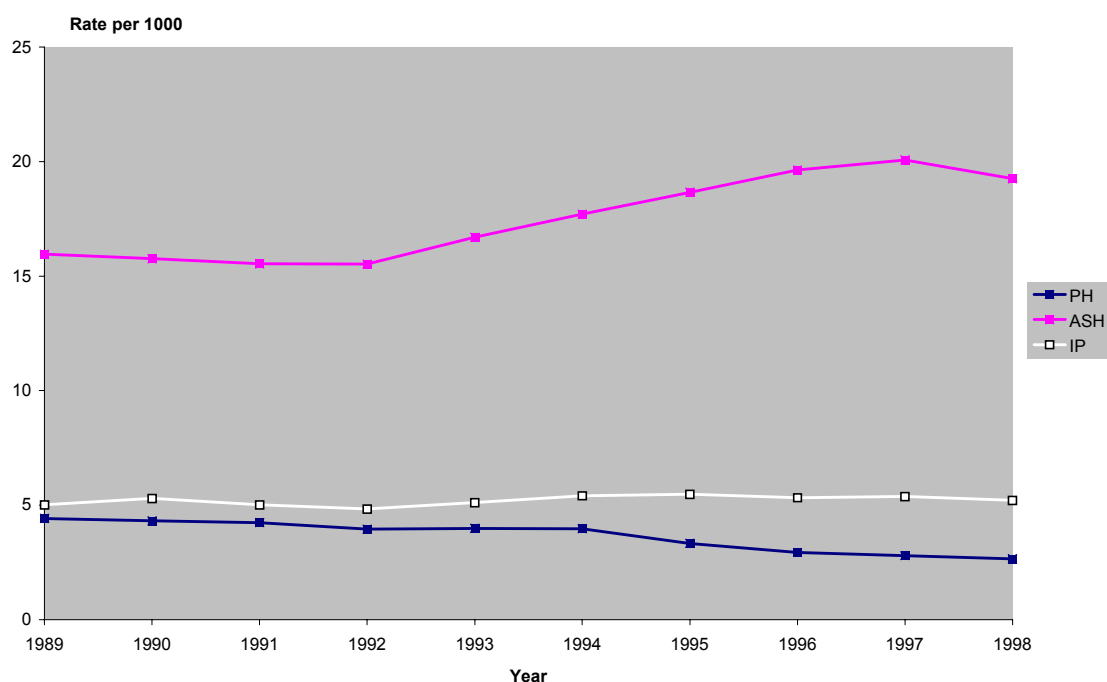
Avoidable morbidity

The concept of avoidability can be extended from mortality to morbidity. In the absence of other suitable data, hospitalisation is used in this report as a proxy indicator for serious (severe) disease and injury. A potentially avoidable hospitalisation is then one involving an individual aged 0–74 years that could in principle either have been prevented altogether (preventable hospitalisation) or could have been successfully treated at an earlier stage in the primary health care setting (ambulatory sensitive hospitalisation).

In this report, preventable injuries are also distinguished from other preventable hospitalisations, so defining three subcategories of avoidable hospitalisations: preventable hospitalisations (PH), ambulatory sensitive hospitalisations (ASH), and hospitalisations avoidable through injury prevention (IP).

Over the past decade the age standardised rate of hospitalisation has steadily increased, a trend that applies to both avoidable and unavoidable hospitalisations. Disaggregating avoidable hospitalisations into subcategories reveals a more complex pattern: injury hospitalisation rates have increased by 6 percent, preventable hospitalisation rates have declined by 40 percent, and ambulatory sensitive hospitalisations (the largest subgroup of avoidable hospitalisations) have increased by 25 percent (Figure 22).

Figure 22: Avoidable hospitalisations, by subcategory, ages 0–74, 1989–98



Source of data: NZHIS

Note: PH = preventable hospitalisation; ASH = ambulatory sensitive hospitalisation; IP = injury prevention; rate is age standardised to Segi's world population.

In 1997–98 almost one third of total hospitalisations in the 0–74 age group (approximately 100,000, excluding small rural hospitals, maternity, mental and disability support services) were assessed as having been potentially avoidable. About one third of these could have been avoided through population-based (health promotion) interventions (preventable hospitalisations) and two thirds through more effective primary health care (ambulatory sensitive hospitalisations).

These avoidable admissions were relatively evenly spread throughout the age range, varying from 20 percent of total hospitalisations among infants to 45 percent among older children. Infections dominated among infants, asthma among older children, and injury among the 15–44 age range (mainly road traffic and sports injuries). From middle age, chronic diseases emerge as cumulative exposure to tobacco, poor diet and physical inactivity begins to take its toll. From age 45 to 74 years at least one in three hospitalisations could be avoided through a combination of health promotion and clinical preventive services (including effective management of chronic diseases and their risk factors in primary care) (Table 17).

Table 17: Avoidable hospitalisations, by age, gender and ethnicity, 1997–98

Rate per 1000	<1	1–14	15–24	25–44	45–64	65–74	Male	Female	Māori	Pacific	European /Other
PH	7.6	0.8	0.7	1.6	8.8	25.7	4.6	3.4	5.4	5.6	3.7
ASH	93.2	18.6	10.0	9.9	21.2	50.7	19.2	18.4	28.5	33.7	16.1
IP	1.4	6.4	8.4	5.0	2.8	2.7	6.6	4.1	6.0	4.8	5.2
Total AH	102.2	25.8	19.1	16.5	32.8	79.1	30.5	25.8	40.0	44.1	25.3
UH	436.9	31.1	56.0	70.4	61.7	127.0	55.5	78.4	75.8	92.0	62.2
Total all	539.1	56.9	75.0	86.8	94.6	206.1	86.0	104.2	115.7	136.0	87.5
AH as % all	19	45	25	19	35	38	36	24	35	32	29

Source of base data: NZHIS

Notes: rates age standardised to Segi's world population; PH = preventable hospitalisation; ASH = ambulatory sensitive hospitalisation; IP = hospitalisations avoidable through injury prevention; AH = avoidable hospitalisation; UH = unavoidable hospitalisation.

Māori and Pacific people have age standardised rates of avoidable hospitalisation approximately 60 percent higher than European/Others; this corresponds to 6600 and 2800 excess hospitalisations in 1997–98 respectively. The highest ethnic gap occurs in ambulatory sensitive hospitalisations (almost twofold); this subcategory also accounts for the largest proportion of avoidable hospitalisations. Improvements in access to culturally acceptable and effective primary health care could therefore achieve substantive gains in Māori and Pacific health.

Both avoidable and unavoidable hospitalisation rates are higher for people living in more deprived areas. The slope of the gradient is shallower for injury and other preventable hospitalisations than it is for unavoidable hospitalisations, and significantly steeper for ambulatory sensitive hospitalisations. Had all New Zealanders enjoyed the rates of those living in the least deprived areas in 1997 or 1998, approximately 26,000 fewer avoidable hospitalisations would have occurred among those aged 0–74 years.

The best opportunity for reducing both the ethnic and the socioeconomic inequalities (which of course interact) in avoidable hospitalisation is to be found in the subcategory of ambulatory sensitive hospitalisations, which has both the highest rate differentials and accounts for the largest share of avoidable hospitalisations. This reinforces the critical role of primary and integrated health care in achieving population health gain, already emphasised in relation to avoidable mortality.

