

POPULATION HEALTH MONITORING IN NEW ZEALAND

Paper submitted by New Zealand

Introduction

1. State of the Public Health Reporting Cycle

The Ministry of Health has a statutory requirement to monitor and report on the state of the public health. Since the early 1990s, this has involved a cycle of three reports:

- Annual report on progress toward specified health targets
- Five yearly comprehensive report on population health status
- Five yearly report on health determinants

1.1 Progress on Health Outcome Targets

Currently approximately 25 targets are monitored, but with subtargets this amounts to over 100 data series. The targets range from specific health outcomes (eg youth suicide rate) to biological risk factors (eg obesity prevalence), lifestyle behaviours (eg smoking prevalence), and health service utilisation rates (eg immunisation coverage).

The targets were developed to address a set of public health goals and objectives through a process involving:

- Selection of an appropriate indicator (direct or proxy measure)
- Establishment of baseline and historical trend
- Projection of the 'business as usual' path
- Estimation of the incremental effect of the proposed strategies

Target indicators are updated annually (where the data source is a mortality or health service record) or five yearly (where the data source is a survey). In addition, the strategies being implemented to attain the targets are updated annually.

.2 Our Health Our Future

The comprehensive five yearly report on population health status was produced for the second time in 1999, and comprised four parts:

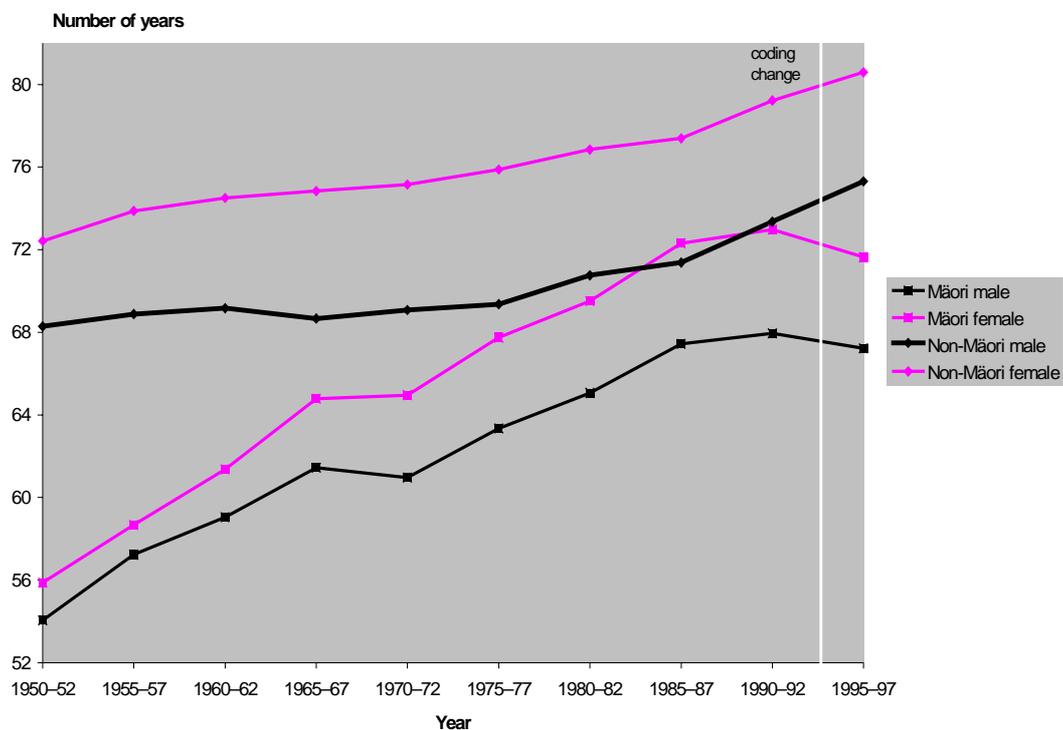
- Mortality analysis
- Morbidity analysis
- Summary measures of population health
- Scope for health gain

1.21 Mortality analysis

The mortality analysis examined:

