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Ethnic classification, intermarriage, and mortality: Some methodological issues in relation to ethnic comparisons in Aotearoa/New Zealand[1]

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This paper is a working paper - we would welcome any comments.

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[1] Although in the pre-European era Mäori had no name for the country as a whole, there is now an entrenched notion that Aotearoa is the Mäori name for New Zealand (King 2003). While acknowledging that this alternative name is often used in academic writing, in this paper we have chosen to use the term New Zealand.

Abstract

In New Zealand, there is considerable interest in measuring disparities between the indigenous Mäori population and other New Zealand residents. While at times non-Mäori are treated as one group, comparisons often go beyond the two groups and assess the relative positions of Mäori, New Zealand Europeans, Pacific people and, to a lesser extent, Asian people. However, neither the two group nor the wider group comparisons are straightforward. This is due to some major methodological challenges involved in identifying and measuring ethnicity and in then assigning people to discrete categories.

In the past health researchers have made single ethnic group mortality comparisons when, in fact, a significant number of individuals are now recording dual or multiple ethnicities. In this paper we examine mortality rates for people who self-identify as just one ethnic group compared to people with multiple self-identified ethnic groups. For example, we compare Pacific mortality when respondents recorded only Pacific ethnicity relative to those Pacific people who recorded at least one other ethnic group in addition to Pacific. We also explore mortality rates in relation to some combinations of Mäori ancestry and ethnicity.

In undertaking this exploration, there are a number of aims. One is to stimulate discussion regarding the recommendations of Statistics New Zealand's Review of the Measurement of Ethnicity. Another is to assess how useful complex ethnicity and ancestry data are for monitoring and measuring health status, and research more generally. Finally, the paper is designed to encourage discussion and theorizing about the differences and disparities presented in this paper and, ultimately if they are to be overcome, discussion and theorizing about the reasons behind them.

Summary Statistics New Zealand Security Statement

(Relevant to pages 28 to 37 of this paper.)

The New Zealand Census Mortality Study (NZCMS) is a study of the relationship between socio-economic factors and mortality in New Zealand, based on the integration of anonymised population census data from Statistics New Zealand and mortality data from the New Zealand Health Information Service. The project was approved by Statistics New Zealand as a Data Laboratory project under the Microdata Access Protocols in 1997. The data-sets created by the integration process are covered by the Statistics Act and can be used for statistical purposes only. Only approved researchers who have signed Statistics New Zealand's declaration of secrecy can access the integrated data in the Data Laboratory. (A full security statement is in a technical report at http://www.wnmeds.ac.nz/nzcms-info.htm .) For further information about confidentiality matters in regard to this study please contact Statistics New Zealand.

Introduction

In New Zealand, there is considerable interest in measuring disparities between the indigenous Mäori population and other New Zealand residents. This is driven by a number of factors. Foremost is the Treaty of Waitangi, signed in 1840 between Mäori chiefs and representatives of the British monarchy, that guarantees equal rights to Mäori and non-Mäori. Equality of health status is widely accepted as one implication of the Treaty, requiring that the relative positions of Mäori and non-Mäori health status be monitored. While at times non-Mäori are treated as one group, comparisons often go beyond the two groups and assess the relative positions of Mäori, New Zealand Europeans, Pacific people and, to a lesser extent, Asians. However, neither the two group nor the wider group comparisons are straightforward. This is due to some major methodological challenges involved in identifying and measuring ethnicity and in then assigning people to discrete categories. This in large part reflects New Zealand's history of high rates of both migration and ethnic intermarriage.

The paper begins by briefly noting why mortality comparisons are useful. There is then a brief history of the settlement of New Zealand and its impact on the size and ethnic composition of the current population. This is followed by a summary of changes in the collection of first race, then ancestry and ethnicity data in the five yearly Census of Population and Dwellings. Particular attention is given to changes that allowed more than one ethnic group to be recorded in official surveys. We focus on the census because, despite its shortcomings, it remains the core data collection for researchers and policy makers in New Zealand. In this section, we briefly consider ethnic intermarriage and the "transmission" of ethnicity to children.[2] This discussion is primarily based on census data. Finally, changes in the collection of mortality data are also discussed in this section. The paper then highlights some research on complex ethnicity, ancestry and social disparities. In this paper we use the term 'complex ethnicity' when moving beyond single ethnic group affiliations by individuals. This section primarily focuses on New Zealand research, but also mentions some US research with regard to Native Americans.

With all this background in mind, the paper then outlines how health researchers (ourselves included) have made single ethnic group mortality comparisons when, in fact, a significant number of individuals are recording dual or multiple ethnicities. This is followed by a presentation of mortality rates for people who self-identify as just one ethnic group compared to people with multiple self-identified ethnic groups. (For example, we compare Mäori mortality when respondents recorded only Mäori ethnicity relative to those Mäori who recorded at least one other ethnic group in addition to Mäori. We also explore mortality rates in relation to some combinations of ancestry and ethnicity.

The paper concludes by assessing whether multiple versus single ethnicity categories are useful when considering ethnic mortality disparities and, ultimately in the development of health policy. While the paper focuses on New Zealand, this issue is relevant to countries

[2] In this paper, the term marriage includes both legal unions and de facto relationships.

such as Australia, Canada and the United States where, like New Zealand, there has been a history of British colonisation, there are currently significant ethnic based health disparities, and where marriage between the indigenous population and other ethnic groups is relatively common (Birrell, 2000; Snipp, 1997).

Why focus on disparities in mortality?

We focus on mortality rates by ethnicity in this paper. Why? Sen (1998) sets out a number of reasons why measures of mortality are useful when looking at both ethnic and gender based disparities. 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.[3]

Sen also puts forward a number of reasons why mortality rather than morbidity data is useful when making comparisons between groups, including across international boundaries. The main one is that morbidity data is often based in perceptions of illness. Amongst groups where medical care is good, people often have a high perception of morbidity, even though they may be in much better health.

Extending the third reason offered by Sen above, health (and its converse mortality) is one measurable 'social outcome' that a society may choose to compare between social groupings to determine inequalities. Following the Statistics New Zealand recommendations in 2004 to use sole and combined ethnic groups for social statistics (Statistics New Zealand, 2004), we present here for the first time mortality rates by some of these recommended groupings. (Some groupings are too small to calculate mortality rates.)