Risk factors

The analysis of population attributable risks presented here – albeit univariate, decontextualised and restricted to the major chronic disease risk factors and alcohol consumption – reveals that major gains are still possible through lifestyle modification. Each of the eight risk factors selected for analysis (with the exception of alcohol and inadequate fruit and vegetable consumption) would reduce mortality by over 1000 deaths per year if its prevalence were reduced to zero (Table 18; see also Figure 17).

Table 18: Population attributable risks applied to 1996 mortality

Risk factor (15 years and over)	Population group	Maximum impact on deaths (per year)	Maximum impact on years of life lost (per year)
Smoking	Male	2778 caused	34,939
	Female	1524 caused	18,655
	Total	4302 caused (15.2%)	53,594 (16.4%)
Alcohol consumption	Male	553 caused	3367 (net)
		612 prevented 59 prevented (net)	593 (net) 3960 (net) (1.2%)
	Female	240 caused	
		364 prevented 124 prevented (net)	
Total	793 caused 976 prevented 183 prevented (net) (-0.6%)		
Inadequate fruit and vegetable	Male	574 caused	9210
	Female	293 caused	4922
	Total	867 caused (3.1%)	14,132 (3.8%)
Physical inactivity	Male	1097 caused	16,280
	Female	1046 caused	12,857
	Total	2143 caused (7.6%)	29,137 (8.9%)
Diabetes (type 2)	Male	613 caused	9234
	Female	779 caused	8544
	Total	1392 caused (4.9%)	17,778 (5.4%)
Obesity	Male	480 caused	7687
	Female	593 caused	7619
	Total	1073 caused (3.8%)	15,306 (4.7%)
High blood pressure	Male	1215 caused	14,758
	Female	1197 caused	11,743
	Total	2412 caused (8.7%)	26,501 (8.1%)
Total cholesterol	Male	839 caused	11,294
	Female	736 caused	6860
	Total	1575 caused (5.6%)	18,154 (5.6%)

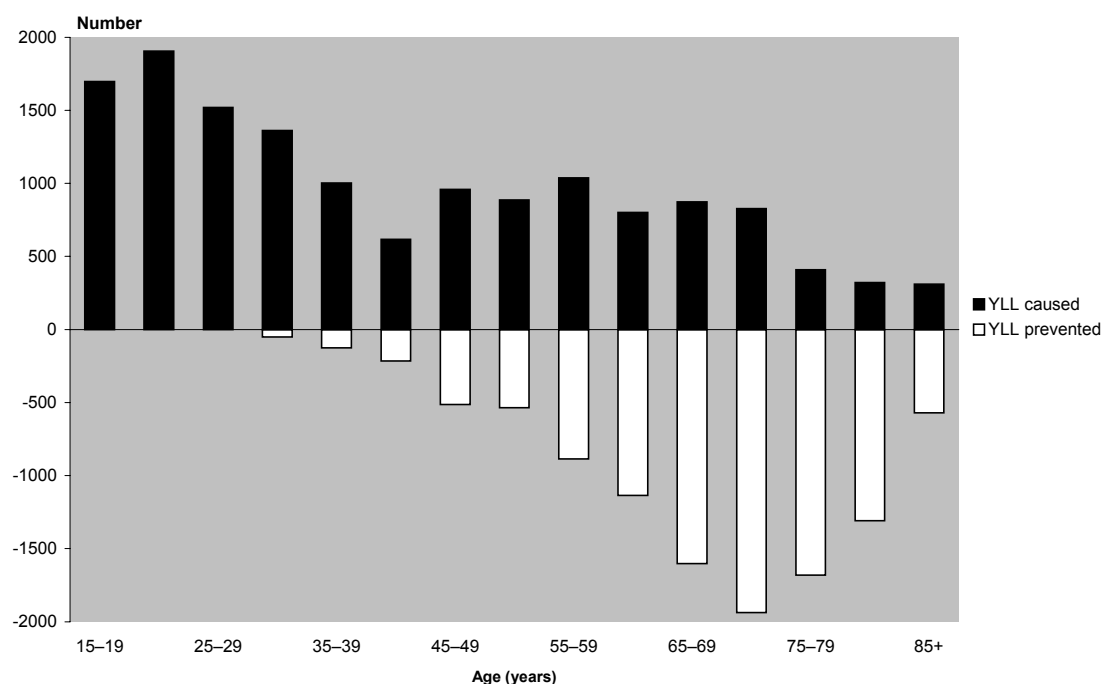
Source of base data: compiled from multiple sources

Note: percentage is of total deaths or YLL; years of life lost are YLL_e discounted at 3 percent per year.

Smoking rates appear to have stabilised at around 24 percent of the population overall, with trends among youth – especially young women – possibly worsening again. Total elimination of smoking would prevent approximately 4300 deaths each year. More realistically, a 10 percent reduction in smoking prevalence (from 24 percent to 21.5 percent approximately) over the next decade would reduce mortality by approximately 70 deaths per year in the short run, and by several hundred deaths per year in the longer term (once the excess risk of former smokers has returned to baseline).

Overall, the negative effects of alcohol consumption outweigh the positive when measured in terms of years of life lost. For 1996–97 a net loss of approximately 4000 years of life is estimated (discounted at 3 percent per year). If the prevalence of hazardous drinkers declined by 10 percent from the 1996 level by 2006, the net loss of life years would be decreased by approximately 700 each year. The health effects of alcohol are complex, because of its protective effect against IHD and some other diseases, and depend not only on the level and pattern of drinking but also on age and gender (Figure 23).

Figure 23: Total years of life lost caused/prevented through alcohol consumption, by age, 1996



Source of base data: NZHIS, NZHS 1996–97, English et al 1995, Thun et al 1997

Note: YLL calculated by the RLE method using West level 26 as the reference, and discounted at 3 percent per year.

The impact of diet is difficult to estimate from available data, but is probably of a similar magnitude to smoking. Energy balance is captured in physical activity and obesity, and fat intake (partially) in blood cholesterol. Salt intake is partly reflected in the prevalence of high blood pressure. The only dietary variable measured directly was fruit and vegetable consumption. If everyone ate five or more helpings per day, mortality would reduce by over 800 deaths per year. More realistically, if the proportion of the population consuming at this level increased by 10 percent from the 1996–97 rate, then by 2006 about 90 fewer deaths would occur each year.

Improvements in physical activity levels would have direct benefits as well as acting indirectly through obesity and diabetes. At least one third of adults are currently insufficiently active. If all adults enjoyed at least the recommended minimal level of 2.5 hours per week of moderate intensity physical activity, approximately 2100 fewer deaths would occur per year. More realistically, if physical activity levels could be increased by 10 percent by 2006, mortality would decline by about 250 deaths per year.

If the rate of increase in the prevalence of obesity could be reduced by 10 percent by 2006, it is estimated that about 190 deaths per year would be prevented (total elimination of obesity prevents almost 1100 deaths per year under very conservative assumptions). For diabetes – for which physical activity and obesity are major modifiable risk factors – stabilising prevalence at current levels would prevent approximately 50 deaths per year (total elimination of diabetes would prevent about 1200–1400 deaths per year).

High blood pressure and high blood cholesterol are major cardiovascular risk factors, with very high prevalences in the older age groups. In both cases there is some evidence that prevalence may be falling slowly; nevertheless, at current prevalence levels total elimination of these risk factors would reduce mortality by about 2400 and 1600 deaths respectively. A further 10 percent reduction in prevalence by 2006 would be associated with reductions in mortality of

approximately 260 and 150 deaths per year respectively. In fact, the impact of blood lipids on health outcomes may be under-estimated here, since lipids other than total cholesterol have not been included and the model used does not fully represent the dose – response curve.*

Further reductions in risk exposures could therefore make major contributions to health gain. However, these behavioural and physiological risk factors operate at the level of the individual and are based on studies that have examined inter individual differences in health outcomes. Thus they may not identify the major causes of differences in the rates of outcomes between social groups.

