Ethnic inequalities in mortality among the elderly in New Zealand

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There are large inequalities in mortality by ethnicity in New Zealand.[1,2] Māori (the Indigenous population of New Zealand; approximately 15% of the population) and Pacific people (mostly migrants from the Pacific Islands; approximately 6% of the population) have higher mortality rates than the majority non-Māori non-Pacific non-Asian (nMnPnA) group (largely of European origin, arriving in New Zealand in a continuing migration since the early 1800s). The explanations offered for the observed differences have included structural, health behaviour risk factors like smoking, differential access to health care and differential quality of care and ethnic discrimination (racism).[1-3] However, studies of differential mortality in New Zealand have focused on adult working age population. Understanding ethnic differences in health at older ages is important because ethnic minorities (including indigenous people) are tending to age rapidly. Furthermore, less is known about mortality rates in Asian people in New Zealand (both adult and old age), despite large increases in the population's numbers over the past decade. The Asian group makes up 10% of total New Zealand population, including people from East, South East and South Asia, but excluding those from Middle Eastern and Central Asian nations. This study investigates ethnic differentials in mortality among older adults (65+ years) in New Zealand, including the contribution of socio-demographic characteristics. This is also the first study of mortality in New Zealand that includes older Asian people as a separate group. Specifically, we explore four research questions in this paper:

- What is the magnitude of ethnic mortality differentials at older ages in New Zealand?
- Do ethnic mortality differentials (in relative terms) decrease with increasing age?
- What is the contribution of socio-economic factors to ethnic differential in mortality?
- What is the contribution of specific causes of death to ethnic differentials in mortality?

Methods

Record linkage of census and mortality records

This paper uses a cohort study of all New Zealanders formed by anonymous and probabilistic record linkage of 2001 census records to 2001-04 mortality records.[4] Of the eligible mortality records for the age group 65+ years, 83.5% were successfully linked to the 2001 Census and at least 97% of these linkages were estimated to be true links.[4] The proportion of mortality records linked to a census record varied by sex, age, ethnicity, and neighbourhood deprivation (see below for description of deprivation index). To allow for varying linkage success by these demographic strata, weights were assigned to the linked census-mortality record to make them representative of all eligible deaths. For example, if 20 out of 30 deaths for Māori males aged 65-74 living in moderately deprived neighbourhoods were linked to a census record, then each of these 20 linked records was assigned a weight of 1.5 (i.e. 30/20). Elsewhere, we have shown these linkage weights to be valid.[5]

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Abstract

Objectives: To explore the contributions of socio-economic and demographic factors to ethnic disparity among older adult (65+) all cause and cause-specific mortality differentials among Māori, Pacific, Asians and non-Māori, non-Pacific non-Asian (nMnPnA) in New Zealand.

Methods: We used univariate and multivariable Poisson regression models on linked New Zealand census and mortality data for older adults (65 years and above) (2001 to 2004, 1.3 million person years) with a comprehensive set of socio-economic indicators (education, income, car access, housing tenure, neighourhood deprivation).

Results: After controlling for the differences in age structure, Māori and Pacific males had a higher relative risk of dying than nMnPnA (RR=1.88 (95% CI: 1.74, 2.04) and RR=1.75 (95% CI: 1.54, 1.99) respectively) while Asian males had lower risk of dying (RR=0.66, 95% CI: 0.57, 0.76). For females, the pattern was similar. The mortality gap between ethnic groups was mediated in part by socio-economic factors. The five socio-economic factors appear to account for greater than 40% of the excess mortality for Māori and Pacific men and about 34% for Māori females and 48% for Pacific females compared to nMnPnA men and nMnPnA women respectively. However, for Asian people, adjusting for socio-economic factors actually increases the relative gaps in mortality compared to nMnPnA by 18% for male and 71% for females.

Conclusion: The results demonstrate that clear ethnic mortality gradients persist into old age and the mortality level of most groups was influenced by varying distribution of socio-economic factors. To reduce ethnic differences in old age mortality, inequalities as a result of socio-economic position should be reduced.