- Mortality risks
- Life expectancies
- Years of life lost

Box 1 Life expectancy at birth by gender and ethnicity, 19951-1997*



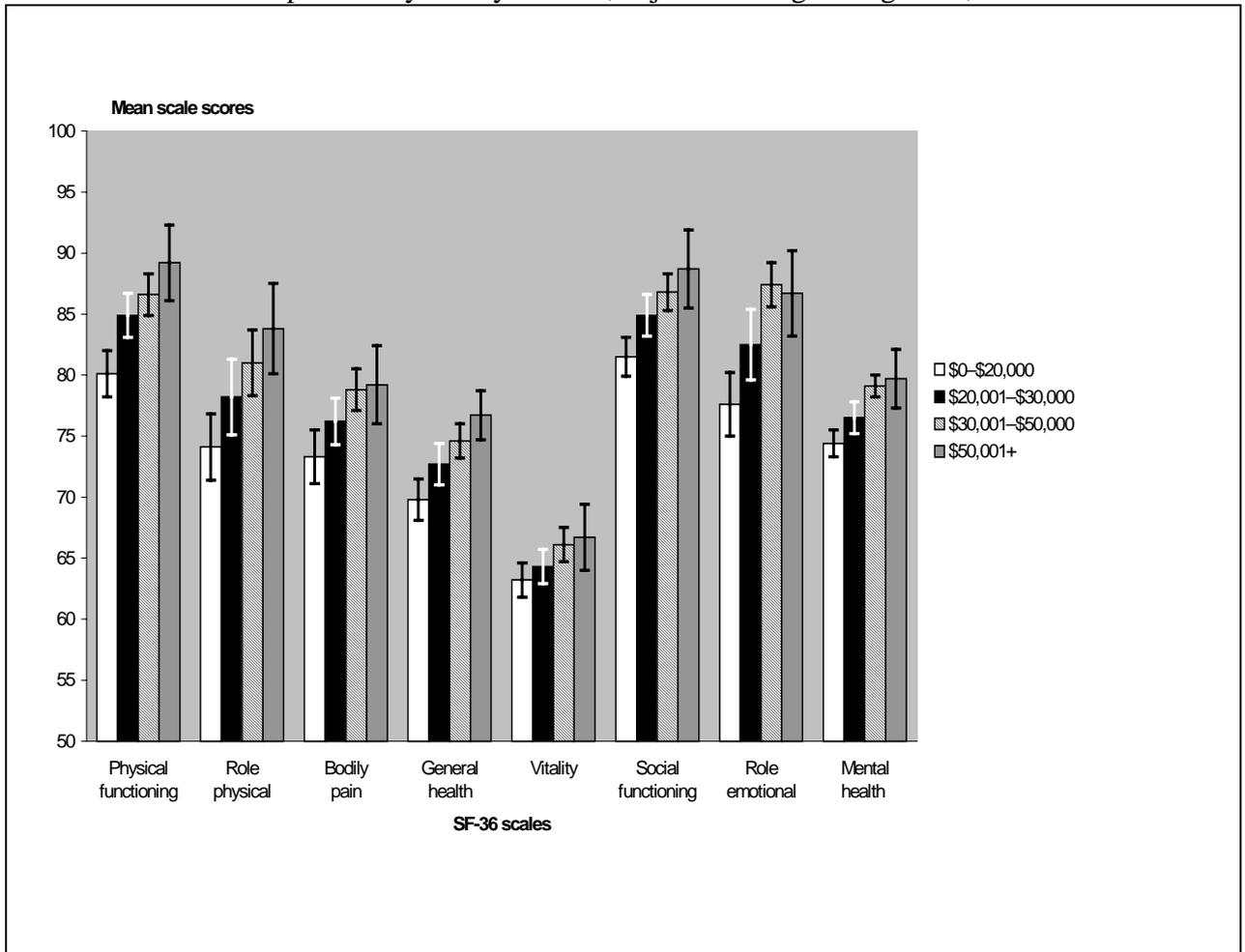
* boxes show illustrative examples

1.22 Morbidity analysis

The morbidity analysis examined:

- Self reported health status (SF-36)
- Disability (functional and activity limitation)
- Chronic disease prevalence
- Hospitalisation rates

Box 2 SF-36 profiles by family income, adjusted for age and gender, 1997



1.23 Summary measures of population health (SMPH)

SMPHs included both health expectancy and health gap measures:

- Independent life expectancy
- New Zealand Burden of Disease Study

1.231 Independent life expectancy (ILE)

ILE was proposed as a key SMPH because the threshold of disability involved in its construction – dependency (ie need for assistance) – is both statistically robust and well aligned with major policy goals (see page 17). ILE in New Zealand in 1997 was calculated by the observed prevalence method using disability data from the 1997 Household and Institutional Disability Surveys.

ILE at birth was estimated to be 64.6 years for males and 67.9 years for females, 87 and 85 percent of total life expectancy respectively. ILE was shown to decline more rapidly than total LE after middle age – yet even at age 65, almost two thirds of remaining life expectancy will be lived independently. At each age the gender gap in ILE is less than the corresponding gap in total LE; thus females spend higher proportions of their longer lives in states of dependency than males. The ethnic difference in health expectancy is also more marked than that of life expectancy for most age-gender groups.

The contribution of different age groups and different causes to ILE was investigated using standard cause deletion methods.

Box 3 Elasticity of Independent Life Expectancy

Independent life expectancy, adjusted for 1 percent changes in mortality and disability prevalence rates, selected ages, by gender, 1996–97