At the group level, other factors – the so called determinants of health – may be more relevant as the focus of policy interventions. Such determinants may operate by shaping social norms of behaviour or constraining lifestyle choices, or act independently of the behavioural and biological risk factors that are so important at the individual level. Future editions of this report may be able to include analyses of major group level variables (for example, labour and housing market conditions, income inequality, social capital, institutional racism, advertising and affordability of harmful products such as tobacco and unhealthy foods, job design and work practices), alongside the individual level risk factors, if the necessary data can be collected.

Population health monitoring

This report demonstrates that the health status of the population can be measured reliably and systematically, that historical trends can be tracked, and that inequalities in population health outcomes among nations and subgroups of the population can be compared. It is possible to analyse the causal structure of these outcomes at multiple levels – from the diseases and injuries that are their proximal causes, to the physiological and behavioural risk factors of these diseases – although not yet to the same extent at the level of the social, cultural and economic determinants that are their ultimate causes. Such analyses provide both an explanation of the observed trends and differences in health outcomes, and an evidence base for intervention.

To optimise the usefulness of population health monitoring as a decision support tool for health and social policy, the technology of health measurement needs to mature. In particular, health outcome indicators (as listed in Tables 1–4) need to be standardised, population health modelling and forecasting methods advanced, and the data feeder systems on which these processes depend improved and institutionalised.

One of the major limitations in the current information base is the lack of valid time series for ethnic health statistics. More effort is needed to collect ethnicity reliably on all health records. Information on socioeconomic status should be routinely included in health-related surveys and health and disability support services, using standard classifications of occupation, income or education. If such data cannot be collected (directly or through record linkage), then census based small area indexes of deprivation provide an alternative. This will allow the routine monitoring of socioeconomic inequalities in outcomes alongside other axes of social stratification, including age, gender and ethnicity.

* The impact of other risk factors, especially high blood pressure and overweight/obesity, are also likely to have been underestimated for similar reasons.

The current ad hoc health, nutrition, disability and behaviour (risk factor) surveys could be integrated, institutionalised and better focused as critical data feeder systems for population health monitoring. A longitudinal component could be built into appropriate surveys so that transition rates into and out of different health states can be estimated. Indeed, record linkage (data integration) can go further, to link health survey, health service and vitals records to census questionnaires while protecting individual privacy. (Linkage of mortality to census records is currently being trialled by Statistics New Zealand and the Wellington Medical School.) Gaps in the collection of population-based data on mental health outcomes and chronic diseases need to be addressed; the Ministry of Health and other stakeholders are currently developing a Mental Health Information National Collection and piloting a national mental health survey.

Such measures would allow the incidence as well as the prevalence of diseases and injuries of public health importance to be monitored – information that is essential if morbidity data are to match mortality data in reliability and validity. Mapping between disease and disability is an important corollary to this, and the necessary data need to be collected in the appropriate surveys.

Further work is necessary on the design of integrated health indicators, including both health expectancy and health gap measures. This report proposes ILE as a key health measure, but in the longer term consideration should be given to a health adjusted life expectancy indicator (such as disability adjusted life expectancy), using the same descriptors and health state valuations as those used to construct the DALY measure. Regardless of whether this is done, a valuation exercise needs to be considered (and possibly repeated at intervals) to obtain New Zealand specific health state valuations for any future burden of disease study, in order to improve the validity of the DALY measure.

The key health indicators identified in Table 4 provide a focus for planning investment in improved population health indicators, methods and data feeder systems. Table 19 summarises the data needs, data sources and improvements required to enable these key indicators to be reliably measured and tracked. Greater capacity for data integration (record linkage), improved consistency of data definitions and standardisation of minimum datasets, and greater availability of longitudinal data, are all critical elements for effective population health monitoring.

Table 19: Data needs, data sources, and improvements required to measure and monitor selected key population health indicators

Key indicator	Data needs	Data sources	Improvements required
Mortality rates (all-cause and avoidable causes)	<ul style="list-style-type: none"> number of deaths by age^a and cause population counts categorical attribution of causes of death 	<ul style="list-style-type: none"> mortality database (NZHIS) population census (SNZ) 	<ul style="list-style-type: none"> recording and coding of cause of death (ICD 10) linkage of mortality records to census questionnaires (pilot study under way)
Life expectancies and probabilities of survival	<ul style="list-style-type: none"> number of deaths by age population counts 	<ul style="list-style-type: none"> death registry (SNZ) population census (SNZ) 	<ul style="list-style-type: none"> official life table for Pacific people official life table by socioeconomic status
Years of life lost (all-cause)	<ul style="list-style-type: none"> number of deaths by age population counts weights 	<ul style="list-style-type: none"> death registry (SNZ) population census (SNZ) model life tables (United Nations) 	<ul style="list-style-type: none"> standardise indicators, weights, and discount rates

Table 19 continued

Key indicator	Data needs	Data sources	Improvements required
Self reported health	<ul style="list-style-type: none"> global self rated health item HRQOL survey instrument, eg, SF-36 population counts 	<ul style="list-style-type: none"> health survey (MoH) population census (SNZ) 	<ul style="list-style-type: none"> replace SF-36 with an instrument with better psychometric properties (especially cross cultural validity) add or substitute an instrument capable of preference rating (ie, one that provides valuation and not just description of health states)
Disability prevalence	<ul style="list-style-type: none"> number of people experiencing long standing functional or role limitation, by level (severity) severity scoring system population counts 	<ul style="list-style-type: none"> disability module in health survey, or separate disability survey (MoH/SNZ) population census (SNZ) 	<ul style="list-style-type: none"> standardise survey instrument standardise classification and severity scoring system (relate to ICDH2)
Disease prevalence ^b	<ul style="list-style-type: none"> number of people currently experiencing disease of interest population count 	<ul style="list-style-type: none"> health survey (MoH) population census 	<ul style="list-style-type: none"> extend survey to include module on self reported chronic disease and mental health (or separate survey) include health examination component in health interview survey
Disease incidence ^b	<ul style="list-style-type: none"> number of people newly developing the disease of interest over time period population at risk of the disease (ie, susceptibles) 	<ul style="list-style-type: none"> disease registers (eg, NZ Cancer Registry) health survey (longitudinal dimension) 	<ul style="list-style-type: none"> establish registers for chronic diseases other than cancer add a longitudinal component to the health survey
Risk factor prevalence ^c	<ul style="list-style-type: none"> number of people with risk factor or expressing risk behaviour population counts 	<ul style="list-style-type: none"> health behaviour survey(s) 	<ul style="list-style-type: none"> standardise definitions, instruments and surveys include health examination component in health interview survey
Hospitalisation rates (all-cause and avoidable causes)	<ul style="list-style-type: none"> number of inpatient separations by age and cause population counts categorical attribution of diagnoses 	<ul style="list-style-type: none"> hospital separations database (NZHIS) population census (SNZ) 	<ul style="list-style-type: none"> improve quality of recording and coding diagnoses and procedures (ICD 10)
Health expectancies (especially ILE)	<ul style="list-style-type: none"> number of deaths by age prevalence of disability by severity level population counts 	<ul style="list-style-type: none"> death registry (SNZ) health or disability survey population census (SNZ) 	<ul style="list-style-type: none"> see note on measuring disability standardise definitions, indicators, instruments