A short history of the settlement of New Zealand

New Zealand has experienced a number of waves of migration. The first was by Mäori who became New Zealand's indigenous population. While there remains debate over the exact timing of the arrival of the first Mäori settlers in New Zealand, generally it is agreed that this occurred less than 1,000 years ago (King, 2003).

The first recorded European visit to New Zealand was by the Dutch mariner Abel Tasman and his crew who arrived in 1642. However, none of them set foot on New Zealand soil. Over 100 years later James Cook arrived in 1769 from Britain. In contrast to Tasman, Cook and his crew had numerous contacts with Mäori (Salmond, 1991). Cook was soon followed by small groups of whalers, sealers and traders who set up bases around New Zealand. Some of these came from the United States and, along with

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

Europeans, included some African Americans and Pacific Peoples who had joined the crew on trips across the Pacific. From the earliest days of contact (including pre-Treaty), there has been a high level of intermarriage, both formal and informal, between Mäori and the new arrivals (Bentley, 1999; Pool, 1991; Wanhalla, 2003; Belich, 1996).

When Cook arrived estimates of the New Zealand population vary from around 86,000 (Belich 1996: 178) through to around 100,000 (Pool, 1991).[4] The ethnic composition was, by definition, 100 percent Mäori. It has been estimated that the Mäori population subsequently halved by the late 1880s from its pre-contact population.[5] There are a number of reasons put forward for this initial post contact decline, including: exposure to introduced diseases such as measles to which Mäori had no natural resistance; land dispossession and loss of culture; and an increased level of fatalities in inter tribal warfare due to the introduction of muskets (Belich, 1996; Crosby, 2001; King, 2003; Sorrenson, 1956). Pool and Cheung (2004), in a specific historical study of mortality, place particular emphasis on the health impacts of forced land loss. In the period of Mäori population decline the settler population was rapidly increasing from fewer than a thousand to half a million between 1831 and 1881 (Belich, 1996: 278). Following this migration driven population expansion, births in New Zealand took over in the mid 1880s (King, 2003: 230)

The decline in the Mäori population was so severe that Riddell (2000) notes in the late 19th century many people believed that Mäori as a group would not survive. Yet, she states "even some of the most ardent 'fatal impact' protagonists allowed that intermarriage with Pakeha would slow the extinction of Maori" (p. 81).[6] O'Regan (2001: 135) notes that early in the colonisation of New Zealand "[k]āi Tahu leaders were quick to recognise the increased resistance to European illnesses in those of mixed descent."[7] However, the role of genetic mixing as opposed to the social, economic and cultural changes that accompany intermarriage and social mixing is a moot point. What we currently know about genetic causes of disease pertains to rare conditions – not common chronic diseases.

> ".. to conclude that we already know that there is a genetic dimension to race that matters because it confers susceptibility to the common chronic diseases is premature. The competing hypothesis, in support of which we have enormous evidence, is that this variation results from differences in environmental exposures. While geneticists rightly object to statements that no biological differences exist among populations, to rush to the opposite extreme and advance claims about the genetic underpinnings of chronic diseases having emerged under conditions of the modern industrial lifestyle is unhelpful." (Cooper, 2003: 25)

[4] Although Pool (1991) notes that no figures before and until contact are definitive (p. 29).
[5] Statistics New Zealand report a figure of 42,113 people with Maori descent in the 1896 census.
[6] The term Pakeha is often used for the majority group in New Zealand.
[7] Kai Tahu is the main Maori tribe or iwi in the South Island of New Zealand.

"Genetic mixing" between Mäori and non-Mäori in the early 19th century probably also provided Mäori access to economic and other resources that are determinants of health.[8] For example, as O'Regan notes (2001: 135), marriage often helped trade between Mäori and non-Mäori.

Around the turn of the 20th century, the Mäori population began to increase again. Based on descent rather than ethnicity measures, in 1896 there were around 42,000 Mäori and by the end of the Second World War this had increased to just over 115,000. Also post war there was significant migration from the Pacific, with this population growing quite rapidly during the late 1960s and early 1970s. The fourth major group, Asians, predates the Pacific migration. There have been people of Asian ethnicity living in New Zealand from the early days of European settlement, although in very small numbers and often predominated by males. However, a century later in the 1980s and 1990s the number of people of Asian ethnicity grew rapidly. A more recent component of migration comprises refugees and other settlers from Africa and the Middle East. However, this group is still relatively small.

While there has been some residential ethnic segregation in New Zealand, it has not been at the level seen in countries such as the U.S. (Johnston, Poulsen and Forrest 2003). Perhaps connected with this, in New Zealand there has been a small but significant level of intermarriage between all four main ethnic groups. [9]

By 2001 there were 604,000 individuals who recorded having Mäori ancestry in the census. The number who recorded Mäori as one of their self-identified ethnic groups was lower at 526,000. Based on the ethnic measure, this represented 15 percent of the total population of just over 4 million people (Statistics New Zealand, 2003). In comparison, and again on a total count basis, people defined as European made up 79 percent of the population, while Asian Peoples and Pacific Peoples both comprised 7 percent. Given that some of these individuals record more than one ethnic group, these proportions add to more than 100 percent.

It is important to note that there is considerable heterogeneity in the four main ethnic groupings identified above. Customs and practices vary considerably by tribe within Mäoridom – although the Mäori language was, and is, reasonably uniform across tribes. Pacific people are more heterogeneous again, with notable cultural differences between Islands of origin and different languages (e.g. Samoan, Cook Island, and Fijian). The Asian population as ascribed in New Zealand is extremely heterogeneous from an international perspective, including (to name a few) people of Indian, Sri Lankan, Chinese, Thai, Malaysia, and Japanese origin. That is, at least half the world's population – if they choose to immigrate to New Zealand – are likely to choose, at least

[8] However, some "intermarriage" simply involved genetic mixing as a consequence of a prominent sex industry in ports of call for British, French, American, and a smaller number of Pacific Peoples and African American, sailors. While such intermarriage involved genetic mixing, there was no passing on of any European economic or cultural capital by the transitory sailors. But there is no data on the health status of the offspring of these encounters to test whether genetic mixing was either beneficial or detrimental to health.

