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New Zealand Regions, 1986-2001: Hospitalisation and some Related Health Facts

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New Zealand Regions, 1986 – 2001: Hospitalisation and some Related Health Facts

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Abstract
Once age and gender composition is controlled for, regional health differentials are a function of problems of health service delivery, of socio-economic variance, and overall Māori Pakeha health differences. They indicate relative levels of exclusion and of inequality. This paper shows that these differentials follow in general the patterns seen in other papers in this series.

Keywords: Health, Hospitalisation, Regions, New Zealand

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1. Introduction

This working paper is part of a large project, funded by the Foundation for Research, Science and Technology (FoRST), being undertaken by the Population Studies Centre. This project explores the links between different types of population transitions, social transformations of various kinds and changes in the political economy of New Zealand's regions between the 1980s and the dawn of the 21st century. It relates to a period of rapid change at the end of which the regional architecture of the country was very different from the way it had been in 1985. The trends also represent a radical departure from what preceded these last two decades.

This particular discussion paper. Uses data collected by the New Zealand Health Information Service on Hospitalisation, Mortality and Health Professionals. Also data from the five yearly Census of Population and Dwellings collected by Statistics New Zealand are used in the denominator for calculations of rates Smoking information from the 1996 census is also used. These data are used to examine the differences between regions in New Zealand[1].

2. Health

In a previous discussion paper the problems of exclusion and cohesion, and thus demand for social services such as benefits were looked at (Pool et al. 2006a). The present paper extends this into another related area: health. In part health is an indicator of a range of dimensions of social and economic development and differentials. Clearly, regions with poorer general levels of health maybe considered to be "excluded". In this sense also relative levels, at a population level, of good/poor health may measure problems in policy and planning, and terms of successes or failures in the system and in access to services. Finally, health can also be taken as a factor of human capital, as one of the measures of its quality (Stroombergen et al. 2002).

To look at the health system it is difficult to obtain data on all dimensions. This paper focuses primarily on one dimension: hospitalisation. It is, however, a very critical dimension particularly if the analysis of admission to hospital is integrated with information on survivorship - a factor already covered in Pool et al. (2005c). A measure combining both hospitalisation and survivorship will be employed later in this paper. Together these two dimensions and especially a composite measure combining them allows a robust evaluation of the health system. This had been summarised in an apposite comment by a senior health official: "A nation's health can be measured by how long we live and how often we end up in hospital" (Primrose 2003).

The present paper is different from the other papers in this series in that it is derived in part from a monograph-length study on regional changes in health in New Zealand 1980-2001. The regions used there are, however, different from those employed here; the former are close to District Health Boards (DHBs), or groupings of these, whereas the areas employed here are Regional Councils. Nevertheless in some cases the configurations are not too different. Most importantly, this other research provides a robust support for the analysis here, showing how

[1] Other topics covered in this series of discussion papers are listed in the end piece to this paper. The culmination of this project will be the publishing of a monograph synthesizing the various themes explored in this series of working papers (Pool et al. forthcoming-a).

health patterns vary over time and geographically (Pool et al. forthcoming-g)[2]. The present paper completes the analysis in that it contextualises health patterns by means of their socio-economic co-variants.

The period under review was one of rapid change across the entire health system. The basic institution that had existed, with some changes, since the *1900 Public Health Act* was subject to major restructuring, most of which had some impact on access and utilization of services. Changes to institutions (Hospital Boards especially) were formulated in the 1974 White paper and were gradually implemented, at least informally from about 1979. Restructuring was accelerated by the demise of Hospital Boards and their replacement firstly by Area Health Boards (AHBs), then by Regional Health Authorities (RHAs) and Crown Health Enterprises, and finally a return to (beyond the end of the period 1986-96) District Health Boards patterned along the lines of AHBs.

This institutional restructuring attempted to integrate primary, secondary and tertiary services. The change of longest duration in this history of frequent turnover of structures and processes adapted the neo-liberal philosophy extant at that time. For that period there was a division of function between "purchaser" of services (RHAs) and "provider" (CHEs), with central government block-funding the RHAs to meet health needs in their regions. The "purchaser – provider" split has continued in a more muted form. Moreover, there was decentralisation of control from central government (the Department of Health, that became a Ministry) to AHBs, RHAs and DHBs, yet with monitoring and micro-level management control from the Ministry and other central government agencies (e.g. the Crown Corporation Monitoring and Advisory Unit, linked to Treasury, that monitors Crown – owned entities such as the CHEs). There was also a shift from a salaried staff and administrative structure to out-sourcing. numerous functions of a managerial support type (e.g. cleaning). Another major change was the integration of disability and geriatric residential services into health.

Over the different periods of structuring and restructuring there was a surfeit of mission statements of varying degrees of utility and longevity. But one of them, near the end of the period covered in this paper, provides a check-list of factors that this paper will analyse and a framework for the evaluation of the hospital services, and by implication associated elements of the health system. Thus, the vision underpinning the New Zealand Government's general health strategy in 1998 was the provision of "timely access to quality, cost-effective health care throughout New Zealand". To meet that need a Hospital Services Plan was based on five objectives:

- timely access to hospitals
- safe, quality hospital services
- fairness across the country
- value for money
- acknowledging the needs of rural and provincial communities (English 1998)

There is a spatial dimension to this, which sets out some of the key factors that we examine in this paper. The "health" of a region is a very important indicator of the wellbeing of its people in relation to that of the whole New Zealand population. The health of the resident population of an area, and the access that the population has to health services is also a critical

[2] This project was funded by the Health Research Council of New Zealand and was titled "Sub-National Differentials in Population Health Status: Policy Implications" (98/587).

indicator of the "quality" of human capital. To this end, the utilisation of certain health services can be computed and this can be used as an indication of the health status of the population. Utilisation alone, however, is not the only measure of the health status of the community. The supply of services also has an influence on community health status. Much of the emphasis here will be on changes over time. In reviewing these, a basic question must be posed: Did changes produce health gains or, instead, decreases in levels of good health? This is a measure of the outcomes of the restructuring.

The data used in this paper are from a variety of sources. "Hospital discharge" data are from the New Zealand Health Information Service, *National Minimum Data Set, Public Hospital Discharges*. These data for each region, made up of medical-surgical inpatient discharges with obstetric and some other categories[3] excluded, have been "filtered" to ensure consistency over the time series (Katzenellenbogen et al. 2001). The regional population was then used as a denominator to calculate all the rates from the 1986, 1991, 1996 and 2001 Census of Population and Dwellings. Then a life-table method – Hospital Utilisation Expectancy – was designed specially for a larger study noted above (Pool et al. forthcoming-g), and applied here to the differently configured regional groupings. For the Hospital Utilisation Expectancies, mortality was also used from the New Zealand Health Information Service, *National Minimum Data Set, and Mortality*.

Four time periods were analysed and each one used three-year averages to minimise random fluctuations. The time periods used were 1985-87, 1990-92, 1995-97 and 1999-2001, the years around the censuses of 1986, 1991, 1996 and years up to and including 2001.

Most of the results presented here are based on cases (hospital discharges), and relate to region of residence. Data on the hospital, or even the type of hospital, to which a patient is referred are not available to non-officials or hospital management analysts, and, in any case are not relevant to our purposes. Near the end, however, public-record data on hospitals as institutions are analysed. At that stage also we look at the human resources in the health sector available in each region and the broader health context such as geographical and travel time factors affecting access to health care.

3. Hospital Stays

Hospital stays measure one aspect of health services utilisation by the population; by comparing regions we see if utilisation is different between segments of the population. The hospital bed-days per person are the sum of all the bed-days spent in hospital divided by an appropriate population denominator. This is distinct from the average length of stay that divides the sum of hospital bed-days by the number of discharges. The former is a population-based measure while the latter limits the index to persons actually admitted to hospital. Hospital bed-days per person are based on place of residence and each stay in hospital, so this is not affected by multiple admissions or by transfers between hospitals and specialities. In this analysis, only bed-days linked to the discharge data set *after filtering* have been considered (Katzenellenbogen et al. 2001).

[3] The list of discharges that are filtered out are: Boarders; Pregnancy-related discharges and obstetrics; Well babies and baby boarders; Day Patients; Selected Mental Health; Disability Support, Respite Care and Rehabilitation; Non-CHE medical discharges for people over the age of one year; Supplementary codes reflecting other excluded categories; and Hospital stays greater than 365 days.

3.1 Age Standardised Rates

Age standardised rates are used here as regions have very different age structures (Pool et al. 2005d). For instance the Bay of Plenty has a higher per cent of its population aged 65 years and over than, say, the Waikato, and this age group has higher hospital utilisation rates that can distort the results. In this age standardisation exercise the regional rate is applied to a standard population so that the ensuring measures are based on the same age structure. During the period under study the national trend has been for the number of hospital bed-days per person to drop for both males and females. As is shown in Table 1 the rate in 1999-2001 is more than 40 per cent lower than it had been in 1985-87.

There were significant declines in every region, and this was accompanied by a decrease in the range between regions. Several reasons can be cited for this. Firstly, in the late 1980s there was a marked convergence in regional levels coming from an attempt to iron out administratively differences in supply and demand for services. Notably, there was in 1985-87, a marked shortfall in Auckland as against an over supply in some other regions. There was further convergence over the next two periods, although, with minor exceptions, not as marked as in the first periods. Secondly, some regions, mainly in the North, have less satisfactory levels and patterns of survivorship (Pool et al. 2005b). But this is confounded by the fact that several of these regions (e.g. Northland, the Bay of Plenty) have ethnically different structures by age: a Pakeha population weighted towards older ages and often consisting of better-off, in-migrant retirees, and a younger, less well-off Māori population.

Table 1: Hospital Bed-Days per Person, Age Standardised[1] by Gender and Region, 1985-87–1999-2001

Region	Males					Females				
	1985-87	1990-92	1995-97	1999-01	change	1985-87	1990-92	1995-97	1999-01	change
Northland	1.02	0.73	0.55	0.54	-0.49	0.93	0.61	0.45	0.44	-0.48
Auckland	0.66	0.54	0.52	0.52	-0.14	0.55	0.44	0.43	0.43	-0.12
Waikato	0.90	0.67	0.54	0.52	-0.38	0.79	0.57	0.48	0.44	-0.35
Bay of Plenty	1.04	0.82	0.63	0.61	-0.43	0.91	0.70	0.56	0.52	-0.39
Gisborne	1.18	0.99	0.77	0.67	-0.51	0.96	0.86	0.70	0.56	-0.40
Hawke's Bay	1.08	0.84	0.70	0.56	-0.52	0.98	0.69	0.59	0.47	-0.51
Taranaki	1.03	0.81	0.61	0.53	-0.50	0.85	0.67	0.52	0.42	-0.43
Manawatu-Wanganui	0.99	0.76	0.60	0.55	-0.44	0.90	0.66	0.52	0.47	-0.43
Wellington	0.93	0.68	0.56	0.44	-0.48	0.81	0.57	0.48	0.38	-0.44
West Coast	1.47	0.96	0.65	0.65	-0.82	1.26	0.83	0.61	0.55	-0.71
Canterbury	0.90	0.67	0.56	0.54	-0.36	0.77	0.57	0.48	0.47	-0.30
Otago	0.96	0.75	0.64	0.50	-0.47	0.79	0.66	0.56	0.43	-0.36
Southland	0.94	0.85	0.64	0.54	-0.40	0.83	0.72	0.54	0.42	-0.41
Nelson-Marlborough	0.83	0.54	0.45	0.39	-0.43	0.72	0.44	0.38	0.35	-0.37
New Zealand	**0.88**	**0.68**	**0.57**	**0.52**	**-0.36**	**0.76**	**0.57**	**0.49**	**0.44**	**-0.32**
Range	*0.81*	*0.45*	*0.33*	*0.27*	*0.68*	*0.70*	*0.42*	*0.32*	*0.21*	*0.59*

(1) Standardised by age to New Zealand total population in 1996

Table 2: Hospital Bed-Days per Person for the Māori Population, Age Standardised[1] by Gender and Region, 1985-87 and 1999-2001

Region	Males			Females		
	1985-87	1999-01	change	1985-87	1999-01	change
Northland	1.53	0.76	-0.77	1.31	0.64	-0.66
Auckland	0.94	0.70	-0.24	0.75	0.61	-0.13
Waikato	1.24	0.74	-0.50	1.01	0.62	-0.39
Bay of Plenty	1.33	0.84	-0.49	1.14	0.74	-0.40
Gisborne	1.61	0.82	-0.78	1.33	0.72	-0.60
Hawke's Bay	1.55	0.85	-0.70	1.51	0.66	-0.85
Taranaki	1.38	0.65	-0.73	1.13	0.59	-0.54
Manawatu-Wanganui	1.19	0.73	-0.46	1.17	0.60	-0.57
Wellington	0.99	0.58	-0.40	0.84	0.48	-0.36
Canterbury	0.53	0.51	-0.03	0.53	0.38	-0.15
Rest of South Island	0.69	0.39	-0.31	0.52	0.37	-0.15
New Zealand	**1.18**	**0.70**	**-0.48**	**1.01**	**0.60**	**-0.41**
Range	*1.08*	*0.46*	*0.76*	*0.98*	*0.37*	*0.72*

(1) Standardised by age to New Zealand total population in 1996

Table 2 repeats the analysis for Māori alone, but just for the beginning and end of the period. In most regions Māori levels of hospitalisation are greater than those for the total. In some regions, such as Northland and Gisborne, it is the high Māori figure that carries along the rate for the total population. Exceptions to this come in the South Island, but the reason is not clear and may be a result of disjunctions between under-reporting of Māori in the numerator (generally it is the receptionist who reports ethnicity) and the denominator (self reported by individuals).

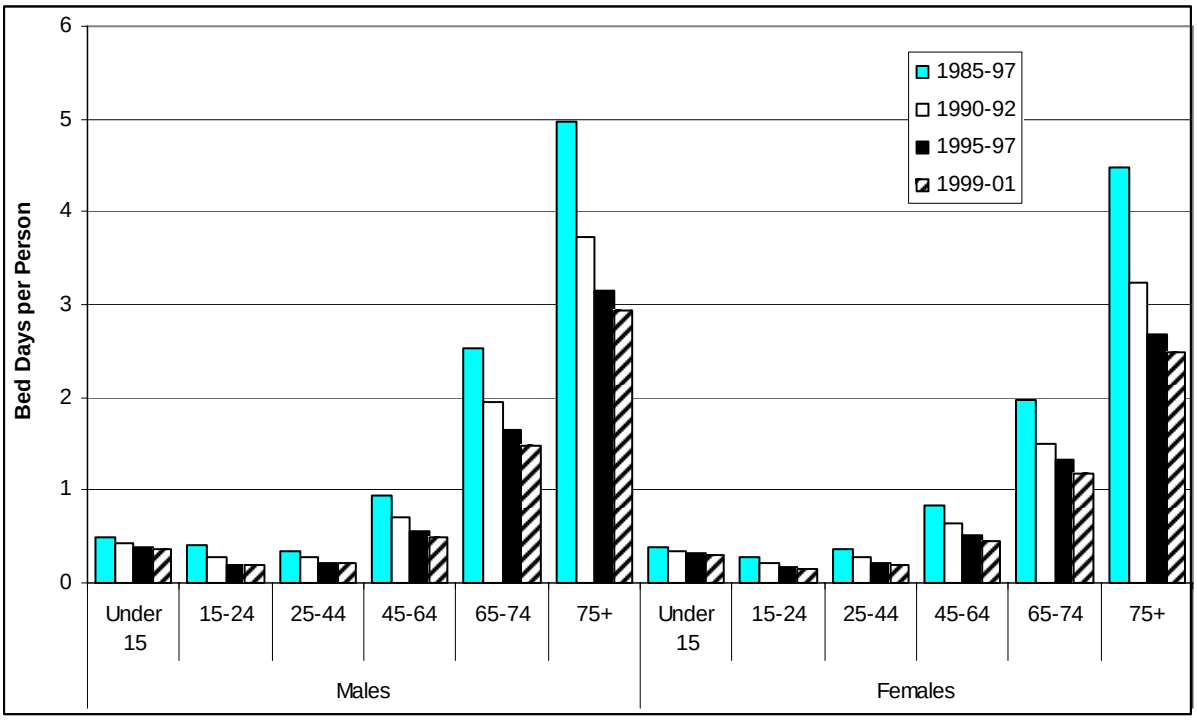
Thus, bed-day rates declined in every region for both genders, moreover, the ranges decreased. There was thus a marked convergence towards the New Zealand level. The agenda for the rest of the chapter is to see whether this produced health gains, a decrease in the ranges of morbidity and mortality rates, or reflected efficiency gains that were at the expense of effectiveness gains.

3.2 Age-Specific Rates

For this analysis broad age groups have been used to detect actual changes. The age groups used were as follows:

- Under 15 years
- 15-24 years
- 25-44 years
- 45-64 years
- 65-74 years
- 75 years and over

Figure 1: Age-Specific Hospital Bed-Days Rates per Person by Age Group and Gender, New Zealand, 1985-87–1999-2001



Looking at New Zealanders as a whole it can be seen that levels are highest at the oldest ages. Similarly changes are most marked at these ages, yet real health changes at these ages are the

most difficult to effect. This raises a question that will be addressed later in the paper: Are the changes due to the adoption of more efficient and effective procedures?

