Dying differently: Gendered mortality trends in New Zealand

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Abstract

This paper has two broad aims. First, we consider whether mortality explains the 'man drought' in the broad 25-44 age group. Confirming earlier work, we find it does not and explanations need to be found elsewhere. But men do die at a higher rate than women through the lifecycle with an overall result that men have a life expectancy of around four years lower than women. Given this overall pattern of higher mortality for men, we then draw on a number of studies to attempt to learn more about the reasons for the differences in life expectancy. In particular, we focus on those men who in other studies we identify as 'missing' in many areas of life. They are the group who tend to have little formal education and who are then over-represented in terms of being on the margins of employment and family life. They are also the group most at risk of poor mortality outcomes.

Keywords: Mortality, gender, missing men, census undercount

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Introduction

This paper explores long-term trends in life expectancy and mortality of women and men. It is divided into three broad sections, which both reflects the journey the investigation took and the direction in which our future work is pointing. Because the original impetus grew out of a consideration of sex ratios, the first section attempts to answer the question of whether differences in mortality between women and men are the main cause of the New Zealand 'man drought'. While this first part focuses on a narrow part of the life cycle, the 25-44 year olds, we observe the relationship between life cycle mortality patterns and the implications this has for life expectancy more generally. Given the current pattern of higher mortality for men, the next section of the paper takes an historical perspective to try and learn about the differences in life expectancy over time. In the final section we consider the recent differences in mortality between women and men in relation to social groups and by main causes of death.

Life expectancy is a blunt but extremely important measure of wellbeing. For example, Sen (1998) sets out a number of reasons why mortality is useful when looking at gender based disparities.[1] He notes (p. 5):

> The significance of mortality information lies, therefore, in a combination of considerations, including (1) the intrinsic importance we attach – and have reason to attach – to living, (2) the fact that many other capabilities that we value are contingent on being alive, and (3) the further fact that data on age-specific mortality can, to some extent, serve as a proxy for associated failures and achievements to which we may attach importance.[2]

Given its importance, mortality is a key component of international measures of overall equality between women and men. The Global Gender Gap Index (GGGI) is one.[3] This type of international gender analysis shows that in many areas of life women still trail men, particularly with respect to the generation of income and, related to income generation, filling top leadership positions in government and the private sector. This pattern holds true for New Zealand (McGregor, 2008). However, in developed countries men have, for a considerable length of time, had lower life expectancy than women (Pool, 1983; Pool and Cheung, 2002; Cheung and Didham, 2006)**.** In relation to another component of the GGGI, in developed countries women are now outperforming men in education (OECD, 2008a).

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[1] In this paper both the terms gender and sex are used. The Ministry of Health (2002: 14) state '[b]oth sex and gender influence the differences in men's and women's health outcomes. Sex refers to the biologically recognised differences between men and women, related to reproduction. Gender is a social category that defines the social and cultural construction of femininity and masculinity in society, justifying the differential allocation of resources and power (Ostlin 2002).'

[2] In this context, Sen is discussing society wide failures rather than personal ones.

[3] But care is needed when considering such measures. For instance, Birks (2007) notes that only female disadvantage is considered in the actual GGGI. If women are performing better than men in this index, including in mortality outcomes, this difference is ignored, a fact the study authors acknowledge (Hausmann *et al*, 2007: 5)

In New Zealand, much attention has been given to understanding mortality disparities between main ethnic groups. While these types of analysis almost always include sex as a variable, sex is often not the starting point of the analysis. Often lacking too is consideration of the difference between the quantity of life and the quality of life.

Debates about health are partly about resources and in some forums it has been argued that men's health has tended to attract less attention that women's health (Mackie, 2005). Even when direct attention is given to men's health, there is often conscious effort made to point out that this is not designed to reduce a focus on women's health. For example, in its 2002 *Reducing Inequalities in Health* discussion document, the Ministry of Health begin the section on gender by carefully balancing outcomes for women and men acknowledging that '[w]omen have longer life expectancy than men' but then adding that women 'have poorer self-reported mental health.'[4] Equally, on the webpage of the Freemasons Foundation Centre for Men's Health at the University of Adelaide, which is the first specialist men's health research centre in Australia, it is stated:[5]

> A focus on men's health does not imply a competition for resources or an attempt to detract in any way from the women's health agenda. Rather, a gender approach to health serves to highlight key biological, social and cultural determinants of health for men and women.

While the main focus of this paper is on overall trends in life expectancy and mortality, as noted, some data on cause of death are presented. This includes information on some specific causes of death including suicides, motor accidents and workplace based accidents, areas in which it is known that men are currently over-represented.

In addition, some data are presented on the association of some key socio-economic variables with differences in mortality rates. Reflecting a wider interest in gender, education and outcomes in the overall Foundation for Research, Science and Technology funded *Missing Men* program of work, education is one of the main variables. However, relationships between both ethnicity and marital status and mortality are also considered.

Access to education has been shown to be a critical foundation to achievement in areas such as paid work and higher education is often associated with better outcomes in many areas of wellbeing, including health (Nair, Smart and Smyth, 2007). Like mortality, the education gap is now in favour of women. In recent decades there have been strong gains in higher educational attainments by both men and women, but with women making the stronger gains. An analysis of educational changes indicates that changes in both absolute and relative outcomes are important (Callister and Newell, 2008). The importance of considering both absolute and relative levels will also be illustrated with mortality trends.

The debates about changes in education and possible changes in relative wellbeing of women and men also raise questions about what is the most important measure of wellbeing. One response to data on women performing better in education is that education should be considered an intermediate measure, with indicators like income

[4] One of these measures, mortality, is an objective measure while the other is subjective.
[5] http://www.adelaide.edu.au/menshealth/?template=print

a better measure of actual wellbeing (for example, Corbett, Hill and St. Rose, 2008). But the same logic could be applied to income versus life expectancy, with income also being an intermediate measure. It could be argued that life expectancy is a better measure of overall relative wellbeing for women and men.

Causes of death differ between men and women, with differing implications for wellbeing in society at large. Of major importance for complex disease is sexual dimorphism. Males are susceptible to different diseases and susceptible in different ways from females. This affects not only a range of serious physical diseases that impact on life expectancy, such as autism, early onset asthma, Parkinson's disease, which are more prevalent in males, in contrast to diseases, such as multiple sclerosis and hyperthyroidism, which are more common in females (Ptak and Petronis, 2008). It is important to note here in passing that these differences are not only genetic but are conditioned environmentally.

Amongst the factors influencing mortality patterns are differences in risk factors. As the Ministry of Health (2002) note, differences in risk factors can be related to different life experiences, perhaps arising from labour segregation (both in the workplace and the home), and/or differential access to social and economic resources. However, the differences between men and women and access to resources are more complex than the usual gradient where those with lower resources have lower life expectancies. Men, as a group, have more resources, and power, than women when simple measures such as median income are considered.[6]

There is also the issue of how much of risk taking is the result of socialisation and how much is 'hard wired'. Baumeister (2007), amongst others, has argued that socio-biology has selected for risk-taking behaviours among men. Fessler (2002: 205), in relation to gendered mortality risks, notes that '[g]ambling with one's life is largely the domain of young males'. He argues this relates to a long history of reproductive competition amongst males. The result of the risk taking is that males populate both ends of outcomes distributions, with men over-represented amongst high-income earners, but also over-represented in areas such as suicides and prison statistics.

In a review article, Gjonca *et al* (1999) consider the role of biology versus other factors in life expectancies of women and men and conclude that there are complex drivers at work including social, environmental and behavioural factors. They argue that in relation to biology, if this were the key driver then the differences observed in the gender gap between countries in Europe would not be so marked. This suggests that differences are driven by a range of complex factors.

In discussing gender inequalities in health within New Zealand, the Ministry of Health (2002) suggest that that the gender differences in cause-specific mortality and morbidity mean that interventions to reduce health inequalities among men need to have a different focus than those to reduce inequalities among women. The Ministry of Health go on to suggest that knowledge about gender and health outcomes is relatively underdeveloped in New Zealand compared with the understanding of socioeconomic and ethnic inequalities in health.

[6] This question of why, if income and power are so important in determining wellbeing, that men have a lower life expectancy than women, is often asked by men's health advocates (Farrell and Sterba, 2008).

Finally, central to an understanding of the impact of causes of death is the relationship between mortality and morbidity. Morbidity is a factor often overlooked in mortality studies. For example some causes of death, such as many cancers, cardio-vascular disease, respiratory diseases and some neurological diseases have protracted periods of morbidity. Other causes, such as sudden infant death syndrome and motor accidents, may have little or no associated periods of morbidity but have major social consequences for families. The associated social dislocation and trauma among the survivors may lead to ongoing costs in, for example, mental illness and stress related illnesses that may shorten life expectancy. Thus gendered mortality trends have complex social implications beyond the mortality event itself. These are, however, beyond the scope of this paper.

Does mortality explain the 'man drought'?

New Zealand census data has been showing an increasing imbalance between the number of women and men in the broad 25-44 age group. Within this overall age group the imbalances are most pronounced for those aged 30-39. In this group there were roughly equal numbers of men and women recorded in the 1981 census but by 2006 there were 11% more women than men.[7] In absence of external events such as gendered differences in international migration and unexpected deaths as a result of epidemics and catastrophes, there would be more men than women at all ages up to approximately 60 years of age in the New Zealand environment of relatively high life expectancy (Callister, Bedford, Didham, 2006). At birth, in human populations, there are approximately 105 male live births for each 100 female live births. This ratio would be higher were it not that males predominate among stillbirths (Engel et al, 2008). The mechanism(s) for this feature of human populations, also found in the populations of many other mammals, is not understood (Sieff, 1990), though a number of post hoc theories have been proposed with varying success (Rodrigues de Ariea, 1990; James, 2001; Mitra, 2007).