[9] This is based on multiple ethnic responses according to census data for both adults and children

in the initial years of living in New Zealand, an 'Asian' ethnicity. Finally, while most people classified as European have ancestral roots in England, Scotland or Ireland, a not insignificant number of people have migrated from a wide range of continental European and Nordic countries.

Given the often complex backgrounds of people in settler societies, self-identified ethnicity in response to official surveys is often not a straightforward process. Statistics New Zealand (2004) sets out a number of factors that may contribute to, or influence, a person's ethnicity. As they note, many of these are interrelated. This list is:

- name [10]
- ancestry:
- culture:
- where a person lives and the social context:
- race:
- country of birth and/or nationality:
- citizenship:
- religion and language:

As a subset of these influences, Broughton (1993) identifies the three key elements of defining Mäori identity as whanaungatanga (the family and kinship ties); te whenua, (the land) and te reo (the language). All these factors may influence the choice of any particular single ethnic identity. However, a major driving factor of the growing percentage of people in New Zealand that identify as two or more ethnic groups are 1) being children of either recent or distant ethnic intermarriages, and/ or 2) placing value on more than one ethnic group.

Defining and counting ethnic groups

Census of Population and Dwellings

Censuses of both Mäori and non-Mäori populations have been carried out in various forms in specific geographic areas in New Zealand. The first Mäori census was in 1857-58, with Mäori making up 48 percent of total population (Statistics New Zealand 1994). 1874 was the first year that a full national Mäori census was undertaken (Riddell 2000). This was after the Land Wars. However, it took until 1926 before the Mäori census was conducted in a similar way to the general census, although a special Mäori census questionnaire remained in use until1951. The questionnaire, which was available in both English and Mäori, was shorter than the standard one. In 1951, Statistics New Zealand

[10] Statistics New Zealand (2004: 7) notes that a "name" is "a common proper name that collectively describes a group of individuals and authenticates the characteristics and the history of its members". In listing a "name", Statistics New Zealand was conscious of the small but increasing number of respondents to official surveys who are classifying themselves as "New Zealanders".

published census tabulations of the total New Zealand population that included Mäori for the first time (Statistics New Zealand 1994).

In the early years of the census, respondents were questioned about their race based on ancestry.[11] While only one ancestral group was collected per person in early censuses, the category Mäori-European half-caste was one of the choices. 19th century New Zealand census data identified and separated out "half-castes", an official indication that a mixed Mäori-European population was becoming important (Brown 1984). "Half-castes" were defined as persons who reported half Mäori and half European descent and were allocated to the Mäori or European population according to their "mode of living". Persons reported as more than half Mäori were allocated to the Mäori group regardless of their mode of living. It appears that decisions about what a half caste actually was in practice and "what living as European" meant when the Mäori population itself increasingly dressed, worked and housed itself along European lines, were often left up to the vagaries of individual enumerators (Brown 1984, Pool 1991).

The 1936 Census question introduced a new complexity by allowing respondents to record fractions such as ¾ European - ¼ Mäori. The term "race" was used until 1951, but then there was a switch made to "descent" related terms.

The concept of ethnicity was first introduced in the 1976 census. In a question under the heading "ethnic origin" respondents were then asked about their ancestry in a two-part question. In the first part the respondent was initially asked if they were of full European descent. If not they were asked to state "whether full N.Z. Mäori, Cook Is. Mäori, Indian, etc as the case may be - If of more than one origin, give particulars, e.g. 7/8 European – 1/8 N.Z. Mäori, ½ Mäori – ½ Samoan". The second part of the 1976 question asked specifically about Mäori ancestry.

The 1981 census question was also under the heading "ethnic origin". In this census neither the terms "ancestry" nor "descent" were used. Specifically, the question asked respondents to either record their "full" origin (e.g. full N.Z. Mäori) or alternatively to record their "parts" (e.g. 1/8 European and 7/8 Mäori).

The 1986 census asked about ethnic origin again, but in a very different format. For the first time respondents were presented with multiple possible ethnic origins (and an "other please state" field), and asked to "tick the box or boxes which apply to you".

The term "ethnic origin" became "ethnic group" in 1991 and this term has also been used in the two subsequent censuses. However, there have been significant changes in the questionnaires that affect how people respond. The three critical changes to questions have been:

1991 - Which ethnic group do you belong to? *Tick the box or boxes which apply to you.*
1996 - Tick as many circles as you need to show which ethnic group(s) you belong to.

[11] For a detailed history of changes to the census in New Zealand prior to 1991 see Brown (1984), Khawaja, Boddington, and Didham (2000), Pool (1991) and Statistics New Zealand (2004).

2001 - Which ethnic group do you belong to? *Mark the box or boxes which apply to you.*

The 1991 and 2001 questions are similar, but both are worded in a way that makes the question internally inconsistent as to whether people could have single or multiple ethnic identities. The main thrust of the question in both 1991 and 2001 was to ask which ethnic group the respondent belongs to. The use of "group" in the singular implied that only one ethnic group should be chosen. In both 1991 and 2001 the second part of the question was underneath the first part and in italics. In both 1991 and 2001 the question was ambiguous, and tends to direct people away from multiple responses.

In 1991, there was also a separate question added on Mäori ancestry and this has been repeated in subsequent censuses. As an example, in the 2001 census a question asks whether the respondent is "descended from a Mäori". This is followed by the sentence "that is, did you have a Mäori birth parent, grandparent or great-grandparent, etc?". The collection of data on Mäori descent is a statutory requirement under the Electoral Act (1993). Mäori descent data are used in conjunction with electoral registration data to calculate Mäori electoral populations that are used in determining the boundaries of Mäori electoral districts. In addition the Mäori descent question in 1991, 1996 and 2001 provided a filter to a question on tribal affiliation.