Keywords: Ethnicity, socio-economic status, mortality, ageing, New Zealand

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Measurement of ethnicity status

The New Zealand Census allows you to self-identify with multiple ethnic groups. This paper uses both 'total' (in bivariate rate/ratios) and 'prioritised' (in regression) concepts of ethnicity. In the 'prioritised' concept, each respondent was assigned to a mutually exclusive ethnic group by means of a prioritisation system commonly used in New Zealand: Māori, if any of the responses to self-identified ethnicity was Māori; Pacific, if any one response was Pacific but not Māori; Asian, if any one response was Asian but not Māori or Pacific; and the remainder non-Māori non-Pacific non-Asian (nMnPnA) (mostly New Zealanders of European descent, but strictly speaking not an ethnic group). In the 'total' concept, people with multiple identities could be counted in more than one group. Using the 'total' concept, ethnicity was grouped as: Māori (4.38% of 65+ years old person-time in 2001 cohort; Table 1), Pacific (1.90%), Asian (2.53%) and the remaining New Zealand population (i.e. non-Māori non-Pacific non Asian-nMnPnA, 91.19%).[a] nMnPnA served as a reference group.

(a) As such it approximates a 'sole' European/Other group, which is mutually exclusive from the three total ethnic groups allowing easy calculation of rate/ratios (and their 95% confidence intervals), despite the fact that the three total ethnic groups of Maori, Pacific and Asian overlap).

Table 1: Descriptive statistics by total ethnicity, 65+ years, 2001-04.

	Maori		Pacific		Asian		nMnPnA	
	Person years	No. of deaths a	Person years	No. of deaths	Person years	No. of deaths	Person years	No. of deaths
Age								
65 +	57,554 (100)	3,324	25,003 (100)	1,209	33,230 (100)	714	1,198,657 (100)	57,663
Adults aged 65-74	41,855 (73)	1,842	17,220 (69)	543	23,929 (72)	276	622,277 (52)	12,270
Adults aged 75 -84	13,189 (23)	1,077	6,535 (26)	462	7,509 (23)	288	430,949 (36)	23,013
Adults aged 85 +	2,511 (4)	402	1,249 (5)	198	1,792 (5)	147	145,431 (12)	22,380
Sex								
Male	26,122 (45)	1,692	10,689 (43)	612	15,579 (47)	357	526,056 (44)	27,078
Female	31,433 (55)	1,632	14,314 (57)	597	17,651 (53)	357	672,602 (56)	30,585
Marital status								
Never Married	3,120 ((5)	210	1,517 (6)	63	843 (3)	18	57,830 (5)	3,696
Married	25,099 (44)	1,170	11,397 (46)	471	20,313 (61)	348	672,282 (56)	22,821
Divorced	25,183 (44)	1,695	9,378 (38)	579	9,229 (28)	309	435,873 (36)	28,554
Not specified	4,154 (7)	249	2,711 (11)	96	2,844 (9)	36	32,673 (3)	2,592
Highest education level achieved								
Nil	24,957 (43)	1,557	11,763 (47)	579	11,537 (35)	303	409,006 (34)	20,508
School	8,263 (14)	390	4,491 (18)	207	11,083 (33)	201	308,676 (26)	13,140
Post-school	4,742 (8)	138	910 (4)	42	4,509 (14)	63	199,773 (17)	5,943
Not estimable	19,592 (34)	1,242	7,840 (31)	384	6,101 (18)	147	281,202 (23)	18,072
Personal Income								
Low	34,861 (61)	2,058	15,088 (60)	771	22,964 (69)	510	690,270 (58)	33,471
Medium	8,780 (15)	465	3,149 (13)	144	3,216 (10)	66	284,719 (24)	11,673
High	3,117 (5)	84	556 (2)	18	1,984 (6)	39	119,755 (10)	3,246
Missing	10,796 (19)	717	6,210 (25)	276	5,066 (15)	99	103, 913 (9)	9,273
Car access								
Nil	10,592 (18)	759	5,155 (21)	249	4,122 (12)	108	153,189 (13)	10,497
One	24,289 (42)	1,317	9,136 (37)	420	12,170 (37)	234	577,657 (48)	21,771
Two or more	17,572 (31)	816	8,264 (33)	348	14,900 (45)	258	359,269 (30)	8,922
Missing	5,101 (9)	432	2,448 (10)	189	2,038 (6)	108	108,543 (9)	16,470
Housing tenure								
Owned Free&Mort	33,980 (59)	1,788	10,912 (44)	492	21,191 (64)	462	887,031 (74)	32,478
Private Tenancy	17,423 (30)	1,056	11,572 (46)	522	9,576 (29)	135	174,493 (15)	7,890
Public Tenure	2,469 (4)	285	1,090 (4)	135	1,185 (4)	90	87,836 (7)	15,315
Free or Not Specified	3,683 (6)	195	1,429 (6)	60	1,279 (4)	27	49,297 (4)	1,977
NZDep quintiles								
1 (least dep)	3,306 (6)	135	1,036 (4)	36	6,387 (19)	165	235,000 (20)	8,958
2	5,620 (10)	255	1,763 (7)	84	6,580 (20)	147	259,465 (22)	11,412
3	8,675 (15)	444	2,890 (12)	129	6,673 (20)	114	277,665 (23)	13,731
4	13,708 (24)	783	5,023 (20)	237	7,216 (22)	159	258,824 (22)	13,926
5 (most dep)	26,058 (45)	1,698	14,288 (57)	723	6,375 (19)	132	167,046 (14)	9,624
Missing Dep	188		3		0		657	