Under 15 Years

The national age-specific hospital bed-day rate for males under 15 years declined by 25 per cent from 1985-87 to 1999-2001 as seen in Table 3. The rate for females showed a 21 per cent reduction over the same time period.

At childhood, mortality patterns are affected to a greater degree than at other ages by diseases related to living conditions (Gray 2001). This shows up even at such a broad level as a region. There is a marked north-south divide. The northern two-thirds of the North Island have higher levels; the Southern third of the North Island and the South Island lower levels. There is no need to elaborate further on this here as this result fits well with the differentials in living conditions. Correlations between bed-days and probability of dying at these ages are not significant.

Table 3: Age-Specific Hospital Bed-Day Rates per Person for Under 15 Year Olds, by Gender and Region, 1985-87–1999-2001

Region	Males					Females				
	1985-87	**1990-92**	**1995-97**	**1999-01**	**change**	**1985-87**	**1990-92**	**1995-97**	**1999-01**	**change**
Northland	0.69	0.50	0.42	0.42	-0.27	0.58	0.38	0.33	0.31	-0.27
Auckland	0.50	0.42	0.41	0.40	-0.10	0.41	0.35	0.34	0.33	-0.08
Waikato	0.52	0.43	0.39	0.39	-0.13	0.39	0.34	0.32	0.31	-0.08
Bay of Plenty	0.68	0.60	0.43	0.44	-0.24	0.50	0.49	0.35	0.37	-0.13
Gisborne	0.64	0.67	0.47	0.44	-0.20	0.38	0.48	0.42	0.38	0.00
Hawke's Bay	0.61	0.59	0.49	0.39	-0.22	0.48	0.50	0.39	0.33	-0.15
Taranaki	0.50	0.49	0.34	0.37	-0.13	0.37	0.34	0.29	0.30	-0.07
Manawatu-Wanganui	0.45	0.42	0.38	0.35	-0.10	0.39	0.32	0.30	0.29	-0.10
Wellington	0.48	0.42	0.38	0.35	-0.14	0.39	0.34	0.30	0.29	-0.09
West Coast	0.46	0.37	0.29	0.32	-0.15	0.28	0.32	0.30	0.28	0.00
Canterbury	0.35	0.33	0.37	0.32	-0.03	0.27	0.26	0.29	0.28	0.01
Otago	0.45	0.37	0.31	0.32	-0.13	0.34	0.29	0.27	0.26	-0.09
Southland	0.43	0.49	0.39	0.35	-0.08	0.33	0.35	0.37	0.25	-0.08
Nelson-Marlborough	0.39	0.30	0.27	0.26	-0.13	0.32	0.26	0.23	0.21	-0.10
New Zealand	**0.50**	**0.43**	**0.39**	**0.37**	**-0.12**	**0.39**	**0.35**	**0.32**	**0.31**	**-0.08**
Range	*0.34*	*0.37*	*0.22*	*0.18*	*0.24*	*0.31*	*0.25*	*0.19*	*0.17*	*0.27*

15-24 Years

The national age-specific hospital bed-day rate for 15-24 year old males declined by 54 per cent from 1985-87 to 1999-2001 as shown in Table 4. For females of the same age group, it declined by 47 per cent. Although the gap between males and females has narrowed, the rate for males continues to be higher than that for females as young men traditionally indulge in more "at risk" behaviour, which results in accidents. A review of regional differences in this shows that the levels tend to be higher in regions that have larger proportions of their populations living in rural areas (see below).

The patterns reported for children carry through to a considerable degree for youth. But here other risk factors enter the equation. These are the ages at which most young people enter the labour force. In the three largest urban areas, many young people are, however, still studying at these ages, and this holds true also for Waikato, Manawatu-Wanganui and Otago (Pool et al. 2005b). Thus if they are working they are likely to be part-time, and thus less exposed to work place hazards than are their peers working full-time. The proportions involved in tertiary study have also increased over the period under review.

Beyond this there is a qualitative difference across the industries. The more rural areas typically have a higher proportion of their labour force, particularly of their male labour force, in occupations that involve manual labour, with its inherent physical risks, and in industries that are more dangerous (notably forestry and meat processing) (Pool et al. 2005a).

Table 4: Age-Specific Hospital Bed-Day Rates per Person Aged 15-24 Years, by Gender and Region, 1985-87–1999-2001

Region	Males					Females				
	1985-87	**1990-92**	**1995-97**	**1999-01**	**change**	**1985-87**	**1990-92**	**1995-97**	**1999-01**	**change**
Northland	0.51	0.37	0.27	0.26	-0.25	0.38	0.24	0.19	0.21	-0.17
Auckland	0.31	0.23	0.17	0.17	-0.14	0.23	0.16	0.14	0.14	-0.08
Waikato	0.42	0.29	0.19	0.20	-0.22	0.31	0.22	0.17	0.16	-0.15
Bay of Plenty	0.60	0.40	0.28	0.26	-0.34	0.36	0.29	0.25	0.23	-0.13
Gisborne	0.56	0.54	0.32	0.36	-0.20	0.46	0.28	0.31	0.23	-0.24
Hawke's Bay	0.50	0.39	0.32	0.21	-0.29	0.42	0.29	0.22	0.17	-0.25
Taranaki	0.51	0.46	0.24	0.22	-0.29	0.36	0.29	0.19	0.18	-0.19
Manawatu-Wanganui	0.46	0.35	0.23	0.19	-0.27	0.35	0.27	0.17	0.17	-0.18
Wellington	0.34	0.23	0.18	0.14	-0.20	0.25	0.17	0.16	0.13	-0.12
West Coast	0.55	0.40	0.24	0.18	-0.37	0.43	0.28	0.21	0.19	-0.24
Canterbury	0.34	0.22	0.18	0.15	-0.18	0.27	0.19	0.15	0.15	-0.12
Otago	0.43	0.31	0.20	0.16	-0.28	0.29	0.23	0.18	0.13	-0.16
Southland	0.45	0.33	0.24	0.21	-0.24	0.33	0.24	0.21	0.16	-0.17
Nelson-Marlborough	0.42	0.30	0.23	0.15	-0.28	0.28	0.18	0.13	0.13	-0.15
New Zealand	**0.40**	**0.28**	**0.20**	**0.18**	**-0.22**	**0.29**	**0.21**	**0.17**	**0.15**	**-0.13**
Range	*0.29*	*0.32*	*0.16*	*0.22*	*0.23*	*0.24*	*0.13*	*0.18*	*0.10*	*0.17*

25-44 Years

The national hospital bed-day rate for 25-44 year old males declined by 37 per cent from 1985-87 to 1999-2001 as shown in Table 5. This reduction was smaller than that at 15-24 years noted above. The hospital bed-day rate for females declined by 48 per cent from 1985-

87 to 1999-2001, but in this case the reduction was similar as that seen for females in the younger age group. The gap between genders has decreased considerably over the time period for bed-day rates though male rates were somewhat higher than females[4].

Regional differences for males are less than at 15-24 years. Those for females are greater. Nationally, and for a number of regions there is a gender cross-over. Female rates start above those for males but end up marginally below. Beyond the gender gaps just noted, many of the differences follow patterns identified at 15-24 years, and for similar reasons.

Table 5: Age-Specific Bed-Day Rates per Person aged 25-44 Years by Gender and Region, 1985-87–1999-2001

Region	Males					Females				
	1985-87	1990-92	1995-97	1999-01	change	1985-87	1990-92	1995-97	1999-01	change
Northland	0.40	0.32	0.25	0.25	-0.14	0.45	0.32	0.24	0.24	-0.20
Auckland	0.26	0.22	0.19	0.21	-0.05	0.27	0.20	0.17	0.18	-0.09
Waikato	0.35	0.27	0.22	0.23	-0.12	0.42	0.29	0.23	0.21	-0.21
Bay of Plenty	0.46	0.36	0.28	0.26	-0.20	0.49	0.35	0.27	0.25	-0.25
Gisborne	0.50	0.45	0.38	0.29	-0.21	0.50	0.44	0.38	0.33	-0.17
Hawke's Bay	0.42	0.34	0.31	0.24	-0.19	0.49	0.33	0.28	0.22	-0.28
Taranaki	0.43	0.40	0.25	0.22	-0.21	0.41	0.39	0.25	0.20	-0.21
Manawatu-Wanganui	0.40	0.32	0.25	0.24	-0.16	0.44	0.36	0.25	0.23	-0.21
Wellington	0.30	0.24	0.23	0.16	-0.14	0.35	0.25	0.20	0.16	-0.20
West Coast	0.41	0.38	0.23	0.28	-0.14	0.51	0.40	0.23	0.28	-0.23
Canterbury	0.30	0.24	0.20	0.20	-0.10	0.36	0.25	0.22	0.21	-0.16
Otago	0.38	0.28	0.24	0.18	-0.19	0.43	0.36	0.25	0.18	-0.25
Southland	0.34	0.27	0.23	0.19	-0.15	0.47	0.33	0.22	0.18	-0.29
Nelson-Marlborough	0.35	0.27	0.19	0.17	-0.18	0.41	0.23	0.20	0.17	-0.24
New Zealand	**0.33**	**0.27**	**0.22**	**0.21**	**-0.12**	**0.37**	**0.27**	**0.22**	**0.20**	**-0.18**
Range	*0.24*	*0.23*	*0.19*	*0.13*	*0.16*	*0.24*	*0.25*	*0.21*	*0.17*	*0.20*

45-64 Years

At the older middle ages hospitalisation rates are higher than at younger ages (see Figure 1). The national age-specific hospital bed-day rate for 45-64 years males declined by 48 per cent from 1985-87 to 1999-2001 as shown in Table 6. The rate for females in the same age group declined by 47 per cent over the same period. At these ages, rates for males are consistently above those for females (an exception seems to be Northland 1985-97).

At these ages, of course, the cause profile shifts increasingly towards degenerative diseases. Nevertheless, the regional differences noted earlier remain to a degree. But Canterbury and Otago join the regions with higher rates. It is not clear whether this is a supply or demand effect, but it does not fit readily with many of the results noted earlier in this paper.

[4] Obstetrics and pregnancy and childbirth related discharges are not included here.

Table 6: Age-Specific Hospital Bed-Day Rates per Person, Aged 45-64 Years, by Gender and Region, 1985-87–1999-2001

Region	Males					Females				
	1985-87	1990-92	1995-97	1999-01	change	1985-87	1990-92	1995-97	1999-01	change
Northland	0.97	0.77	0.58	0.53	-0.44	1.07	0.67	0.50	0.47	-0.60
Auckland	0.70	0.56	0.48	0.46	-0.24	0.60	0.50	0.43	0.41	-0.19
Waikato	0.94	0.71	0.51	0.48	-0.47	0.90	0.67	0.52	0.46	-0.44
Bay of Plenty	1.15	0.91	0.68	0.63	-0.52	1.07	0.83	0.63	0.54	-0.53
Gisborne	1.30	1.09	0.94	0.63	-0.67	1.13	1.07	0.76	0.62	-0.50
Hawke's Bay	1.17	0.90	0.64	0.53	-0.65	0.98	0.74	0.60	0.47	-0.51
Taranaki	1.11	0.78	0.62	0.54	-0.58	1.04	0.80	0.54	0.44	-0.60
Manawatu-Wanganui	1.05	0.84	0.61	0.53	-0.52	0.96	0.81	0.59	0.50	-0.46
Wellington	0.98	0.72	0.52	0.41	-0.57	0.80	0.59	0.50	0.37	-0.43
West Coast	1.43	0.95	0.54	0.65	-0.78	1.33	0.85	0.65	0.59	-0.74
Canterbury	0.97	0.67	0.55	0.50	-0.47	0.81	0.58	0.50	0.47	-0.34
Otago	1.12	0.86	0.68	0.50	-0.62	0.93	0.80	0.64	0.46	-0.47
Southland	1.17	0.86	0.67	0.50	-0.67	1.01	0.78	0.61	0.45	-0.56
Nelson-Marlborough	0.90	0.56	0.45	0.41	-0.49	0.79	0.48	0.41	0.37	-0.42
New Zealand	**0.95**	**0.71**	**0.55**	**0.49**	**-0.46**	**0.83**	**0.64**	**0.51**	**0.45**	**-0.39**
Range	*0.73*	*0.54*	*0.49*	*0.24*	*0.54*	*0.73*	*0.59*	*0.35*	*0.25*	*0.56*

65-74 Years

The national age-specific bed-day rate for males aged 65-74 years declined by 42 per cent from 1985-87 to 1999-2001 as shown in Table 7. For females in the same age group the rate declined by 40 per cent over the same time period. Rates, of course, are much higher than at 45-64 years, but so too are the ranges for regions. These decline over the period. Finally, male rates exceed female rates consistently over time across regions.

Regional differences at these ages start to show a different pattern from those at younger ages. Above all the apparent link to socio-economic indicators starts to decline. Thus Northland rates are lower than might be expected; Canterbury and Otago higher. This raises questions about supply and demand for services, an issue which is addressed in detail elsewhere (Pool et al. forthcoming-g) and later in this paper. Suffice to say here that some of the possible supply issues relate to declines in elective discharges for the elderly, and that in some regions, Northland for example, the achievement of health cost-efficiencies in the mid to late 1990s may possibly have been at the expense of health equity between regions and within where services are limited, including even for access to alternatives such as private care. This has a critical overall effect because much of the hospitalisation at all ages involves patients 65 years and over.

Table 7: Age-Specific Bed-Day Rates per Person Aged 65-74 Years by Gender and Region, 1985-87–1999-2001

Regions	Males					Females				
	1985-87	1990-92	1995-97	1999-01	change	1985-87	1990-92	1995-97	1999-01	change
Northland	2.78	1.88	1.43	1.31	-1.47	2.22	1.44	1.13	1.06	-1.16
Auckland	1.84	1.56	1.53	1.43	-0.41	1.34	1.14	1.17	1.13	-0.21
Waikato	2.65	1.88	1.58	1.43	-1.22	2.01	1.48	1.32	1.13	-0.88
Bay of Plenty	2.79	2.17	1.72	1.62	-1.18	2.32	1.80	1.44	1.24	-1.07
Gisborne	3.50	2.76	2.16	2.14	-1.37	2.55	2.27	2.06	1.40	-1.15
Hawke's Bay	2.98	2.30	1.89	1.59	-1.39	2.50	1.59	1.50	1.26	-1.24
Taranaki	2.90	2.20	1.80	1.47	-1.43	2.09	1.76	1.52	1.17	-0.92
Manawatu-Wanganui	2.89	2.16	1.74	1.49	-1.41	2.24	1.64	1.47	1.34	-0.91
Wellington	2.72	1.92	1.63	1.28	-1.44	2.09	1.53	1.27	1.03	-1.06
West Coast	4.42	2.82	2.05	1.88	-2.53	3.31	2.34	1.79	1.47	-1.84
Canterbury	2.74	2.08	1.67	1.60	-1.14	2.16	1.57	1.33	1.25	-0.91
Otago	2.66	2.19	1.87	1.52	-1.14	2.16	1.81	1.59	1.33	-0.82
Southland	2.75	2.67	1.91	1.67	-1.08	2.46	2.00	1.51	1.30	-1.16
Nelson-Marlborough	2.25	1.52	1.20	1.12	-1.13	1.63	1.14	1.03	0.90	-0.72
New Zealand	**2.54**	**1.95**	**1.64**	**1.47**	**-1.07**	**1.96**	**1.50**	**1.32**	**1.18**	**-0.78**
Range	*2.58*	*1.31*	*0.96*	*1.02*	*2.13*	*1.97*	*1.20*	*1.03*	*0.56*	*1.63*

75 Years and Over

The national age-specific bed-day rate for males aged 75 years and over declined by 41 per cent from 1985-87 to 1999-2001 as shown in Table 8. For females in the same age group the rate declined by 44 per cent over the same time period. Most of the comments made for age group 65-74 years apply, except that rates and ranges are higher.