Table 1 summarises changes in the number of Mäori by the different measures since both the ethnic group(s) question and the separate ancestry question were introduced in the census. It shows both the number of respondents recording Mäori ancestry and the total number who recorded Mäori as one of their ethnic groups. The number recoding only Mäori ethnicity declined strongly between 1991 and 1996 before rising again to 2001. This is likely to be connected with changes in the ethnicity question. However,in a study of intercensal change in New Zealand, Coope and Piesse (2000) found there was an inflow into the Mäori ethnic group in 1996 of individuals amounting to 23.4 percent of the 1991 group. There was also an outflow out of the Mäori ethnic group between censuses of 5.7 percent. These type of data suggest the boundaries between the group recording only one ethnicity and those recording more than one are fluid

Table 1: Māori Population 1991 – 2001

Census Year	Māori Descent	Māori Ethnic Group *	Sole Mäori ethnic group	Mäori plus other ethnic group(s)	% recording more than one group	Ratio of descent to ethnicity
1991	511,278	434,847	323,494	111,353	26	1.18
1996	579,714	523,371	273,438	249,933	48	1.11
2001	604,110	526,281	294,726	231,555	44	1.15

* Mäori ethnic group comprises those people that ticked one or more ethnic origins/groups, and one of those was Mäori. It is also referred to as the 'Total Mäori Ethnic Group'. Note that [Sole] + [Mäori plus other…] = [Mäori Ethnic Group]

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

Table 2 just shows 2001 data and again indicates the intersection between ethnicity (Total Mäori ethnic group) and Mäori ancestry.

Table 2: Response to Mäori descent question compared with responses to the ethnic group question, 2001

		Mäori descent				
		Yes	No	Don't know	Not elsewhere included*	Total
Mäori ethnic group	Yes	487,317	5,322	6,846	26,796	526,281
	No	112,665	2,655,516	58,974	233,295	3,060,450
	Not elsewhere included*	4,125	16,671	1,791	127,956	150,546
	Total	604,110	2,677,506	67,608	388,050	3,737,277

* Includes response unidentifiable, response outside scope and not stated.
Source: Census of Population and Dwellings, Statistics New Zealand.

As Table 2 shows, in 2001 the number reporting Mäori ancestry was 604,110 while the total Mäori ethnic group was 526,281. This greater proportion reporting Mäori descent or ancestry than Mäori ethnic identity has been found in other studies of Mäori (e.g. Broughton *et al*, 2000).[12] In addition, in this census 5,322 respondents reported they belonged to the Mäori ethnic group but stated they did not have Mäori ancestry, while a further 6,846 respondents did not know if they had Mäori ancestry but nevertheless recorded themselves as belonging to the Mäori ethnic group. Assuming mistakes by census respondents completing the ancestry or self-identified ethnicity forms data entry and coding mistakes are not fully responsible for these differences, it appears that factors other than Mäori ancestry are sufficient for a small group of respondents to self-identify as being of Mäori ethnicity.

However, also of importance, Table 2 indicates a relatively high rate of "Don't knows, response unidentifiable, response outside scope and not stated". There is also a small group of New Zealanders who do not complete census forms. It is worth keeping in mind these missing responses when considering any apparent societal trends, particularly when there are some indications that individuals facing economic and social disadvantage are over-represented amongst this non-respondent group.

As indicated in Table 1 of all those people who recorded Mäori as one or more of their ethnic groups, 74 percent recorded only Mäori in 1991 but this declined to 56 percent 2001. This is much lower than for other ethnic groups (Table 3).

[12] Of the 15 percent of individuals in the Christchurch Health and Development Study who identified as having some Maori ancestry, a quarter stated they had no Maori ethnic affiliation (Broughton *et al*, 2000).

Table 3: Single ethnicity responses by each total ethnic group, 1991-2001

	Percentage of total ethnic group that only identify with that ethnic group		
Ethnic group (total responses)	1991	1996	2001
European	94.6	82.7	89.9
Mäori	74.4	52.2	56.0
Pacific Peoples	77.9	61.4	67.5
Asian	87.8	81.5	88.1
Other	68.0	59.9	75.1

Source: Lang (2002) based on census data.
Note that people that "only identify with that ethnic group" would include the following examples: a Pacific person that self-identified as both Samoan and Cook Island ethnic groups; an Asian person that self-identified as both Chinese and Korean ethnic groups; and an European person that self-identified as both New Zealand European and Dutch ethnic groups.

Affiliation to one or more ethnic group also varies by age. In 2001 in the younger age groups less than half the wider Mäori ethnic group record only Mäori, while the figure for Pacific Peoples is just over half (Callister, forthcoming). While much lower, the proportion of young people in the Asian ethnic group who list two or more ethnic groups is not insignificant. For example, in 2001 28 percent of Asians, and 23 percent of Europeans under the age of five recorded, or had recorded for them, more than one ethnic group.

For all ethnic groups, it is likely that based on ancestry alone an even greater proportion of people 'could have' reported two or more ethnic groups. Whilst this issue is not exclusive for Mäori, it is more apparent due to parallel recording of Mäori ancestry (but no other ancestry) in the New Zealand census. Why do people record only one ethnic group when they could record more based on ancestry? First and foremost, that ethnicity is about affiliation which can be different to ancestry or descent. A second-generation 'New Zealander' with predominantly English ancestry, but a Dalmatian grandparent, may self-identify as just 'European New Zealander'. There could be many reasons for such a simplification, including using the European identity to cover both options and considering the Dalmatian grandparent as overwhelmed by the English ancestry. Likewise, some Mäori respondents may see their non-Mäori ancestry as irrelevant to their feelings of belonging to the Mäori group – and vice versa, some non-Mäori respondents may see their Mäori ancestry as irrelevant. What are some of the other reasons why someone might identify as a sole ethnic group:

- When quickly completing an official form, many individuals may tend to simplify their ethnicity down to one group. This is a form of self-prioritisation.
- The ethnicity question does not encourage multiple responses.
- Some respondents may be basing their response primarily on lived cultural experiences rather than strictly on ancestry.
- Connected with this, some respondents may be influenced by the networks they are linked into. For example, if a respondent has a spouse with Mäori ancestry and lives in a community with a high proportion of Mäori they may be more likely to record sole Mäori.

- Some respondents living in mixed ethnic marriages or partnerships who clearly perceive their children as belonging to two or more ethnic groups may feel more inclined to just solely identify with their own 'self-prioritised' ethnic group.
- Some respondents may be reflecting how others view them. For example, it may be that those who "look more Mäori" (or look more "Pacific") are more likely to record only Mäori (or a Pacific Peoples) ethnicity. If this is correct, and if discrimination is rife is New Zealand, the sole Mäori (or Pacific Peoples) group would be more likely to suffer discrimination by the police, landlords and, potentially, healthcare providers.
- For some, recording a single ethnicity may be a political statement.