Note:
(a) Weighted for the complete linkage.
All numbers are random rounded to a near multiple of three.
Figures in parentheses denote percentages.

Measurement of socio-economic status

The socio-economic variables represent differential access to resources which may in turn affect mortality. Most studies on SES differentials in mortality in old age have focused on a single measure of SES such as income, education, or home ownership. But it has been recommended that studies focusing on socio-economic inequalities in older people should focus on a set of measures rather than a single indicator of socio-economic status[6] as no single measure proves comprehensive enough to portray the entire picture of socio-economic position, particularly among the older people.[7] We use the following multiple set of socio-economic indicators in our analysis (Table 1).

Highest educational qualification

Education has been commonly used to assess socio-economic mortality and health/mortality gradients among older adults in the US and Europe. It is a preferred measure of SES among the elderly because education is generally fixed some time in late adolescence or early adulthood, making it among the least susceptible of all measures to reverse causality.[8] Education categories were based on the highest level of qualification achieved and the three categories were nil qualification, school qualification and post-school qualification.

Personal income

Personal income categories of the respondent were classified into high, medium and low groupings to approximate equalised income tertiles based on older people responses. Tertiles were used to allow identification of groups with sufficient numbers ranked in some logical hierarchy so that gradients in health inequalities can be investigated. We choose not to use household income due to the large number of subjects that would be excluded from analyses (e.g. not living in private dwellings, another adult in household absent on census night or not reporting an income, etc, all invalidate a measure of household income).

Housing tenure and car access (household-level)

These are the commonly used measures of asset wealth. Such measures may be more appropriate economic measures for older adults, assessing economic advantage or disadvantage accumulated over the life course[9]. Housing tenure was dichotomised as owning the house or not owning the house while car access was classified into having none, one, two or more cars in the household.

Neighbourhood deprivation

Neighbourhood deprivation was measured by NZDep2001, an index calculated from 2001 census data on socio-economic characteristics (e.g. car access, tenure, and receipt of benefits) at aggregation of about 100 people, and assigned to mortality data by use of address.[10] NZDep2001 deprivation scores apply to areas rather than individual people. The index scale used here is from one to five, where one = the least deprived 20% of areas and five = the most deprived 20% of areas.

Data Analysis

Table 1 shows the number of deaths and person-years by level of each variable, including missing for each variable. Missingness ranges from less than 1% for neighbourhood deprivation to 34% for education. All variables were treated as categorical variables in the analyses. To enable comparison of rates between ethnic groups, we measured directly age-standardised mortality rates by sex using WHO standard age distribution. Both standardised rates (per 10,000) and standardised rate ratios (SRRs) are presented in this paper. To estimate the size of relative mortality differences and to measure the contribution of socio-economic factors to disparities between the minority groups (Māori, Pacific and Asian) and the majority nMnPnA, we used Poisson regression. All relative risks (RR) were adjusted for differences in age structure, using five-year age categories. Poisson regression analyses (a usual technique for person-type data) were done with and without adjustments for differences in marital status, education, income, car ownership and home ownership and NZDep index by sex.

Poisson regression analyses were restricted to those with complete data on all socio-economic factors for 'univariate' analyses (i.e. adjusted for age, marital status and ethnicity) – 400,275 person years for males and 446,277 person years for females or 68% and 59% of all eligible person years for males and females respectively. Analyses were conducted using SAS v8.2 on-site at Statistics New Zealand (SNZ). Regression models used exact data, but all frequency output presented in tables in this paper are random rounded to a near multiple of three as per SNZ protocol.