Table 8: Age-Specific Bed-Day Rates per Person Aged 75 Years and Over by Gender and Region, 1985-87–1999-2001

Region	Males					Females				
	1985-87	1990-92	1995-97	1999-01	change	1985-87	1990-92	1995-97	1999-01	change
Northland	5.65	3.66	2.35	2.47	-3.18	4.89	3.23	2.10	2.01	-2.88
Auckland	3.15	2.71	2.92	3.01	-0.13	2.71	2.32	2.46	2.58	-0.13
Waikato	4.93	3.53	2.92	2.71	-2.22	4.29	2.94	2.40	2.30	-1.99
Bay of Plenty	4.86	3.95	3.14	3.05	-1.80	4.48	3.29	2.75	2.69	-1.79
Gisborne	6.50	4.56	3.08	3.01	-3.50	5.41	4.37	3.12	2.41	-3.00
Hawke's Bay	5.96	4.24	3.80	3.01	-2.96	6.02	3.92	3.30	2.48	-3.54
Taranaki	5.75	4.28	3.33	2.66	-3.09	4.96	3.31	2.89	1.99	-2.97
Manawatu-Wanganui	5.84	4.21	3.32	3.19	-2.65	5.98	3.58	2.74	2.53	-3.44
Wellington	5.66	4.18	3.31	2.53	-3.13	5.77	3.69	2.83	2.13	-3.64
West Coast	10.59	6.35	4.65	3.95	-6.65	9.74	5.56	3.81	3.20	-6.54
Canterbury	5.92	4.30	3.26	3.46	-2.47	5.21	3.80	2.84	3.06	-2.15
Otago	5.69	4.29	4.04	2.83	-2.86	4.24	3.74	3.26	2.37	-1.86
Southland	5.09	5.09	3.63	3.10	-1.98	3.99	4.45	2.66	2.14	-1.85
Nelson-Marlborough	4.71	2.56	2.37	1.97	-2.75	4.32	2.29	1.92	1.82	-2.50
New Zealand	**4.97**	**3.73**	**3.16**	**2.94**	**-2.03**	**4.48**	**3.23**	**2.68**	**2.50**	**-1.98**
Range	*7.45*	*3.79*	*2.30*	*1.98*	*6.51*	*7.02*	*3.27*	*1.89*	*1.37*	*6.41*

Māori

When comparing Table 9 with data in earlier tables we can see that overall, Māori have significantly higher levels of age specific Hospital Bed-day rates across most regions for both 1985-87 and 1999-01 periods. Although Māori rates remain at higher levels than do overall New Zealand rates, in the 1999-01 period the difference decreased indicating that there is a convergence of Māori rates towards those of the total population.

Table 9 also shows that in the 1985-87 period Māori aged 65-74 and 75+ had significantly high Hospital Bed-day rates. For Māori Males these rates were particularly high in Taranaki, Gisborne and Northland, for Māori Females these rates were particularly high in Hawke's Bay, Gisborne and Taranaki. In the 1999-01 period Māori aged 65-74 and 75+ also has high levels of Hospital Bed-day rates however, these levels were not as marked as in previous years. For Māori males these rates were particularly high in Hawke's Bay, Bay of Plenty and the Waikato, for Māori females these rates were particularly high in the Bay of Plenty, Gisborne, Hawke's Bay and Taranaki.

It is also important to note that the ranges between the regions are significantly higher for Māori compared to the total population. Nevertheless, for the Māori population, the ranges between the regions, over the two periods analysed, have significantly decreased at all age groups.

Table 9: Age-Specific Hospital Bed-Day Rate per Person for the Māori Population by Age Group, Gender and Region, 1985-87 and 1999-01

a) 1985-87

Region	Males						Females					
	Under 15	15-24	25-44	45-64	65-74	75+	Under 15	15-24	25-44	45-64	65-74	75+
Northland	0.93	0.61	0.66	1.68	4.44	7.18	0.80	0.45	0.62	1.91	3.29	5.26
Auckland	0.60	0.38	0.45	1.19	3.16	2.97	0.49	0.27	0.43	1.10	2.05	1.89
Waikato	0.61	0.45	0.48	1.51	3.67	6.65	0.44	0.32	0.50	1.48	3.16	3.78
Bay of Plenty	0.84	0.62	0.66	1.65	3.85	4.64	0.58	0.41	0.67	1.63	3.19	3.76
Gisborne	0.85	0.62	0.73	1.89	4.53	8.70	0.48	0.55	0.75	1.62	3.44	6.89
Hawke's Bay	0.86	0.55	0.64	1.99	4.45	6.70	0.69	0.49	0.73	1.66	4.66	7.16
Taranaki	0.50	0.53	0.70	1.48	7.40	3.48	0.40	0.34	0.61	1.60	2.98	5.98
Manawatu-Wanganui	0.48	0.53	0.52	1.39	4.36	4.98	0.41	0.33	0.58	1.45	3.76	5.54
Wellington	0.55	0.32	0.44	1.48	2.91	2.87	0.42	0.22	0.45	1.24	2.32	3.02
Canterbury	0.26	0.27	0.32	0.81	1.20	2.10	0.16	0.20	0.31	0.87	1.32	1.83
Rest of South Island	0.26	0.34	0.33	0.85	2.08	3.37	0.24	0.17	0.41	0.84	1.42	1.02
New Zealand	**0.63**	**0.46**	**0.52**	**1.45**	**3.82**	**5.09**	**0.48**	**0.32**	**0.53**	**1.40**	**2.95**	**3.96**
Range	*0.67*	*0.36*	*0.40*	*1.18*	*6.20*	*6.60*	*0.64*	*0.38*	*0.44*	*1.07*	*3.35*	*6.14*

(continues on the next page)

Table 9: (continued)

b) 1999-01

Region	Males						Females					
	Under 15	**15-24**	**25-44**	**45-64**	**65-74**	**75+**	**Under 15**	**15-24**	**25-44**	**45-64**	**65-74**	**75+**
	1999-2001											
Northland	0.52	0.31	0.37	0.94	2.05	2.93	0.37	0.25	0.36	0.80	1.85	2.39
Auckland	0.39	0.29	0.35	0.90	2.40	2.51	0.31	0.20	0.30	0.81	1.79	2.70
Waikato	0.43	0.23	0.33	0.92	2.06	3.41	0.32	0.15	0.28	0.84	1.82	2.74
Bay of Plenty	0.49	0.28	0.40	1.03	2.45	3.68	0.37	0.24	0.34	1.02	2.27	3.04
Gisborne	0.52	0.40	0.37	0.98	2.54	3.06	0.41	0.23	0.41	0.85	1.81	3.38
Hawke's Bay	0.47	0.25	0.36	0.95	2.90	3.82	0.40	0.17	0.30	0.93	1.68	2.93
Taranaki	0.34	0.17	0.33	0.80	2.30	2.50	0.26	0.12	0.26	0.76	2.27	2.56
Manawatu-Wanganui	0.38	0.16	0.33	0.95	2.62	2.88	0.21	0.14	0.31	0.75	2.00	2.70
Wellington	0.37	0.15	0.21	0.74	1.65	2.75	0.26	0.16	0.23	0.66	1.61	1.72
Canterbury	0.24	0.13	0.24	0.63	1.52	2.40	0.16	0.10	0.21	0.50	1.05	1.89
Rest of South Island	0.21	0.14	0.22	0.52	1.17	1.40	0.18	0.08	0.21	0.53	1.14	1.34
New Zealand	**0.40**	**0.24**	**0.32**	**0.87**	**2.19**	**2.97**	**0.30**	**0.17**	**0.29**	**0.80**	**1.81**	**2.59**
Range	*0.31*	*0.27*	*0.19*	*0.51*	*1.73*	*2.42*	*0.25*	*0.17*	*0.21*	*0.53*	*1.21*	*2.05*

4. Ambulatory Sensitive Hospitalisations

In reviewing hospitalisations it is important to evaluate the way in which the primary and secondary/tertiary sectors are successfully integrated. The prevalence of potentially avoidable hospitalisation (ie. cases that should have been handled in the primary sector) in the regional profile of cases is an indicator of these linkages.

Ambulatory Sensitive hospitalisation is one category of so-called potentially avoidable hospitalisations as discussed in work done in Ministry of Health (1999)[5]. Ambulatory sensitive hospitalisations are defined as those "resulting from diseases sensitive to prophylactic or therapeutic interventions deliverable in a primary health care setting (for example, vaccine preventable diseases, early recognition and excision of melanoma, mammography for early breast cancer, effective glycemic control in diabetics)" (Ministry of Health 1999). Among the potentially avoidable causes this particular category is used here as it most directly reflects access to and the efficiency of primary care. The others are more dependent on public health education (e.g. for smoking, see later in the paper) or factors beyond the control of health system (preventable accidents). The ambulatory sensitive codes are largely derived from lists prepared by earlier researchers (Begley et al. 1994; Billings et al. 1996; Jackson et al. 1998; Weissman et al. 1992), again extended where necessary to reflect recent developments in health care technology and New Zealand patterns of practice (Ministry of Health 1999).

A potential cause of confusion is the categorisation of admissions as "discretionary" or "nondiscretionary". These terms are not synonymous with the concept of avoidability. For example, an admission for appendicitis is nondiscretionary and unavoidable, but an admission for a ruptured appendix is nondiscretionary yet avoidable.

The most critical finding is that the rates decline over the period, but that regional differences still remain. Earlier the peripheral poorer regions had higher rates, especially in the north, but so too did Wellington. While Auckland's rate was very low over time it barely shifted, whereas Wellington's rate drops dramatically. In all probability, Wellington had earlier seen over-use of hospital services for what should have been treated at a primary level, whereas Aucklanders at the time had less access than might have been needed. But over the period there differences were ironed out. Thus, by 1999-2001 it is northern regions that have higher rates, especially the peripheral regions, while for Southern regions rates are lower, the exception being the West Coast. Northland makes a peculiar and puzzling exception to this pattern among Northern regions.

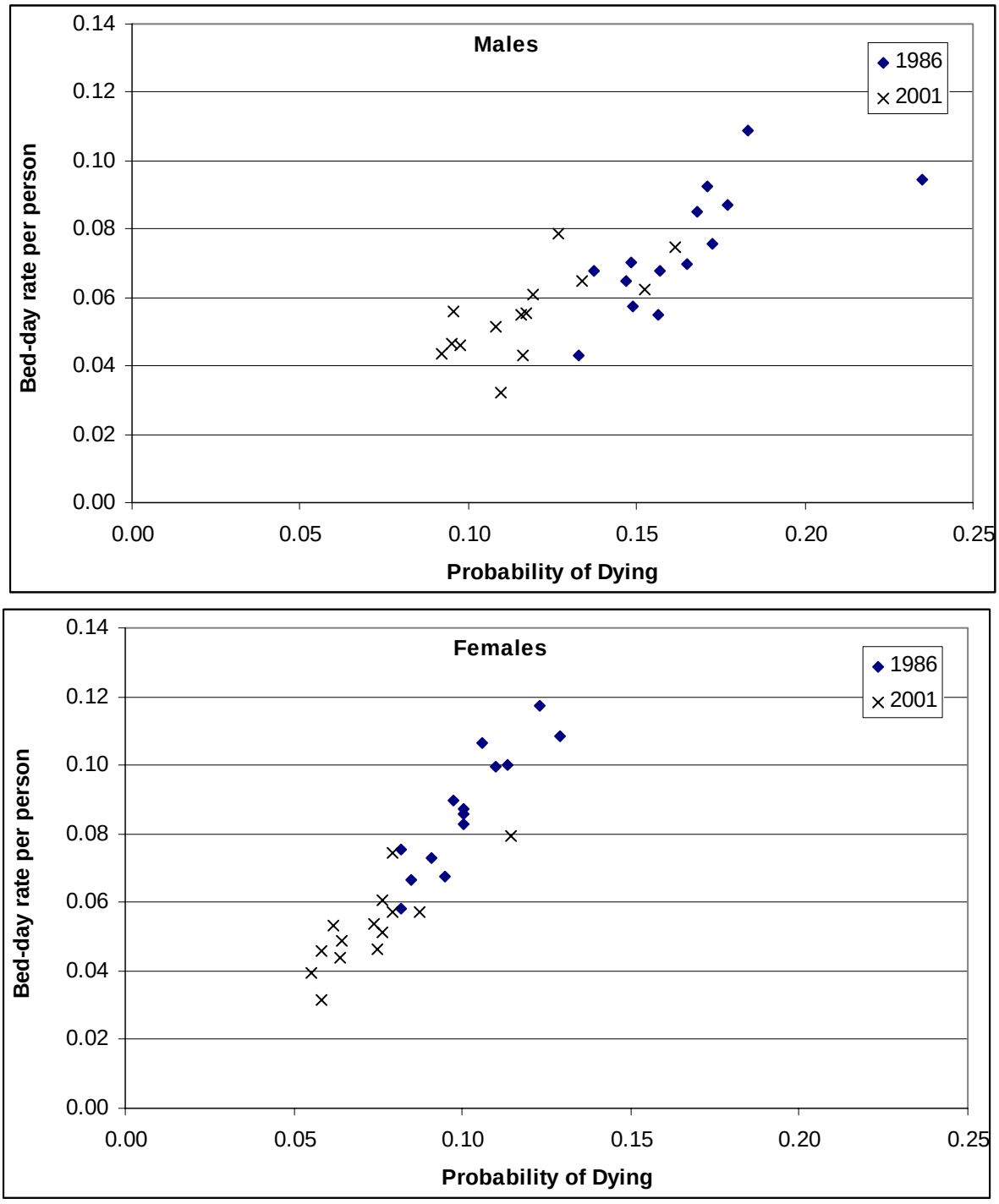
[5] This draws on work done by Dr Gary Jackson, Manager, Public Health, Counties-Manakau District Health Board.

Table 10: Ambulatory Sensitive Hospitalisation, Age Standardised[1] Bed-Day Rates per Person by Gender and Region, 1985-87 - 1999-2001

Region	Males				Females			
	1985-87	**1990-92**	**1995-97**	**1999-01**	**1985-87**	**1990-92**	**1995-97**	**1999-01**
Northland	0.24	0.18	0.13	0.13	0.22	0.16	0.12	0.11
Auckland	0.14	0.11	0.14	0.14	0.12	0.09	0.11	0.11
Waikato	0.20	0.14	0.14	0.13	0.16	0.12	0.12	0.11
Bay of Plenty	0.22	0.18	0.17	0.17	0.20	0.16	0.14	0.14
Gisborne	0.29	0.23	0.18	0.15	0.23	0.20	0.17	0.13
Hawke's Bay	0.26	0.19	0.17	0.14	0.24	0.16	0.15	0.12
Taranaki	0.22	0.15	0.13	0.13	0.17	0.12	0.12	0.10
Manawatu-Wanganui	0.23	0.16	0.13	0.13	0.21	0.14	0.12	0.11
Wellington	0.24	0.17	0.14	0.12	0.20	0.14	0.12	0.10
West Coast	0.37	0.21	0.16	0.18	0.34	0.20	0.14	0.12
Canterbury	0.22	0.17	0.15	0.13	0.17	0.12	0.11	0.11
Otago	0.21	0.15	0.15	0.11	0.16	0.12	0.11	0.09
Southland	0.20	0.17	0.16	0.12	0.16	0.15	0.13	0.09
Nelson-Marlborough	0.17	0.09	0.09	0.08	0.14	0.08	0.07	0.07
New Zealand	**0.20**	**0.15**	**0.14**	**0.13**	**0.17**	**0.12**	**0.12**	**0.11**
Range	*0.23*	*0.14*	*0.10*	*0.10*	*0.22*	*0.12*	*0.10*	*0.07*

(1) Standardisation by age to New Zealand total population in 1996.

Figure 2: Scattergram of Ambulatory Sensitive Bed-Days per Person 15-59 years (age standardised) by Probability of Dying from 15 to 59 Years, by Gender and Region, 1985-87 and 1999-01



Not surprisingly the level of ambulatory sensitive hospitalisation is correlated with mortality, measured here as nqx, the probability of dying, as is shown in Figure 2. A failure to treat, or to gain access to treatment, at the primary level, probably means late presentation overall and lower chances of surviving hospitalisation. This effect seems to decrease over time, and to be more marked for females than for males.

5. Acute versus Elective Hospitalisations

Acute hospitalisations are emergencies and by definition are unplanned. In contrast, elective hospitalisations are planned, tend to be less urgent and are not crisis-related. Acute hospitalisations are by very nature unpredictable. In New Zealand, people in urgent (acute) need of hospital care are hospitalised. However, because of the way the public hospital services are funded in New Zealand, an increase in acute admissions often results in a corresponding decrease in elective surgery. This is because an increase in acute admissions will divert funding and staff away from routine admissions, especially for general surgery of all kinds.

Because of this, elective hospitalisations are more subject to influence by funding levels, staff availability and other supply factors. Acute hospitalisations, on the other hand, could perhaps be considered a better indicator of health status or demand factors. The hospital bed-day analysis below used hospitalisations disaggregated into these two categories of hospitalisation: acute and elective. The sum of the hospital bed-days for these two clusters reflects the total hospital bed-days for medical-surgical hospitalisations as discussed in section 3.

5.1 Acute Bed-Day Rates

Acute bed-day rates should be a better reflection of the health status of the population than other bed-day measures as acute cases are more reflective of demand than is true for the overall bed day rate. As in the earlier sections, age standardised rates are used to ensure that levels are comparable between regions.

That said, in the 1980s acute admission rates did not necessarily reflect demand. They were higher in some Northern regions and on the West Coast, as might be expected. Auckland's levels were very low, but in contrast the level for Wellington was high paralleling what was found above for ambulatory sensitive cases. By 1999-2001, the pattern had changed with poorer northern regions still high – a notable and puzzling exception to this again is Northland – while Auckland had merged close to the national figure, and Wellington had dropped dramatically. In general the north was higher, the south lower, while inter regional ranges decreased.