Table 19 continued

Key indicator	Data needs	Data sources	Improvements required
Burden of disease (DALY)	<ul style="list-style-type: none"> number of deaths by age and cause incidence and duration of non-fatal diseases and injuries disability weights population counts 	<ul style="list-style-type: none"> mortality database (NZHIS) disease registries longitudinal health survey disease models health state valuation exercise 	<ul style="list-style-type: none"> see note on disease incidence (and prevalence) improvements to disease models, including co-morbidity adjustment valuation exercise to obtain New Zealand specific health state valuations (disability weights)
Population attributable risks ^b	<ul style="list-style-type: none"> risk factor prevalences relative risks for relevant outcomes 	<ul style="list-style-type: none"> health behaviour survey(s) epidemiological studies for relative risks 	<ul style="list-style-type: none"> see note on risk factor prevalence support for local cohort studies (using record linkage) to obtain (and update) New Zealand specific relative risks extend from risk factors to determinants

Source of base data: compiled from multiple sources

a age refers also to data differentiation by gender, ethnicity and (where relevant) socioeconomic status

b not itself a key health outcome indicator, but needed for construction of one or more of the indicators or elaborations of them

c data on risk factor incidence and remission rates are also valuable, and could be collected through the proposed longitudinal survey component

Information on health outcomes and their causes (diseases, risk factors, and determinants) is necessary but not sufficient for evidence-based policy. Data on health resources (inputs) and health policies, programmes and services (processes) are also needed, especially evidence on the cost effectiveness of different interventions.

Population health monitoring is not an end in itself: data need to be fed into appropriate models that will enable *future* – rather than past or present – health needs of the population or its subgroups to be estimated, and the impacts of different policy options to be simulated. Such models will need to incorporate demographic trends, epidemiological forces and socioeconomic determinants (including changes in health technology and health services) as well as the interactions between these sets of variables.

Integration of population health forecasts with health resource and health service estimates will then provide a solid evidence base for health policy, as well as for assessment of intersectoral policies affecting population health outcomes.

The Health of New Zealanders in Detail

Background

Objectives

To achieve its health and independence objectives, the Government needs information on population health outcomes and risks to health. Such information helps to identify needs, and hence to design policies to meet these needs and evaluate the success or otherwise of these policies.

This report on the health of New Zealanders at the end of the 20th century is intended to contribute to better and more equitable health and independence outcomes by strengthening the evidence base for policy. The policies that may be influenced by this report are not restricted to those for the health and disability sectors alone, but relate to all sectors that impact on these outcomes.

The focus of the report is on robust and high quality analysis of:

- levels, trends and inequalities in health and independence outcomes
- the burden of premature mortality and disability, and how this health loss is distributed
- the scope for health gain.

The purpose of the report is not to present comprehensive health statistics on individual diseases or injuries. Rather, it attempts to transform raw statistics into information that is relevant to evidence-based policy advice. It is hoped that the report will be widely read and will help to foster informed debate about health outcomes within the community. It also serves to identify gaps in health statistics that could lead to improvements in our information infrastructure.

It is important to emphasise that monitoring the health of the population is a means to an end, not an end in itself. This report will be of value only if the analyses it presents are useful to policy makers and others involved in the health and related sectors.

Context

Population health monitoring synthesises information from at least four different domains (Table 20) and is supported by an information infrastructure comprising population statistics (including the census and vital statistics), health statistics (including cause of death and hospital discharge statistics and cancer registrations), and a set of periodic health, disability, nutrition and health behaviour (including lifestyle) surveys, most recently fielded in 1996–97.

Table 20: Information domains covered by population health monitoring

Population	<ul style="list-style-type: none">• size• structure• dynamics• spatial distribution
Health outcomes	<ul style="list-style-type: none">• quality of life• quantity of life• integrated health measures• health inequalities
Health risks* (causes)	<ul style="list-style-type: none">• diseases and injuries**• behavioural and biological risk factors• social, cultural and economic determinants
Health sector	<ul style="list-style-type: none">• health services• health resources• health and social policies

* A distinction should be drawn between proximal risk factors and distal determinants: this category is intended to include all causes of health outcomes.

** Incidence/prevalence of specific diseases and injuries could be considered outcomes rather than causes.

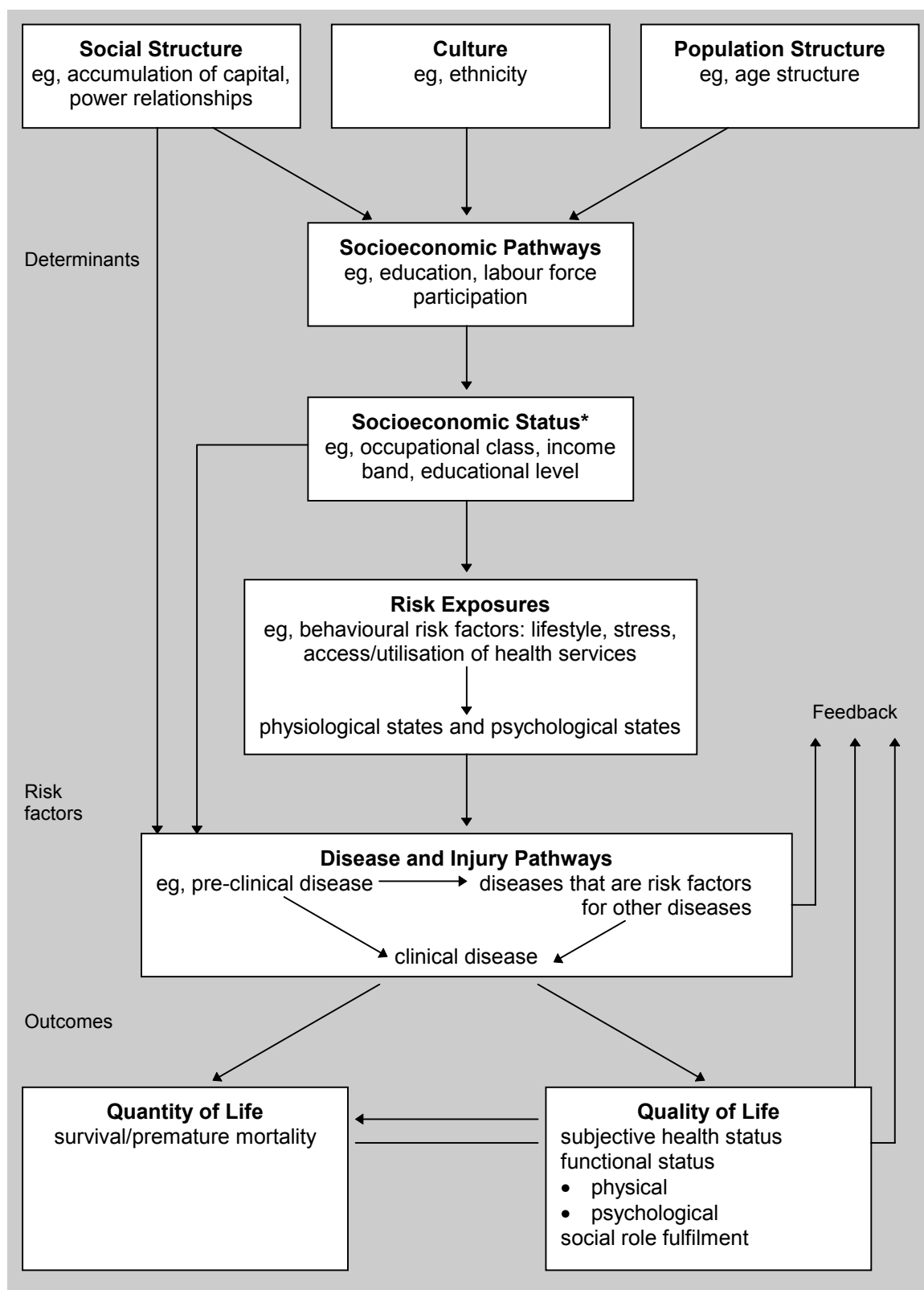
This information enables the Ministry of Health to monitor:

- progress towards specified health targets
- health and independence outcomes
- health inequalities
- health risks and determinants
- health and disability support services (including access, utilisation and quality)
- health and other relevant policies
- health resources (human, financial, technological and informational).