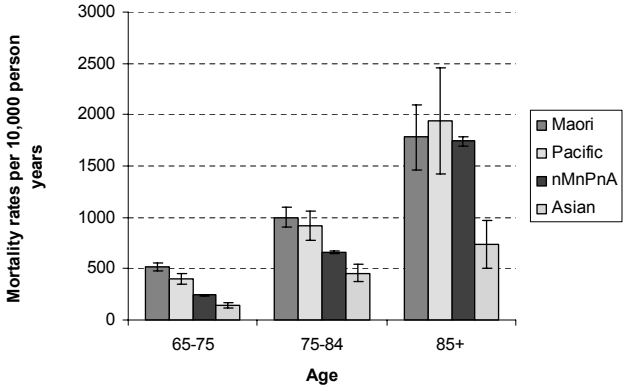
Results

Minority groups were younger than the nMnPnA (Table 1). Asian and Pacific groups were often married, while Māori and nMnPnA were more frequently single/unmarried (never married + divorced). nMnPnA were more likely to live in the least deprived areas, and have higher qualifications.

Figures 1a and 1b show the age-standardised mortality rates for Māori, Pacific, Asian and nMnPnA. Asian people consistently have the lowest overall and age-specific mortality rate, followed in turn by nMnPnA, Pacific and Māori – although Pacific rates for 85+ were higher than Māori. The absolute differences among Māori and nMnPnA decreased at the oldest ages among both sexes and the decline in absolute difference between Māori and nMnPnA was largest for females. The absolute differences between Māori and Pacific and nMnPnA peaked at ages 75-84 years.

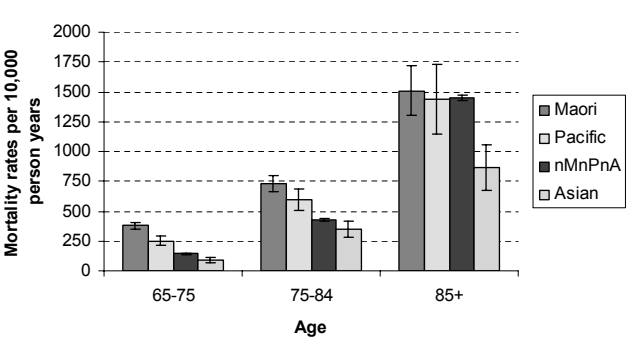
Table 2 shows the age-standardised rate ratios per age group for Māori, Pacific and Asian compared to nMnPnA. Compared with nMnPnA, Māori and Pacific males had 59% and 41% higher 65+ years mortality rate respectively, while Asian males had 41% lower mortality risk (Table 2). Females also followed the similar pattern. Of note, relative inequalities (rate ratios) for Māori and Pacific compared to nMnPnA decreased steadily with age for both sexes. For example, comparing Māori females to nMnPnA, they had a 164% higher mortality rate among 65-74 year olds, reducing to 70% among 75-84 year olds and only 4% among 85+ year olds. However,

Figure 1a: Age standardised mortality rates by ethnicity – males.[a]



(a) Actual figures are available from the corresponding author on request.

Figure 1b: Age standardised mortality rates by ethnicity – females.[a]



(a) Actual figures are available from the corresponding author on request.

Table 2: All-cause mortality SRRs for total Māori, Pacific, and Asian compared to nMnPnA (95% confidence intervals), by sex and age among older adults, New Zealand, 2001-04.

	Total Māori	Total Pacific	Total Asian
Males			
65+	1.59 (1.50-1.69)	1.41 (1.28-1.55)	0.59 (0.52-0.67)
65-74	2.16 (2.01-2.33)	1.68 (1.47-1.91)	0.61 (0.51-0.73)
75-84	1.51 (1.37-1.67)	1.39 (1.19-1.62)	0.69 (0.57-0.83)
85+	1.02 (0.86-1.23)	1.12 (0.86-1.46)	0.42 (0.31-0.58)
Females			
65+	1.75 (1.65-1.85)	1.36 (1.24-1.50)	0.69 (0.61-0.78)
65-74	2.64 (2.43-2.86)	1.74 (1.50-2.02)	0.64 (0.51-0.79)
75-84	1.70 (1.54-1.87)	1.40 (1.20-1.63)	0.81 (0.67-0.98)
85+	1.04 (0.90-1.20)	0.99 (0.81-1.22)	0.59 (0.47-0.74)

Note:
587, 508 person years for males and 750, 494 person years for females, 65+ years, 2001-04.

the Asian mortality advantage appeared to increase at oldest ages for males (i.e. the relative gap between nMnPnA and Asian mortality was actually greatest for 85+ year olds for men).