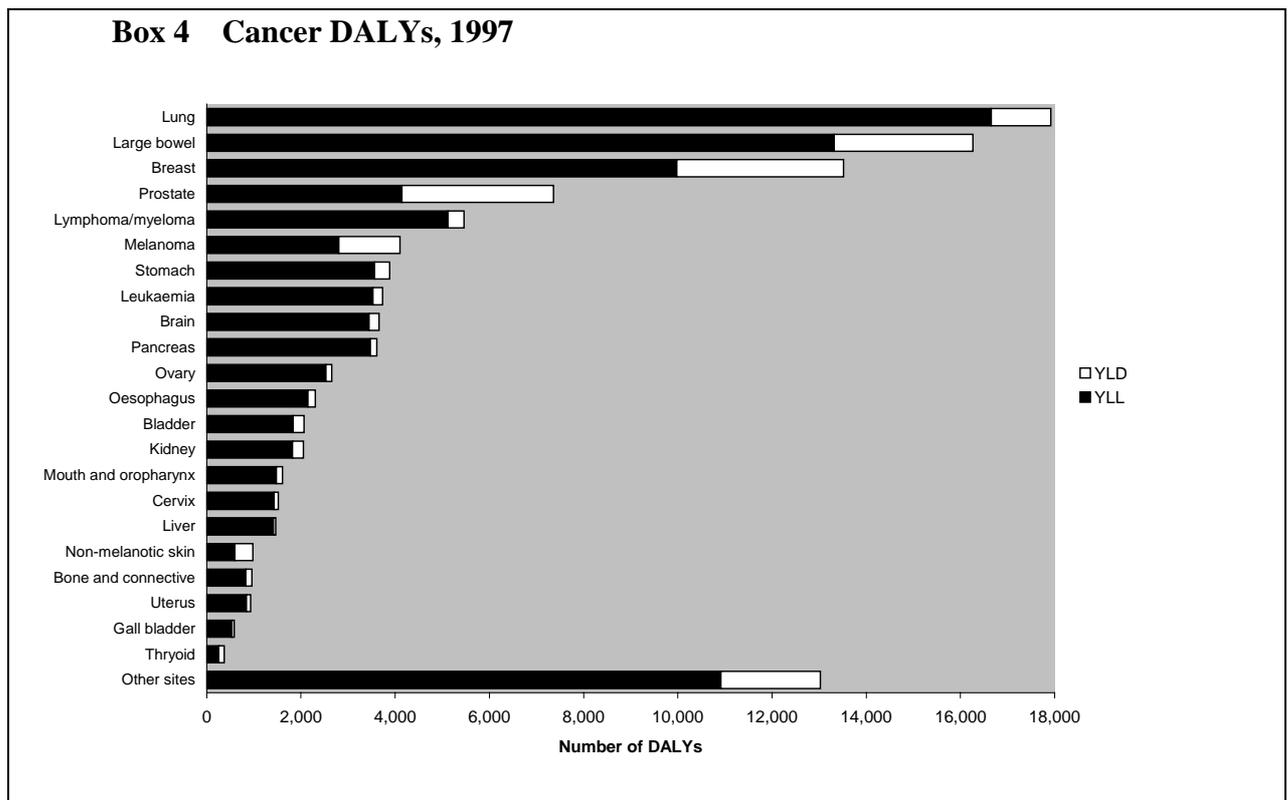
		Number of years (percentages) gained/lost from:			
		1% reduction in both mortality and disability		1% reduction in mortality and 1% increase in disability	
		Male	Female	Male	Female
At birth	Life expectancy	0.13 (0.17%)	0.12 (0.15%)	0.13 (0.17%)	0.12 (0.15%)
	ILE	0.17 (0.27%)	0.18 (0.26%)	-0.02 (-0.03%)	-0.06 (-0.08%)
At age 15	Life expectancy	0.12 (0.20%)	0.11 (0.17%)	0.12 (0.20%)	0.11 (0.17%)
	ILE	0.16 (0.31%)	0.17 (0.31%)	-0.02 (-0.03%)	-0.06 (-0.10%)
At age 45	Life expectancy	0.11 (0.33%)	0.10 (0.29%)	0.11 (0.33%)	0.10 (0.29%)
	ILE	0.13 (0.52%)	0.14 (0.51%)	-0.02 (-0.07%)	-0.04 (-0.16%)
At age 65	Life expectancy	0.09 (0.56%)	0.09 (0.46%)	0.09 (0.56%)	0.09 (0.46%)

ILE	0.10 (0.99%)	0.11 (0.92%)	-0.02 0.19%)	(- -0.04 0.33%)	(-
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1.232 New Zealand Burden of Disease Study

Selection of conditions was similar to that of the Australian Burden of Disease Study, which also provided most of the disease natural histories, disability weights, and comorbidity adjustors, as well as epidemiological data for those conditions for which New Zealand data were unavailable.

A home-grown multistate life table model was used in preference to DISMOD for estimating incidence rates. DALYs were discounted but not age weighted. Lack of epidemiologic data meant that YLD estimates were highly uncertain for many conditions, necessitating sensitivity analysis.