The monitoring information is accessible in a series of reports and, increasingly, in electronic format. This report covers health outcomes only, and includes only a summary of the information available. In particular, *Social Inequalities in Health: New Zealand 1999* (Ministry of Health, forthcoming) should be consulted for more information on socioeconomic gradients in health.

This is not the first report on the health status of New Zealanders: five years ago the Public Health Commission published *Our Health, Our Future: The state of the public health in New Zealand 1994*. Building on this foundation, the current report aims to structure health outcomes information so that it ties in with an underlying conceptual model of health (Figure 24). It is intended that this report will be updated at five yearly intervals.

Figure 24: The concept of health underpinning population health monitoring



Source: compiled from multiple sources

Notes: the model as shown does not include all the health information domains listed in Table 20. In particular, health policies and health services are not shown as they are not explicitly covered in this report. Variables shown within boxes are examples only.

* individual, current socioeconomic position

Structure

Traditionally, the only 'health' outcome that could be monitored at the population level was mortality. In a low mortality society such as ours, deaths have become increasingly concentrated into old age. This has made mortality data less informative about health at earlier stages of the life cycle. Also, with the majority of the population living into old age and so increasingly at risk of chronic disease and disability, the need for information on quality as well as quantity of life has become more pressing.

Yet separate analyses of the length of life and quality of life dimensions of health are insufficient for evidence-based policy. Increasingly, when setting policy, a trade off between gains in quantity and gains in quality of life must be made, creating the need for a composite unit of health that integrates both dimensions. Such measures are now available – and are becoming increasingly reliable – for use as monitoring tools, and include both health expectancy and health gap measures.

Accordingly, this report is structured into four parts, in turn analysing indicators of mortality, morbidity (health-related quality of life), integrated measures of health (health expectancy and health gap indicators) and the scope for health gain.

Part I: Mortality

The mortality of the population is analysed in terms of its social and causal structure, with the units of measure being *mortality rates and risks* (the probabilities of dying in specified age intervals). The mortality rates are then summarised across the life span using actuarial methods to derive survival curves and *life expectancies*. Traditionally, life expectancy at birth has attracted most attention (as a whole of population measure), but changes in life expectancy in old age are of increasing policy relevance. An analysis of this issue (technically known as 'rectangularisation of the survival curve') is included. The analysis of inequalities in life expectancy is extended to include differences in socioeconomic status. Also, for the first time, the contribution of different causes (diseases and injuries) to life expectancy is systematically analysed.

Although life expectancy is a classic indicator of health – or, more precisely, of survival – it fails to differentiate between senescent (old age) and premature death. A better measure of the social impact or burden of mortality is potential *years of life lost* (YLL), a health gap measure derived by weighting deaths by the age at death. YLL provides a different perspective on mortality, as well as being needed for the construction of *disability adjusted life years* (DALYs).

Part II: Morbidity

Information on health-related quality of life can be obtained most directly through self report, using a health profile survey instrument such as the Medical Outcomes Study Short Form 36 (SF-36). Yet *subjective health status* – whether measured by SF-36 scores or other similar instruments – provides only one perspective on this dimension of health.

Disability surveys provide a perspective that is more objective – albeit narrower in scope – than that provided by the SF-36. In this report, disability is defined as functional and/or role limitation. Although saying little about disability as lived experience, this definition is appropriate for population health monitoring purposes.

The morbidity experience of the population is also analysed using *health service utilisation* statistics as a way of measuring disease incidence. Although such analysis is confounded by factors affecting access to care (at different levels) and is also limited in coverage (being restricted mainly to public hospital discharge statistics), it nevertheless provides another perspective on health-related quality of life.

Part III: Integrated health status

Integrated health outcome measures combine indicators of quantity of life (survival or mortality) with indicators of quality of life (usually disability) into a single composite index. Two different approaches to the construction and application of such an index have been adopted here.

The first approach has been to extend ‘life expectancy’ to ‘*health expectancy*’. The health expectancy indicator selected as a monitoring tool for this report is *independent life expectancy* (ILE). ILE estimates years lived independently (without the need for assistance with everyday routines) by integrating dependent disability with life expectancy. The report includes analyses of the contribution of different age groups to loss of ILE, and contrasts the responsiveness of ILE to changes in disability and changes in mortality. Analysis of the contribution of different causes to ILE is illustrated using the example of injury.

Another approach to integrated health measurement is *burden of disease analysis*. This analysis extends ‘years of life lost’ to ‘years of *healthy* life lost’, combining years lost due to premature mortality (YLL, the burden of fatal disease and injury) with equivalent years lost due to disability (YLD, the burden of non-fatal disease and injury). This requires the estimation of social preferences for different non-fatal health states so that the two components (YLL and YLD) can be added together. The resultant integrated unit of health gap is the disability adjusted life year (DALY): one DALY represents the loss of one year of healthy life. This report includes the key results from the first New Zealand Burden of Disease Study.

ILE represents a positive measure of health (time spent living independently), while the DALY is a health gap measure, quantifying health loss or the burden of disease. The two approaches have complementary strengths and weaknesses as health monitoring tools: health expectancy is relatively easy to measure but difficult to map to specific causes (diseases or risk factors); by contrast, a national burden of disease study is very data intensive but provides health outcome information at a cause specific as well as at an aggregate level.

Part IV: Scope for health gain

In order to be relevant for policy making, population health monitoring must be related to the scope for health gain. Ideally, sophisticated modelling and forecasting tools would be employed to predict future need rather than merely assess current need. Such tools are under development by the Ministry but were only available to a limited extent for this report.

Instead, simpler methods have been used to estimate the (potential) scope for health gain. The first of these is to *benchmark* performance. Although international comparisons of health outcomes need to be interpreted with care, they do provide a different perspective on New Zealand’s performance as a nation. Within New Zealand, the health status of one subgroup may provide a useful standard for the level of health that theoretically could be attained by another.

The categorisation of health outcomes into those that are *avoidable* (at primary, secondary or tertiary levels) and those that are *unavoidable* provides yet another perspective on health gain – one that relates directly to a wide range of interventions, including health care and disability support.

Epidemiological assessment of *population attributable risks* shifts the focus of health gain from disease processes to their more distal causes. Data availability has limited the risk analysis to the well known lifestyle and biological risk factors; future editions of this report may be able to extend this analysis to include a more comprehensive treatment of the socioeconomic and cultural determinants of health.

This analysis of the scope for health gain contrasts current levels of health with theoretically attainable standards rather than with realistically attainable goals. Specific policies aimed at closing health gaps will require more detailed analysis, including analysis of the marginal cost effectiveness or cost utility of different policy options. The information reported here provides a framework or context for such analyses, and also serves to identify priority populations with high need – and correspondingly high potential for health gain.