Table 3 shows mortality rate ratios from Poisson models for those people with non-missing data on all variables shown (all changes in deviance statistics for adding one, or all, socio-economic factors to the baseline age-adjusted model were highly statistically significant – results available from authors on request).

Table 3: All-cause mortality rate ratios from Poisson regression for prioritised Māori, Pacific, and Asian compared to nMnPnA (95% confidence intervals), by sex after adjustment for age and, socio-economic status among older adults, New Zealand, 2001-04.

	Māori	Pacific	Asian
Adjusted for age			
Male	1.88 (1.74-2.04)	1.75 (1.54-1.99)	0.66 (0.57-0.76)
Female	2.18 (2.00-2.37)	1.71 (1.49-1.97)	0.86 (0.74-1.00)
Adjusted for age and marital status			
Male	1.80 (1.66-1.95)	1.71 (1.50-1.95)	0.67 (0.58-0.77)
Female	2.13 (1.96-2.32)	1.68 (1.46-1.93)	0.85 (0.73-0.99)
Adjusted for age and education level			
Male	1.80 (1.66-1.95)	1.65 (1.45-1.88)	0.65 (0.56-0.75)
Female	2.07 (1.90-2.26)	1.60 (1.40-1.84)	0.83 (0.71-0.97)
Adjusted for age and income			
Male	1.78 (1.65-1.93)	1.62 (1.43-1.85)	0.61 (0.53-0.71)
Female	2.14 (1.96-2.32)	1.67 (1.45-1.91)	0.83 (0.72-0.97)
Adjusted for age and car access			
Male	1.78 (1.64-1.93)	1.60 (1.41-1.82)	0.64 (0.55-0.74)
Female	2.15 (1.97-2.33)	1.71 (1.49-1.96)	0.88 (0.76-1.03)
Adjusted for age and housing tenure			
Male	1.83 (1.69-1.99)	1.65 (1.45-1.88)	0.64 (0.55-0.74)
Female	2.12 (1.95-2.31)	1.64 (1.42-1.88)	0.85 (0.73-0.99)
Adjusted for age and NZDep			
Male	1.68 (1.55-1.82)	1.51 (1.33-1.73)	0.64 (0.55-0.74)
Female	1.99 (1.83-2.17)	1.55 (1.34-1.78)	0.86 (0.74-1.00)
Adjusted for age, marital status and all socioeconomic factors (education, income, car access, housing tenure and NZDep)			
Male	1.51 (1.40-1.63)	1.41 (1.24-1.60)	0.60 (0.52-0.70)
Female	1.78 (1.64-1.93)	1.37 (1.20-1.57)	0.76 (0.66-0.88)
Percentage decrease in excess mortality rate ratios from baseline model (controlling for age) to the model controlling for all socioeconomic factors[a]			
Male	42%[a]	45%	-18%
Female	34%	48%	-71%

Note: These analyses are based on complete data set. 400,275 person years for males and 446,277 person years for females.
*(a) For example (1.88-1.51)/(1.88-1.00)*100=42%*

Controlling for all the SES variables tends to reduce the relative differences in mortality for Māori and Pacific males and females compared to nMnPnA. For example, after controlling for all the SES indicators, Māori men have 1.51 times higher risk of dying (compared to 1.88 times in model controlling for age only) than nMnPnA men while Pacific men who had 1.41 times higher risk of dying (compared to 1.75 times in model controlling for age only) than nMnPnA men. However, among Asian people, the relative advantage in mortality rates increased further when adjusting for socio-economic factors, e.g. the RR for males moved further away from null, from 0.66 to 0.60.

In order to measure the proportion of the ethnic inequality in mortality mediated by socio-economic inequality, we calculated the percentage reduction of the ethnic disparity in mortality from the baseline model (the model controlling for age only) to the model controlling for all the socio-economic factors. The results shown in the last two rows of Table 3 shows that the five socio-economic factors appear to account for 42% to 45% of the excess mortality for Māori and Pacific men compared to nMnPnA men. For Asian people, adjusting for socio-economic factors actually increases the relative gaps in mortality compared to nMnPnA by 18% for males and 71% for females (i.e. at these older ages, Asian people actually have lower SES than nMnPnA).