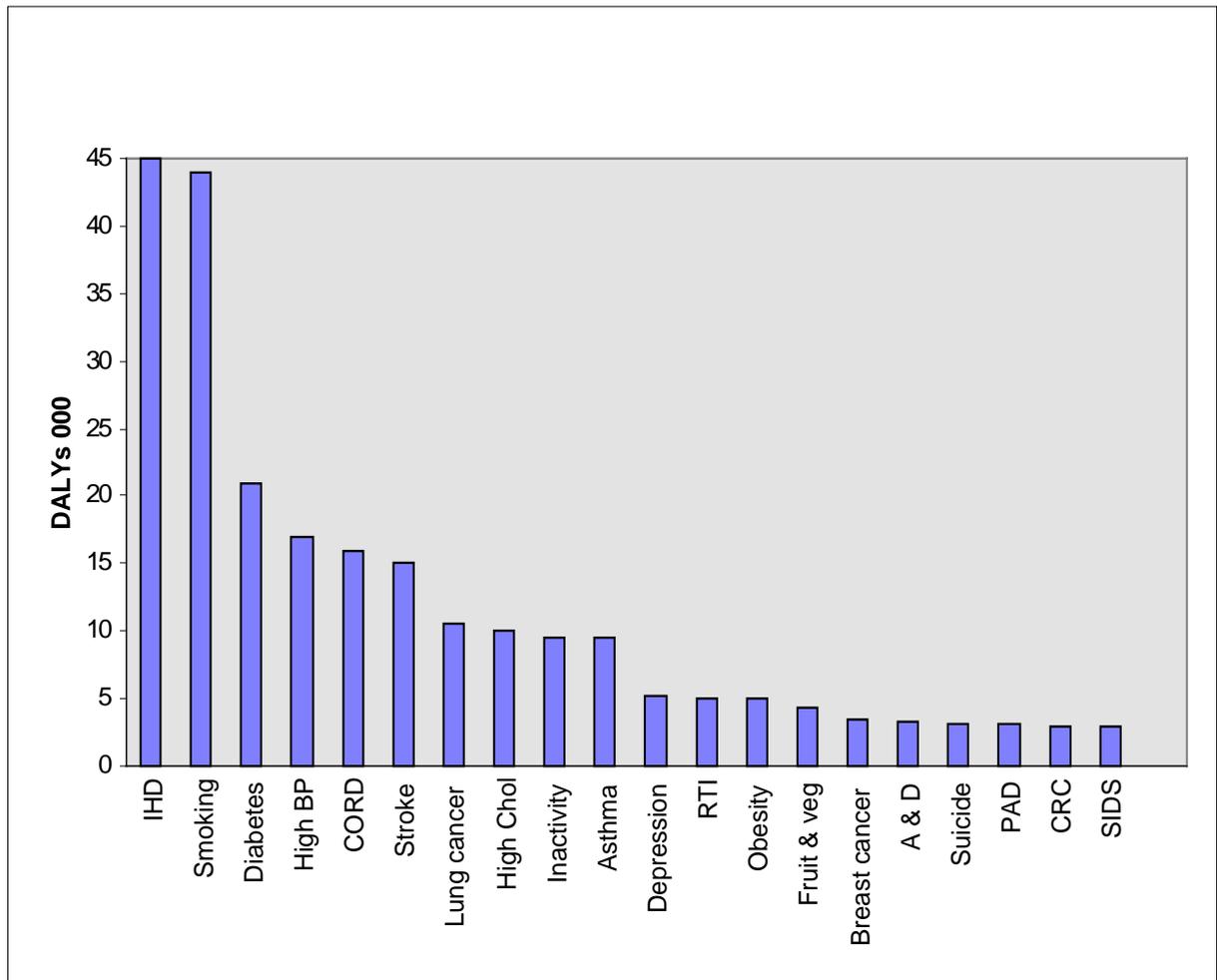


Box 5 Equity adjusted modifiable DALYs

Following a change in government in 1999, a *New Zealand Health Strategy (NZHS)* is being developed. The NZBDS was used to provide epidemiologic input into the selection of priority health objectives for the NZHS.

This involved estimation of ‘equity adjusted modifiable DALYs’ to quantify the scope for health and equity gain from each condition included in the NZBDS (modifiability multipliers were based on expert judgement of a panel, and equity adjustors were derived from an impact share model, which took into account how unequally each condition was distributed between Maori and non-Maori and the contribution made by each condition to the total DALY gap between the two ethnic groups).

Top twenty causes of equity adjusted modifiable DALYs lost, 1997



1.24 Scope for health gain

The scope for health gain was estimated in three ways:

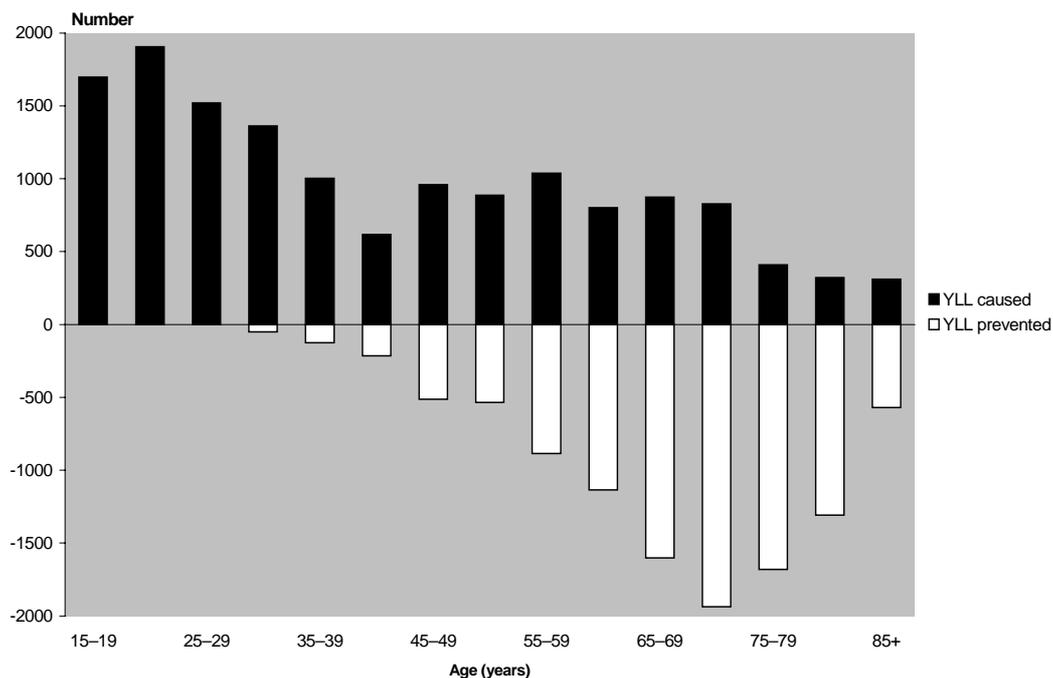
- International benchmarking (OECD database)
- Calculation of 'avoidable' mortality and morbidity (categorical attribution, list of conditions updated and upper age limit extended to 75 years)
- Population attributable risks of eight chronic disease risk factors (standard univariate methods)

Box 6 Attributable fractions

Selection of risk factors was based on availability of recent national prevalence data from the survey programme, together with robust estimates of relative risk of incidence or mortality from the literature; this excluded determinants.

Attributable fractions were calculated for both DALYs and YLL separately; the latter are more robust. The estimates for alcohol are shown below for illustration.