Data sources and methods of analysis

What follows is a description of the key data sources and generic statistical methods used in this report. More detailed discussions of specific data sources and methods are included in relevant chapters. Population denominators are discussed first, followed by health statistical collections and health surveys, then the statistical methods used in this report are briefly summarised.

Population data

In 1996 Statistics New Zealand introduced changes to its population estimates methodology, which affect the population denominators used in this report. These changes include a shift from the *de facto* to the *usually resident* population concept. Under this new concept, the census count is adjusted to take account of New Zealand residents temporarily overseas on census night, and is also adjusted for the estimated census undercount, based on a post enumeration survey. The effect of these changes was a 1.2 percent increase in the overall estimated population for 1996. The increase was greatest in the 15–29 year age group, at 2.1 percent. New estimates of the size of the usually resident population have been made for all years from 1991 onwards. The effect of the larger resident population estimate is to slightly reduce mortality and morbidity rates from 1991 onwards, particularly in the young adult age group, compared with previous years. For most health indicators, the discontinuity in the time series pre- and post 1991 is of little practical importance.

Ethnicity data

The classification of ethnicity is problematic in New Zealand health and vital statistics. In calculating rates of disease and death, compatible definitions for the ethnicity of cases or deaths (numerator) and the population at risk (denominator) are necessary. Because definitions have changed over the past 30 years, reliable time series for Māori and Pacific people's health statistics are not available.

Box 2: Changes in ethnicity coding

Population data

Denominators for New Zealand ethnic populations are derived from Statistics New Zealand census data. Discontinuities have occurred in the census data as a result of changes to definitions of ethnicity. The 1971 Census question on ethnicity departed significantly from that used in earlier censuses, so affecting the ethnic specific time series. The change from a biological definition of Māori in the 1981 Census to a broader self identification of cultural affiliation in the 1986 Census (with respondents being able to identify with one or more ethnic groups) resulted in discontinuous change to the enumerated 'Māori' population between these years (Pool 1991; Johnstone et al 1998). Changes to the census ethnicity questions in 1991 and again in 1996, to further allow for classification on the basis of multiple ethnic group affiliation, further disrupted the time series.*

Vitals data

Prior to 1995 the 'biological' classification of ethnicity was used for statistical purposes. From 1 September 1995 important changes occurred in the collection of ethnicity information for all births and deaths. The aim of these changes was to align the ethnicity question asked on birth and death registrations with the Statistics New Zealand standard classification of ethnicity. These changes have disrupted the historical ethnic specific birth and death time series, so 1996 was the start of a new time series for ethnic specific vital statistics.

The standard ethnicity question is now based on the concept of self identification and asks individuals to identify which ethnic group or groups they affiliate with. Up to three ethnic groups can be coded and a field for Māori ancestry is also included. Infant death registrations continue to be linked back to the infant's birth registration to avoid biases in the calculation of rates. The advantage of this new approach to the classification and coding of ethnicity in vital statistics is that for ethnic specific information the numerator (number of births or deaths) and the denominator (total number at risk in the population) now correspond. Vitals ethnicity data is no longer derived from the ethnicity of the parents of the newborn baby or of the deceased. The proportion of non-respondents can now be quantified, whereas previously if ethnicity was not stated it was classified as non-Māori/non-Pacific. Birth and death data can now be classified for all ethnic groups.

Hospitalisation data

From 1 July 1996 the method of collecting ethnicity information was revised to enable people admitted to hospital to self identify with up to three ethnic groups, whereas previously they could identify with only one ethnic group. So, from 1996 onwards all ethnic specific rates have been calculated using a Māori ethnic group population denominator: for example, Māori are classified as all those who identified Māori as their only or one of their ethnic groups. People of Māori ancestry who do not identify as Māori are no longer counted as Māori in health statistics. This data collection method now aligns closely with that used in the census and in the collection of vitals data.

* The 2001 Census is likely to revert to the ethnicity questions used in the 1991 Census (Denise Brown, Statistics New Zealand, personal communication 1999).

While these changes in ethnicity coding in vital and health statistics should improve the reliability and validity of ethnic specific data from 1996 onwards, there is evidence that Māori deaths are still being under-reported to some extent. Also, analysis of a sample of hospital admission forms indicates that significant differences still persist between hospitals in the wording and implementation of the ethnicity question (Denise Brown, Statistics New Zealand, personal communication 1999).

The effect of the 1995–96 changes in ethnicity classification and coding

The effect of these changes has been dramatic. In 1994 the total number of deaths recorded as Māori (based on the biological concept of ethnicity) was 1405. In 1996, after the ethnicity definition had changed, 2627 deaths were classified as Māori. The number of Pacific deaths recorded increased from 291 in 1994 to 750 in 1996. And in 1996, 15,813 newborns were classified as Māori, compared with only 7053 in 1994 (SNZ 1999b).

For both mortality and hospitalisation data prior to September 1995, the population of ‘sole’ Māori ethnicity had been used as the denominator in calculating Māori mortality and hospitalisation rates. Although this denominator provides the best match with the numerator for mortality data collected prior to this date, rates estimated in this way are likely to under represent the ‘true’ mortality rates for all those who self identify as Māori. The same also applies to the Pacific ethnic group. Conversely, for hospitalisation rates prior to 1996, use of the ‘sole’ population denominator overestimated ‘true’ hospitalisation rates for both Māori and Pacific groups due to the mismatch in the way ethnicity was collected for the numerator compared to the denominator.

These changes in the classification and coding of ethnicity on birth and death registrations and hospital records (the numerators) and the introduction of a ‘mixed’ ethnic denominator have meant that the age standardised (all-cause) mortality rate for Māori appears to have *increased* by approximately 25 percent from 1994 to 1996, and the total hospitalisation rate for Māori appears to have *decreased* by about 30 percent. Similar changes apply to rates for the Pacific ethnic group. Therefore, analyses of historical trends in ethnic specific health data that span the 1995 classification changes must be interpreted with extreme caution. In fact, 1996 marks the start of a new time series of ethnic specific health statistics for New Zealand.

Ethnic group comparisons made in this report

For several of the indicators monitored in this report, separate estimates for Pacific and Asian New Zealanders were either unavailable or unstable (due to small numerators and denominators). Accordingly, ethnic comparisons are frequently made between Māori and non-Māori ethnic groups. In some analyses, the ‘European/Other’ group is compared with Māori and Pacific groups; ‘European/Other’ in this context includes Asian and ‘other’ ethnicities, as well as those with ethnicity unstated or unclassifiable. Future developments in health statistics should allow more comprehensive monitoring of health outcomes separately for Pacific and possibly Asian ethnic groups.

Health statistical collections

The New Zealand Health Information Service (NZHIS) collects data on hospital discharges (public and private), and mortality, mental health and cancer registrations. The National Minimum Dataset maintained by the NZHIS is essentially a combination of these four categories of data.

Hospital morbidity data

Data on morbidity are primarily based on discharges from public hospitals (strictly speaking, these hospitalisations are referred to as ‘hospital separations’). Day cases have been counted as hospitalisations since 1986, but recording of these admissions* was incomplete until the introduction of the ‘three hour rule’ in 1992. Attendances at outpatient clinics or emergency departments are not included. Hospitalisation data are counts of the number of episodes of care rather than of individual patients, so readmissions for the same condition are counted twice. Hospital separations include patients who die in hospital after formal admission.