Table 11: Acute Age Standardised[1] Rates per Person by Gender and Region, 1985-87 – 1999-2001

Region	Males				Females			
	1985-87	1990-92	1995-97	1999-01	1985-87	1990-92	1995-97	1999-01
Northland	0.73	0.55	0.42	0.38	0.61	0.44	0.34	0.31
Auckland	0.54	0.43	0.36	0.37	0.42	0.34	0.29	0.30
Waikato	0.60	0.48	0.41	0.39	0.46	0.38	0.36	0.33
Bay of Plenty	0.73	0.59	0.45	0.46	0.59	0.47	0.38	0.38
Gisborne	0.80	0.71	0.58	0.50	0.58	0.61	0.52	0.39
Hawke's Bay	0.79	0.63	0.49	0.41	0.69	0.50	0.41	0.34
Taranaki	0.80	0.58	0.43	0.35	0.62	0.46	0.36	0.28
Manawatu-Wanganui	0.71	0.53	0.41	0.37	0.62	0.44	0.34	0.31
Wellington	0.68	0.49	0.40	0.32	0.57	0.40	0.33	0.26
West Coast	0.94	0.64	0.41	0.42	0.73	0.54	0.35	0.32
Canterbury	0.63	0.48	0.40	0.38	0.51	0.39	0.34	0.32
Otago	0.61	0.50	0.45	0.35	0.45	0.42	0.38	0.29
Southland	0.66	0.62	0.46	0.34	0.55	0.49	0.37	0.27
Nelson-Marlborough	0.56	0.37	0.32	0.25	0.45	0.29	0.26	0.21
New Zealand	**0.64**	**0.50**	**0.40**	**0.37**	**0.52**	**0.40**	**0.33**	**0.31**
Range	*0.40*	*0.34*	*0.27*	*0.24*	*0.31*	*0.32*	*0.25*	*0.17*

(1) Standardised by age to New Zealand total population in 1996. Acute hospitalisations are emergencies that are events unplanned.

5.2 Elective

Turning now to elective admissions, the balances between supply and demand change, in that supply factors still operate, despite attempts to standardise access to services, this becomes clear in Table 12. While the percentage of cases that is elective has not changed greatly there are still major differences between regions. It is in the south where elective interventions are more likely to take place and the north where they are less likely.

Table 12: Proportion of Bed-Days per Person which are Elective[1] by Gender and Region, 1985-87 – 1999-2001

Region	Males				Females			
	1985-87	1990-92	1995-97	1999-01	1985-87	1990-92	1995-97	1999-01
Northland	29.1	25.0	23.4	28.4	34.4	27.0	25.4	29.6
Auckland	17.9	19.4	31.4	28.2	23.4	22.3	33.9	29.5
Waikato	33.2	28.7	24.1	24.4	41.3	32.5	26.0	25.5
Bay of Plenty	29.8	27.8	28.3	25.3	35.1	32.6	32.3	26.7
Gisborne	32.6	27.7	24.3	25.7	39.5	28.7	26.0	30.2
Hawke's Bay	26.4	25.7	29.9	26.1	29.2	27.7	29.7	27.6
Taranaki	22.3	28.1	29.5	33.6	27.0	31.4	31.3	34.7
Manawatu-Wanganui	28.1	31.1	32.2	32.7	31.2	34.0	34.2	33.5
Wellington	26.5	28.2	29.3	28.7	30.1	29.1	30.7	30.8
West Coast	36.1	33.2	37.4	35.5	41.9	35.5	42.2	42.0
Canterbury	29.8	28.0	29.3	29.6	33.6	30.8	30.8	32.1
Otago	37.0	33.3	29.8	30.2	42.8	36.9	31.6	33.3
Southland	30.5	26.8	29.1	38.0	33.3	31.9	30.8	35.4
Nelson-Marlborough	32.8	30.4	29.1	35.4	37.8	33.2	31.0	37.8
New Zealand	**27.5**	**26.6**	**29.4**	**29.1**	**32.2**	**29.5**	**31.4**	**30.7**
Range	*19.1*	*13.9*	*14.0*	*13.6*	*19.4*	*14.6*	*16.8*	*16.5*

(1) Standardised by age to New Zealand total population in 1996. Elective hospitalisations are planned, tend to be less urgent and are not health crisis-related.

Although the proportion of elective hospitalisations has had minimal change between 1985-87 and 1999-2001 we can see in Table 13 that the overall rates of elective hospitalisation have decreased during this same period for all regions. For both males and females the ranges between the regions decreased from 0.4 in 1985-87 to 0.1 in 1999-01 illustrating that the differences between the regions in elective hospitalisation rates are minimising. In 1985-87 the West Coast and Gisborne had relatively high rates while Auckland and Taranaki had relatively low rates of elective hospitalisation. By 1999-01 there were minimal differences between the regions with only the West Coast standing out by having a relatively high rate of elective hospitalisation.

Table 13: Elective Age Standardised[1] Rates per Person by Gender and Region, 1985-87 – 1999-2001.

	Males				Females			
Region	**1985-87**	**1990-92**	**1995-97**	**1999-01**	**1985-87**	**1990-92**	**1995-97**	**1999-01**
Northland	0.30	0.18	0.13	0.15	0.32	0.16	0.12	0.13
Auckland	0.12	0.10	0.16	0.15	0.13	0.10	0.15	0.13
Waikato	0.30	0.19	0.13	0.13	0.32	0.19	0.12	0.11
Bay of Plenty	0.31	0.23	0.18	0.15	0.32	0.23	0.18	0.14
Gisborne	0.39	0.27	0.19	0.17	0.38	0.25	0.18	0.17
Hawkes Bay	0.28	0.22	0.21	0.15	0.29	0.19	0.17	0.13
Taranaki	0.23	0.23	0.18	0.18	0.23	0.21	0.16	0.15
Manawatu-Wanganui	0.28	0.24	0.19	0.18	0.28	0.22	0.18	0.16
Wellington	0.25	0.19	0.17	0.13	0.24	0.17	0.15	0.12
West Coast	0.53	0.32	0.24	0.23	0.53	0.30	0.26	0.23
Canterbury	0.27	0.19	0.16	0.16	0.26	0.17	0.15	0.15
Otago	0.36	0.25	0.19	0.15	0.34	0.24	0.18	0.14
Southland	0.29	0.23	0.19	0.21	0.28	0.23	0.17	0.15
Nelson - Marlborough	0.27	0.16	0.13	0.14	0.27	0.15	0.12	0.13
New Zealand	**0.24**	**0.18**	**0.17**	**0.15**	**0.25**	**0.17**	**0.15**	**0.14**
Range	*0.4*	*0.2*	*0.1*	*0.1*	*0.4*	*0.2*	*0.1*	*0.1*

(1) Standardised by age to New Zealand total population in 1996. Elective hospitalisations are planned, tend to be less urgent and are not health crisis-related.

5.3 Summary

To summarise, the results presented in this section of the paper have pointed to regional inequalities that often parallel those described in earlier discussion papers. They do, however, also show the impact of other factors, notably, the effects of biological ageing on the health of individuals, and thus, through age-compositional differences, on populations. But this said in an equitable system of care, population rates of discharges should not vary greatly between regions once age and gender composition are controlled for.

Cutting across this is the form of care. There is often a need for elective procedures that are designed to improve quality of life, especially among the elderly. A lack of access to an elective procedure can, in certain circumstances, result in the need for acute services. There is an analogue in the case of lack of access to primary health care which may then result in admission to hospital. Both these issues will be looked at further in a later section of the paper. The review here of certain causes of hospitalisation also raises issues relating to supply and demand and to access both to hospitalisation and primary services.

Simple bed-day rates as just presented can, however, be misleading. There is not just the factor of duration of stay that affects hospitalisation and thus health care, but also the prevalence level. Moreover, discharges include not only those who survive but also those who die during their hospital stay. Finally there is the survivorship or deaths in the community of those who have not been admitted to hospital, for whatever reason. The next section of this paper turns to a composite index that combines all these factors.

6. Hospital Utilisation Expectancies (HUEs)

In recent years, attempts have been made to synthesise mortality and morbidity indices to achieve more global and relevant measures of population health status than is possible using either index on its own (Johnstone et al. 1998). Thus research on population health status indices has concentrated on quantifying the relationship between mortality and morbidity in order to predict future health trends. Health expectancy (HE) (Robine and Michel 1992) and Disability Adjusted Life Years (DALY) (Murray and Lopez 1996) are two macro-level indices developed over the last decades and are being used ever more frequently by governments and health planners to describe the health status of the population. Since 1993 the OECD included HE in its official health statistics and the *World Health Report*, 1997 (World Health Organisation 1997) emphasised HE as a key indicator of population health.

The feasibility of combining the level of mortality with data on public hospitalisations appears to have mostly been explored by New Zealand researchers (Cheung 1999; Pool and Cheung 1999, but see St Leger 1989). The resultant index, called Hospital Utilisation Expectancy (HUE), uses a life table methodology that is an extension of conventional Health Expectancies in which mortality and morbidity data are combined into a single population health measure (Cheung 1999; Pool et al. 2000; Pool et al. forthcoming-g).

This section provides national and regional HUE rates for New Zealand for 1985-87, 1990-92, 1995-97 and 1999-2001, three-year averages around the census of 1986, 1991, 1996 and years up to and including 2001.

6.1 Data Sources and Methods

When calculating HUEs, hospital utilisation replaces the conventional morbidity measure in the HE calculation. In this study, the hospital utilisation component of the HUE was obtained from hospital discharge data that have been collected in New Zealand since the 1980s, of a quality permitting national level analysis from the 1950s and of a coverage sufficient to allow regional analyses from the late 1970s. Because of policy and data collection changes between 1986 and 1996, comparisons of discharge data cannot be made without some adjustment. This was carried out in a series of steps that filtered out certain categories of discharge, so that the study relates to medical-surgical inpatient discharges only, as was described in Section 2 above (detailed in Pool et al. forthcoming-g). The number of days of hospitalisation for the population were summed and divided by the total in the population to obtain the hospital days per population. Data for the mortality or survivorship components were obtained from official death registration sets and cover both hospitalisation cases and persons living in the community. Rates for both were calculated using census population counts as denominators for the relevant years.

For each age group, age-specific rates of hospital discharges are combined with the age group specific average length of hospital stay to calculate the period prevalence of hospital utilisation in the population. This set of period prevalence rates is then incorporated into the life table using Sullivan's observed prevalence life table method (Sullivan 1971). This allows the disaggregation of remaining life expectancy into time spent either in contact with, or outside, public hospitals. Since the former was expected to be only a fraction of life expectancy at each age, the focus here is on the time spent in hospitals. In contrast, the general family of health expectancy methods normally capture states of positive health.

The resultant HUE is defined as the number of days during the remaining period of life expectancy in which the population can be expected on average to be in contact with public hospitals. The number of days was selected as the unit of measurement because the results tend to be superficially suppressed to insignificance when expressed in number of years. The same methodology can be extended to other population health variables, for example time in a disabled state or on a benefit.

6.2 Hospital Utilisation Expectancy at Birth

As has been found in a more detailed New Zealand regional study (Pool et al. forthcoming-g), national HUEs decreased substantially (29 per cent for females and 35 per cent for males) over the period under study as shown in Table 14. Over the time period under consideration male HUEs were consistently lower than those for females although the gender discrepancy had reduced by 1999-2001. This result is not surprising given the lower survivorship of males, but contrasts with the bed-day rates analysed above. Because of the HUEs actuarial and composite nature these results are more powerful than those used earlier based on simple indices.

Table 14: Hospital Utilisation Expectancy (Days) at Birth by Gender and Region, 1985-87 – 1999-2001

Region	Males					Females				
	1985-87	1990-92	1995-97	1999-01	change	1985-87	1990-92	1995-97	1999-01	change
Northland	81	60	46	47	-34	95	65	47	47	-48
Auckland	53	47	49	52	-1	56	49	50	53	-3
Waikato	71	56	49	49	-22	81	61	54	50	-31
Bay of Plenty	82	69	56	56	-26	89	72	60	58	-31
Gisborne	89	79	61	55	-34	96	88	67	57	-39
Hawke's Bay	85	69	60	52	-32	99	74	64	52	-47
Taranaki	84	69	57	51	-33	87	71	60	47	-40
Manawatu-Wanganui	78	65	53	51	-26	94	70	57	53	-41
Wellington	75	60	52	43	-31	88	65	54	45	-44
West Coast	100	76	56	61	-39	125	88	68	66	-59
Canterbury	74	59	52	55	-19	85	66	57	60	-25
Otago	77	66	59	50	-28	82	74	65	51	-31
Southland	72	67	55	49	-22	79	77	57	47	-33
Nelson-Marlborough	69	48	41	38	-31	78	50	42	40	-38
New Zealand	**71**	**58**	**52**	**50**	**-20**	**79**	**63**	**55**	**52**	**-27**
Range	*47*	*32*	*19*	*23*	*37*	*69*	*40*	*25*	*27*	*56*

The regional analysis shows that the general pattern of decreasing HUEs was consistent over all regions except for Auckland. That said, however, there were significant differences between regions (Table 14). The ranges in the HUEs reduced substantially over the period.

In 1985-87 period, the Auckland HUE had been lower than that of any other region and substantially below the national level. The reason is probably that Auckland was underserviced, as its expectancy remained largely unchanged over the entire period under review, while others declined as part of an overall convergence to New Zealand levels. The difference was so marked, and Auckland's contribution to the national figure so considerable, that almost every other region was above the national level. Thus HUEs were very high (80 days or above for males and 90 and above for females) on the West Coast, and in Gisborne, Hawke's Bay and Northland. Males in the Bay of Plenty and Taranaki, and females in Manawatu-Wanganui were also in this very high HUE group. West Coast levels were substantially higher than for any other region, especially for females. Waikato, Southland and Nelson-Marlborough had about average HUEs, while the remaining regions had above average estimates, albeit in a more modest scale.

By 1990-92, the New Zealand HUE had gone through a significant drop in absolute terms, the largest in the period under review, declining by 18 per cent for males and 21 per cent for females. This indicates that the years between the two censuses had been ones of very significant change, a marked convergence. The HUE reduction was *least* marked in Southland, Otago, Gisborne and Auckland. The reduction in HUEs was *most* marked for the West Coast (no longer an outlier but still ranking in the top two), Nelson-Marlborough (no longer average but substantially below average and just above Auckland) and Northland (now just above average). Waikato rates had also dropped to a level below the New Zealand level.

Wellington, Canterbury and Northland had HUE levels just above average while those for the remaining regions were well above average with Gisborne and West Coast having the highest HUE level.

The national decrease in HUE for 1990-92 to 1995-97 was less than that during the previous period. For Auckland, in fact, a slight increase was evident. Northland HUEs were below average during this period, ranking second lowest after Nelson-Marlborough. Gisborne, West Coast, Hawke's Bay, Otago, Taranaki, the Bay of Plenty and Southland all had higher than average HUEs. Canterbury, Wellington, Waikato and Manawatu/Wanganui had HUE levels at about the national level.

There was a further modest decrease between 1995-97 and 1999-2001 for New Zealand as a whole. A large decrease occurred in Gisborne, Hawke's Bay, Taranaki, Wellington, Otago and Southland. In contrast, increases were seen in Auckland and Canterbury for males and females and Northland and West Coast for males. The highest HUE at birth in 1999-2001 was for the West Coast with the Bay of Plenty, Gisborne and Canterbury also high. The lowest HUE at birth in 1999-2001 was for Nelson-Marlborough with Wellington being the second lowest.

These results provide robust support for the analysis of hospitalisation carried out earlier in this paper. Two major trends have been identified. Firstly there has been convergence. Auckland seems to have been underserved and to have caught up. Some of the more peripheral regions have high HUEs, as might be expected. But Northland that is low and Canterbury that is high seem to be deviant cases. Changes over the entire period were greater for females than males, and interregional ranges were wider for them also. This holds true even when the extreme case of Auckland is excluded (range: 17, males; 34, females).

Ethnicity

Elderly Māori, both males and females and for all regions, at the beginning of the period could expect to spend longer in hospital than the total elderly population (see Table 15). However the HUEs for Māori over the age of 65 years decreased so markedly that by the end of the 1990s they were lower than those for the total population, both nationally and regionally. In general elderly, both Māori and Total population, in the Auckland and Waikato had more favourable HUEs, and those in Hawkes Bay/Tairawhiti and The Bay of Plenty/Lakes the least favourable. Both groups of elderly in Manawatu/Wellington showed dramatic improvements in this measure, being above the national levels at the start of the review period but below this benchmark at the end. This synchronicity between Māori and total population in regional trends may in part be explained by variations in provision of services for the elderly.