Lower male survivorship results in higher losses for males, but major events such as wars have not affected the current young adult cohorts in New Zealand, hence do not explain the significant proportion of men missing from the population in the young adult years. Differential mortality is one, albeit minor, source of this imbalance, and one of the purposes of this paper is to show that mortality is not a significant contributor to the imbalance in the young adult ages. While differences in mortality across all age groups are important, we are particularly interested in men and women in the broad 25-44 age group. As already noted, this is due to the unexpectedly large number of men 'missing' in recent censuses (Callister, Bedford and Didham, 2006). This growth in 'missing men' has led the media in both New Zealand and Australia to incorrectly portray the gap as a 'man drought'. In the 2006 study on 'missing men', life tables indicated that changes in patterns of mortality could not be completely discounted in explanations for the increasing surplus of women over men in the age group 20-49 years. While migration was a factor in sex ratio imbalances, the study suggested that census undercounting, at a level greater than indicated by post enumeration surveys, in the 20-49 age group was important.

[7] This paper is part of a wider project considering 'missing men' in education, migration flows, undercount in official statistics and men missing from family life, http://ips.ac.nz/events/completed-activities/Missing%20men/Missing%20men.html

One measure of the effect of mortality on sex ratios among the 25-44 year olds is the number of survivors per 100,000 births who reach their 45th birthday. The 2005-2007 period life tables (Statistics New Zealand 2008a) show that at the age of 45 years, of 100,000 live births, 95,800 men are expected to survive compared with 97,600 women. Given that there are 104 male babies for each 100 female babies at birth, this suggests that there would be accordingly 102 males for every 100 females at the age of 45 years. In the 25-44 year age group, there are approximately 450 female deaths and less than 750 male deaths.

Table 1 gives another indication of the minor effect excess male mortality has on various age groups. Over the 5 year period, each of the 5-year age groups among the 20-49 year olds lose around 80 more men than women. These relative greater losses of men due to mortality are very much smaller than losses due to either undercount or gendered migration.[8] However, it should be noted that more than twice as many men die at these ages than women do.

Table 1: Deaths registered in New Zealand, March 2001-February 2006

Year of Birth	Male	Female	Difference
2002-2006	718	597	121
1997-2001	348	275	73
1992-1996	123	97	26
1987-1991	340	194	146
1982-1986	718	317	401
1977-1981	697	249	448
1972-1976	692	328	364
1967-1971	893	520	373
1962-1966	1,143	716	427
1957-1961	1,495	1,054	441
1952-1956	1,952	1,470	482
1947-1951	2,945	2,105	840
1942-1946	3,737	2,568	1,169
1937-1941	5,116	3,487	1,629
1932-1936	6,618	4,499	2,119
1927-1931	9,602	6,778	2,824
1885-1926	32,837	44,970	-12,133
Total	69,974	70,224	-250

Source: Statistics New Zealand

This finding raises a concern in relation to mortality studies that are based on census data, or on some other measure such as population estimates or projections derived from census if these are not adequately adjusted for undercount. One implication is that any reported differential gendered mortality will be exacerbated if there are more missing men than missing women in the denominator upon which the rates are based. This will tend to overstate the relative age-specific rates for both sexes, but more severely for men. Because we know deaths are well counted, we would not expect a compensating undercount in the numerator. Also if the census undercount is not

[8] Research carried out in 2006 indicated that undercount was probably a more important factor than gendered migration (Callister, Bedford and Didham, 2006). As at late 2008, further research was being undertaken into this issue.

ethnically neutral the results will affect some ethnic groups more than others. Age also matters, since undercount is known to be higher among young adult males than for other age groups. Accidents, risk behaviours and suicide figure prominently in deaths among younger males. This is of major health concern, but it is possible that these rates are inflated because of the missing men in the denominator. A similar concern may be true for Māori and Pacific health.

Long term mortality trends

Taking a very long time horizon, Gjonca *et al* (1999) note research that suggests that while overall life expectancy was low, there was little difference between women and men before the development of agriculture. They then point to evidence which indicates that in the early stages of agriculture, females had a lower life expectancy than males. Reasons put forward for the female disadvantage included a higher work burden for women, high levels of fertility and associated risks with that and the microbiological environment. In New Zealand specific research, Chapple (2000) suggest a similar pattern for Māori prior to colonisation. Gjonca *et al* (1999) draw on research from England and Wales to determine patterns in the 17th to 20th centuries. Based on these data they suggest that there was, overall, little difference between male and female mortality rates. In some periods males had a slight advantage while in others there was a very small female advantage.

The Statistics New Zealand cohort mortality study presents an historical picture of the New Zealand population (Dunstan, 2007). The study shows the mortality experience of people born from 1876 to 2004, based on data to 2005. This is undertaken by deriving complete cohort life tables. The cohort life tables are built up from component data: birth registrations, death registrations and external migration data. However, the study notes that significant data estimation is necessary because of variations in data coverage and completeness over time. The authors state that census data were not used directly in the study due to variability over time in terms of coverage and quality.

Data from this cohort study show that the chance of surviving to old age in New Zealand has increased steadily for most successive birth cohorts (Cheung and Didham, 2006). Cheung and Didham note that for males born in 1876, cohort life expectancy at birth was 50.4 years but for the 1931 birth cohort this had increased by nearly 20 years to reach 69.5 years. They show even stronger increases for women from 54.0 years to 75.2 years. Cheung and Didham also demonstrate that between the late 1870s and 1910, New Zealand cohort life expectancy at birth surpassed many comparable countries such as Canada, England and Wales and Sweden. Based on this international comparison, they suggest that the New Zealand 1870s female cohorts are likely to have been the first population in history to attain cohort life expectancy at birth of 55 years, and the 1890s the first to reach 60 years.

Table 2 shows the proportion of each birth cohort who survived between particular age groups. For example, for males born in 1876 there was an 85.6% chance of surviving to a first birthday and then, of those who survived to 1, an 88.6% chance of surviving from 1 to 15 years of age. In contrast, for those males born in 1986, 98.8% survived to 1 year of age, while 99.5% survived from 1 to 15 years of age. Equally, of those males born in 1876 just under a third survived from 65 to 85 (31.2%) while for

those born in 1931, over half survived (53%). This type of analysis is based on actual events, so the older age experiences for those born later than 1931 are not yet known.

Pool and Cheung (2002), based on data for 'Pakeha' only, show a very rapid mortality decline in infancy and childhood in the late 19th century. This decline continued in the 20th century and the most up to date data show very high survival rates in the 0-1 and 1 to 15 age groups. In these age groups, most boys and girls survive. However, there are slight sex differences. For those born in 2001, 99.4% of boys had survived from 0-1 but 99.5% for girls. For those born in 1986, of those boys who reached 1 year old, then 99.5% survived to 15 years old versus 99.6% for girls.

While survival rates are still very high, the differences between women and men become stronger in survival rates from 15 to 45 and then 45 to 65. In the first age span, for men born in 1956 the survival rate was 95.3% versus 97.7% for women. In the later age span, for men born in 1938 the rate was 84% for men but 89.5% for women. The more significant sex differences are for those surviving from 65 to 85 years of age. For men born in 1931, 53% survived across this age group, but for women it was 65%.

Table 2 show male death rates have been higher than female for all cohorts and ages. However, Pool and Cheung (2002) show that when age specific cause of death is analysed as at 1876, females had higher mortality rates in the 25-44 age group. While the main cause of death that contributed to this difference were due to 'chronic non-communicable diseases', in this period maternal mortality was also very important. In addition, Dunstan (2007) notes that if male war deaths were to be excluded, female death rates were slightly higher than male at the main reproductive ages (20–34 years) among cohorts of the late 19th century.

Overall for male and female trends, only for cohorts born in the 1920s and 1930s has the sex gap appeared to narrow at all ages, driven mainly by reductions in male mortality rates at the older working ages (45 years and over). Statistics New Zealand data suggest that the narrowing gap observed in period life tables of recent decades has yet to fully emerge in the cohort life tables.