Concern has been expressed about the accuracy of the ICD 9 coding (see Box 3) of hospital discharge diagnoses in New Zealand in the past (Smith 1989). However, data suppliers now contract for a 95 percent level of accuracy. Furthermore, NZHIS audits indicate a concordance between patients’ notes and codes of over 90 percent at the three digit ICD code level.

Box 3: ICD codes

All diagnoses are coded according to the International Classification of Diseases, 9th Revision, Clinical Modification, Australian version (ICD 9 CMA). The ICD system for classifying diagnoses is the international standard for patient care and health services management. However, there are in excess of 8000 separate codes, structured by anatomical site and aetiology; this level of detail is not helpful when our concern is population health. In this publication, ICD 9 codes have been grouped to facilitate analysis of causes of morbidity and mortality in a way that is more relevant for policy. Codes are grouped at three levels of detail, with just five cause groups at the first level, L1 (infectious diseases, maternal and infant disorders, injuries, chronic diseases and neuropsychiatric disorders); 25 at the second level, L2 (corresponding closely to ICD chapters); and 115 at L3. Each level also has a category for ill defined causes that do not fit into any of the other categories (Ministry of Health 1998d). This classification is summarised in Appendix 1 to this report.

In mortality data, the grouped causes (L1, L2 and L3) are assigned according to the underlying cause of death. In morbidity data, they are assigned according to the principal diagnosis or the external circumstances of injury or poisoning (E code), if the patient receives such a code. In some instances, patients receive an E code for an injury or poisoning that is a secondary diagnosis, yet the cause group is assigned based on that E code; the result is a slight under count of hospitalisations for non-injury causes in this report compared with other published data.

Categorical assignment of cause of death or reason for hospitalisation is less accurate among older people, especially people aged 85 or more years, as the prevalence of co-morbidity rises steeply with age.

* The terms ‘hospitalisation’, ‘discharge’, and ‘admission’ are used synonymously in this report.

A limitation in the use of hospitalisation rates to monitor health outcomes is that changes in such rates can reflect:

- a real change in incidence or prevalence of the disease or condition
- improved primary health care (so reducing the need for hospital care)
- a change in access to (or provision of) hospital services
- a change in diagnostic methods
- a change in disease classification or coding practices.

The relative importance of these factors is often unknown.

Hospital discharge data used in this publication have undergone a filtering process that removes some records, including transfers from one hospital to another, the discharge of well newborn babies and duplicate records. The filtered data set for 1997 contained 18 percent fewer records than did the raw data set for that year.

Mortality data

The mortality statistics maintained by NZHIS are based on death certificates completed by medical practitioners, post mortem reports, coroners' certificates and death registration forms completed by funeral directors. Supplementary data are obtained from a variety of other sources (such as public hospitals and the New Zealand Cancer Registry). The most recent available mortality data used in this publication are for 1996, although provisional 1997 mortality data are used for certain analyses.

When a person dies, the law requires that the death be registered within seven days; however, there is no time limit after which a death may not be registered. National mortality statistics are based on death registrations – not on actual deaths – during a specific year, but there is only a very small variation each year between the number of registrations and the actual number of deaths.

Cancer registrations

The New Zealand Cancer Registry was established in the Department of Health in 1948, and is now maintained by NZHIS as a register of all types of malignant neoplasms except basal and squamous cell skin cancers. Cancers reported on death certificates and incidental autopsy findings are also registered.

The New Zealand Cancer Registry has been limited by under reporting in the past – for example, of melanoma (Elwood and Glasgow 1993). In an attempt to address this general problem, the Cancer Registry Act 1993, which came into force in July 1994, requires pathology laboratories to supply the Registry with a copy of any pathology report with a diagnosis of cancer. While this has improved the coverage of the Registry, other dimensions of data quality remain to be fully evaluated. The latest available cancer registration and mortality data used in this publication are for 1995 and 1996 respectively.

Health survey data

Data on the prevalence of some diseases, disabilities and risk factors are primarily based on three national population surveys fielded in 1996–97: the New Zealand Health Survey, the National Nutrition Survey and the New Zealand Disability Surveys. For some analyses, data were also extracted from other national or regional surveys or epidemiological studies; these are indicated in the relevant chapters.

The New Zealand Health Survey 1996–97

This survey, the second national health survey, was sponsored by the Ministry of Health and fielded by Statistics New Zealand from October 1996 to October 1997. The survey population was the usually resident civilian population of all ages, living in private dwellings. A stratified cluster sampling process was used to sample this population, using an area based sampling frame. One adult was randomly selected from each selected household to participate in the survey; a subsample was asked to act as proxy respondent for a selected child in the household. Māori and Pacific ethnic groups were oversampled. The achieved sample size was 7862 adults and 1019 children, an overall participation rate of 74 percent. Data were collected through personal interview, except for SF-36 (self reported health) and AUDIT (alcohol related behaviour) questionnaires, which were self completed.

The survey collected data on health status, including self reported health, disability, injury and selected chronic diseases (asthma and diabetes). Data were also collected on health risk behaviours and other risk factors (smoking, lack of physical activity, hazardous drinking and high blood pressure). Finally, the survey asked about the use of, and satisfaction with, health care services.

The National Nutrition Survey 1997

Adult participants in the New Zealand Health Survey were invited to participate in the National Nutrition Survey. The achieved sample size for all components was 4636, representing a participation rate of only 50.1 percent overall, but 84.7 percent of New Zealand Health Survey respondents who consented to being contacted about participation in this survey. Because of this relatively low response rate, caution should be used in interpreting analyses based on National Nutrition Survey data. The oversampling of Māori and Pacific people in the Health Survey was carried through to this survey. Through the use of computer assisted interviewing, anthropometric testing, medical examination and blood sampling, the survey collected extensive data on food consumption patterns, nutrient intakes and nutritional status.

The New Zealand Disability Surveys 1996–97

The 1996 Household Disability Survey and its companion 1997 Disability Survey of Residential Facilities, sponsored by several government agencies including the Ministry of Health and fielded by Statistics New Zealand, were the first ever national surveys of disability in New Zealand. The two surveys were designed to be pooled, thereby providing national estimates of disability prevalence both for people living in private dwellings and for those living in residential institutions. For ease of description, the surveys are referred to collectively in this report as the New Zealand Disability Surveys 1996–97.

The household survey was linked to the 1996 Census, so allowing use of information collected in the census. The census also provided the sampling frame, which involved a multi stage sample of private households with stratification by region, ethnicity and age. The data were collected by

personal interview. A series of screening questions was used to identify participants with disability, the others forming the control group. A more detailed content questionnaire was then administered to respondents with disability. Disability was defined on the basis of self report or proxy (caregiver) report, when necessary.

The survey of residential facilities was based on a stratified random sample of long term residential institutions for people with disabilities and older people (hospitals, rest homes and long stay institutions for people with intellectual, psychiatric and physical disabilities). This survey was designed so that the data collected could be pooled with the household survey data, enabling the calculation of population-based disability prevalence rates.

Both household and institutional samples were nationally representative. The achieved sample sizes were 17,548 and 1016 respectively, representing response rates of 86 percent and 92 percent.

The functional concept of disability, defined as any limitation in activity resulting from a long term condition or health problem, was used in these linked surveys. Respondents who indicated they experienced difficulty or needed help performing specified everyday activities because of a long term condition or health problem were considered to have a disability. For children under 15 years (reported via proxy), a broader definition was used which included specific chronic conditions and education or other support needs. A disability had to have lasted for a minimum of six months (or be expected to last for that time) and not be eliminated through the use of simple corrective devices such as eyeglasses. For the analyses presented here – and in earlier reports on the surveys (HFA and Ministry of Health 1998) – the survey definition of disability was adapted to be compatible with that used for disability support service eligibility. A severity score based on the need for assistance (rather than on the number of functional limitations) was developed by a health and disability sector working group for this purpose.