Table 15: Hospital Utilisation Expectancy at Age 65 Years (HUE(65)) for Māori and Total Population by Gender and Larger Regions, Selected 5-Years Averages, 1990-2000

Region	Māori Population				Total Population			
	1990-94[1]		1996-00[2]		1990-94[1]		1996-00[2]	
	Males	Females	Males	Females	Males	Females	Males	Females
Northland	69	81	49	51	57	63	47	48
Auckland	63	65	47	46	48	50	50	52
Waikato (excl. Taupo)	68	70	44	48	57	61	48	53
Bay of Plenty/Taupo	74	80	52	59	67	72	55	58
Hawke's Bay/Gisborne	129	139	52	56	71	76	54	56
Taranaki/Wanganui/ Manawatu/Wellington	90	107	43	47	61	65	48	51
New Zealand	**77**	**86**	**46**	**49**	**58**	**62**	**50**	**53**
Range	*67*	*74*	*9*	*12*	*23*	*26*	*8*	*10*

(1) 1991 Socio-cultural Māori population is used as denominator.
(2) 1999 linear interpolated population using the Socio-cultural Māori population of 1996 and 2001 censuses.
Source: (Pool et al. forthcoming-g)

7. Sickness/Invalid Benefit

In order to look a little further into demand versus supply it is useful to look at illness benefits. Benefits targeted to meet differing needs are analysed in detail in the another discussion paper (Pool et al. 2006a). In the present paper benefits relating specifically to health status are reviewed. A key point to remember about these benefits is that the eligibility of all beneficiaries has been assessed before payments are made. One drawback is that while the focus in this paper is on physical health many beneficiaries will suffer psychiatric conditions, although frequently physical co-morbidities will also occur.

Sickness/invalid benefits are not, however, simply indicators of health. Though people on sickness/invalid benefits need to meet set medical criteria to be eligible for these benefits, when the economy is doing well people who might be eligible, especially say the intellectually handicapped or mentally ill, often hold down a job albeit menial or unskilled. But the key point is that they do not need a benefit. Conversely when the economy is not doing well, they are often the first people who lose their jobs, and thus end up on a benefit, legitimately on sickness/invalid payments. Some of this group could also be discouraged workers (Preston 1996).

There is an additional dimension to this being explained in depth in a separate study (Pool et al. forthcoming-g). This shows that there is also a link to the health status of the region and the availability of acute and elective services. It must be recalled that, particularly in the 1990s, the health system was radically restructuring, including the integration of disability services into the broader health system and de-institutionalisation, while other aspects of social welfare delivery were also being reshaped. It seems that as a result some displacement occurred between the more formal and hospital sector and informal and primary health care sectors.

In this sense Sickness Benefits represent another aspect of health: the 'burden of illnesses' in the community. The 'burden of disease' is a well known phrase (Murray and Lopez, 1996); the term we are introducing provides an analogy. The notion is of a latent, underlying level of illness in the community manifesting itself through access to sickness benefits and perhaps to primary health services of one sort or another. Contact with the more formal components of the health system is, however likely in many cases to involve late presentation at secondary health care facilities. All of these infer a 'burden' in the service delivery, fiscal and economic senses of this word, but a burden that is diffused and difficult to document exactly – our indicator used here is, at best, but a proxy of this.

There have been some changes in sickness/invalid benefit levels with respect to unemployment benefit over the period from 1986 to 1996 which can effect decision on benefit movement. Initially in 1986, benefit levels for sickness and invalid benefits were higher than the unemployment benefit thereby creating a two tier system making it more advantageous to be on the sickness/invalid benefit than on unemployment benefit. In 1991 there were *pro rata* benefit cuts for unemployment and sickness benefits, but not invalid benefits, creating a three tier system which was still in place in 1996. The different levels of benefits give people an incentive to move from one benefit to another. "Analysis of the figures also indicates a high degree of "mobility" into the higher paid invalids and sickness benefits from the formerly unemployed. For example 30% of all new grants of Sickness Benefit in 1995 were to people previously on Unemployment Benefit" (Preston 1996).

In this section the age-specific rates of all the people receiving sickness/invalid benefits between ages 15-59 years is investigated. In the previous section, benefit use for the overall population (15-59 years) was investigated with sickness/invalid benefit being part of a hierarchical structure which was not an overall prevalence. The census question was posed asking whether over the year, a person, received one or more types of benefit.

The trends for New Zealand over time have shown an increase in the levels of sickness/invalid benefit (see Table 16) In 1986 and 1991 males generally had higher rates than females except in the age group 15-24 years which includes women who go on the sickness/invalid benefit while they are pregnant. By 1996 in the older two age groups there was not that much difference between males and females. In 2001 the 45-59 years group had higher rates for females than males. The oldest age group 45-59 years had the highest percentage of people on sickness/invalid benefit with this percentage going up considerably over the time period compared to little change in the people aged 15-24 years. Māori have considerably higher percentages of sickness/invalid benefit than Pakeha. The increase over time for Māori was larger than Pakeha especially for females 45-59 years.

Table 16: Percentage of the Population getting Sickness/Invalid Benefit[1], by Age, Gender and Ethnicity, New Zealand, 1986-2001

Year	Age Group (years)	Pakeha		Māori		Total	
		Males	Females	Males	Females	Males	Females
1986	15-24	2.3	2.7	2.9	4.7	2.3	3.0
	25-44	2.2	1.5	4.0	2.6	2.4	1.6
	45-59	3.7	1.8	9.0	4.1	4.1	2.0
1991	15-24	2.1	2.6	2.7	3.6	2.1	2.7
	25-44	2.7	2.2	4.7	3.7	2.8	2.3
	45-59	4.5	3.3	10.7	7.9	5.0	3.7
1996	15-24	2.8	3.7	3.7	6.4	2.7	3.9
	25-44	3.8	3.2	6.7	5.9	3.9	3.5
	45-59	5.0	5.7	12.0	12.2	5.6	5.8
2001	15-24	2.5	3.1	3.5	5.1	2.4	3.2
	25-44	4.0	3.4	7.0	5.8	4.2	3.6
	45-59	5.2	5.8	12.5	13.3	5.8	6.5

(1) Received a sickness/invalid benefit any time in the last 12 months.

Regional

For the remainder of the analysis the focus will be on the overall standardised rate as shown in Table 17. The regions which had the smallest increase in Sickness/Invalid Benefit usage over the 12 month leading up to the census over the time period 1986 to 2001 and also the lowest rate in 2001 were Auckland and Wellington. Southland, Wellington and Taranaki were low in 1986 with Southland and Taranaki joining the middle of the pack by 2001. The regions with the highest levels in 2001 were Northland, Gisborne and the West Coast. These first two regions also experienced the largest change over the period of over three percentage points with the large change occurring between 1991 and 1996. West Coast and Nelson-Tasman had the highest rates in 1986 with Nelson-Tasman still remaining relatively high.

Table 17: Standardised[1] Percentage of the Population Receiving Sickness/Invalid Benefit[2] (15-59 years), by Region, 1986-2001

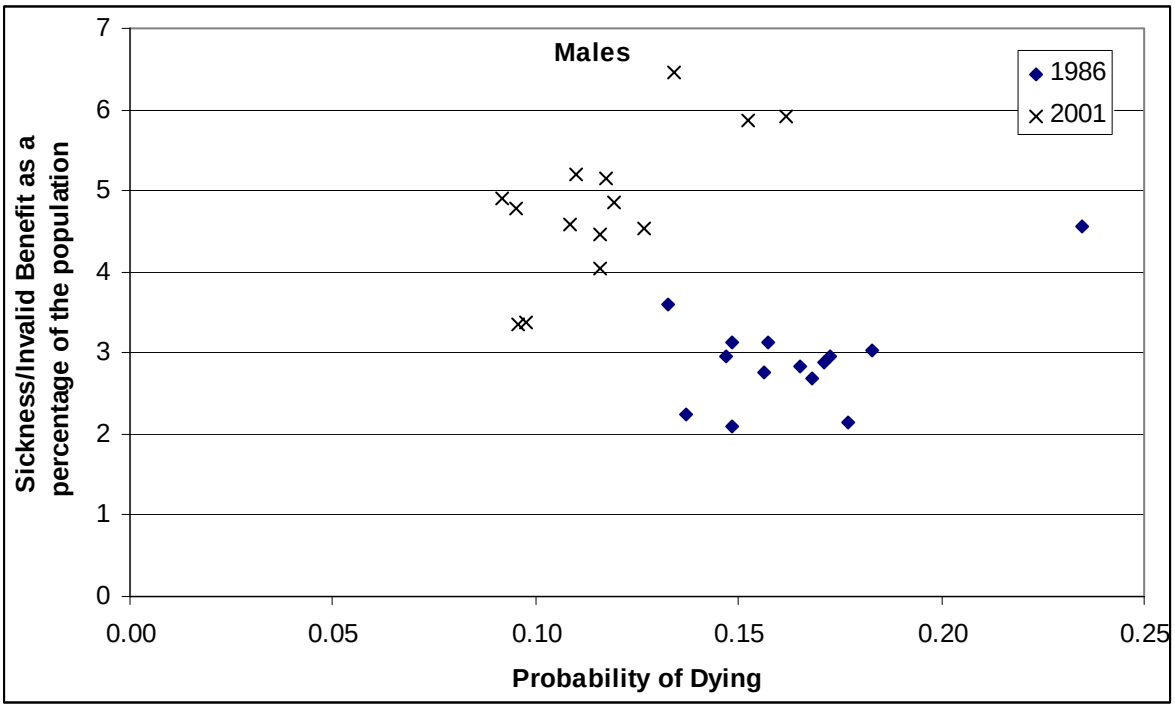
Region	Percentage of Population				Percentage Point Change			
	1986	1991	1996	2001	1986-91	1991-96	1996-01	1986-01
Northland	2.4	3.8	5.4	5.7	1.3	1.6	0.3	3.3
Auckland	2.5	2.8	3.4	3.4	0.4	0.6	0.0	0.9
Waikato	2.4	3.1	4.3	4.5	0.7	1.2	0.2	2.0
Bay Of Plenty	2.3	3.1	4.5	4.6	0.8	1.3	0.1	2.2
Gisborne	2.6	3.7	4.9	5.8	1.1	1.2	0.9	3.1
Hawke's Bay	2.6	3.1	4.8	4.9	0.5	1.7	0.1	2.3
Taranaki	2.0	2.8	4.3	4.7	0.8	1.5	0.4	2.7
Manawatu-Wanganui	2.7	3.6	4.9	5.3	0.9	1.3	0.4	2.6
Wellington	1.9	2.3	3.2	3.4	0.4	0.9	0.1	1.4
West Coast	3.7	5.8	6.6	6.3	2.1	0.9	-0.4	2.6
Canterbury	2.7	3.7	4.7	4.8	1.0	1.1	0.0	2.1
Otago	2.6	3.4	4.5	4.7	0.9	1.1	0.2	2.2
Southland	1.9	2.4	4.4	4.3	0.5	2.0	-0.1	2.4
Nelson-Tasman	3.5	4.1	5.5	5.6	0.6	1.4	0.1	2.1
Marlborough	2.5	3.2	4.2	4.6	0.7	1.0	0.4	2.1
New Zealand	**2.5**	**3.1**	**4.1**	**4.2**	**0.7**	**1.0**	**0.1**	**1.8**
Range	*1.8*	*3.4*	*3.4*	*2.9*	*1.7*	*1.4*	*1.2*	*2.3*

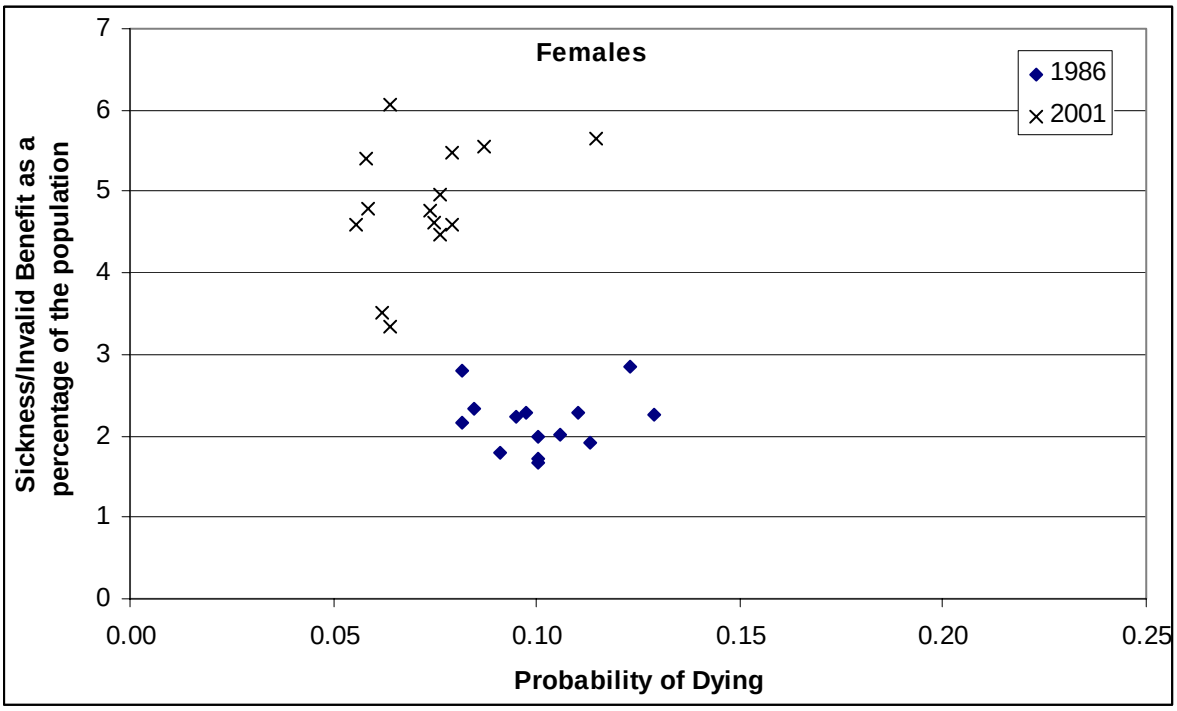
(1) Standardised by Age and Gender to New Zealand 1996.
(2) Received a sickness/invalid benefit any time in the last 12 months.

At a regional level, as is shown in Figure 3, there is a degree of correlation between benefit use and the probability of dying. This is weaker for males than for females, but in both cases strengthens over time to reach significant levels for males. It must be stressed that these increases are not a function of changing age structures. While the factor of failure to survive changes over time, a much more powerful aspect of change comes from the growth in need to turn to benefit use.

The results in Figure 3 certainly raise questions about gains in health effectiveness (how well the system addresses health problems) over the period, as against gains in health efficiency (management changes, notably access to and duration in hospital). It will be recalled from the earlier analysis that there was a convergence for the measures used, indicating improved efficiency. The decreases in Figure 3 in nqx (probability of dying) are one measure of improved effectiveness, but against this the increases in benefit use points to problems of effectiveness. That is, the health system was missing some people - not necessarily increasing death rates but certainly affecting those that have an impact on quality of life and capacity to be in the productive population. But to this we must add an extra point: where benefit use was higher so too were levels of failure to survive. Thus there seems to be a relationship between system ineffectiveness and the ultimate measure of health: death.

Figure 3: Scattergram of Percentage of the Population Receiving the Sickness/Invalid Benefit 15-59 Years (Age Standardised), by Probability of Dying from 15 to 59 years, by Gender and Region, 1985-87 and 1999-01





Pearson's Correlation r[6]

Males	1986	-0.550
	2001	-0.697
Females	1986	-0.055
	2001	-0.385

[6] The focus here is on comparison over time. Thus the underlying hypothesis to be tested is that in 1986 correlations will be weak, whereas by 2001 they will be stronger indicating growing regional divergence in social, economic and health outcomes.

8. Access to Public Hospitals

The earlier sections of the paper have identified problems relating to supply and demand, and to access to health care services. This section of the paper looks at the geographical dimensions of this by analysing time taken to travel to hospital. Three levels of hospital care were included in an analysis of time from hospital institutions, and the effect of the time taken to travel there; these levels have been categorised in official statements (English 1998). In the late 1990s they were:

- **Sub-Acute Units** – These provide in-patient medical beds and day surgery. Lower level diagnostics, day stay care, some inpatient surgery, and clinical support services may also be available. Sub-acute units can initiate the resuscitation of an injured patient, but would almost always attempt to transfer emergency medical patients to a secondary or tertiary hospital service. The institutions are:
  Hospitals – Waitakere, Botany Road Super Clinic, Browns Road Super Clinic (all three Auckland region), Thames, Te Kuiti, Tokoroa, Taupo (all four Waikato region), Taumarunui (Wanganui), Hawera (Taranaki), Napier (Hawke's Bay), Kenepuru (Porirua, Wellington) and Buller (Westport, West Coast).
- **Secondary Hospitals** – These are equipped to cater for most of the local population's health needs, and so offer 24-hour acute secondary (specialist) services. Secondary hospitals contain intensive care units, but where patients need prolonged ventilation or tertiary surgical management, they would be transferred to a tertiary hospital services. The institutions are:
  Hospitals – Kaitaia[7], Whangarei (both Northland), North Shore (Auckland), Tauranga, Rotorua, Whakatane (all three Auckland region), Gisborne, Taranaki Base (New Plymouth, Taranaki), Hastings (Hawke's Bay), Wanganui, Palmerston North (both Manawatu-Wanganui), Masterton, Hutt (both Wellington), Nelson (Nelson-Tasman), Wairau (Blenheim, Marlborough), Grey Base (Greymouth, West Coast), Ashburton, Timaru (both Canterbury) and Southland (Invercargill, Southland).
- **Tertiary Hospitals** – Tertiary hospitals are national-level institutions. They are characterised by specialised high-tech services that are usually of high cost and low volume. They have a greater number of sub-specialists with 'on site', as opposed to 'on call' specialists. At this advanced level, these hospitals have many 24-hour 7 days resources, and have most major modern diagnostic services. They provide a rapid retrieval and primary response service within their geographic area, and also perform sub-acute and secondary hospital services. The institutions are:
  Hospitals – The Auckland Hospital/Starship cluster, National Women's/Greenlane cluster, Middlemore/Otara Spinal cluster (all three cluster are in the Auckland region), Waikato (Hamilton), Wellington, the Christchurch/Burwood/Christchurch Women's cluster (Canterbury) and Dunedin (Otago).