YLL caused / prevented through alcohol consumption, by age (genders pooled), 1997



1.3 Social Inequalities in Health

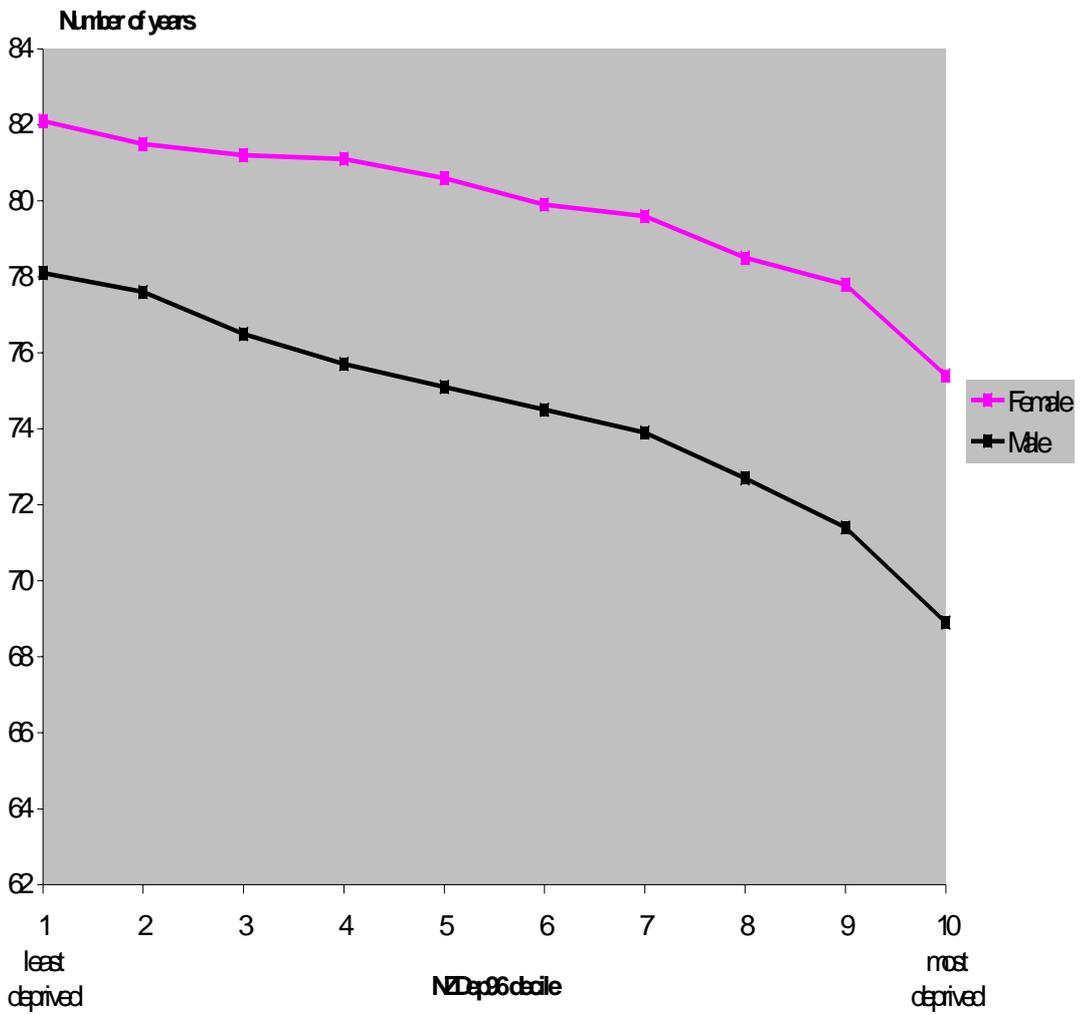
Social Inequalities in Health: New Zealand 1999, the first five yearly companion report to *Our Health Our Future*, was published earlier this year. It explores in detail social gradients in health in New Zealand in the mid to late 1990s, using a range of:

- SES and deprivation measures
- health outcome, health risk, and health service utilisation measures.

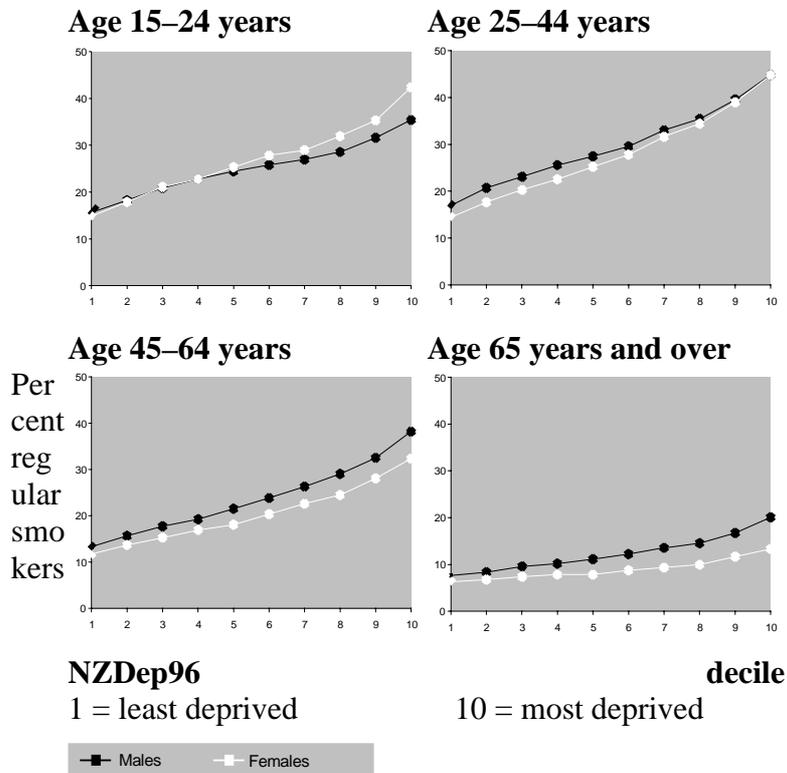
The deprivation index used – the NZDep96 – is a census based small area index derived by principal components analysis of nine socio-economic variables from the 1996 Census; the geographic unit is the meshblock, which has a median population of 90 people.