Table 2: Proportion Surviving between Selected Ages 0 to 85 years by Sex and Selected Birth Cohorts 1876–2001

Year of birth	Male proportion surviving from exact age to exact age (years)					Female proportion surviving from exact age to exact age (years)				
	0 to 1	1 to 15	15 to 45	45 to 65	65 to 85	0 to 1	1 to 15	15 to 45	45 to 65	65 to 85
	Percent									
1876	85.6	88.6	83.1	75.3	31.2	87.3	89.3	85.2	79.5	41.1
1881	86.8	90.1	83.0	74.3	31.2	88.7	90.5	86.1	80.0	42.2
1886	87.0	91.6	81.1	75.1	30.3	88.3	91.8	87.0	81.1	43.6
1891	87.4	92.2	78.3	75.2	29.2	89.3	92.4	87.3	81.7	45.6
1896	89.4	93.8	79.5	74.9	30.6	91.0	94.2	89.3	82.7	48.5
1901	89.9	94.4	90.0	76.3	33.7	91.3	94.7	90.5	84.3	50.7
1906	91.1	94.7	90.6	75.9	36.4	92.4	95.1	92.2	84.9	52.6
1911	93.1	95.4	89.8	75.8	40.5	94.5	95.7	92.8	85.2	55.4
1916	93.6	95.6	87.5	77.3	43.3	94.9	96.0	94.2	86.5	59.9
1921	93.9	96.4	88.4	78.1	46.4	95.2	96.7	94.8	87.0	61.6
1926	94.7	96.8	93.9	80.2	49.1	95.6	96.8	95.7	87.7	64.3
1931	95.1	96.6	94.4	82.6	53.0	96.3	97.2	96.2	88.4	65.0
1936	95.1	96.6	94.6	84.0	..	95.9	97.2	96.9	89.5	..
1941	95.4	97.8	95.3	..	..	96.3	98.2	97.4	..	..
1946	96.3	98.5	95.7	..	..	97.0	98.8	97.5	..	..
1951	96.8	98.7	95.5	..	..	97.5	98.9	97.6	..	..
1956	97.5	98.9	95.3	..	..	97.9	99.2	97.7	..	..
1961	97.4	99.0	..	..	..	98.0	99.3	..	..	..
1966	97.9	99.2	..	..	..	98.5	99.4	..	..	..
1971	98.2	99.3	..	..	..	98.5	99.5	..	..	..
1976	98.4	99.4	..	..	..	98.8	99.6	..	..	..
1981	98.7	99.5	..	..	..	99.0	99.6	..	..	..
1986	98.8	99.5	..	..	..	99.0	99.6	..	..	..
1991	99.1	..	..	..	..	99.3	..	..	..	..
1996	99.2	..	..	..	..	99.4	..	..	..	..
2001	99.4	..	..	..	..	99.5	..	..	..	..

Source: Dunstan (2007)

As noted, Table 2 shows that the impact of war deaths on the mortality experience of New Zealand males has been hugely significant. In the 15 to 45 age group for males survival dropped for those born in 1891 and 1896, largely because of excess male deaths during World War I but also due to the 1918 influenza epidemic (Rice 2005). In contrast, for women there has been increased survival for all successive cohorts. Without the direct impact of deaths in World War I and II, life expectancy at birth may have been five years higher for males born in the mid-1890s and three years higher for males born in the late 1910s. One-third of deaths by age 30 to males born in the mid-1890s were directly attributable to war deaths. For males born in the early 1890s, one-third had died before the age of 32. Removing the war deaths raises this

age where one third had died to 53. For females born at the same time, one-third had died by age 57.

To put these war death figures into a long-term perspective in relation to the unexpected differences in sex ratios found in recent census data, the following table shows census data for 1921, 1926 and 2006. In New Zealand, in 1921 and 1926 war memorials were being built to the truly "missing men", those who died in WW1 (or later as a result of war wounds). Table 3 shows the overall picture of sex ratios in 2006 was even more dramatic than the on-going effects of loss of men in WW1. However, as we know, in 2006 many of the missing men are not dead but are either missing through undercount or through migration.[9]

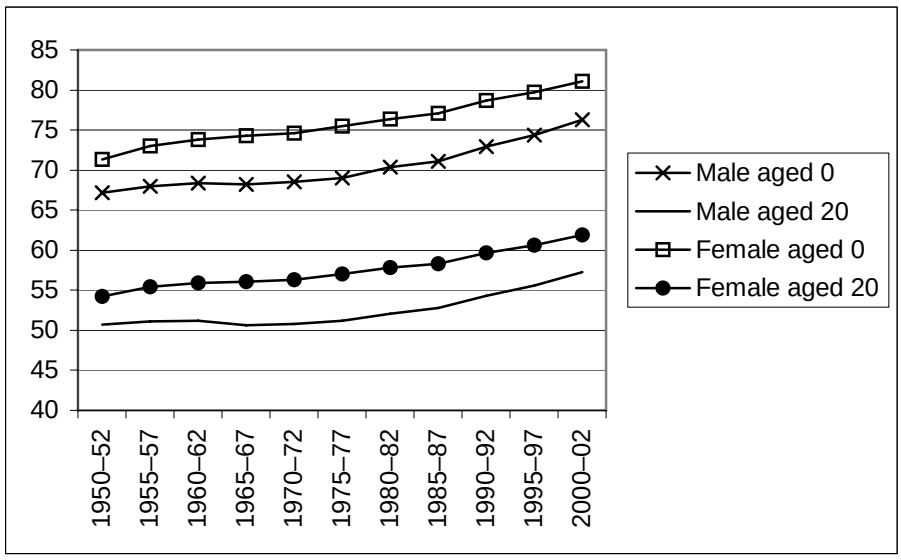
Table 3: Ratio of women to men aged 25-39, 1921, 1926 and 2006

	1921	1926	2006
25-29	1.10	1.00	1.07
30-34	1.01	1.09	1.11
35-39	0.94	1.01	1.11

Source: Census data, Statistics New Zealand

Figure 1 combines historical data and projections and shows life expectancy for men and women at birth and at age 20. Again it shows improvements for both women and men, but with women having a higher life expectancy in each cohort. When the 'gap' between women and men in years is considered at birth, it started at 4.1 years for those born 1950-52, rose to a peak of 6.4 years for those born 1975-77 before declining to 4.8 years for those born 2000-02.

Figure 1: Life expectancy at birth and expected years of life remaining at age 20, by sex, birth cohorts beginning 1950-52.



Source: New Zealand Life Tables, Statistics New Zealand

Table 4 compares the New Zealand life expectancies with some comparable industrialised countries. Compared with a number of countries with similar populations and standards of living, life expectancy at birth in New Zealand appears not to be out of line internationally. With the exception of Singapore, the gap in New

[9] This comparison assumes that gendered undercount was not a major issue in 1921 or 1926.

Zealand between males and females, however, is smallest among these selected countries. The gap of 4.1 years is also closing as can be seen when we consider that over the previous 5 years male life expectancy has increased by around 1.7 years for 1 year improvement for females. Over 70 percent of this improvement for both sexes is due to increased longevity, but 14 percent of the male improvement came from the 10-49 year age group for males compared with 6 percent for females.

Table 4: Life expectancy at birth: international comparisons

Country	Period	Life expectancy at birth (years)		
		Male	Female	Female - male
Australia	2004–2006	78.7	83.5	4.8
Canada	2004	77.8	82.6	4.8
Denmark	2004–2005	75.6	80.2	4.6
England and Wales	2003–2005	76.9	81.1	4.2
Finland	2005	75.5	82.3	6.8
France	2006	77.2	84.1	6.9
Hong Kong (SAR)	2006	79.4	85.6	6.2
Japan	2005	78.6	85.5	7.0
Netherlands	2005	77.2	81.6	4.4
NEW ZEALAND(1)	2004–2006	78.0	82.2	4.1
Norway	2005	77.7	82.5	4.8
Singapore	2005	77.9	81.6	3.7
Scotland	2004–2006	74.6	79.6	4.9
Sweden	2006	78.7	82.9	4.2
United States	2004	75.2	80.4	5.2

(1) NZ Life Tables 2005–2007.

Source: Demographic Trends 2007, table 4.19.

However, for Māori the pattern is quite different. The gap between males and females widened to 4.7 years, with the improvements in life expectancy at birth for Māori females (75.1 years) improving by around half a year more than the improvement for Māori men (70.4 years) (Statistics New Zealand, 2008). Māori life expectancy may be slightly higher than the official life tables suggest if Tobias *et al* (forthcoming) are correct. In this paper Tobias *et al* have calculated Māori female life expectancy to be 75.8 years, compared with 71.2 years for Māori males, implying a gender gap of 4.6 years and greater improvement relative to the population as a whole. As with the total population, the majority of the improvement occurred due to longevity but for both male and female young Māori adults there was either no improvement or a slight negative contribution to life expectancy improvement (Statistics New Zealand, 2008b), implying that either this is an area of health concern or that changes in the proportion of people missing from the population has masked improvements for these age groups.

The long-term data New Zealand data are useful for setting the scene for the following mortality analysis. These data emphasise that for both men and women survival rates have improved significantly over time. The data also demonstrate that in the younger age groups there are a very small numbers of deaths of both women and men. Therefore while differences in mortality are important, the disparities need to be seen in this context of relatively low numbers. It is only at the older age groups that

mortality differences between women and men become very large in terms of numbers.

Gaps between men and women in relation to social groups and by main causes of death

In this section we main draw in data from the New Zealand Census–Mortality Study. The Census–Mortality Study, as indicated by its name, is a probabilistic record linkage study of census and mortality records (Hill, Atkinson and Blakely, 2002; Blakely *et al*, 2005; Blakely *et al*, 2006; Blakely *et al*, 2007; Fawcett, Atkinson and Blakely, 2008). This is a study of the relationship between social factors and mortality in New Zealand from 1981-84 to 2001-04. It is based on the integration of anonymised population census data from Statistics New Zealand and mortality data from the New Zealand Health Information Service. The NZCMS has linked records for the three years following each census back to the 1981 Census, so creating five short-term cohort studies. The follow-up is limited to three years because linkage of census to mortality records depends on residential stability, and also to allow timely reporting on inequalities in mortality. The authors state this provides individual-level microdata free of numerator–denominator bias. While over time, considerable work has been undertaken to improve both numerators and denominators, as already indicated given that net census undercount appears to be greater than indicated by post enumeration surveys there will be some undercount factors that are not taken into account in this study. That is, the NZCMS might overestimate some mortality rates as the weighting method assumes all eligible mortality records should have their corresponding census record in the file, and if no linkage is made it is assumed that the linkage was missed (between 70% to 80% of mortality records are linked back to a census record). Where a mortality record is not linked, similar linked census-mortality records are weighted-up. If some of this weighting up was for mortality records not represented in the census data base, mortality rates will accordingly be overestimated. This is most likely to be the case for young adult males.