In addition to information about the level (severity) of disability, the survey provided data on the type, multiplicity, age of onset, duration and cause of the disability. The content questionnaire focused on the impact of disability on respondents' lives, including such topics as employment, income, accommodation, transport, recreation, education and training, living arrangements and social support.

Statistical methods

Age specific and age standardised rates

This report uses both age specific and age standardised rates. Age standardisation is a technique for reducing the effect of variations in the population age structure when comparing rates between populations (or subgroups of the population), or rates for the same population at different times (Borman 1995).

This report has used direct standardisation by applying the age specific rates for a particular subgroup or time period to a standard population, namely Segi's world population. This was done because Segi's world population has been widely used in earlier reports on population health status in New Zealand (for example, PHC 1994). However, this model population has a much younger age structure than the current New Zealand population, with the result that the contribution of older people to age standardised mortality or morbidity rates may be

undervalued.* For international comparisons, the OECD reference population has been used, as the OECD health statistical database does not allow for other options.

Spatial analyses

This report does not describe the geographical distribution of death, disability or disease within New Zealand. Such analyses may be found in reports of the Health Funding Authority or its predecessor, the Regional Health Authorities. The focus here is on the total population of New Zealand and on comparisons across subgroups of the population (differentiated by age, gender, ethnicity and socioeconomic status) at the national level. This is not to deny the importance of geographical variations in health risks and outcomes, but such mapping is outside the scope of this report. Spatial analyses may be included in future editions, however.

NZDep96 index of deprivation

A spatial method has been used to derive a census-based small area index of deprivation, the ‘NZDep96’ (Salmond et al 1998). This index provides a deprivation score for each meshblock in New Zealand. Meshblocks are the smallest geographic unit defined by Statistics New Zealand, and contain a median of 90 people. The NZDep96 score is derived by principal component analysis of nine variables from the 1996 Census, representing eight domains of deprivation (both material and social) (Table 21). It is scaled to have a mean of 1000 and a standard deviation of 100 index points. Scores may be grouped into deciles or other categories to create an ordinal scale.

Table 21: Census variables included in the NZDep96

	Variable	Description
1	Communication	proportion of people with no access to a telephone
2	Income	proportion of people aged 18–59 receiving a means tested benefit
3	Employment	proportion of people aged 18–59 who are unemployed
4	Income	proportion of people living in households with equivalised household income below a defined income threshold
5	Transport	proportion of people with no access to a car
6	Support	proportion of people aged < 60 living in a single parent family
7	Qualifications	proportion of people aged 18–59 without any qualifications
8	Owned home	proportion of people not living in own home
9	Living space	proportion of people living in households below equivalised bedroom occupancy threshold

Individuals are assigned a score (or placed in a decile) by geocoding their usual residential address to a meshblock. The deprivation index applies to areas, not people, and so captures contextual as well as compositional variables affecting socioeconomic status. However, it is used in this report also as a proxy for individual socioeconomic status when individual level data on income, education or occupation are not available. When used in this way, the heterogeneity that exists within meshblocks means that any socioeconomic gradient in the outcome of interest will probably be under-estimated.

* On the other hand, Segi’s world population is well suited to the Māori and Pacific populations, which have a younger age structure than the European/Other population.

The interaction between ethnicity and socioeconomic status in New Zealand is clearly illustrated by comparing the deprivation profiles of the different ethnic groups (Figure 25).

Figure 25a: Deprivation profile (NZDep96), Māori, 1996

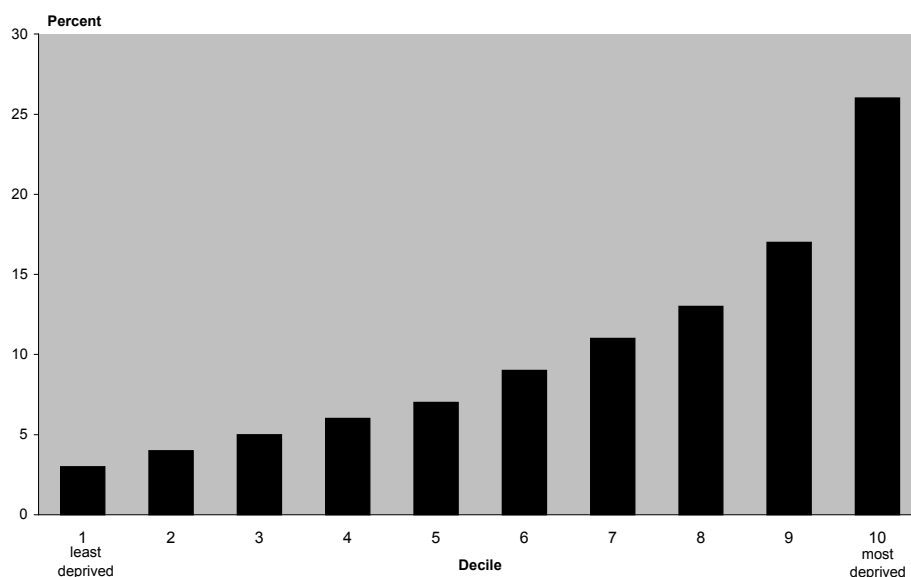
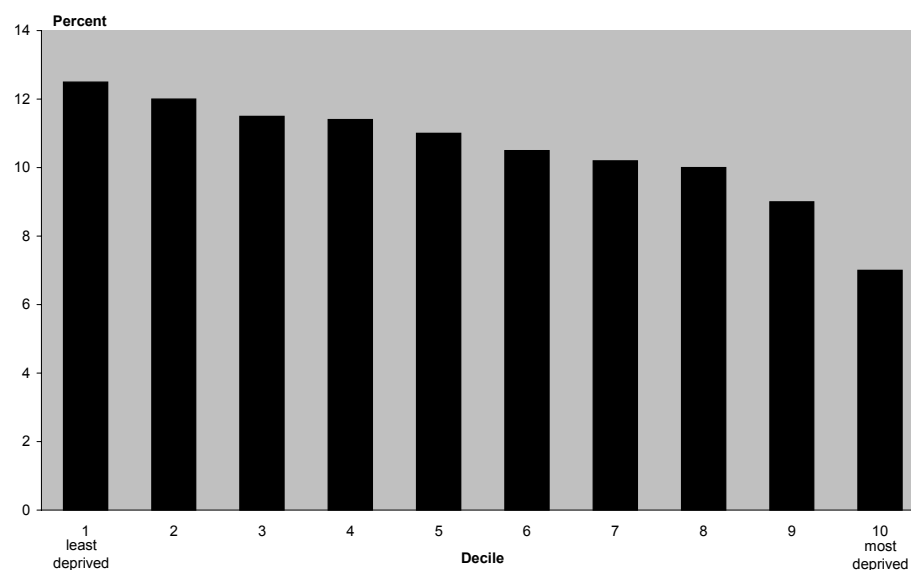


Figure 25b: Deprivation profile (NZDep96), non-Māori, 1996



Source of base data: SNZ
 Note: scale varies between charts.

Specific indicators and methods

The construction of indicators (such as YLL or ILE) and methods (such as burden of disease analysis or calculation of population attributable risks) specific to particular analyses are explained in the relevant chapters. Further details on methods, and more detailed tables of data than can be published in this report, are also available from the Ministry of Health.