Age standardised mortality rate ratios for selected diseases are shown in Table 4. Māori and Pacific males and females had an excess mortality from all major causes of death. In particular, mortality from chronic lung diseases and lung cancer was more than two times higher for Māori men (RR=2.10 and RR=2.07 respectively) and Māori women (RR=2.57 and 3.47 respectively). Pacific prostate cancer rates were more than two times higher than for nMnPnA rates (RR=2.15). Mortality from cerebrovascular disease was elevated for Pacific males and females and Māori females. Mortality from CVD and ischemic heart disease was high for Māori males and females and for Pacific males. Mortality from all major diseases was low for Asian people, though it was particularly low for chronic lung diseases and all cancers mortality for Asian males (RR=0.48 and RR=0.54 respectively) and Asian females (RR=0.34 and 0.46 respectively).

In order to specify the contribution of each specific cause of death to ethnic disparity in mortality, we decomposed the age standardised rate difference (SRD) into the 'shares' contributed by different causes of death. The total width of each bar in Figure 2 is the SRD for each of Māori, Pacific and Asian compared to nMnPnA. The contribution of each cause of death is shown in different shading. Note that it is possible for some causes of death to have inequalities in the opposite direction to the all-cause mortality combined, hence (for example) the dementia component being to the left of the zero x-axis intercept for Māori. The major cause of lower Asian mortality is lower chronic lung diseases and all cancers combined, which together accounted for more than half of the total absolute gap in mortality between Asian and nMnPnA ethnic groups. Among Māori and Pacific males and females, excess mortality from CVD, chronic lung diseases, and all cancer made a large contribution to the absolute gap in all-cause mortality.

Discussion and conclusions

This study clearly shows that levels and patterns of old age mortality vary considerably by ethnicity and age. Asian people consistently have the lowest overall and age specific mortality rate, followed in turn by nMnPnA, Pacific and Māori. However, while Māori and Pacific groups have a high mortality at younger old ages (65+) which tends to merge at oldest old ages (85+), the Asian group had low mortality at all ages (Figure 1a, 1b and Table 2). In other words, Māori and Pacific disadvantage in mortality seems to decline steadily with age definitely in relative terms, but also possibly in absolute terms.

Table 4: Cause-specific mortality SRRs for total Māori, Pacific, and Asian compared to nMnPnA (95% confidence intervals), 65+ years, 2001-04.

	Total Māori	Total Pacific	Total Asian
Males			
CVD	1.47 (1.34-1.62)	1.38 (1.18-1.61)	0.57 (0.47-0.69)
IHD	1.51 (1.34-1.70)	1.10 (0.89-1.36)	0.55 (0.44-0.70)
Cerebrovascular disease	0.95 (0.72-1.24)	1.82 (1.33-2.47)	0.80 (0.56-1.15)
Chronic lung disease	2.10 (1.73-2.53)	1.71 (1.22-2.39)	0.48 (0.29-0.81)
Cancer	1.51 (1.36-1.68)	1.20 (0.99-1.45)	0.54 (0.42-0.70)
Lung cancer	2.07 (1.71-2.50)	1.38 (0.93-2.04)	0.78 (0.50-1.21)
Colorectal cancer	1.05 (0.75-1.46)	[a]	[a]
Prostate cancer	1.46 (1.12-1.91)	2.15 (1.49-3.11)	0.70 (0.38-1.30)
Injury	1.57 (0.95-2.62)	[a]	[a]
Dementia	0.90 (0.45-1.78)	[a]	[a]
Females			
CVD	1.67 (1.53-1.82)	1.35 (1.17-1.56)	0.77 (0.65-0.92)
IHD	1.67 (1.48-1.89)	1.13 (0.91-1.41)	0.72 (0.56-0.93)
Cerebrovascular disease	1.26 (1.05-1.52)	1.66 (1.30-2.12)	0.95 (0.71-1.29)
Chronic lung disease	2.57 (2.12-3.10)	0.92 (0.57-1.46)	0.34 (0.18-0.66)
Cancer	1.69 (1.52-1.89)	1.20 (0.98-1.46)	0.46 (0.34-0.61)
Lung cancer	3.47 (2.86-4.22)	1.54 (0.99-2.39)	0.74 (0.41-1.34)
Colorectal cancer	0.64 (0.42-0.99)	0.55 (0.29-1.07)	[a]
Breast cancer	1.47 (1.07-2.01)	1.08 (0.60-1.94)	[a]
Injury	1.76 (1.16-2.66)	[a]	1.01 (0.48-2.14)
Dementia	0.64 (0.36-1.17)	0.81 (0.38-1.71)	[a]

Note:
(a) Insufficient numbers to calculate SRRs.
Same data set as in Table 2.