Table 5 shows directly standardised 1-74 year old mortality rates per 100,000 people. This is the rate weighted to an externally specified age structure, in this study the WHO world population. To keep the analysis simple, the 95% confidence bands are not shown here (or in subsequent tables) but can be downloaded from the New Zealand Census–Mortality Study website (www.otago.ac.nz/NZCMSWebTable/)**.** The table shows a number of patterns. First, as already indicated in the longer term Statistics New Zealand study, there have been improvements in mortality for both men and women in all age groups. But table 5 also shows the mortality rates of men relative to women. These ratios show that in all age groups and over all time periods, women have lower mortality rates than men. As the rates for males have come down in the 1-14 age group the gap has been closing. But again it needs to be emphasized that the rates overall are very low so the while the differences are important the actual gap in terms of numbers are not large. Standing out more is the difference in the 15-24 age group. Women have less than half the mortality rate in this age group. For young men this is a high-risk age group in terms of behaviour.

Table 5: Standardised Mortality Rates per 100,000

		Age				
		1-14	15-24	25-44	45-64	65-74
Male						
	1981-84	42.6	155	174	1,146	4,448
	1986-89	39.0	165	179	1,030	4,083
	1991-94	30.2	152	174	889	3,680
	1996-99	27.7	127	163	779	3,262
	2001-04	22.5	112	137	666	2,811
Female		-	-	-	-	-
	1981-84	29.4	55.6	108	664	2,547
	1986-89	26.3	56.3	93.5	622	2,340
	1991-94	23.2	51.9	85.3	573	2,094
	1996-99	20.5	51.3	79.4	507	1,963
	2001-04	20.6	41.5	75.6	455	1,777
Ratio male to female						
	1981-84	1.45	2.79	1.61	1.73	1.75
	1986-89	1.48	2.93	1.91	1.66	1.74
	1991-94	1.30	2.93	2.04	1.55	1.76
	1996-99	1.35	2.48	2.05	1.54	1.66
	2001-04	1.09	2.70	1.81	1.46	1.58

Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

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In discussing their main research report from the study, Blakely *et al* (2007:27) note that while it focuses on ethnic and socioeconomic inequalities, gender inequalities in mortality are also important. They demonstrate that within all ethnic and income groups, for all periods and most age groups and conditions included in study, males have substantially higher mortality rates than their female counterparts. When they pooled all age groups (1–74 years), considered main ethnic groups, and averaged over the 1981-2004 observation period, male all-cause mortality rates were about 50%, 70%, 80% and 90% higher than the corresponding female rates for Māori, Pacific, European/Other and Asian ethnic groups respectively. The authors note that the data suggest some evidence that among European/Others, male mortality rates are falling relatively faster than are the corresponding female rates, but there is less evidence of any catch-up trend in relative terms over time for the other ethnic groups. They also note that the narrower gender inequality in Māori mortality (in relative terms) reflects particularly high mortality rates among Māori females.

Table 6 shows standardised mortality rates for those aged 1-74 years for main ethnic groups. Also shown again are the ratios of men's rates to women's. The data show clearly the trends described above, that is in all ethnic groups men have higher mortality rates than women.

Table 6: All causes of death, Standardised Mortality Rates per 100,000, 1-74 years

		Total Māori	*Total Pacific*	*Total Asian*	*Total European/ other*
Male					
	1981-84	925	614	446	507
	1986-89	843	707	344	466
	1991-94	871	566	282	402
	1996-99	824	626	255	339
	2001-04	698	527	188	294
Female					
	1981-84	626	361	213	273
	1986-89	572	378	179	251
	1991-94	559	349	163	223
	1996-99	541	362	136	195
	2001-04	489	324	106	178
Ratio male to female					
	1981-84	1.48	1.70	2.09	1.86
	1986-89	1.47	1.87	1.92	1.86
	1991-94	1.56	1.62	1.73	1.80
	1996-99	1.52	1.73	1.88	1.74
	2001-04	1.43	1.63	1.77	1.65

Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

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Next some major causes of death are considered. When a long-term perspective is taken, main causes of death have changed significantly. Connected with this, there have been some periods of rapid decline of particular causes. For example, tuberculosis was a significant cause of death for both men and women in the late 1800s (Pool and Cheung, 2002). In 1876, for men aged 25-44 the main cause of death of men was 'accidents and violence' and these male rates far exceeded female rates. However, Pool and Cheung notes that as New Zealand's economy shifted from dangerous exploitative industries (e.g. mining and timber extraction) to intensive pastoralism, and the forest clearing for farming was drawing to a close (late 1890s) the risk of accidental death decreased significantly. In 1876, maternal mortality was a significant risk for women.

Moving forward over 100 years, maternal mortality and infant mortality remain a concern but have both fallen to much lower levels than has been historically the case. Data from the Ministry of Health shows the highest age-standardised rates of death in the total population in 2003 were from cancer, ischaemic heart disease and cerebrovascular disease (Table 7). Based on these data (all ages combined) males had an age-standardised death rate for all causes of death that was around one and a half times the female rate, nearly twice the female age-standardised death rate for ischaemic heart disease, more than twice the female rate of stomach cancer and transport accidents, and more than twice the female rate of intentional self-harm in 2003.

Causes of death can also change reasonably quickly in times of demographic and economic change. However, the trends are not always clear. For example there have been improvements in the incidence of deaths from cardiovascular disease in New Zealand, especially among the 35-64 year olds (Blakely, Tobias, Atkinson 2008). However, according to Olshansky and Persky (2008) there are indications that in the international context this may be a lull before the rapid onset of increases in these diseases, especially among the older ages. This view may have some validity in New Zealand if the current obesity epidemic results in the improvements in CVD mortality stalling or reversing among some cohorts. It should also be noted that death rates due to CVD and injuries continue to decline the contribution of these causes of death to either ethnic or gender differentials will diminish and more prevalent causes, such as cancers, would be expected to increase significantly (Tony Blakely, pers comm.)

The recording of causes of death may conceal as much as they reveal. Certification of death tends to cite single causes, but many of the major causes of death involve extended periods of morbidity which may be exacerbated by the presence of other diseases, disabilities and injuries. Thus co-morbidity may contribute directly to mortality. This is particularly important when looking at years lost, the mix of causes of death and changing age structures can lead to situations where the loss of life, for example from cancers in 2000 relative to 1970, may increase while the incidence rates decline (Beltrán-Sánchez, Preston and Canudas-Romo, 2008). Political and social conditions are factors in modifying life expectancy and health outcomes, and these affect different age groups in different ways (Ivanova, 2004; Taylor and Lopez, 2007).

Attributing causes to deaths is complex. For example, men who live alone have a higher risk of dying, whereas this is not a major risk factor for women (Kandler *et al*, 2007). The condition of living alone may in fact have little to do with the mortality risk even for men – it may be that the factors that lead them to be living alone are the underlying contributors to the mortality risk. Men living alone may be more likely to be living alone may have social, psychological and physical conditions that limit their access to resources to maintain their wellbeing and be subject to increased risks from, for example, seasonal distress (Davie *et al*, 2007). That is, there are confounding factors responsible for the 'spurious' association of 'living alone' with mortality.

Notably absent from the list in table 6 as a specified cause of death are deaths due to workplace accidents. Workplace accidents are a small, but important, cause of death for men, though rarer for women. Historically though these accidental deaths have been a significant feature of the labour market, with a greater loss of men among earlier cohorts, especially among Māori (McCracken, 2001).

Both men's and women's health advocates, as well as high profile campaigns, often focus on gender specific issues such as breast cancer and prostate cancer.[10] In terms of prostate cancer, in New Zealand there was the 'Movember' campaign in 2007, and the Blue September campaign in 2008.[11] In the US there have been debates about relative spending on research on prostate cancer versus breast cancer (Farrell and Sterba, 2008). However, table 7 indicates that, in terms of cancers colorectal and lung cancers are both more likely to be a health matter for men than for women. Colorectal cancer is "the leading cause of non-tobacco-attributable cancer mortality across sexes"

[10] A very small number of men develop breast cancer.
[11] http://www.blueseptember.co.nz/about.php

(Blakely *et al*, 2007: 80). Lung cancer, along with a number of other major cancers, is typically linked with either active or passive use of tobacco. Historically, smoking has been higher amongst males but the similarity of the male and female rates indicates the growing shift towards female smokers and the effect of passive smoking. Not shown in the table are skin cancer deaths. In this area, it is older men who are over-represented in the deaths. Again, the reasons for this are likely to be very complex with possible factors being that men are more likely to be outdoor workers such as builders, that extreme exposure and sunburn were not regarded as health risks when they were children and that men are less likely to consult their doctors even if they do notice changes in moles or freckles (Lewis, 2008).