Social gradients were stratified by age, gender and ethnicity, and inequality summary statistics – which typically assume linearity – were not used (although in many cases the gradients are in fact reasonably monotonic).

Box 7 Life expectancy at birth by deprivation decile, 1995-97



Box 8 Prevalence of regular smokers by gender, age group and deprivation decile, 1996



1.31 NZ Census Mortality Study

A record linkage study, the New Zealand Census Mortality Study, is currently in progress. This study, which links Census questionnaires to deaths occurring over the following 4 years (using probability matching), should enable partitioning of the compositional and contextual effects captured by the NZDep96 deprivation index. It will also enable more detailed analysis of socio-economic mortality gradients than is currently possible, and will become a key tool for monitoring social inequalities in health in future reports.

2 The Periodic Health Related Survey Programme

Data for the SPHR cycle is sourced mainly from:

- the National Minimum Data Set maintained by the New Zealand Health Information Service (comprising mortality, hospitalisations, and cancer registrations)
- the national periodic survey programme
- other databases maintained by specialised agencies (eg DrownBase maintained by the Water Safety Council)

At present the periodic survey programme comprises:

Core surveys:

- New Zealand Health Survey (five yearly)
1992, 1997 (mental health 2000), 2002
- National Nutrition Survey (ten yearly)
1978, 1989, 1997 (child nutrition 2000)
- Household Disability Survey (post censal) and companion Disability Survey of Residential Facilities (five yearly)
1997, 2002

Non core surveys: (smaller, more ad hoc or irregular surveys)

- drug use (smoking is sometimes included in the Census)
- sun exposure
- partner relations and fertility
- breastfeeding
- second hand smoke exposure
- other topics.

2.1 The 1996/97 New Zealand Health Survey

Design:

Study population	Total usually resident noninstitutionalised civilian population of all ages residing in private households
Sampling strategy	Stratified cluster sampling of households using an area based frame, with oversampling of Maori and Pacific households. One eligible adult was selected randomly from each selected household. One child was also selected randomly from those selected households containing children, and an adult parent or caregiver acted as proxy respondent for the selected child.
Achieved sample	7862 adults and 1019 children

size	
Overall participation rate	73.8%
Administration method	Face to face interview (except for the SF-36 and AUDIT which were self completed) over a twelve month period (October 1996 – October 1997)
Forms	Household form Adult health questionnaire Child health questionnaire 'General Health' questionnaire (SF-36 and AUDIT) – adults only

Content:

Health status	Self reported physical and mental health (SF-36) Disability (filter questions) Chronic diseases (asthma, diabetes and high BP) Injuries
Behavioural risk factors	Smoking Alcohol (AUDIT) Physical Activity
Health service use	Frequency of contact Reason for last contact Satisfaction with last contact Unmet need for care Prescriptions (including non-collection)
SES	Educational qualifications Occupation Labour force status Income (family, not equivalised) Health insurance and health cards Housing tenure Number of bedrooms
Demography	Age Gender Ethnicity Living arrangements

Box 9 Cultural specificity of the SF-36

A principal components analysis was carried out on the SF-36 scale scores as a test of construct validity. The factor analysis was performed using the Proc Factor component of the SAS

package (SAS Institute Inc.), specifying two factors and varimax rotation. A survey weight (uniquely assigned to each respondent) was applied which adjusted for varying probabilities of selection among members of the sample population, and post-stratified the age and sex distribution of the sample so that it matched the age and sex distribution of the New Zealand population. The principal components analysis was performed on the weighted data. Comparisons of the factor structure across ethnic groups were age and sex-standardised (but age stratified within ethnic groups).

In the NZ European population the factor structure of the SF-36 is very similar to that found in the US general population (Ware et al 1994), with the Mental Health (MH) scale loading most highly onto the mental health factor, the Physical Functioning (PF) scale loading most highly on the physical health factor, and the other scales clustering in a roughly similar manner to the US sample.

Pacific people however, show a different pattern. In the Pacific population it is the Vitality (VT) scale that loads most highly on the mental health factor (followed by the MH scale), and the Role Physical (RP) scale that loads most highly on the physical health factor (followed by the PF scale). The Bodily Pain (BP) scale, which in Europeans loads mainly onto the physical health factor, in the Pacific population loads higher on the mental component. The same applies to the General Health (GH) scale. By contrast, the Role Emotional (RE) scale shows the opposite reversal.