When only one ethnic group is collected, coding and analysis of ethnic groups is straightforward. When more than one group is collected, then reporting becomes more complex. This is not just an issue faced by New Zealand researchers, it is one recognized worldwide by health researchers. For example, in a paper entitled *Glossary of terms relating to ethnicity and race: For reflection and debate*, Bhopal (2004: 444) notes in relation to mixed ethnic (and racial) groups:

> This glossary omits a clear exposition on these terms, which require fresh thought. The increasing importance of the category mixed (ethnicity or race) is self evident. The increasing acceptance of sexual unions that cross ethnic and racial boundaries is adding both richness and complexity to most societies. The way to categorise people born of such unions is unclear and the current approaches are inadequate, partly because the number of potential categories is huge.

In the initial period during which more than one group was recorded, in New Zealand Statistics New Zealand (as well as most researchers) relied primarily on the prioritisation of ethnic groups in order to simplify the presentation and analysis of the data. Under this system, Mäori had priority coding, followed by Pacific peoples, then Asian, other ethnic groups besides European, followed by "Other European", and finally "NZ European" (Allan 2001 p. 18). This prioritisation system meant that, for example, if a person recorded himself or herself as belonging to both Mäori and Samoan ethnic groups they were classified as belonging just to the Mäori ethnic group.

There are both advantages and disadvantages in this process of prioritisation. The one major advantage is that the sum of ethnic counts equals the total population count. However, this advantage is arguably outweighed by the disadvantages: (1) there is no strong underlying logic in the order of prioritisation, (2) it is not ethnically neutral (that is it elevates one ethnic group over another), (3) it undermines, or at best does not permit, the preferences of people. However, it should be noted that the process of prioritisation has become more problematic in recent years, with the growth in the number of people reporting more than one ethnic group. When prioritisation of ethnic responses was first introduced, multiple reporting of ethnicity was relatively uncommon. Thus, while still potentially problematic, prioritisation of the responses had little actual impact on the resultant statistics.

A number of other alternatives are available when reporting multi-ethnic data responses. These include:

- Let people choose their own prioritisation: Its advantage is that it explicitly values people's preferences. It is ethnically neutral but adds complexity for respondents. Its disadvantage is that respondents have to subjectively self-identify with one group rather than allowing the possibility to identify with several.
- Total counts, whereby the total counts of people self-identifying at least in part with each ethnic group are provided. There are some problems with a total count solution. First, the total counts across ethnic groups sum to more than the population, since multi-ethnic people get counted in all the groups to which they belong. This can be confusing. Second, people with one, two, or three or more self-identified ethnic groups are not explicitly identified. Third, when making comparisons between outcomes for total count ethnic groups there will be an overlap. That is, people in the overlap will be counted in both (or more ethnic groups) necessarily dampening any differences between groups. This overlap problem may not matter if overlap is small but it does matter when this overlap is large.
- Randomly allocate prioritisation. This option would involve random allocation of multi-ethnic people to a single ethnic category. As an example, people who were both Mäori and European would have half a chance of being allocated in either box. People who are Mäori, European and Samoan, would have a 1/3 chance of being in any one of three boxes. This approach also has the advantage of being simple, readily understood, and imposes no additional burden of complexity on respondents. It is ethnically neutral if we assume that, on average, people were evenly predisposed to both (or more) ethnic groups. The total sum of all ethnic groups adds up to the population. However, it still undermines the preferences of people.
- A fractional ethnicity model (see Gould, 2001, 2002). This would count the number of times each ethnicity was claimed. However, unlike total responses options, the response of each individual would be given equal weight, a total value of one for his/her ethnicities. This would be achieved by adding to each ethnicity a coefficient equal to the reciprocal of the number of affiliations claimed. Thus, a respondent ticking only Mäori would be coded (1/1) Mäori; but a respondent ticking both the Mäori and the NZ European options would be (1/2) Mäori plus (1/2) NZ European. The total of the responses would then equal the total population.
- Do not prioritise ethnicity. This option is attractive in terms of neutrality and the principle of multiple self-identification. The approach lists all permutations of single and multi-ethnicity individuals. It is ethnically neutral and respects people's self-identification. Potentially it leads to a proliferation of group identities that hinders presentation of precise statistics when subgroups are small. This latter issue will be particularly problematic for researchers interested in uncommon or rare characteristics of each group (e.g. mortality rates – as shown later in this paper).

Some New Zealand studies which include Mäori as a target group have asked respondents to choose or self prioritise ethnicity. In addition, there are still some official data collections that ask for only one ethnic group, for instance hospital admissions, a system that forces prioritisation. Allowing multi ethnicity, but then asking respondents to prioritise, is the approach used by Waikato University in its *New Zealand women: Family, employment and education study* (Kukutai, 2001). Kukutai (2003) uses these

data to show that among those who recorded Mäori plus one or more other ethnic group about two fifths claimed Mäori as their primary identity. About the same number claimed a non-Mäori identity and the remainder had no leaning either way. In this dimensional or continuous representation, if respondent's self-identity is forced to move from three categories (sole Mäori, Mäori plus other ethnic groups, non-Mäori) to two (Mäori and non- Mäori) the middle mixed category would split about evenly either way. But some of this Mäori plus other ethnic group that would be forced to choose between Mäori and non-Mäori would have no strong preference either way.

In its final report from its Review of the Measurement of Ethnicity (RME), released in mid 2004, Statistics New Zealand (2004) recommends abandoning its practice of ethnic prioritisation. It is also not recommending having two questions so individuals can prioritise their own ethnicity. Instead it is suggesting an expansion by all agencies of government, including the health sector, of the reportage of non-prioritised multi-ethnic data. They suggest that the standard output for ethnicity data be single and combination responses as well as total response data. Total counts are seen as important as they provide correct denominators for ethnic groups. Statistics New Zealand is recommending that the following single and group combinations be used:

- Single ethnic group: European, Mäori, Pacific Peoples, Asian, and two new groups: Middle Eastern, Latin American and African (MELAA) and Miscellaneous.

- Two ethnic groups: Mäori/European, Pacific Peoples/European, Mäori/Pacific Peoples, Asian/European, any other two ethnic groups not elsewhere included.

- Three ethnic groups: Mäori/ Pacific Peoples/ European, three groups not elsewhere included.