We have also demonstrated that socio-economic factors were a sizeable contribution to inequalities in mortality for Māori and Pacific compared to nMnPnA. Controlling for all the SES variables tends to reduce the relative differences in mortality for Māori and Pacific males and females. The five socio-economic factors appear to account for greater than 40% of the excess mortality for Māori and Pacific men and about 34% for Māori females and 48% for Pacific females. There may have been a further residual contribution of socio-economic status, because indicators of socio-economic status do not necessarily have the same validity for all ethnic groups.[11] It is also likely, that better measurement of socio-economic factors, including over the lifecourse, would account for yet more of the ethnic inequalities in mortality between Māori, Pacific and nMnPnA. However, controlling for socio-economic factors increased the gap between Asian and nMnPnA groups.

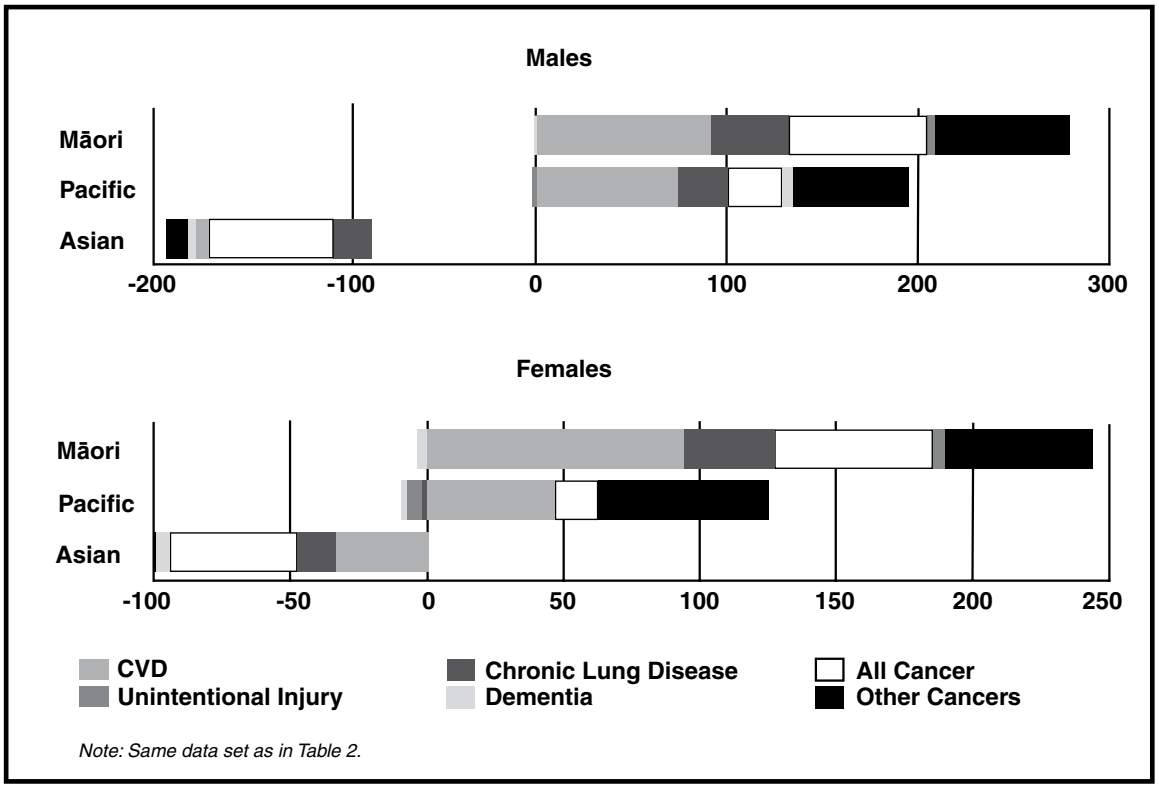
Regarding cause-specific mortality, mortality from chronic lung diseases and lung cancer was particularly high among Māori men and Māori women. For Pacific males, mortality was particularly high for prostate cancer. Mortality from all major diseases was low for Asian people, though it was particularly low for chronic lung diseases and all cancers mortality for both Asian males and Asian females.