Table 7: Age-standardised death rates per 100,000 for selected causes by sex, 2003

	Total	*Male*	*Female*
Total cancer	120.6	141.4	105.5
Lung cancer	23.3	28.5	19.4
Colorectal cancer	16.5	18.7	14.6
Breast cancer	10.9	0.1	20.7
Prostate cancer	6.7	16.1	-
Stomach cancer	4.6	6.8	2.8
Ischaemic heart disease	75.6	102.2	52.7
Cerebrovascular disease	30.4	29.1	30.6
Chronic obstructive pulmonary disease	18.6	24.0	15.7
Other forms of heart disease	15.7	19.3	12.4
Transport accidents	13.8	20.1	7.7
Diabetes mellitus	12.1	14.5	10.0
Intentional self harm	11.5	17.0	7.7
Pneumonia and influenza	4.4	4.7	4.3
Hypertensive disease	2.8	2.6	2.8
All causes of death	393.3	476.4	323.4

Source: From Table 5, Mortality and Demographic data 2002 and 2003, Ministry of Health 2006

Table 7 are cross sectional data and the overall trends already shown indicate that age standardised mortality rates have been decreasing. Tables 8 and 9 use New Zealand Census–Mortality Study data again and show trends for cancer and ischaemic heart disease, the two single largest causes of death. Added into the tables are two ethnic group comparisons, Māori and European/other (Pacific and Asian estimates are less reliable because of the number of incidents and the smaller populations in the high-risk ages and are not shown).

Table 8 shows that age standardized cancer mortality rates have declined overall for both men and women and the ratio of male rates to female rates have also declined. This pattern of decline is also seen with the total European/other group. However, the Māori rates do not follow this pattern. When ethnic differences within men and within women are considered, the improvement amongst European/other but not Māori shows up in increasing ratios.

Table 8: All Cancers, Standardised Mortality Rates per 100,000, 1-74 years

		Total	*Total Māori*	*Total European/ other*	*Ratio of Māori to European/ other*
Male					
	1981-84	144	203	133	1.53
	1986-89	140	200	129	1.55
	1991-94	139	222	126	1.76
	1996-99	131	218	115	1.90
	2001-04	123	203	110	1.85
Female					
	1981-84	111	170	102	1.67
	1986-89	110	163	101	1.61
	1991-94	109	169	100	1.69
	1996-99	110	190	96.0	1.98
	2001-04	102	179	88.8	2.02
Ratio male to female					
	1981-84	1.30	1.19	1.30	
	1986-89	1.27	1.23	1.28	
	1991-94	1.28	1.31	1.26	
	1996-99	1.19	1.15	1.20	
	2001-04	1.21	1.13	1.24	

Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

As noted by Blakely *et al* (2007:27) the decline in age standardised mortality rates due to ischaemic heart disease has been dramatic (Table 9). While the decline has been greater for European/other in percentage terms, the decrease has been strong for Māori as well. The rapid decline for both men and women has meant that both men and women are better off, but the gap between men and women remains strong.

Table 9: Ischaemic heart disease, Standardised Mortality Rates per 100,000, 1-74 years

		Total	*Total Māori*	*Total European/ other*	*Ratio of Māori to European/ other*
Male					
	1981-84	183	263	173	1.52
	1986-89	161	228	149	1.53
	1991-94	130	243	111	2.19
	1996-99	101	202	80.0	2.53
	2001-04	73.8	160	56.9	2.81
Female					
	1981-84	73.1	137	63.6	2.15
	1986-89	63.5	130	51.3	2.53
	1991-94	47.9	106	37.2	2.85
	1996-99	34.9	92.5	23.9	3.87
	2001-04	28.1	75.7	19.1	3.96
Ratio male to female					
	1981-84	2.50	1.92	2.72	
	1986-89	2.54	1.75	2.90	
	1991-94	2.71	2.29	2.98	
	1996-99	2.89	2.18	3.35	
	2001-04	2.63	2.11	2.98	

Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

The Social Report 2007 (Ministry of Social Development, 2007) notes that males have a much higher rate of death by suicide than females, with 20.1 deaths per 100,000 males in 2002–2004, compared with 6.4 deaths per 100,000 females. They note that the male suicide rate increased sharply in the late 1980s, declined after 1996–1998, and in 2004 was almost the same as the 1985–1987 rate of 20.3 deaths per 100,000 males. In comparison, the female rate has been relatively stable over the last 20 years. MSD suggest that due to the small numbers involved, it is more reliable to consider the trend over several years.

MSD also note that while the suicide death rate is higher for males, more females than males are hospitalised for intentional self-harm. In 2005, the female–male ratio for intentional self-harm in New Zealand was 2.0 female hospitalisations to every male hospitalisation per 100,000 population. Females more commonly choose methods that are less likely to be fatal. This is one aspect of a difference between men and women of major public health importance – as Rutter (2003: 17) has noted "major improvements in infantile mortality and life expectancy during the last century were probably mainly caused by improvements in public sanitation and in nutrition rather than anything to do with medical advances as such." This is certainly true, at least up to the 1970s, but since then health services have improved in the organization and delivery of services as well as medical advances providing improvements in treatment and preventative medicine (Blakely *et al*, 2008). However, Rutter (2003: 17) goes on to observe that "in contrast, in the psychopathological arena there have been changes

for the worse in psychosocial disorders in young people". Neurodevelopmental disorders have more than double the incidence among males relative to females – and these disorders are frequently preconditions for self-harm. Males generally are more successful in achieving suicide.

Table 10: Suicide, Standardised Mortality Rates per 100,000, 15-24, 25-44 and 25-64

		Age group		
Male		15-24	25-44	45-64
	1981-84	19.6	20.9	18.8
	1986-89	33.3	26.6	27.2
	1991-94	40	32.1	22.9
	1996-99	46.1	38.2	23
	2001-04	29.5	31.1	22.7
Female				
	1981-84	4.6	7	10.7
	1986-89	7.5	7.6	9.4
	1991-94	8	6.9	8.6
	1996-99	13.5	9.6	6
	2001-04	10.3	9.9	7.4
Ratio male to female				
	1981-84	4.26	2.99	1.76
	1986-89	4.44	3.50	2.89
	1991-94	5.00	4.65	2.66
	1996-99	3.41	3.98	3.83
	2001-04	2.86	3.14	3.07

Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

Table 11 shows road accidents, some of which could be suicide. Three patterns are clear. First, unlike most causes of death, the rates are the highest among young people. In all the age groups shown men have a higher mortality rate than women, but while the underlying numbers are small so there are large confidence intervals, it seems the difference is the strongest in the younger age groups. Third, there has been a significant decline in mortality rates reflecting major road safety campaigns, as well as safer roads and cars.

Table 11: Road accidents, Standardised Mortality Rates per 100,000, 15-24, 25-44 and 25-64

		Age group		
Male		15-24	25-44	25-64
	1981-84	76.2	29.7	26.6
	1986-89	79.8	38.3	22.5
	1991-94	64.2	31.4	15.2
	1996-99	41.1	26	15.5
	2001-04	37.5	19.9	15.6
Female				
	1981-84	20.4	8.2	11.8
	1986-89	24.1	11	10.9
	1991-94	22.3	10.1	8
	1996-99	15.2	7.4	8.1
	2001-04	11.4	7.6	7.3
Ratio male to female				
	1981-84	3.74	3.62	2.25
	1986-89	3.31	3.48	2.06
	1991-94	2.88	3.11	1.90
	1996-99	2.70	3.51	1.91
	2001-04	3.29	2.62	2.14

Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

Fatal accident claims to ACC to year ended December 2006 accounted for a total of 81 deaths, reported as more than 75 males and less than 4 females.[12] It is not particularly a younger person's problem with 73 percent of the deaths in 2006 falling in the age group 45 and over. What is significant though is that when industry and occupation are considered, the main areas of concern are the industry and occupational groups within agriculture, forestry and fisheries, the construction industry and the occupational group plant and machinery. These industries and occupation groups are not only traditionally dangerous, though increasingly less so, but they have remained largely employers of men.[13] Nor are deaths the only concern, for fatal accidents are but a small proportion of all accidents, which is reflected in both the high rates of ACC levies in these industries but also the higher incomes they attract.

When we consider factors such as income and education in relation to mortality it becomes difficult to separate the causal factors. The relationship between income and mortality is a particularly vexed one. For example, when people are sick they will have low incomes so mortality will always appear to be higher for low income people, but the link between the causes of the morbidity and preceding income levels are far from clear. The key difficulty is the problem of confounding variables (Hernán *et a*l, 2002) and the problem that income is just one element in socio-economic status.

[12] Injury Statistics – Work-related Claims: 2006., Statistics New Zealand 2007
[13] A possible future side effect of campaigns to attract more women into areas such as building and other non-traditional employment may be a reduction in the gap between male and female deaths.

Socio-economic status is difficult to group into categorical form to produce robust usable indicators (Blakely and Pearce, 2002). Tony Blakely concluded "there is no convincing evidence of an association of income inequality within New Zealand with adult mortality" (Blakely, Atkinson and O'Dea, 2003), at least at the societal level, over and above the relationship between income and health at the personal level. Nevertheless, there is a strong but concave association between mortality risk and personal income at the individual level (Blakely *et al*, 2004; Blakely, Tobias and Atkinson, 2008; Blakely and Wilson, 2006). There is also a strong link between suicide and unemployment (Blakely, Collings and Atkinson, 2003). One aspect of the data that needs to be kept in mind is that men missing from the denominator have an effect on the relativities because it is believed that the missing men in the census are most likely to be among the most disadvantaged groups.

Levels of formal educational qualification also have a strong association with mortality outcomes. Both men and women with no formal qualification have significantly higher age standardized mortality rates than those with formal qualifications. For men aged 25-44, the mortality rate for those with no qualifications was double that of those with post-school qualifications (Table 12). A similar pattern is evident for women, and international studies have found similar evidence (e.g. Klotz and Doblhammer, 2008).