Table 4 sets out the main single and multi ethnic groups in New Zealand. It also shows total counts and the old prioritised counts. It illustrates how very different ethnic counts could arise through different ways of handling multi-ethnic data. For example, if only those children recording sole Pacific Peoples are counted as Pacific Peoples, then the Pacific group represents 6.5 percent of the population. Under the system of ethnic prioritisation the young Pacific Population represents 8.3 percent of the population, but under total counts this rises to 11 percent.

Table 4: Percentage breakdown of 2001 census data by ethnic group, using the following categorisations: prioritised; main one, two and three-group census ethnic combinations; and total counts *

	Ethnic group combination	0-14 yrs	15-24 yrs	25-44 yrs	45-64 yrs	65-74 yrs	0-74 yrs
Prioritised data	European	60.5	62.9	72.0	82.2	89.1	71.5
	Mäori	24.0	18.9	14.2	8.9	5.5	15.4
	Pacific Peoples	8.3	7.1	5.6	3.4	2.2	5.7
	Asian	6.2	10.0	7.3	5.0	3.0	6.6
	Other	1.0	1.1	0.9	0.5	0.2	0.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0
Main single and multi-group data	Sole European	60.5	62.9	72.0	82.2	89.1	71.5
	Sole Mäori	11.0	9.8	8.8	6.4	4.2	8.6
	Sole Pacific People	6.5	5.8	4.9	3.2	2.1	4.8
	Sole Asian	5.3	9.5	7.1	4.9	2.9	6.2
	Sole Other	0.6	0.8	0.7	0.4	0.2	0.6
	Mäori / European	10.1	7.6	4.9	2.3	1.2	5.7
	Mäori / Pacific People	1.2	0.7	0.2	0.0	0.0	0.5
	Pacific People/ European	1.8	1.3	0.7	0.2	0.1	0.9
	European / Asian	0.9	0.5	0.2	0.1	0.1	0.4
	Mäori/Pacific/ European	1.2	0.5	0.2	0.0	0.0	0.4
	Combinations not above	0.9	0.6	0.3	0.3	0.1	0.4
	Total	100.0	100.0	100.0	100.0	100.0	100.0
Total counts	European	75.1	73.2	78.1	85.0	90.6	79.2
	Mäori	24.0	18.9	14.2	8.9	5.5	15.4
	Pacific Peoples	11.0	8.5	6.1	3.6	2.3	6.8
	Asian	6.9	10.5	7.6	5.1	3.0	6.9
	Other	0.9	0.9	0.8	0.4	0.2	0.7
	Total**	117.9	112.0	106.8	103.0	101.6	109.0

* Total population counts for the five age groups, respectively, were 820,104, 485,520, 1,061,844, 789,867, 235,320, making a combined total of 3,392,655 0-74 year olds at the 2001 census. ** This total indicates the overlap between the groups. In this table the not specified responses are excluded.
Source: Census of Population and Dwellings, Statistics New Zealand.

Table 5 reworks some of the data shown in Table 4 from the perspective of the total Mäori, Pacific and European ethnic groups. Among children (0-14 year olds), 54 %, 41% and 19 % of the total Mäori, Pacific and European ethnic groups, respectively, belong to two or more ethnic groups. Whilst multiple self-identified ethnicity is far more prevalent among Mäori (all ages) and Pacific people (mainly young people), it is also becoming common among young Europeans (and Asians). One would expect the proportions of each total ethnic group with two or more self-identified ethnic groups to increase in the future. Table 5 also illustrates that amongst young people there is a significant proportion identified as dual combinations of Mäori, Pacific or European, and all three ethnic groups simultaneously.

Table 5: Changing ethnic mix of the total Mäori, Pacific Peoples and European ethnic groups by age, 2001

	0-14	15-24	25-44	45-64	65-74
Total Mäori ethnic group					
Sole Mäori	45.8	51.9	62.0	71.9	76.4
Mäori /European	42.1	40.2	34.5	25.8	21.8
Mäori /Pacific Peoples	5.0	3.7	1.4	0	0
Mäori /Pacific/ European	5.0	2.6	1.4	0	0
Other combinations	2.1	1.6	0.7	2.2	1.8
Total Pacific Peoples ethnic group					
Sole Pacific	59.1	68.2	80.3	88.9	91.3
Pacific/Mäori	10.9	8.2	3.3	0	0
Pacific/European	16.4	15.3	11.5	5.6	4.3
Pacific/Mäori //European	10.9	5.9	3.3	0	0
Other combinations	2.7	2.4	1.6	5.6	4.3
Total European ethnic group					
Sole European	80.6	86.0	92.2	96.8	98.4
European /Mäori	13.4	10.4	6.2	2.7	1.3
European /Pacific	2.4	1.8	0.8	0.2	0.1
European/Asian	1.2	0.7	0.3	0.1	0.1
European/Mäori/Pacific	1.6	0.6	0.2	0.1	0.0
Other combinations	0.8	0.5	0.3	0.1	0.1

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

Ethnic intermarriage and the transmission of ethnicity to children

The data on ethnic groups of individuals again raise questions as to what might be influencing decisions to choose either a sole ethnic group or more than one. One is historical and current ethnic intermarriage. In a report on fertility by ethnic group, Didham (2004: 7) notes that in the 1996 census, 66 percent of partnerships involving people of Mäori ethnicity were partnerships between a Mäori and non-Mäori partner. The comparative figure for People of Pacific ethnicities was 42 percent, while for the Asian ethnic group it was 32 percent. These are based on total counts, so some of those forming partnerships outside their "ethnic group" will already be recording more than one ethnic group. Didham also makes the point that by the late 1990s a large proportion of Pacific People were in New Zealand and increasingly their children were also of Mäori and other ethnicities. Using a different measure, that of individuals rather than couples, Callister (2004) found that in 1996 around half of partnered Mäori had a non-Mäori partner.

While much lower, couple partnerships between non-Mäori non-Pacific individuals and other ethnic groups is, nevertheless, important. Table 6 shows such intermarriage by broad age groups for women in 2001. Amongst other things, the table illustrates the added complexity of considering multiple ethnicities within couples. While the numbers are small in the 15-24 age group and, in this age group, are likely to represent a group

with potentially different behaviours than those who form couples living in one households at later age groups, much evidence would point to increasing intermarriage between people with non-Mäori non-Pacific ethnicities and those who record either or both Mäori and Pacific ethnicity.