When people are ill, particularly with an acute condition, it is clearly an advantage if they do not have to travel great distances or over long periods to access services. But the very institutional nature of hospitals means that it is not possible for every segment of the population to be within, say, 30 minutes of a hospital. Today hospitals tend to be located where populations are large and of higher density. In the past many small towns had hospitals that performed sub-acute and secondary services, often relying on staff with a limited skill-base, and with insufficient cases in any particular area to maintain their expertise. The health reforms of the 1980s and 1990s saw many of these units closed or their functions changed.

[7] At the time of writing this had been down graded to a sub-acute unit.

It is not only people who are sick who have to travel to hospital, but also the relatives who need to visit and give support. Thus sub-populations living long distances from hospitals face increased costs not only of getting patients to services (although there is assistance available), but also the expenses required by relatives and friends wanting to visit patients. On release post-hospital care may be expensive or difficult, or patients may have costly trips into in/out patient facilities (see also footnote 3 above). In this context, it must be stressed that this has health implications in that quality of life is affected.

A further point is that persons in need may not always be able to be served by their nearest hospital, as it may not always be able to carry out the required services. Thus, a person living near a sub-acute hospital may have to travel to a secondary or tertiary hospital to receive the care required.

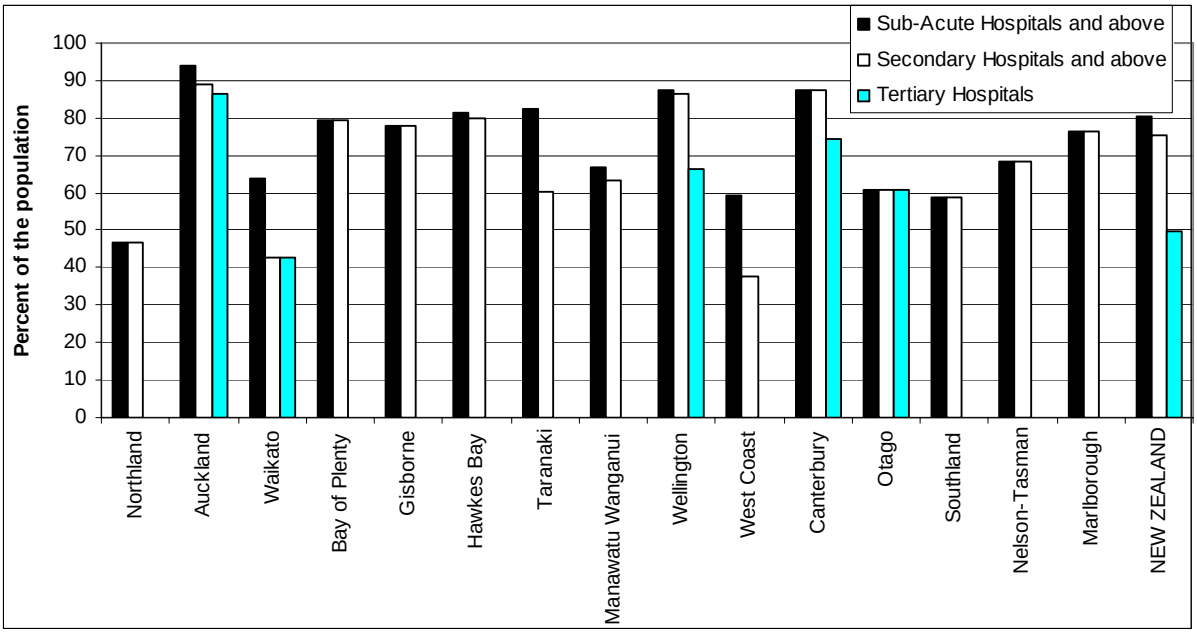
There is one further ramification. Bed-day rates are affected where distance from a unit is such that the medical staff may decide not to release a patient from hospital. Someone living near at hand can lead to a release at an earlier date.

With these points in mind, the following analysis considers the percentage of the population living within different travelling times of the different levels of hospital services. We look mainly at time because this gives a better indication on how long it takes to get to hospital. It does not take long to travel to services if the roads are good and straight, but when the roads are narrow and windy it could take much longer to travel the same distance. Unsealed roads also increase travelling time and this is an important factor in some of the mountainous coastal areas such as the Coromandel Peninsula (Waikato), the East Cape (Gisborne Region), the Marlborough Sounds, Banks Peninsula and for many of the more remote parts of the Western half of the South Island. In the last case of course, population numbers are also small. Two time intervals are investigated in detail: 30 minutes and 60 minutes (see Figures 4 and 5 and Appendix Table 1). It is important to stress that we deal with road-times, not with times for planes or helicopters.

For the New Zealand population as a whole, half live within 30 minutes of a Tertiary Hospital, 76 per cent within 30 minutes of a hospital providing Secondary services or above, and four fifths are within 30 minutes of a Sub-acute hospital or a higher level service. The situation is slightly better when considering the population within one hour of a hospital, with 58 per cent being within 60 minutes of a Tertiary Hospital, 90 per cent being within 60 minutes of a Secondary Hospitals or above, and 93 per cent of people being within 60 minutes of a Sub-acute or above.

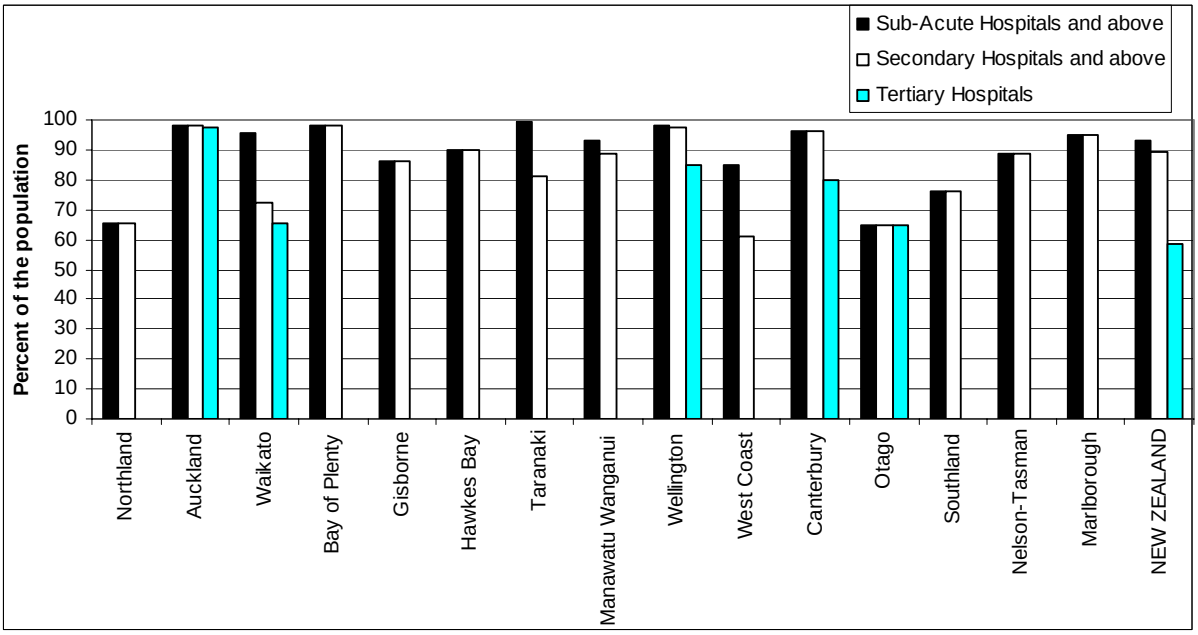
Areas with the best access to all levels of hospital care are those with one or more Tertiary hospital: Auckland, Waikato, Wellington, Canterbury and Otago. The region best served is Auckland, as it is compact and has several Tertiary hospitals. In this region, 87 percent of the population was within 30 minutes and 97 per cent within 60 minutes of a Tertiary hospital. The other regions with Tertiary hospitals had varying proportion of their population living within 30 minutes and 60 minutes of a Tertiary Hospital. Of regions with tertiary facilities, Waikato had the lowest percentage with only two fifths of the people being within 30 minutes of the Tertiary hospital, while Otago had the lowest proportion of its population within 60 minutes of a Tertiary hospital (65 per cent). No other region has access to a Tertiary hospital within 60 minutes.

Figure 4: Percentage of the Population within 30 minutes of a Hospital by Level of Hospital and Region, 1996



Note: Most regions have **no** tertiary facility.
Source: Commissioned analysis by Lars Brabyn, GIS specialist, Department of Geography, University of Waikato.

Figure 5: Percentage of the Population within 60 minutes of a Hospital by Level of Hospital and Region, 1996



Note: Most regions have **no** tertiary facility.
Source: Commissioned analysis by Lars Brabyn, GIS specialist, Department of Geography, University of Waikato.

All regions have a Secondary hospital or above, but the degree of access varies depending on how large the area is and how dispersed the population is. For example, the West Coast, Waikato and Northland have less than half of their populations within 30 minutes of a Secondary Hospital because these regions cover very large areas, and, there is only one available Secondary Hospital (which is also a Tertiary in the case of the Waikato). The regions with over 90 per cent of the population within 60 minutes of a Secondary Hospital

and above are Auckland, the Bay of Plenty, Hawke's Bay, Wellington, Canterbury and Marlborough.

The regions with less than 80 per cent of the population within 60 minutes of sub-acute public hospitals and above are Northland, Otago and Southland which are some of the geographically more difficult regions to serve; there are only two hospitals in Northland, which is long and narrow, and one each in Otago and Southland. The only other regions where less than 90 per cent of the population is within 60 minutes of a hospital of any sort are Gisborne, the West Coast and Nelson-Tasman, all narrow coastline regions. In Gisborne's case the one unit is in the far south of the region.

9. Workforce involved in the Health Sector

Health workforce data provide an indication of differential access to health professionals for people in various regions. It is hard of course to know what an ideal level might be, but lower rates might well suggest a degree of disadvantage.

Linked to geographical access is the availability of medical care. Here official data on the medical workforce are referred to. They are imperfect in that the regions they relate to are different from those employed elsewhere in this paper. More importantly data on nurses were not published in comparable form in 1986 and more recently the official series use different regions (Area Health Boards). The analysis refers only to doctors and dentists in Area Health Boards in 1986 and 1996 and District Health Boards in 2001 Some have been re-assigned to the regions we are using.

The health workforce data for 1986, 1996 and 2001, coming from New Zealand Health Information Service, Medical Workforce Statistics, Morris (1986) and Morris and Leatham (1986) are compared, although there could be some slight differences in how the data these other sources used were collected. Moreover the regions used in this analysis had slightly different boundaries from the standard regional council boundaries but do approximate those for most of the regions. To add to this, the data used do not relate to full-time equivalents, but rather the actual numbers in the profession, and thus the resultant indices could be affected by different levels of part-time work in various regions. Data for nurses were not available in a comparable form for 1986. Rates for these indicators are cited per 100,000 of the population as the numbers would be too small otherwise.

Nationally the number of medical practitioners per 100,000 population (the conventional international index) increased from 174 (1986) to 227 (2001) as shown in Table 18. This is in part a function of changes in the size of medical schools graduating classes and in the proportion of graduates who stay on in New Zealand. A lack of medical workforce planning (eg. changing the size of intakes drastically), the student loan scheme that is forcing some graduates offshore, reliance on migration coupled with radical changes in migration policy (the New Zealand medical workforce is heavily recruited from overseas) have all combined to affect numbers. A further factor, particularly affecting the regions in the ratio between specialists and general practitioners.

Table 18: Various Health Professionals as a Rate per 100,000 People, New Zealand, 1986-2001

	1986	1996	2001
All Doctors (Medical Practitioners)[1]	174	211	227
General Practitioners	65	81	81
Specialists	55	64	73
All Nurses	N/D	1003	998
Registered Nurse	N/D	844	885
Enrolled Nurse	N'D	159	113
Dentists[2]	47	46	54

(1) There are other practitioners that get included in total which include House Officer, MOSS and Registrar.
(2) Rates per 100,000 people, aged 14+ years. Dentists only treat children once they start Secondary School.
(3) N/D = No Data
Sources: (Morris 1986; Morris and Leatham 1986)
New Zealand Health Information Service, Medical Workforce Statistics.
Statistics New Zealand, 1996 and 2001 Census of Population and Dwellings.

As might be expected Specialists and Dentists are centred more in areas with metropolitan areas, an exception being the Waikato in part because a large part of this area is non-urban. General Practitioners are not evenly spread, with low rates in small peripheral regions where typically, problems of timely care have been identified (earlier in this paper). Somewhat of an exception to this finding is seen in Nelson-Marlborough which has relatively higher rates and this appears to be reflected in their higher health status.

The relative sizes of the health workforce are given in Table 19, 20 and 21 for 1986, 1996 and 2001 respectively. The rates, especially for medical practitioners, increased considerably between 1986 and 2001 mainly between 1986 and 1996. It is not clear whether this higher level is indicates improved access to care by comparison with what was suggested by lower levels in the 1980s, or whether there is a need for this extra capacity simply as a response to the development of new bio-medical technologies.

We will initially consider all medical practitioners and then two sub-categories of General Practitioners and Specialists. This is an important distinction because General Practitioners are in the primary health sector while specialists are in mainly in the secondary and tertiary sector. There are other categories of medical practitioners which we do no look at here like House Officer, MOSS (medical officers of special scale) and Registrar.

First it is important to note that the rate of practitioners per 100,000 people for all three of these categories increased. Specialists had a 16 per cent increase from 1986 to 1996 with a further 14 per cent increase to 2001. General Practitioners increased from 1986 to 1996 of 25 per cent then had no further increase to 2001. Otago stands out as having higher rates for all medical practitioners than any other region, and Auckland and Wellington also had higher levels than did other regions. Otago and Auckland contain the nation's two medical schools[8] which attract additional medical practitioners. In addition, the regions with these medical schools are able to carry out more specialised work. West Coast had a rate of health professionals that was lower than any other region, which is probably caused by this region's isolation and because the most serious cases go to the larger centre of Christchurch. Other

[8] That said Clinical Schools for Otago University are located in Christchurch and Wellington, and for more recently Auckland University has established a Clinical School in the Waikato.

regions had low rates in 2001 were Northland, Gisborne, Hawke's Bay, Taranaki and Nelson-Marlborough which are all the more rural areas of New Zealand.

Table 19: Number of Health Professionals as a Rate per 100,000 People, by Approximate Area Health Board Regions, 1986

Region	All medical practitioners[1]	General Practitioners	Specialists	Dentists[2]
Northland	132	68	34	31
Auckland	205	73	62	50
Waikato	153	64	46	41
Bay of Plenty	132	63	43	41
Gisborne	133	50	46	32
Hawke's Bay	129	58	42	41
Taranaki	137	56	47	42
Manawatu-Wanganui	142	50	50	38
Wellington	193	63	67	50
West Coast	100	60	29	22
Canterbury	186	66	59	45
Otago	237	62	86	87
Southland	109	53	25	46
Nelson-Marlborough	148	77	48	41
New Zealand	**174**	**65**	**55**	**47**
Range	*137*	*27*	*61*	*65*

(1) There are other practitioners that get included in total which include House Officer, MOSS and Registrar.
(2) Rates per 100,000 people, aged 14+ years. Dentists only treat children once they start Secondary School.
Source: (Morris 1986; Morris and Leatham 1986)

The pattern for the rate of General Practitioners to the population is different from that seen for all medical practitioners. The rates for General Practitioners were high for Auckland for 1986 and 1996, but had dropped below the New Zealand figure by 2001. Nelson-Marlborough was high in 1986, Wellington high in 1996 and 2001, and in 2001 Canterbury, Otago and Southland was also high. Manawatu-Wanganui was very low for the whole period. West Coast was low for 1996 and 2001. Southland, Taranaki and Gisborne were low for 1986 and 1996. Hawke's Bay was also low in 1986.

The number of specialists in the population was high in Otago, with Auckland and Wellington also having high rates for the whole period. Northland, West Coast and Southland had low rates for the whole period, with Hawke's Bay having a low rate in 1996.