These findings are consistent with those reported for the younger age cohort using the same data set, which showed markedly lower all-cause and cause-specific mortality rates among the Asian and higher rates for the Māori and Pacific.[2] The evidence presented in this study suggests that the socio-economic measures – education, income, car access, housing tenure and NZDep – contribute markedly to the observed ethnic differentials in overall mortality.

The Asian results from our study agree with literature from the US that found lower death rates for Asian American men and women than the majority caucasian American.[12-14] However, Asian Americans have the most advantaged socio-economic composition of the groups studied,[14] hence, when the socio-economic characteristics are controlled, their mortality advantage relative to the other groups decreases. In our study, Asians have lower socio-economic composition as compared to the majority nMnPnA, hence, when socio-economic factors being controlled, the gap between Asian and nMnPnA actually increases. Similar to the Mexican, Native, and African Americans, the mortality gap between the least socio-economically advantaged groups in New Zealand (Māori and Pacific) and the majority nMnPnA group reduced when socio-economic factors were controlled. Thus, improvements in further reducing socio-economic gaps between nMnPnA and Māori and Pacific groups may have an impact in reducing mortality differences between these groups.

There are several limitations of the study that may have influenced the results of this study. First, we were not able to address ethnic variations within the Asian and Pacific groups (e.g. Chinese and Indian, Samoan and Niuean). Mortality differences for specific Asian and Pacific groups may have been larger as both are ethnically heterogeneous groups in terms of country of origin, language, customs and immigration context (e.g. Indian vs Chinese; Tongan vs Samoan vs Fijian).

Second, the small number of deaths for Asian and Pacific result in wide confidence intervals for several major causes of death. Moreover, because of small number of deaths, cause-specific mortality from all causes could not be shown for Pacific and Asian groups (e.g. colorectal cancer, injury and dementia for Pacific and Asian males).



Note: Same data set as in Table 2.

Figure 2: Contribution of causes of death to the ethnic inequalities, ages 65+ years.

Third, our regression analyses included everyone aged 65 and over living only in private households. If institutional residence is affected by personal preferences and patterns of behaviours – as influenced by ethnicity – then the exclusion of people living in institutions can be a serious source of bias. For example, we know from studies conducted in the US that ethnicity played an important role in explaining older people's use of care (formal vs informal) with older people from ethnic minority less likely than White elders to use formal services.[15] This difference might be related to ethnic differences in the elder's preferred source of care (family vs service provider)[15] or it might be a response to perceived barriers to access or to the financial costs of nursing homes and other types of facilities that provide personal care to elders who are unable to live independently, such as rest homes, board and care homes, or adult care homes.[16] If there was a tendency on the part of ethnic minorities (Māori, Pacific and Asians) to stay in private households and the tendency among nMnPnA to move to institutional homes when disabled, then the mortality differentials presented here may be overestimated. However, we have no good information to suggest which way the bias (if any) might actually be.

Fourth, more than a quarter of the person-time had to be excluded because socio-economic data were missing (mostly due to missing education data), selection bias may impact on our multi-variable results shown in Table 3. Despite these and other limitations, the present study underscores the importance of examining ethnic differences among older people. This study showed that Māori and Pacific groups had elevated old-age mortality and socio-economic factors were associated with higher old age mortality among them. To reduce differences in old age mortality, inequalities as a result of socio-economic position should be reduced.

Key Points:

- Ethnic inequalities in mortality among the older population have received little attention in New Zealand.
- Clear ethnic mortality gradients persist into old age (i.e. 65 years plus).
- Compared with nMnPnA, mortality was high among Māori and Pacific groups, and low among Asian groups.
- The mortality level of most groups was influenced by varying distribution of socio-economic factors. Socio-economic factors appear to account for about 40% of excess disparity in mortality for Māori and Pacific groups compared to nMnPnA.
- For Asian people, adjusting for socio-economic factors actually increased the relative gap in mortality compared to nMnPnA.
- Mortality from chronic lung diseases and lung cancer for Māori and prostate cancer for Pacific men were of particular importance for explaining their high mortality.

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Contributors

Santosh Jatrana conceived the study and led the design, interpretation and preparation of drafts of the paper and is the guarantor of this paper. Tony Blakely is the principal investigator of the NZCMS. He contributed to the design, interpretation and revision of drafts.

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