Table 12: All causes of death, Standardised Mortality Rates per 100,000 in each highest qualification group, 25-44 and 45-64 years

		No Qualifications		School Qualifications		Post-School Qualifications	
Male		25-44	45-64	25-44	45-64	25-44	45-64
	1981-84	214	1,227	147	1,009	126	912
	1986-89	217	1,149	192	962	140	868
	1991-94	230	1,018	161	798	145	795
	1996-99	233	907	149	723	126	629
	2001-04	204	787	132	587	94	520
Female							
	1981-84	118	698	87	571	101	454
	1986-89	111	667	83	580	77	504
	1991-94	116	645	64	525	71	442
	1996-99	107	579	80	469	61	417
	2001-04	115	520	69	412	54	307
Ratio male to female							
	1981-84	1.81	1.76	1.68	1.77	1.25	2.01
	1986-89	1.95	1.72	2.31	1.66	1.81	1.72
	1991-94	1.98	1.58	2.52	1.52	2.04	1.80
	1996-99	2.18	1.57	1.86	1.54	2.08	1.51
	2001-04	1.77	1.51	1.90	1.42	1.75	1.69

Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

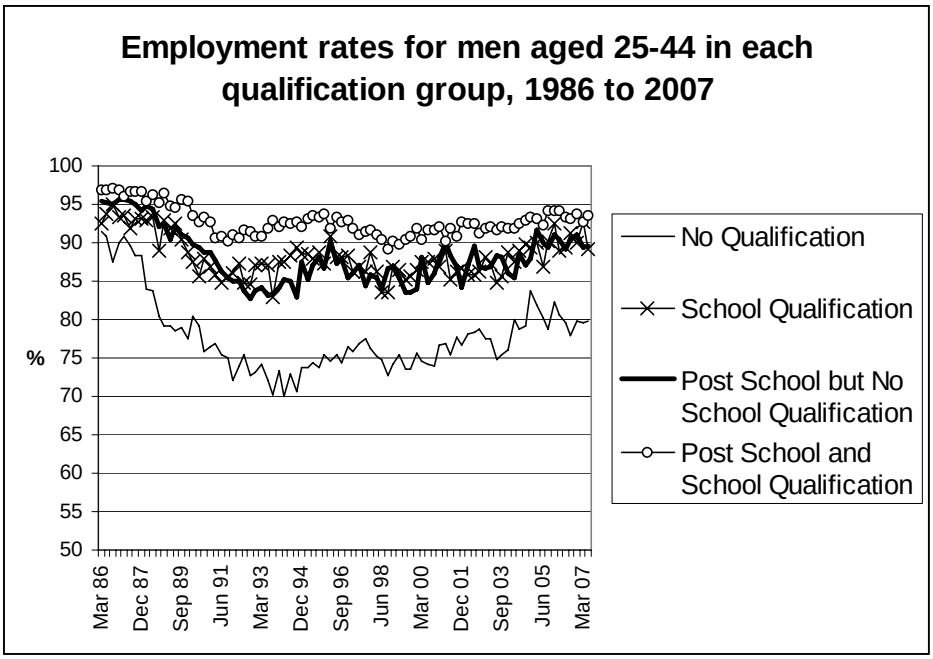
While the mortality rate figures in each column of Table 12 have changed over time so too have the underlying numbers. In particular the group with no qualifications has become much smaller over time. In the 1981-84 period, 43% of males in the 25-44 age group had no formal qualifications, but by 2001-04 this had reduced to 21%. The decline was even stronger for women down from 50% to 18%. This resulted in there being fewer unqualified women than men in later period, reversing an earlier imbalance in the other direction. For the older age group, the proportion of males with no qualifications declined from 63% in 1981-84 to 32% in 2001-4, while for women it declined from 72% to 34%. Given that higher mortality is associated with having little formal education, the lifting of education across the population would tend to improve overall mortality rates regardless of in-group changes in mortality. It may also be that the characteristics of groups change over time. For example, in the latter period those with no formal qualifications may be increasingly a group of disadvantaged people.

This idea that the group with no formal qualifications are increasingly disadvantaged is supported by long-term employment data. Figure 2 shows the employment rate for men aged 25-44 by a range of highest qualification.[14] While employment rates for those with no formal qualifications have increased since the peak of unemployment in the early 1990s, the rates are well below that of 1986. While some of these men will have swapped employment for positive activities, such as undertaking study or looking after children, in the UK, Australia and New Zealand there are indications that such low skill men tend to be on the margins of family life, not involved in education and have some limiting health problem (Callister, 2000; Dixon, 1999; Faggio and Nickell, 2003; Lattimore, 2007). Faggio and Nickell show that in the UK by the late 1990s around 70% of inactive prime aged men reported having a limiting health problem. The data also show that in the 1970s, just 10% of prime aged men reporting a health limiting problem were inactive but this has risen to around 40% by the late 1990s. In Australia, in 2005 around half of inactive men in the 35-44 age group reported that disability or an illness was the main reason for withdrawing from the labour force (Lattimore, 2007).[15]

[14] These are data from the Household Labour Force Survey so only include men living in private dwellings. Excluded are those in prison or living in boarding houses.

[15] The Australian research also notes that increasing life expectancy for all men along with the increase in activity means that longer overall spells of being inactive for a group of men.

Figure 2



The growth in activity due to health problems is also reflected in a growth in the number of prime aged men on sickness or disability benefits in Australia, New Zealand and the UK. In New Zealand, between June 1996 and September 2007, the number of men aged 25-39 on an unemployment benefit dropped from over 35,000 to just 5,506. In contrast, those on an invalid benefit increased from just over 8,000 to nearly 9,500, while those on sickness benefits rose from 7,313 to 9,155. While there was also some growth in the number of women in this age group on both benefits, there were significantly more men in the invalid benefit and nearly twice as many on the sickness benefit.[16]

As indicated, a number of New Zealand and Australian studies indicate that men not in the labour market are also far less likely to be married or living full time with a partner. Taking associations further, there is international evidence that men living outside of family settings have higher mortality rates than married men, or men living in defacto relationships (for a review of the literature see Lees, 2007). Table 13 shows this association of marital status with mortality in both the 25-44 and 45-64 age groups. In all marital statuses men have higher mortality rates than women. But the highest mortality rates are to be found amongst never married men, among whom are the disabled or socially compromised who may find it impossible to get a mate. An important note of caution though is that 'never married' does not equate to 'never partnered'.

[16] Data supplied under an OIA request from the Ministry of Social Development.

Table 13: All causes of death, Standardised Mortality Rates per 100,000 in each marital status, 25-44 and 45-64 years

		Never married		Current married		Separated, divorced and widowed	
Male		25-44	45-64	25-44	45-64	25-44	45-64
	1981-84	249	1,505	160	1,116	190	1,251
	1986-89	278	1,410	146	982	214	1,205
	1991-94	255	1,338	143	831	191	1,046
	1996-99	210	1,142	131	705	185	945
	2001-04	179	1,004	101	584	166	828
Female							
	1981-84	149	700	97	651	143	728
	1986-89	150	757	87	582	89	718
	1991-94	111	729	76	542	101	648
	1996-99	99.7	639	67.6	474	111	569
	2001-04	92.7	648	63	402	84.8	526
Ratio male to female							
	1981-84	1.67	2.15	1.65	1.71	1.33	1.72
	1986-89	1.85	1.86	1.68	1.69	2.40	1.68
	1991-94	2.30	1.84	1.88	1.53	1.89	1.61
	1996-99	2.11	1.79	1.94	1.49	1.67	1.66
	2001-04	1.93	1.55	1.60	1.45	1.96	1.57

Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

When underlying population numbers are looked at, like education, there have been some major changes in partnering patterns (although these data do not indicate living arrangement). In the 25-44 age group for males 77% were married in 1981-84. However, by 2001-04 this had dropped to 51%. The largest growth was in the never married category from 15% to 39%. A similar pattern can be found for women aged 25-44, but with fewer never married. The growth in never married was from 8% to 31%. The changes in underlying numbers was not so dramatic for those aged 45-64. For men 84% were married in 1981 reducing to 74% in 2001-04. For women it was from 77% to 69% in 2001-04.

Emphasising the potential link between education and exclusion, there is also some level of association between highest level of formal education and marital status. In the age group 25-44, in 2006 both men and women, but particularly men, who had no formal educational qualifications were less likely to be been married either currently or in the past (Table 14).

Table 14: Marital status of men and women aged 25-44 within each level of qualification, 2006

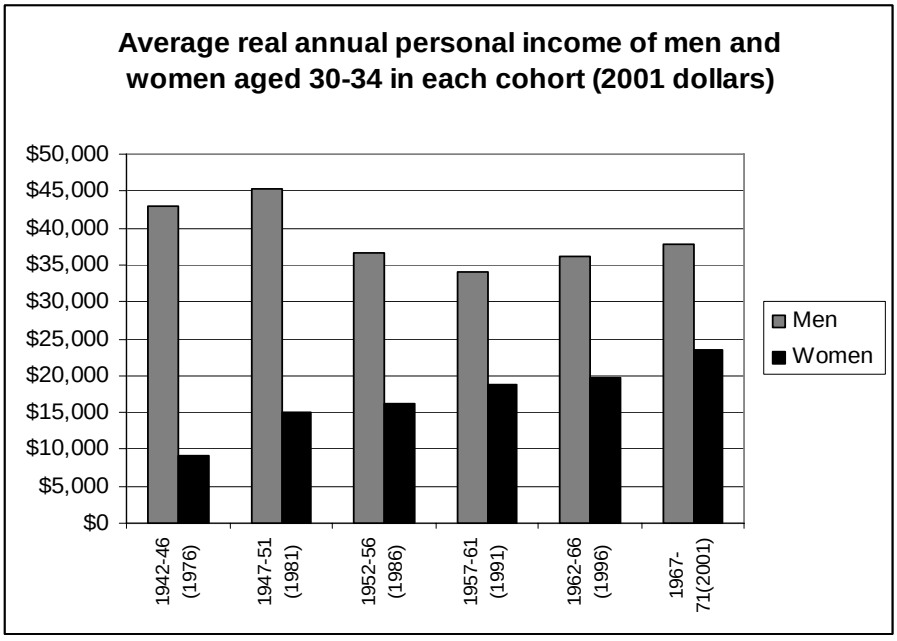
		No Qualification	Level 1 to 4	Level 5 Diploma - Doctorate Degree
Male	Never married and never joined in a civil union	52.5	41.5	41.5
	Married (not separated)	35.8	49.2	49.2
	Separated, divorced, widowed or bereaved civil union partner	11.7	9.3	9.3
		100.0	100.0	100.0
Female	Never married and never joined in a civil union	42.9	32.5	36.3
	Married (not separated)	39.5	53.7	54.6
	Separated, divorced, widowed or bereaved civil union partner	17.6	13.8	9.1
		100.0	100.0	100.0

Source: Census of Population and Dwellings, Statistics New Zealand.