Table 20: Number of Health Professionals as a Rate per 100,000 People, by Area Health Board, 1996

Region	All medical practitioners[1]	General Practitioners	Specialists	Registered Nurses3	Enrolled Nurses4	Total Nurses	Dentists[2]
Northland	155	77	36	887	196	1,083	36
Auckland	234	87	73	795	106	901	48
Waikato	193	81	55	808	139	947	42
Bay of Plenty	177	76	54	782	138	920	38
Gisborne	157	61	52	767	190	957	33
Hawke's Bay	160	78	40	817	271	1,088	33
Taranaki	176	66	57	826	208	1,034	41
Manawatu-Wanganui	153	52	54	778	184	962	34
Wellington	250	85	82	956	127	1,083	52
West Coast	129	71	37	1,080	394	1,474	28
Canterbury	219	83	63	921	175	1,096	48
Otago	278	84	90	809	201	1,009	76
Southland	160	68	40	1,053	341	1,394	42
Nelson-Marlborough	161	79	51	865	208	1,073	45
New Zealand	**211**	**81**	**64**	**844**	**159**	**1,003**	**46**
Range	*148*	*34*	*53*	*314*	*288*	*573*	*48*

(1) There are other practitioners included in the total such as House Officers, MOSS and Registrars.
(2) Rates per 100,000 people, aged 14+ years. Dentists only treat children once they start Secondary School.
(3) A Registered Nurse practises independently and in collaboration with other health professionals, performing general nursing functions. They delegate to and direct enrolled nurses and nurse assistants (Nursing Council of New Zealand, 2005 a and b).
(4) An Enrolled Nurse assists registered nurses in delivering nursing care to individuals in community, residential and hospital settings. An Enrolled Nurse does not undertake independent nursing assessments or plan and evaluate nursing interventions (Nursing Council of New Zealand, 2005 c and d).
Source: New Zealand Health Information Service, Medical Workforce Statistics and 1996 Census

For Dentists there was a decline of 2 per cent in the rate per 100,000 people 14 years and over between 1986 and 1996 for New Zealand as a whole, the rate increased 15 per cent between 1996 and 2001 thus finishing above the 1986 rate. There were a mixture of increases and decreases across the regions. The largest decreases occurred in Hawke's Bay and Otago though in the Otago case this was from a high level. The largest increase occurred in Northland and West Coast, both of these increases were from low levels. The West Coast had the lowest rate of dentists to population for both 1986 and 1996 by a considerable margin and was also low in 2001. Northland, Manawatu-Wanganui and Gisborne also had low rates for the whole period with the Bay of Plenty and Hawke's Bay having low rates in 1996 and 2001. In 2001 Waikato, Taranaki and Southland also tended low. The region which had a significantly higher rate than any other region was Otago which is probably because the country's only dentistry school is located in this region. Wellington and Auckland had rates that were only just above the New Zealand level.

Table 21: Number of Health Professionals as a Rate per 100,000 People, by Region, 2001

	Based on DHB regions[1]			Based on AHB regions[1]			
Regions	**All medical practition-ers[2]**	**GPs**	**Specialists**	**Registered Nurses**	**Enrolled Nurses**	**Total Nurses**	**Dentists[3]**
Northland	162	81	44	817	108	925	47
Auckland	254	79	86	836	73	908	59
Waikato	216	81	62	877	113	989	45
Bay of Plenty	175	76	53	836	128	965	43
Gisborne	164	71	45	801	141	942	28
Hawke's Bay	164	75	47	833	108	941	39
Taranaki	167	65	60	794	164	958	41
Manawatu-Wanganui	181	64	62	833	135	968	41
Wellington	261	90	85	989	80	1,069	64
West Coast	116	56	43	994	287	1,281	25
Canterbury	251	94	81	1014	131	1,145	54
Otago	312	91	106	986	196	1,182	96
Southland	178	91	39	832	203	1,035	44
Nelson-Marlborough	159	80	47	872	182	1,054	51
New Zealand	**227**	**81**	**73**	**885**	**113**	**998**	**54**
Range	*197*	*38*	*67*	*220*	*214*	*372*	*71*

(1) The configuration of the regions are slightly different ie. Taupo is in Waikato for an AHB but in the Bay of Plenty in DHB's.

(2) There are other practitioners that get included in total which include House Officer, MOSS and Registrar.

(3) Rates per 100,000 people, aged 14+ years. Dentists only treat children once they start Secondary School.

Source: New Zealand Health Information Service, Medical Workforce Statistics and 2001 Census

The workforce statistics for nurses show quite different results to those for the other health professionals (see Table 20 and 21). For New Zealand as a whole for nurses there was a slight decline in the rate per population. The rates for nurses were particularly high in the West Coast in 1996 and 2001 where those for the medical practitioners were low. The rate was high for nurses in Northland in 1996 then became low in 2001. Southland and Hawke's Bay were also high in 1996 and Canterbury and Otago in 2001. Auckland had low numbers of nurses per population for 1996 and 2001, while the rate for medical practitioners was high. This was also seen to a lesser extent in 1996 for Otago although this region had a low level of registered nurses. Wellington went against this trend with a high level of medical practitioners as well as a high level of registered nurses and total nurses, although there was a low level for enrolled nurses.

10. Smoking

The census provides one further piece of evidence on the context of health, in this case a well-documented risk-factor, smoking. Unfortunately we only have data on it from the 1996 census.

Earlier in this paper many of the social co-variants of health trends, as measured here have been identified and analysed. Smoking is in a somewhat different category. It is a proximate determinant of many causes of hospitalisation. To simplify the analysis, this section will focus on the percentage smoking (current smokers). For New Zealand as a whole eight per cent did not specify their smoking status. Also 20 per cent were ex-smokers, a statistic not investigated in this paper.

The level of current smoking in the overall New Zealand population 15 years and over is 22 per cent, but the range between the highest and lowest region is eight percentage points as is shown in Table 22. The region which is the highest was Gisborne followed by Northland, the Bay of Plenty, Hawke's Bay and the West Coast. At the other end of the spectrum the lowest level was in Auckland followed by Canterbury.

Table 22: Standardised[1] Percentage of the Population 15 years and over Currently Smoking, by Region, 1996

Region	Pakeha	Māori	Total
Northland	22.4	40.0	25.8
Auckland	19.1	37.3	19.8
Waikato	20.9	39.4	23.4
Bay Of Plenty	21.8	38.8	25.4
Gisborne	21.9	38.8	27.7
Hawke's Bay	23.1	39.6	25.4
Taranaki	22.0	38.8	23.3
Manawatu-Wanganui	21.9	38.9	23.6
Wellington	20.5	36.8	21.3
West Coast	25.2	38.5	25.2
Canterbury	20.3	34.9	20.5
Otago	21.9	33.6	21.6
Southland	23.9	39.2	24.8
Nelson-Tasman	21.0	33.7	21.2
Marlborough	20.6	35.9	21.4
New Zealand	**20.7**	**38.1**	**21.9**
Range	*6.1*	*6.4*	*7.9*

[1] Standardised by age and gender to New Zealand total population in 1996.

Māori levels of smoking are much higher than Pakeha with the rates being 38 and 21 per cent respectively. Nevertheless, for both Pakeha and Māori there was only a six percentage point difference between the highest and lowest region. For Māori the regions which were high were Northland, Waikato, Hawke's Bay and Southland, and low were Otago, Canterbury and Nelson-Tasman. For Pakeha the lowest region was Auckland and the highest were the West Coast, Hawke's Bay and Southland.

Table 23: Percentage of the Population Currently Smoking by Age, Ethnicity and Region, 1996

Region	15-24	25-44	45-64	65+	15-24	25-44	45-64	65+
	Pakeha				Māori			
Northland	23.6	27.3	19.8	10.4	39.3	50.6	36.8	18.9
Auckland	21.1	22.9	17.9	9.2	39.5	46.6	35.6	16.9
Waikato	23.2	25.1	18.9	9.9	40.2	49.7	35.8	20.3
Bay Of Plenty	26.6	25.8	18.6	9.0	41.1	48.4	36.0	18.1
Gisborne	22.3	26.3	20.7	9.9	40.2	49.2	35.1	17.6
Hawke's Bay	26.9	27.3	20.3	10.1	41.3	49.7	37.4	16.9
Taranaki	24.9	26.4	20.0	9.2	38.0	48.0	36.9	18.9
Manawatu-Wanganui	22.4	26.8	20.5	10.1	40.3	47.9	37.7	19.0
Wellington	23.1	23.9	19.4	10.5	39.8	45.2	34.9	18.6
West Coast	26.1	30.2	24.1	12.3	42.9	46.0	33.1	20.8
Canterbury	23.6	24.2	18.6	9.0	38.1	42.8	33.7	14.2
Otago	22.9	26.4	21.0	10.3	32.6	41.6	32.5	17.0
Southland	28.5	27.5	22.4	10.2	44.8	45.6	36.1	21.1
Nelson-Tasman	28.0	24.9	17.0	8.0	39.7	42.6	28.1	12.8
Marlborough	25.0	24.2	18.3	8.6	38.5	42.9	35.1	14.0
New Zealand	**23.3**	**24.8**	**19.1**	**9.6**	**39.8**	**47.4**	**35.7**	**18.1**
Range	*7.4*	*7.4*	*7.2*	*4.2*	*12.2*	*9.1*	*9.6*	*8.3*
	Total							
Northland	27.9	32.4	22.1	10.7				
Auckland	21.4	24.1	18.3	9.1				
Waikato	26.4	28.9	20.4	10.2				
Bay Of Plenty	31.0	31.2	21.1	9.5				
Gisborne	30.5	34.5	24.2	10.9				
Hawke's Bay	29.7	30.9	22.0	10.3				
Taranaki	26.4	28.3	20.9	9.3				
Manawatu-Wanganui	25.2	29.2	21.5	10.3				
Wellington	24.3	25.3	19.8	10.3				
West Coast	26.9	30.3	23.6	11.8				
Canterbury	23.5	24.6	18.7	8.9				
Otago	22.2	26.3	20.7	10.2				
Southland	30.1	28.6	22.9	10.3				
Nelson-Tasman	27.7	25.5	17.0	7.9				
Marlborough	26.2	25.3	18.8	8.4				
New Zealand	**24.5**	**26.6**	**19.8**	**9.6**				
Range	*9.6*	*10.3*	*7.2*	*3.9*				

By age the highest percentage smoking was in the 25-44 years age group followed by the 15-24 years being 27 and 25 per cent respectively as is shown in Table 23. The lowest level of smoking was in the oldest age group 65 years and over. The largest range between the regions (10 percentage points) was in the two youngest age groups 15-24 and 25-44 years. A notable result is the low level of smoking in the youngest age group 15-24 years in Auckland, Otago and Canterbury; and the high levels in the Bay of Plenty, Gisborne, and Southland. In the 25-44 years age group there was low level of smoking in Auckland, Wellington and

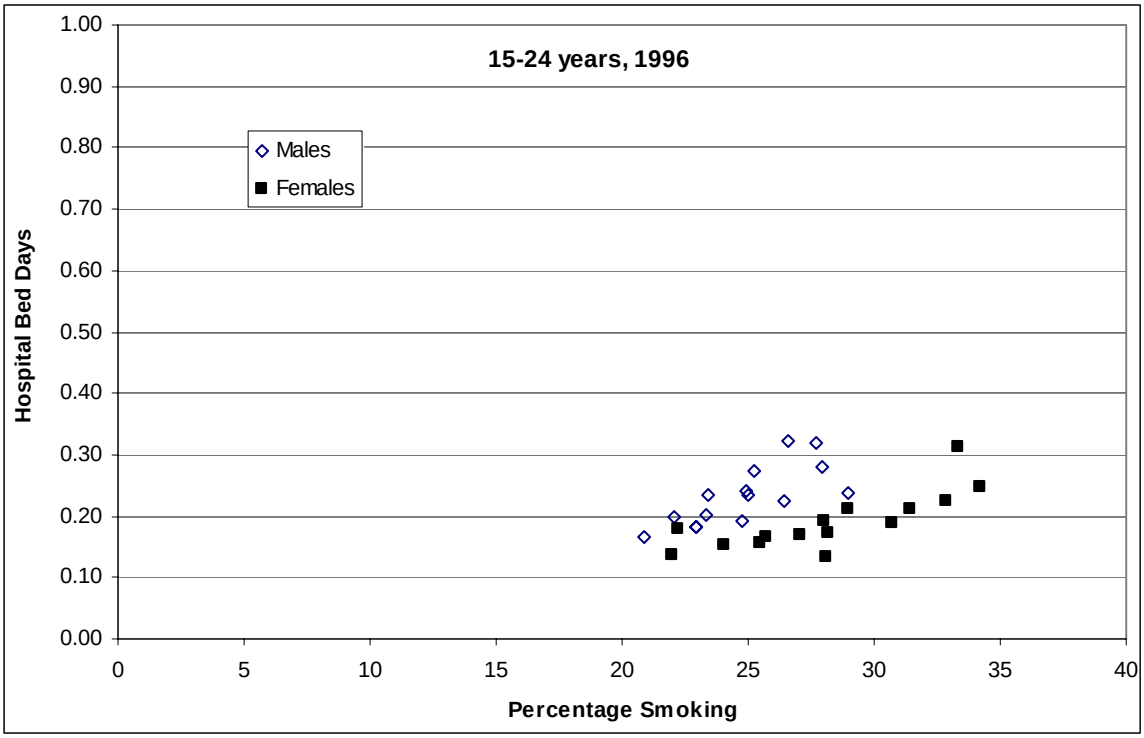
Canterbury which have large metropolitan areas and Nelson-Tasman and Marlborough which have low levels of Māori.

When comparing the result by age for Pakeha and Māori there are some big differences. Māori levels of smoking are very high especially in the 25-44 years age group at 47 per cent compared to 25 per cent for Pakeha. There are also differences at the other age groups but they are not as extreme, though still disturbing. In the 15-24 years age group the Pakeha level was 23 per cent compared to Māori at 40 per cent, and for the 45-64 years age group the levels were 19 and 36 per cent respectively. The oldest age group the levels are lower at 10 per cent for Pakeha and 18 per cent for Māori.

The ranges between the regions were higher for Māori but this was mainly because of some extreme values in the South Island which had a smaller percentage who were Māori, particularly at older ages. Even at age group 15-24, by excluding Otago the range drops from 12.2% to 6.8%.

For Pakeha the three age groups under 65 years all had a range of seven percentage points. The results that stand out for Pakeha are the high levels in the West Coast for age groups 25 years and over, and the high levels in Southland and Nelson-Tasman in the 15-24 years age group, though interestingly at 45 years and over this last named region had the lowest levels.