Table 6: Non-Mäori, non-Pacific women in each age group by ethnicity of their opposite sex partner, 2001 (percentage)

Age of female	Mäori Only	Pacific Only	Mäori and Pacific (with or without other ethnicities)	Mäori (with other ethnicities)	Pacific (with other ethnicities)	Neither Mäori or Pacific	Total	Number
15-24	6.7	1.8	0.5	7.1	1.1	82.8	100.0	6,645
25-44	2.7	0.6	0.1	3.1	0.3	93.1	100.0	214,692
45+	2.0	0.5	0.0	1.6	0.2	95.7	100.0	93,264
Total	2.5	0.6	0.1	2.7	0.3	93.7	100.0	314,607

Note: In this table the not specified responses of partners are excluded.
Source: Census of Population and Dwellings, Statistics New Zealand.

A critical question is if parents are from different ethnic groups, will these groups be then recorded as the ethnic groups of the children of such a union? While such information is difficult to obtain from adults without specifically asking them, census data itself can provide some guide for children living in couple households as ethnicity is recorded for adults. (However while census is a useful dataset, like most data it is has imperfections. For instance, there is no way of determining whether the parent(s) in couples and single parent households are actually the biological parents. In addition, in sole parent households no information is available on the absent biological parent. This latter point is particularly important for sole Mäori and sole Pacific Peoples given their over-representation in sole parent families.)

Three studies have been carried out in New Zealand in recent years that comment on the 'transmission' of ethnicity to children. (It is important to note that in younger age groups it will be an adult not the child completing the census form and identifying the child's ethnicity.) Kukutai (2001) used two data sources, one of which was the 1996 census, to examine the transmission of three ethnic categories. These were sole Mäori, mixed Mäori (Mäori and one or more other ethnic group) and non-Mäori. The other data source was Waikato University's retrospective survey *New Zealand women: Family employment and education*. Kukutai found that in couples where both parents were sole Mäori, mixed Mäori or non- Mäori, the children were nearly always reported as having the same ethnic group as their parents. However, outside of these combinations there was considerable variation in how ethnicity is transmitted to children.

Kukutai found that just under a third of children from both data sources who were reported as sole Mäori had a non-Mäori mother or father. She also found that in inter-ethnic unions, the decision to emphasise a child's Mäori ethnicity depended on whether or not the Mäori partner identified as Mäori only or affiliated with several ethnic groups. However, in Mäori / non-Mäori couples there was a tendency to emphasis Mäori

ethnicity when identifying the child. Kukutai also found that children who were assigned or claimed Mäori ethnicity, and especially those who reported sole Mäori ethnicity, were more likely to have separated parents. This pattern was stronger for more recent cohorts.

Kukutai argues that her data on the transmission of ethnicity castes some doubt on the idea that intermarriage will eventually lead to a blurring of ethnic distinctions between Mäori and non-Mäori. She notes that many families are continuing to value Mäori ethnicity even when children could potentially be classified as belonging to the dominant non-Mäori group.

In a later study, Callister (2003) used 2001 census data to assess how various ethnic groups were chosen or allocated to children. Drawing on this study, Table 7 shows the ethnicity of parents of children recording sole Mäori ethnicity.

Table 7: Ethnicity of parents of sole Mäori children under the age of 12 living in a two parent household, count and percentage of children with each parental ethnic combination - Top ten groups, 2001*

Ethnic Group of Mother	Ethnic Group of Father	Number of sole Mäori children	% of all sole Mäori children
Mäori	Mäori	10,461	63.7
NZEuropean	Mäori	1,473	9.0
Mäori	NZEuropean	1,311	8.0
Mäori	Not Defined	687	4.2
Mäori	NZEuropean/Mäori	471	2.9
NZEuropean/Mäori	Mäori	447	2.7
Not Defined	Mäori	357	2.2
NZEuropean	NZEuropean	240	1.5
Mäori	Pacific People	126	0.8
NZEuropean	NZEuropean/Mäori	105	0.6

* This table represents 96 percent of sole Mäori children living in a two-parent household.
Source: Census of Population and Dwellings, Statistics New Zealand

Table 7 shows the top ten combinations of parental ethnicity where the child was recorded as being sole Mäori. The recording of sole Mäori ethnicity is linked to having both parents also record sole Mäori as their ethnic group. A total of 64 percent of children were in this category. However, this means that 36 percent of sole Mäori children in two-parent households did not have both parents record sole Mäori ethnicity. The two next largest combinations are where either the mother or father was sole Mäori and their partner NZEuropean (total 17 percent). This combination shows that a significant number of sole Mäori children could be classified as being in the Mäori/NZEuropean group if only their parents' ethnicity were considered. Like the findings of Kukutai (2001), this suggests that boundaries between the sole ethnic and the dual-ethnic Mäori group are somewhat fluid.

While primary focussing on fertility amongst different ethnic groups (and therefore restricted to using 1996 data due to the fertility question not being asked in the 2001 census), Didham (2004: 7) provides some data on the transmission of ethnicity in couple

families. He restricted his analysis to two-parent families in which the number of children ever-born equals the number of children in the family, all children were at home on census night and ethnicity was specified in both parents and the child. He notes that among these families, most (93 percent) children of European ethnicity had both parents of European ethnicity, but for children of Mäori ethnicity, around 24 percent shared this ethnicity with their male parents only and nearly 32 percent with their female parents only. Only 44 percent of Mäori children shared this ethnicity with both parents. Didham notes that this pattern holds more strongly for both Pacific and Asian children with as an example given, over 49 percent of the Asian children deriving their Asian ethnicity from their mother only. He also notes that for European, Mäori, Pacific and Asian children who share the same ethnicity as one parent only, there is an increasing tendency for the ethnicity to be shared with the female rather than male parent. Given that Mäori and Pacific women are over-represented amongst sole mothers, this transmission of ethnicity by the mother is likely to be even more important with both these ethnic groups (Callister 2003).