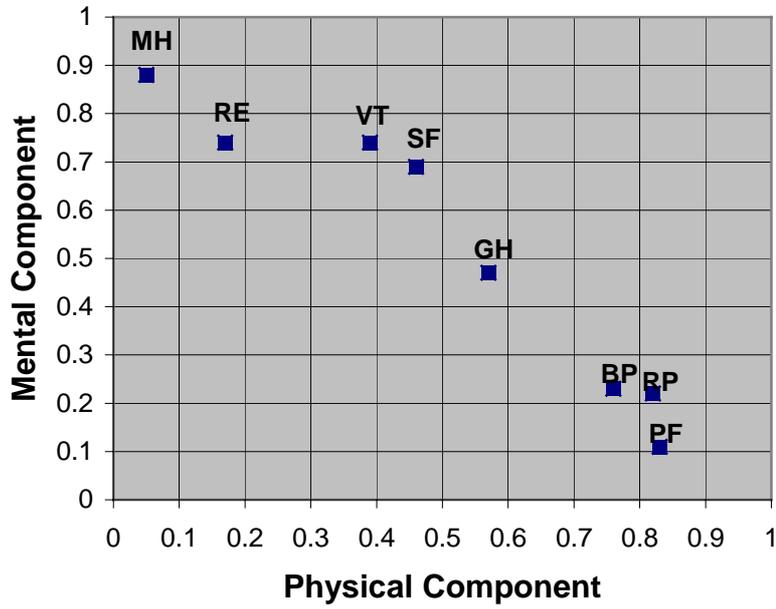
Maori showed an intermediate pattern, but (unlike the case for the other two ethnic groups) this was age dependent, with younger Maori (<45 years) showing a similar pattern to the European, and older Maori (>45 years, and especially >65 years) showing a single rather than a two factor underlying structure.

Although a confirmatory factor analysis would provide a more formal test of ethnic differences in underlying structure, the statistical assumptions required for such an analysis are not met by complex survey data.

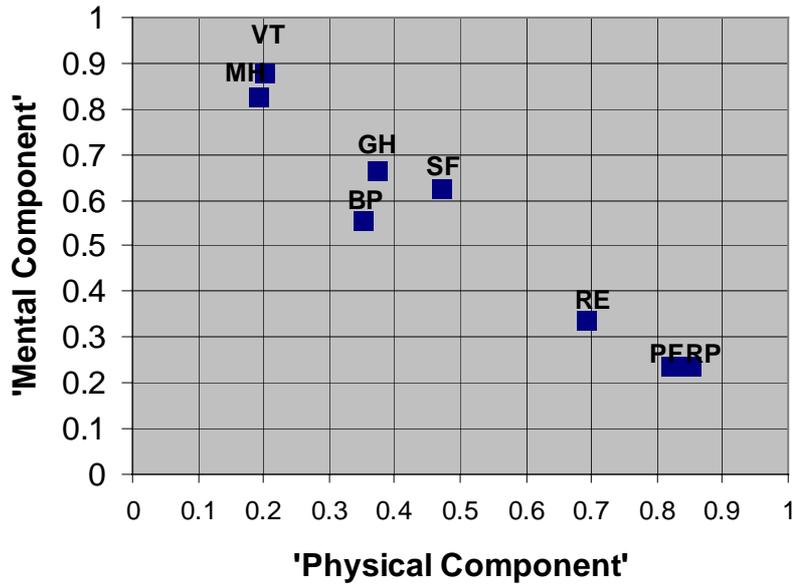
Comparison of SF-36 profiles and (especially) summary component scores between ethnic groups in New Zealand thus appears problematic, using the criteria suggested by Ware (Ware 1998) – particularly the factor loading pattern.

European and Pacific factor loading patterns are shown below:

NEW ZEALAND EUROPEAN (n=5467)



PACIFIC (n=618)



2.2 1997 National Nutrition Survey

Design:

Study population	Total usually resident noninstitutionalised civilian population aged 15 or more years residing in private households
Sampling strategy	Stratified random subsample from the NZHS sample, with continuation of the oversampling of Maori and Pacific households
Achieved sample size	4636 adults
Overall participation rate	84.7% of selected NZHS respondents
Administration method	Face to face interview and examination, over a twelve month period from December 1996 to November 1997
Forms and tests	Multiple pass 24 hour dietary recall Dietary supplements questionnaire 'Your Usual Food Intake' questionnaire (a qualitative FFQ) 'Barriers to Dietary Change' questionnaire Food Security Questionnaire Anthropometric measurements (height, weight, circumferences, elbow breadth, skinfolds) Blood pressure Blood sample (haematology, blood lipids, iron status, other analytes)

Content:

Health status	Body size and composition Blood pressure Blood lipid profile Iron status
Nutrient intakes	Energy Protein Fats Carbohydrates Fibre Alcohol Vitamins Minerals
Dietary sources (food intakes)	Breads and cereals Dairy foods Meat and fish Fruits and vegetables Beverages

	Miscellaneous foods
Eating patterns	Type of diet Food preparation practices Dietary change and barriers Household food security
Dietary supplements	Vitamins Minerals Other

2.3 1997 Household and Residential Disability Surveys

Design:

	Household Survey	Residential Facilities Survey
Study population	Total usually resident noninstitutionalised civilian population of all ages residing in private households	All people aged 15 years or more living in health related long stay residential facilities
Sampling strategy	Stratified random samples of adults and children with positive and negative responses to the two disability filter questions in the 1996 Census, in proportions suggested by a conversion study, with oversampling of Maori, Pacific and (among adults) older people	Two stage stratified random sample of residential facilities followed by residents within the selected facilities
Achieved sample size	17 548 (4100 reporting and 13 448 not reporting disability) Respondents with disability comprised 2 669 adults and 1 431 children	1016 (all reporting disability)
Overall participation rate	86%	92%
Administration method	Telephone interview (Face to face interview if necessary) Proxy respondent (parent or caregiver) for child participants (Proxy caregiver respondent for adult if necessary) Fielded May 1996	Face to face interview (proxy if necessary) Fielded February 1997
Forms	Adult screening questionnaire Adult content questionnaire	Modified adult content questionnaire