Figure 6: Scattergram Age-Specific Rates of Smoking by Bed Day Rate per Person, by Gender and Region, 1996



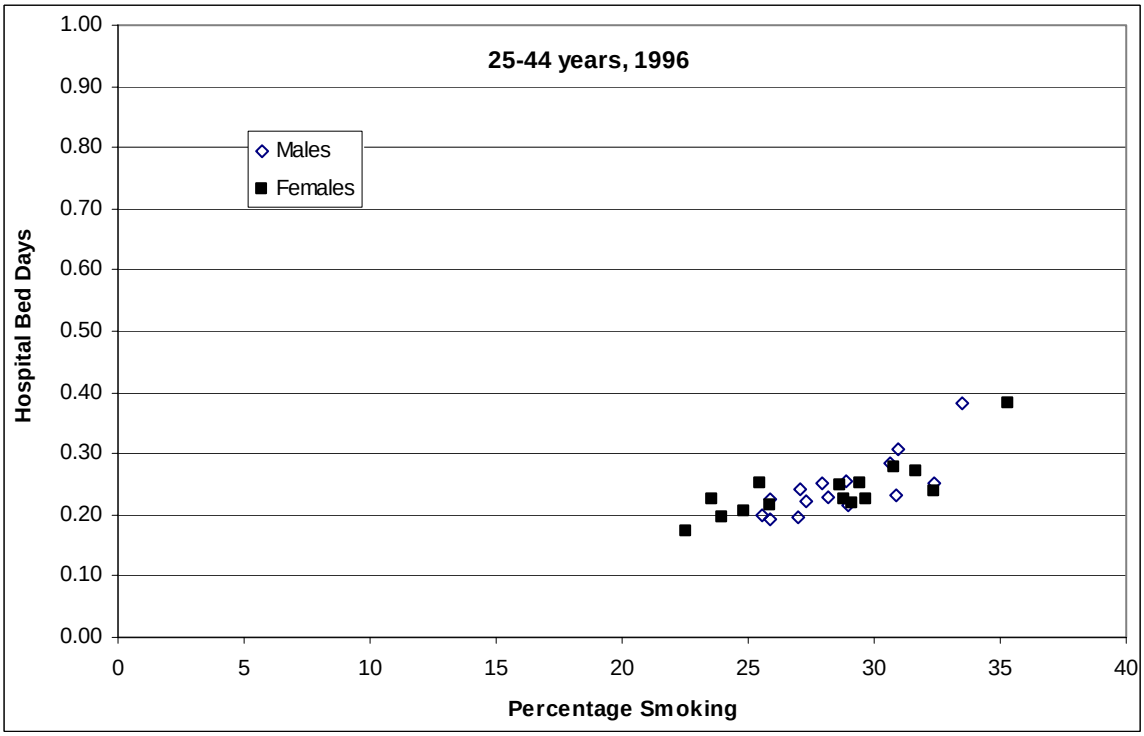
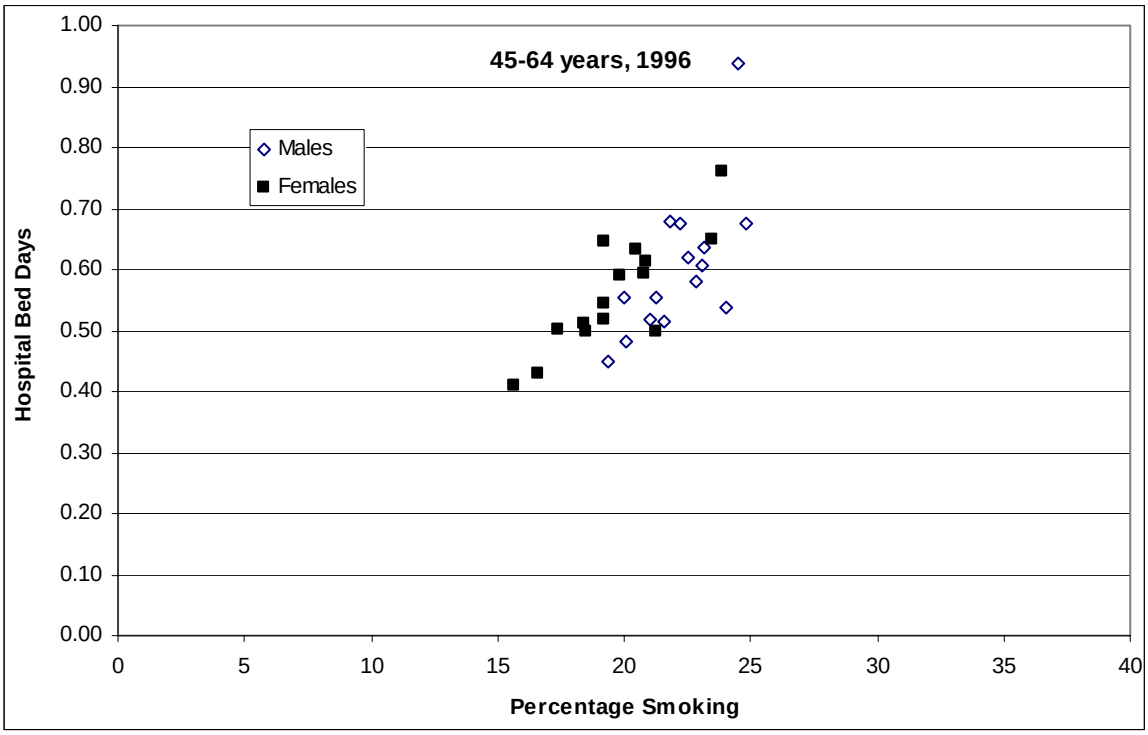


Figure 6 (continued)



Pearson's Correlation r

	Males	Females
15-24	0.738	0.766
25-44	0.780	0.794
45-64	0.677	0.846

Figure 6 graphs a bi-variate analysis for hospital bed-days and percentages smoking, presenting these by age and gender.

While not arguing causality – our data do not permit this – there is a correlation between these two variables. Not unexpectedly, bed days are highest, by a significant margin, at older ages, but we cannot be sure whether this is related, at least in part, to long-term smoking. A more surprising result is that the regional spread is widening and that correlations are higher for women than for men.

11. Other Contextual Factors

The empirical data presented here point to improvements in health over time. Moreover, health differentials are affected by bio-social factors that have been controlled for here (age and gender). Despite controlling for this, regional differentials remain. Thus we have brought into the analysis other factors: notably the proportion who are Māori, health service differentials (access, health professionals), and variance in smoking rates. But even after all these variables are taken into account, there remains the possibility that regional differentials in other more socio-economic factors that are highlighted in other papers in this series come into play. This is implied at times in the forgoing analysis, particularly when benefit-use, in this case sickness/invalid benefits, was looked at. There were positive correlations between benefits and probability of dying for example. While Sickness and Invalid beneficiaries have all had their health status assessed clinically, there are also linkages with use of other benefits that are provided in response to conditions that are clearly not bio-medical.

This section of the paper takes this analysis further. Figures 7, 8 and 9 show bi-variate analyses of sickness/invalid benefit use and some key economic indicators: job losses, unemployment, discouraged workers. The postulates here can be stated in two ways. The first is that a correlation between these factors points to socio-economic factors being determinants of the burden of ill-health as defined earlier. The second postulate can be: we, along with some of the analyses in the rural community health literature (Ajwani et al, 2003), see the economic restructuring and the attendant growth in social inequalities as a cause at least of continuing Māori /Pakeha differentials.

Nevertheless, this postulate needs modifying. Pool and Cheung (2003:123) after a detailed cohort analysis postulated "that the deterioration in 1991-96 was a residual effect of a history of cycles of cohort gain and deterioration reinforced by period effects coming from restructuring". The analysis of regional differences allows us to explore this a bit further. In any region the health differences by comparison with New Zealand as a whole will be a function of the contemporary social and economic conditions, and particularly the disadvantaged Māori and Pacific Island people might face. But they will also be a function of the health history of cohorts in the region, reinforced by the strengths and weaknesses of the health system in that area.

Figure 7: Scattergram of Percentage of the Population Receiving the Sickness/Invalid Benefit 15-59 Years (Age Standardised), by Job Losses, by Gender and Region, from 1991 to 2001.

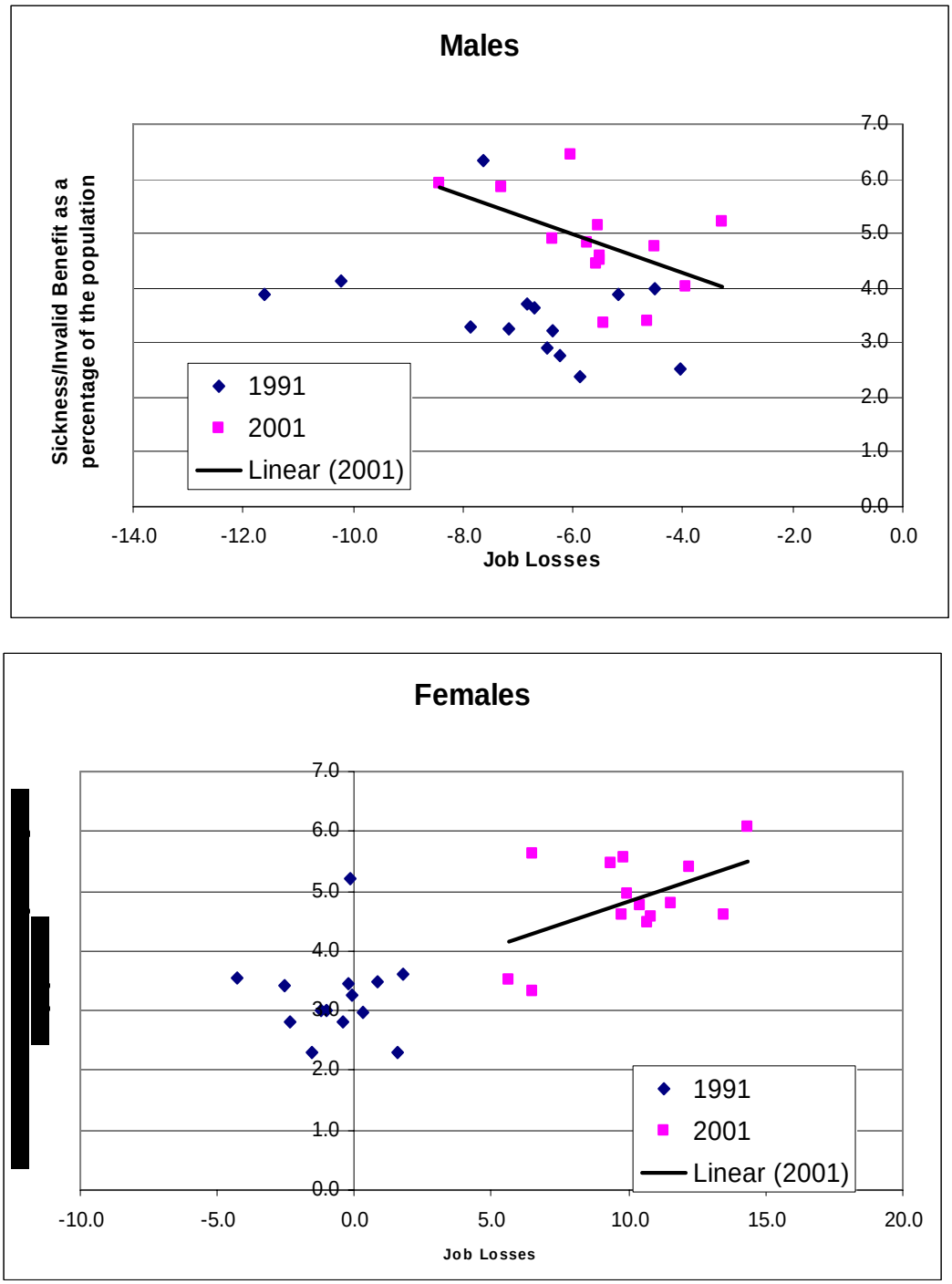


Figure 8: Scattergram of Percentage of the Population Receiving the Sickness/Invalid Benefit 15-59 Years (Age Standardised), by Unemployment, by Region, 1986 and 2001.

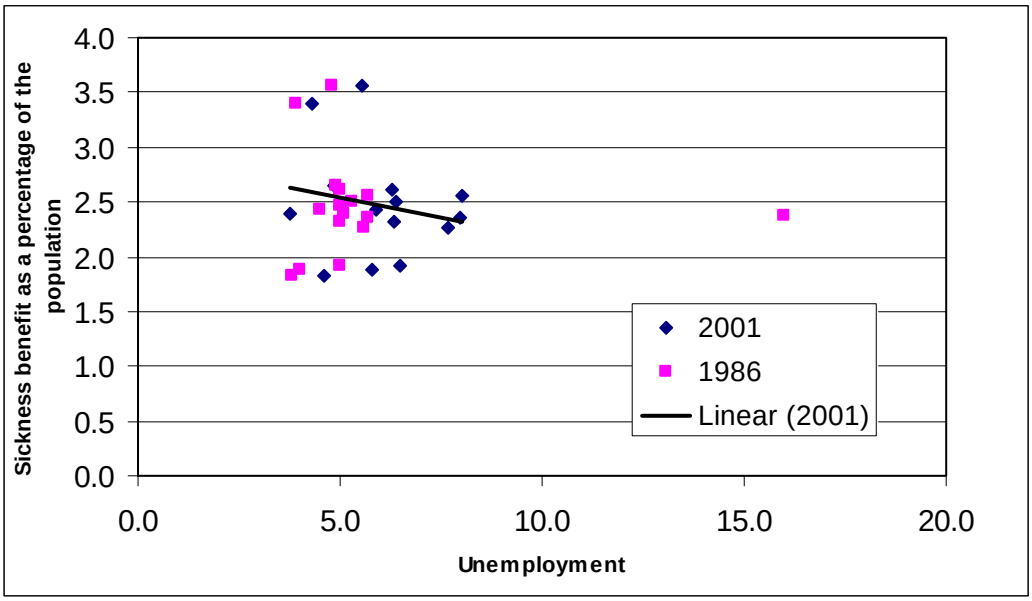
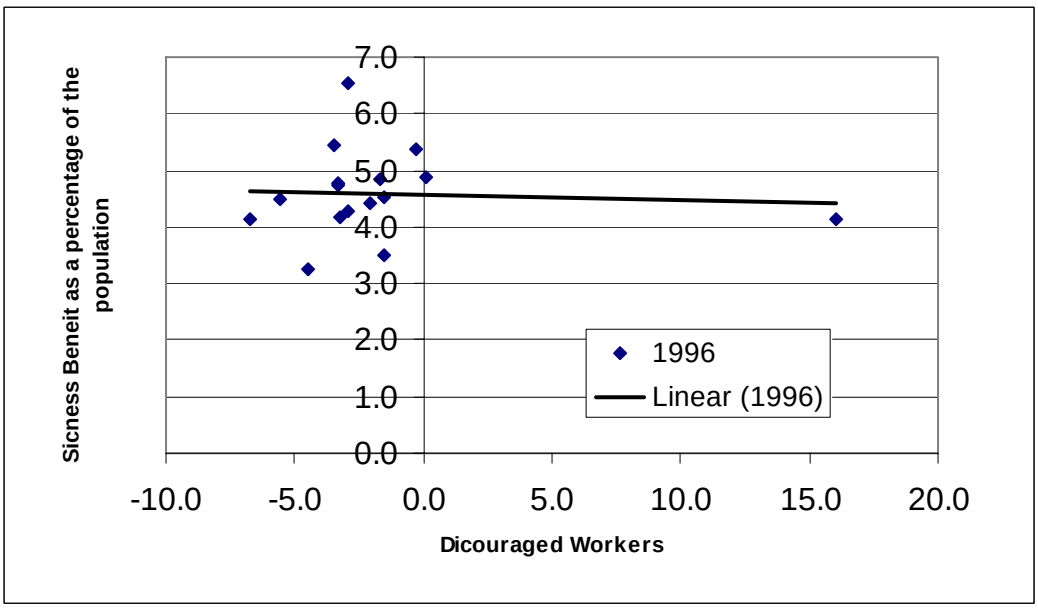


Figure 9: Scattergram of Percentage of the Population Receiving the Sickness/Invalid Benefit 15-59 Years (Age Standardised), by Discouraged Worker Effects, by Region, 1996.



12. Conclusion

This paper introduces a different theme from those discussed in other discussion papers in this series, yet the overall results seem remarkably familiar. This similarity is all the more compelling because population health is not just determined by socio-economic and cultural factors, but these linkages are mediated by bio-social characteristics, such as age and gender, the macro-level analogues of which are documented in any region's demographic profile. The peripheral regions, especially in the North Island, but also the South Island's West Coast, have health indicators that mirror their unsatisfactory status for their social and economic attributes analysed in earlier discussion papers. Indeed, the analyses in this one show correlations with a number of factors discussed in earlier discussion papers.

These same regions also face problems of access to hospitals and are less well served in terms of an available health workforce. There are also some indications here that the interface between primary health care and secondary and tertiary sectors is not as well articulated as it is in some more favoured areas.

The period covered in this paper saw some attempts to standardise the health system, as much as possible, across the regions. Some differences – for example the absence of a tertiary facility – are inevitable, but, recalling that the data here refer to place of residence, it seems that there are still marked inter-regional health inequalities. Moreover, some of the restructuring may have produced another problem: it may have left populations that are dependent on health benefits but perhaps not integrated fully into the health system. The level of this problem varies from region to region.

Finally, health is an important determinant of the quality of human capital. The findings in this paper reinforce those in earlier discussion papers showing marked inequalities across many dimensions of human capital.

Appendix Table 1: Percentage of the Population within Specific Times of a Hospital by Level of Hospital and Region, 1996

Regions	Sub-Acute Hospitals and above				Secondary Hospitals and above				Tertiary Hosptials			
	<15min	<30min	<60min	<90min	<15min	<30min	<60min	<90min	<15min	<30min	<60min	<90min
Northland	27	47	66	93	27	47	66	93	0	0	0	0
Auckland	76	94	98	100	53	89	98	100	39	87	97	99
Waikato	43	64	96	99	29	43	72	92	29	43	66	83
Bay of Plenty	54	79	98	99	54	79	98	99	0	0	0	0
Gisborne	73	78	86	89	73	78	86	89	0	0	0	0
Hawke's Bay	76	82	90	94	41	80	90	93	0	0	0	0
Taranaki	53	82	99	100	41	60	81	100	0	0	0	0
Manawatu-Wanganui	52	67	93	96	49	63	88	91	0	0	0	0
Wellington	65	87	98	100	53	87	97	100	34	66	85	93
West Coast	51	59	85	93	34	38	61	68	0	0	0	0
Canterbury	66	87	96	98	66	87	96	98	57	75	80	86
Otago	46	61	65	79	46	61	65	79	46	61	65	70
Southland	48	59	76	94	48	59	76	94	0	0	0	0
Nelson-Tasman	50	68	89	92	50	68	89	92	0	0	0	0
Marlborough	71	77	95	97	71	77	95	97	0	0	0	0
New Zealand	**62**	**80**	**93**	**97**	**50**	**76**	**90**	**96**	**28**	**50**	**58**	**63**
Range	*49*	*47*	*34*	*21*	*46*	*51*	*37*	*32*	*57*	*87*	*97*	*99*

Source: Commissioned analysis by Lars Brabyn, GIS specialist, Department of Geography, University of Waikato.

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