The final main variable we consider in relation to mortality is income. As background, a number of studies have indicated that in industrialised countries education, but more importantly the lack of it, is a key factor in determining income. The pathway to this income is often through the labour market. In the US writers such as Juhn (1992), Juhn and Murphy (1995) and Gottschalk and Danziger (2005), and Australia (Gregory, 1999) have especially noted the decline in real income over time of low skill men. Also in Australia, Lattimore (2007: 198) demonstrates that in recent times males with lower skills have found it harder to participate effectively in labour markets, whereas females aged over 24 years have increased their engagement for all levels of educational attainment (from a lower base).

In New Zealand, tracking of real yearly income (from all sources) over time shows a significant effect of the restructuring period on average real male income (Callister, 2006). As an illustration, Figure 3 shows average real personal incomes for men and women aged 30-34. Even by 2001, real male income was not back to levels seen in 1981. Yet, underneath these average data is a polarisation of incomes within groups (Ministry of Social Development, 2008).

Figure 3



Source; Callister (2006) Based on census data

As further background to a discussion of income and mortality, previous tables indicate some associations between education and mortality as well as marital status and mortality. But education, martial status and income may not be exerting independent effects. Table 15 uses census data to give some idea of the association between education, martial status and unequivalised household income for men and women aged 25-44 in 2006. Table 15 shows the percentage of men and women in this age group who in each education category and then each marital status earned $15,000 or less per annum from all sources.

Table 15 shows a number of patterns. In 2006, for both women and men, but particularly for women, having no formal qualifications was associated with lower incomes. However, low incomes can be found in all qualification groups. For men, the the lowest incomes were to be found amongst those with no qualifications and who were ‘never married and never joined in a civil union’ or were separated. For women, this pattern is a little less clear. However, overall in 2006 women with no qualifications were over-represented amongst low income earners. Not surprisingly being married brings with it higher income, in part because often two incomes are being considered instead of just one income in the households of those who are divorced or never married.

Table 15 also reinforces the fact that there are more men with no qualifications than women, and significantly more women with a level 5 or higher qualification in this age group.

Table 15: % and number of men and women aged 25-44 whose household income was $30,000 or less (from all sources) in each educational and marital status category, 2006

		No Qualification	Level 1 to 4	Level 5 Diploma - Doctorate Degree
		%		
Male	Never married and never joined in a civil union	24.3	12.2	8.3
	Married (not separated)	10.9	6.8	5.7
	Separated, divorced, widowed or bereaved civil union partner	23.9	14.4	10.0
Female	Never married and never joined in a civil union	37.8	20.8	9.7
	Married (not separated)	13.0	8.0	5.8
	Separated, divorced, widowed or bereaved civil union partner	42.6	31.7	19.9
		Total specified N=		
Male	Never married and never joined in a civil union	34,629	87,270	48,501
	Married (not separated)	25,185	106,656	74,601
	Separated, divorced, widowed or bereaved civil union partner	8,028	19,902	7,692
		67,842	213,828	130,794
Female	Never married and never joined in a civil union	23,700	73,107	63,198
	Married (not separated)	23,025	122,499	96,462
	Separated, divorced, widowed or bereaved civil union partner	9,966	31,149	15,750
		56,691	226,755	175,410

Source: Census of Population and Dwellings, Statistics New Zealand

Moving directly back to the mortality data, Table 16 shows mortality rates by broad household income group.[17] Again the difference between women and men is evident within each age group and within each income group. The lowest standardised mortality rates are to be found amongst high-income women, while low-income men have the highest rates. In fact, in the 25-44 age group, high income men had higher mortality rates than low income women.

[17] In terms of income a household equivalent income is used. A revised Jensen index was used to equivalise household incomes. Incomes were adjusted for inflation using the Consumer Price Index (base year 1996) and there are three levels: Low Income (less than $26,109); Medium Income (between $26,109 and $43,016); High Income (over $43,106). For full details see Atkinson and Bastiampillai (2007).

Table 16: All causes of death, Standardised Mortality Rates per 100,000 in each household income group, 25-44 and 45-64 years

		Low income		Medium income		High income	
Male		25-44	45-64	25-44	45-64	25-44	45-64
	1981-84	214	1,456	170	1,136	155	947
	1986-89	201	1,290	180	1,062	152	799
	1991-94	227	1,160	180	875	127	678
	1996-99	212	1,085	154	776	126	513
	2001-04	201	1,006	134	637	102	488
Female							
	1981-84	107	795	104	679	101	517
	1986-89	103	759	93	637	80	471
	1991-94	101	707	79	560	69	383
	1996-99	104	636	71	507	60	357
	2001-04	96	581	73	419	56	326
Ratio male to female							
	1981-84	2.00	1.83	1.63	1.67	1.53	1.83
	1986-89	1.95	1.70	1.94	1.67	1.89	1.70
	1991-94	2.25	1.64	2.27	1.56	1.83	1.77
	1996-99	2.04	1.71	2.16	1.53	2.11	1.44
	2001-04	2.10	1.73	1.85	1.52	1.83	1.50

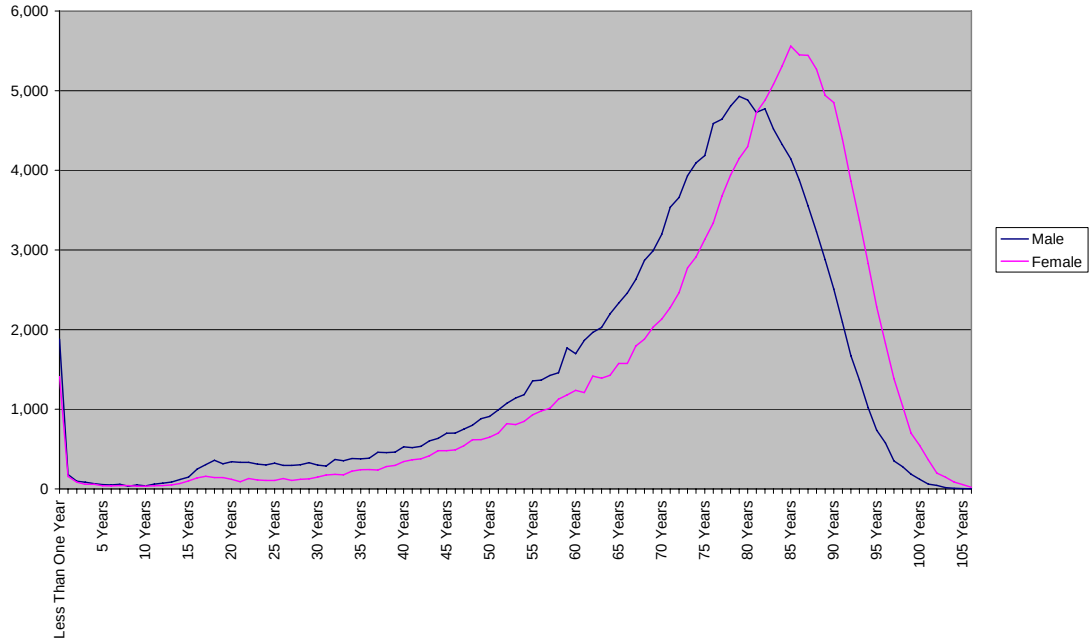
Produced from the New Zealand Census-Mortality Study Website (Atkinson and Bastiampillai, 2007)
Note: 95% confidence intervals are not shown

Two issues stand out in Table 16. First, there has been very little change in mortality rates for low income men and women, especially when compared with those on high incomes. But also it is amongst the low income groups that the differences in outcomes between women and men are the greatest. These data suggest that further investigation of issues such as economic and social exclusion and mortality, particularly in relation to men, could be useful. In terms of economic exclusion, ideally income over time and, just as importantly, wealth data would help us better understand relationships between resources and mortality. In terms of social inclusion, networks of friends and family, as well as links to paid work are likely to be important.

Finally, an aspect of mortality which can only be touched on here is seasonality of deaths (Rau, 2006). If we look at all deaths over the period 1998-2008, figure 3 shows that the modal age at death is 79 years for males and 85 years for females. This directly reflects differences in life expectancy but is in many ways a more informative measure (Canudas-Romo, 2008). However when we consider month of death, we note that excess winter (June to August) deaths occur: there are 13 percent more male deaths in winter than summer and 18 percent more for females. But females tend to be older when they die and the age-specific analysis shows that when analysed by age there is not a lot of difference between men and women up to 90 years of age. It is significant though that excess winter deaths affects babies and people aged 40 years and over but not young adults.