	Child screening questionnaire Child content questionnaire	
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Content:

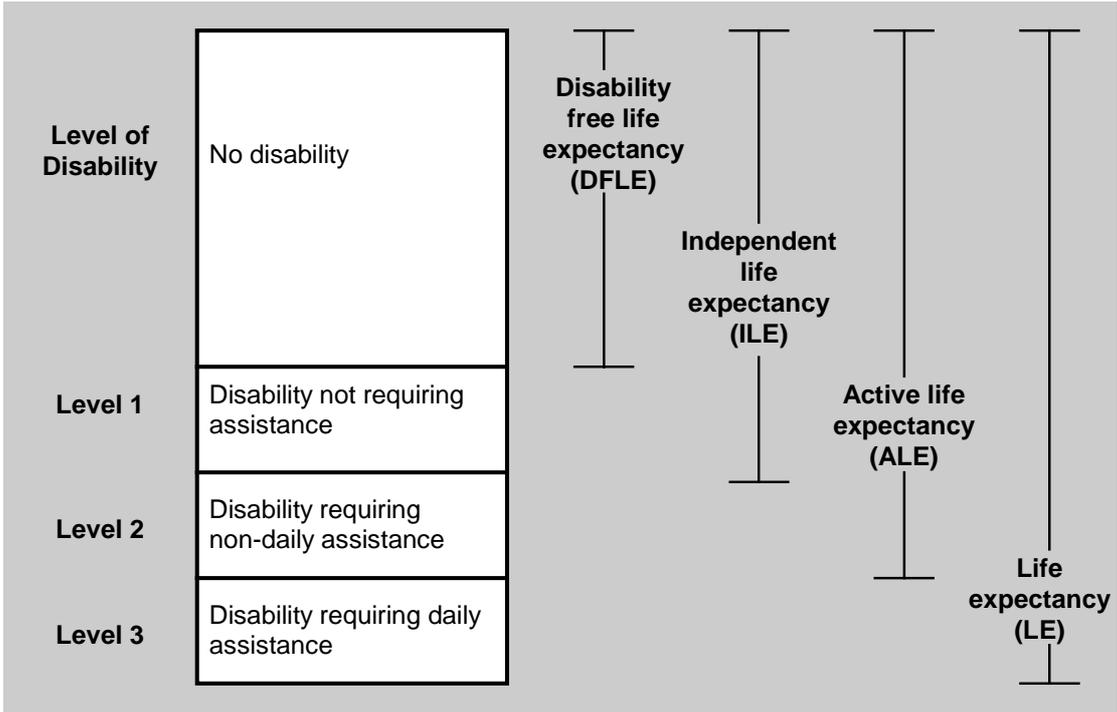
Disability status	Severity Type Multiplicity Onset and duration Cause	Content as for household survey, but less detailed for some items
Service use	Met needs Unmet needs	
Impact	Work / schooling Income Housing Transport Discrimination / Barriers	
SES	Education Income Benefit receipt Occupation Labour force status Housing tenure Assets (car, phone)	
Demography	Age Gender Ethnicity Living arrangements	

Box 10 Measuring the severity of disability

The social impact of disability was measured in terms of level of dependency:

- level 1 – functional limitation acknowledged, but any need for personal assistance or a complex assistive device denied
- level 2 – functional limitation requiring personal assistance (including supervision) or use of a complex assistive device, but not on a daily basis
- level 3 – functional limitation requiring personal assistance or supervision, or use of a complex assistive device, on a continuous or daily basis

This severity grading enabled life expectancy to be partitioned into active, independent and disability free components, as illustrated:



I.

II. 3. Data and indicator development

3.1 Key improvements needed for monitoring population health:

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) - underway • linkage of mortality records to census questionnaires – 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

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 (eg diabetes) • add a longitudinal component to the health survey

<p>Risk factor prevalence^c</p>	<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
<p>Hospitalisation rates (all-cause and avoidable causes)</p>	<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 (ICD10)
<p>Health expectancies (especially ILE and DALE)</p>	<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 • valuation exercise to obtain social preferences for different disability states so that DALE can be monitored instead of, or in addition to, ILE • standardise definitions, indicators, instruments

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

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

Notes:

- DALE and DALYs are proposed as the key SMPHs, in keeping with the framework for measuring health system performance employed in the *World Health Report 2000*
- Implementation of the New Zealand Health Strategy will involve substitution of the existing health outcome targets with a new set, reflecting changes to the public health goals and objectives.

3.2 Proposed development of the periodic survey program

Change	Comment
Integration	Health, mental health, nutrition, disability and behavioural surveys (for adults and children) currently not fully integrated – leading to gaps and overlaps
Harmonisation	Enhance international benchmarking (cf ICIDH2)
Longitudinal dimension	Even a single follow up 12 months after baseline would allow estimation of transition rates between states
Wider record linkage	Required for both integration of surveys and cohort studies
Specific enhancements – Health Survey	Replace SF-36 Extend chronic disease module Add (subsample) external calibrators Add (subsample) valuation exercise

4. Recent SPHR publications

(available as hard copy or on the web www.moh.govt.nz)

- *Progress on Health Outcome Targets 1999*
- *Our Health Our Future: The Health of New Zealanders 1999*
- *Social Inequalities in Health: New Zealand 1999*
- *Taking the Pulse: report on the 1996-97 New Zealand Health Survey*
- *NZ Food NZ People: report on the 1997 National Nutrition Survey*
- *Disability in New Zealand: overview of the 1996 Household Disability Survey and 1997 Disability Survey of Residential Facilities*