Gabrielle Davie and her colleagues studied data from the two decades 1980-2000 and found that around 1,600 excess deaths occurred in winter when the summer are was taken as the base (Davie *et al*, 2007). Of particular note, and suggestive of some deaths being avoidable, nearly half of the excess winter deaths were due to circulatory failures and a further third due to respiratory diseases. It should be noted though that this study included the earlier part of spring in their winter grouping (June to September), which implicates allergy related respiratory diseases in excess winter deaths. However, the study does demonstrate the point that excess winter mortality is a problem for the youngest and the oldest age groups, rather than the younger adult ages.

Figure 3: Modal age at death, deaths in New Zealand, 1998-2008



Source: Statistics New Zealand

Other aspects of mortality that can not be pursued in this paper, but would repay work because of the implications they have for the topics which are discussed, include the question of life expectancy and the limits of improvement. The linear increase in life expectancy over the last century in New Zealand can be disaggregated into components of change – radical decreases in infant mortality, reduction of accidental and disease related deaths as well as non-accidental deaths among children and young adults, for example have contributed directly to the increase. The linearity of the increase is largely an accident of timing of these contributors. What we have recently experienced has been increases longevity. This raises the question of the relationship between disease, mortality and extreme age, which has lead many researchers to conclude that not only are there limits to longevity but that we are on the brink of declines. Jim Oeppen and James Vaupel suggest that the limits are not yet showing signs of being reached because of the linearity of the increase in life expectancy over the last 170 years, declaring the naysayers as "pernicious" (Oeppen and Vaupel, 2002). At the other end of the debate, are those who say we are near the limits (Olshansky *et al*, 2005a, 2005b; Olshansky, 2008).

In a review of changes in education throughout the OECD (2008b: 291-292), the question of how changes in education, particularly the shift from more men having higher education to it being women who are better educated, will influence future trends in mortality. The OECD raise the possibility that the gender shift could increase the gap between women and men, but suggest that there are many complexities. They point out that there are studies that show the increase in life expectancy has been faster in the well-educated sectors of the population. But they also note research suggesting that the life expectancy gains related to increases in education have been stronger for men than women. Conversely, the mortality penalty for men having poor education is higher than for poorly educated women. Overall, the OECD are unclear as to how changes in education will affect future mortality trends.

Bruce Carnes and Jay Olshansky (2007) have typified the debate about mortality as between the futurists, optimists and realists, putting themselves among the realists. While the jury is still out, an intriguing and previously unrecognized turning point in old-age mortality trends around 1970 has been identified (Le Bras, 2008) but there is as yet no way to either explain this or predict whether it is an unprecedented fluctuation or a transitional change. Problematic for this discussion too is the observation that while some arguments appear to be valid for some countries, it is not for others (Rau *et al*, 2008), and while some trends are closely linked with the prevalence of risk behaviours such as smoking, the causal factors and their consequences are complex. It is fair to suggest that this is a topic in mortality and health studies that is not only very heated but equally important for our future. Suffice it to comment here that this and other central topics need considerable further serious research.

Conclusion

Discussions of gender and health have both technical and political elements. Beginning with some technical issues, in relation to sex ratios in the census it can be concluded that that differences in mortality trends do not explain more than a tiny fraction of the phenomenon of missing men in the prime working ages, though mortality explains some of the gap within the older age groups. Currently men typically do not live as long as women in New Zealand and the greater number of women than men in the older ages is entirely expected and explicable in terms of relative longevity. Explanations for the so-called 'man-drought' lie elsewhere – as other work in this project has shown, principally in gendered migration and in differences between undercount of males and females.

However, the fact that part of the 'man drought' appears to be due to undercount being officially under-estimated creates problems in itself for mortality studies. The concern here is that the relatively greater number of men missing from the denominator used to calculate the rates may mean that male mortality is more overstated than female mortality with the result that that the gender gap may be overstated significantly. This suggests that the already small contribution of mortality to the man-drought may be in fact less significant than already appears to be the case.

Despite some possible data problems, overall it is clear that in New Zealand women have been outliving men for the whole time period that official mortality and life expectancy data has been produced. Recent more in depth data indicate that when

factors such as ethnicity, education and socio-economic status are considered, within each of the variables women outlive men. However, while the modal age at death for men is lower than it is for women, and life expectancy for women is higher than it is for men, these are average measures. Men can, and do, outlive women. In addition, both the long term and recent data also show major gains in life expectancy for both women and men. Both absolute and relative levels are important.

In health research over the long-term there has been some highlighting of the mortality gap between men and women. However, while the health related inequalities framework does include sex as a variable, reportage of the findings has tended to shift the focus more towards ethnic differences. The ethnic differences are clearly very important. In parallel discussions about differences in educational outcomes between women and men, again in favour of women, there is an on-going debate as to whether the ethnic and socio-economic differences are more significant than sex related differences. However, our view is that in health all these variables are important.

The differences in the causes of male and female morbidity and death are significant. There are some predominantly male causes of death (and timing of deaths) and some predominantly female. More boys are born alive than girls. But the slightly higher child mortality for boys and deaths during the young (predominantly male) adult "accident hump" accounts for some of the reducing number of excess males over time. But death risk factors have changed over time – vastly reduced child mortality (which in New Zealand has benefited boys and girls in similar ways), less dangerous working conditions (this affects men more than women, though more women are now working in the traditionally dangerous occupations), significant improvements in safety of birth (female specific) and much improved facilities for the care of older people. The risk factors of course merely delay death and improve morbidity costs for those factors. However, the removal of these risks change the causes of death, with greater incidence of age related disorders.

There is on-going debate about the causes of the mortality gap between women and men. It seems that biology, especially genetic differences, might be having an impact on the gap. However, it could be contended though that gains for both women and men has been made over time, which shows that biology is not a simple constraint for either women or men. There are other influences at work. Linking to our wider research on ‘missing men’, the data we have indicate that poorly qualified men are over-represented amongst those with lower life expectancies, and it is probable that there is a direct link between lack of education, being on the margins of labour market, having dysfunctional or absent family relationships and being socially disabled. Awareness of why it is that men in particular may end up on the margins of society, and designing programs to address the problem, might be important in improving men's health overall.

Research informs health policy decisions but so does lobbying and political activism. Debates about cervical and breast cancer as well as prostate cancer screening involve technical issues regarding the effectiveness of such screening but also some emotion. Equally, discussions about the use of drugs such as herceptin involve trying to weigh up often partial technical data and funding constraints against real concerns about the lives of individuals and their families. While some women’s health advocates have argued for more funding for such drugs, men’s heath advocates have argued that

men's health has had a lower priority. This may be changing. Non profit organisations such as the Cancer Society are now highlighting men's health issues, especially prostate cancer. Equally, in the run up to the 2008 election, the main political parties have noted a concern about men's health. Given that resources are scarce for health interventions, inevitably there will be some tensions about resources being directed towards 'men's' versus 'women's' health.

Linked to lobbying for resources, historically in New Zealand when outcome gaps were in favour of men, such as in education and still in pay, institutions have been set up to assist in overcoming these gaps. Over time a number of agencies have a role in analysing the disadvantages women may face. These include the National Advisory Council on the Employment of Women, the Equal Employment Opportunities (EEO) Programme within the Human Rights Commission[18], and the now disbanded Women's Advisory Committee on Education and the Girls' and Women's section of the Ministry of Education.[19] However, the main agency is the Ministry of Women's Affairs. In contrast, there have never been specialist agencies considering areas where men might be disadvantaged, such as life expectancy. While we are not advocating that a specialist agency is set up to consider areas of male disadvantage, we can see that having the specialist agencies focusing on areas of female disadvantage has helped highlight these issues.

Looking into the future, one can consider both short term trends and those in the longer term. In the short of significant concern is the fact that there appears to be no improvement in mortality rates in recent times for either men or women of low income in the 25-44 year age group. The reasons are unclear at this stage but this trend is of particular concern as at end of 2008 New Zealand faces the possibility of a long and deep economic downturn. While such downturns affect most groups in the community, those with low levels education and income are particularly vulnerable. While some major contributors to early mortality, such as smoking, are long term drivers, based on our recent past, recessions appear to have the potential to have a reasonably immediate negative affect on contributors such as cardiovascular disease.

In the longer term it is assumed by many that life expectancy will continue to increase, based on tantalizing indications that the link between diet and longevity and the advances in the treatment of circulatory and respiratory disorders may enable continued increases in longevity. Others, however, warn that this may be unachievable and that we may be on the edge of rapid increases in ailments that will limit our life expectancy to little more than current levels. Those who are more pessimistic point to the possible long-term effects of the 'obesity epidemic'. In addition, relative outcomes for men and women have changed in the past and mortality gaps may be starting to close. There could be two reasons for this. One is that campaigns focusing on improving men's health may be having a positive impact on men. But a more negative trend is that it seems women are starting to increase their risky behaviour. This is especially the case for some of the causes of death, such as specific cancers, where increases in smoking and other activities have increased

[18] These were disestablished in 1991 and 1992 respectively.

[19] One of the aims of the EEO program is 'Monitoring of the progress of women moving into leadership roles in the state sector, corporate, legal, academic and other fields through intervention strategies developed with business, unions, industry and the state sector', http://www.hrc.co.nz

female deaths. Current trends in the uptake of smoking among young females and among the Asian communities suggest this is of growing concern.

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