Health and Mortality Data

Health researchers and epidemiologists have struggled with the choice of ethnic classification since the introduction and coding of multiple responses in the census.[13] A classification system for mutually exclusive groups is viewed as more parsimonious, but for outcomes such as death there must be reasonable numbers in each ethnic group to calculate mortality rates with precision. Therefore, the prioritised system had some intuitive appeal. However, it has long been known that mortality data (at least during the 1980s and early 1990s) undercounted Mäori and Pacific deaths (Graham, Jackson, Beaglehole, & de Boer, 1989; Pomare, Keefe-Ormsby, Ormsby, Pearce, Reid, Robson et al., 1995; Te Ropu Rangahau Hauora a Eru Pomare, 2000). The 'ethnicity' recorded on mortality data (more specifically, the 'Death Registration Form') prior to September 1995 was actually biological race, determined by next of kin report of the decedent's parents percentage Mäori or Pacific origin as follows:

> Father: Degree of (Maori blood and tribe (if any) of father of deceased: ……
> (Pacific island blood - state which island):
> Mother: Degree of (Maori blood and tribe (if any) of father of deceased: ……
> (Pacific island blood - state which island):

It is noteworthy that responses were only sought for Mäori and Pacific people. All non-responses were coded as non-Mäori/non-Pacific. Hence, under-reporting was pervasive and it was virtually impossible to quantify the level of non-response and its consequential impact.

[13] This section draws heavily on the work of Khawaja, Boddington and Didham (2000).

According to Khawaja, Boddington and Didham (2000: 5-6) the data was problematic for a number of reasons. These included:

i) Ethnicity of the deceased was derived from the ethnicity of the deceased's parents. Consequently, in many cases, it was the deceased's children who were asked about the degree of blood of their grandparents. Given that the question attempted to collect information many next-of-kin did not themselves possess, it is hardly surprising that people found the question offensive, irksome and irrelevant. In many cases, funeral directors were reluctant to seek the details.

ii) For statistical purposes, a person was only defined as Mäori or a person of Pacific ethnicities if they possessed "half or more" Mäori/Pacific blood. Thus, many people were excluded from their chosen ethnic group. For example, if one parent were ¾ Mäori and the other $^1/_8$ Mäori then the deceased would be recorded as non-Mäori (less than half Mäori blood), regardless of how they had viewed themselves.

iii) Many people misunderstood the question. Unlike the census questionnaire, which gave an example of the type of required response, the vital registration forms simply asked for degree of blood. As a result, many people simply answered "Mäori", gave an iwi, etc. For statistical purposes, it was necessary to develop rules for assigning a degree of blood to these people.

To try and overcome the resultant 'numerator-denominator biases' that arose when calculating mortality rates up to September 1995, a best-practice developed of using the sole ethnic counts for Mäori and Pacific populations (Pomare, Keefe-Ormsby, Ormsby et al., 1995). In this way, the smaller of the two possible census denominators for Mäori and Pacific were chosen, hopefully approximating the undercount in mortality data. This best-practice still required each individual New Zealander to only be counted once in the denominator – although this was at least consistent with single-option only recording on mortality data up to September 1995. It should also be noted that researchers unfamiliar with numerator-denominator bias did not always use this best practice. Rather, they obtained official Statistics New Zealand ethnic counts (which at the time were a prioritised classification) thereby severely underestimating Mäori and Pacific mortality rates, and slightly over-estimating non-Mäori non-Pacific (or non-Mäori) mortality rates.

Following the successful introduction of the ethnic affiliation concept in the census, Statistics New Zealand organised an inter-departmental working group to ensure the standardisation of the ethnic concept across all data collections, including vital statistics registration and hospital statistics. To bring vital statistics into line with 1996 Census statistics, amended birth and death registration forms were introduced in September 1995. These forms carried an ethnicity question almost identical to the 1996 Census question.

According to Khawaja, Boddington and Didham (2000), the revised death registration form only sought the ethnic groups the deceased belonged to. For funeral directors, administering the form, this was a positive development. The authors note that the previous practice of asking about the deceased's parents often drew criticism from next-of-kin. The new question applied universally (rather than just to Mäori and Pacific

populations). It is probably safe to conclude that in many cases the old question went unasked, especially when families showed no obvious cultural affiliation with Mäori or Pacific groups. This was confirmed by a survey that found that previously only 60 percent of funeral directors were completing the question (Robson, 1999:39). Around 90 percent of surveyed funeral directors indicated that they drew information for the new form from family, 60 percent indicated also that they used birthplace as a guide and a range of other items of information, including 25 percent who used "name/appearance" (Robson, 1999: 26). Khawaja, Boddington and Didham, quoting from an earlier Auckland-based study of Mäori mortality data, also recognised that "the main problem with the death registration data is, not that Maoris are being misclassified as other nationalities (sic), but that ethnic information is not obtained for all Maori deaths" (Graham et al. 1989: 125).

The change to the collection of ethnicity on mortality data in September 1995 was profound. Overnight, the recorded number of Mäori and Pacific deaths jumped dramatically (Harris, Keefe, Reid, & Robson, 2000; Sporle & Pearce, 1999). Curiously though, there were still only about 10% of total Mäori deaths that were also identified with at least one other ethnic group – less than what would be expected based on 1996 census data, even allowing for the age structure variation between living people and decedents. Analysts at the Ministry of Health, and from other agencies, quickly deduced that the most sensible way to calculate Mäori mortality rates was to use total Mäori ethnic group counts from both mortality and census data (e.g. Ministry of Health, 1999). The desire for mutually exclusive ethnic groups resulted in the use of prioritised ethnic groups for both mortality numerators and census denominators. This change of best practice also disclosed a large jump in Mäori and Pacific mortality rates about the September 1995 cleavage date – even comparing the (strictly speaking incomparable) sole denominator estimates pre-1995 with prioritised estimate post-1995. Obviously, there were still large and unresolved biases in best-practice estimations of ethnic mortality rates in New Zealand that needed addressing.

The advent of the New Zealand Census-Mortality Study (NZCMS) allowed a direct examination of numerator-denominator biases. The NZCMS anonymously and probabilistically links census and mortality data (Blakely, 2002; Blakely, Salmond, & Woodward, 2000). In so doing, it is possible to then compare the ethnic classification on mortality and census data for the same people (Ajwani, Blakely, Robson, Atkinson, Fawcett, & Kiro, 2002; Ajwani, Blakely, Robson, Atkinson, & Kiro, 2003a; Blakely & Atkinson, 2001; Blakely, Robson, Atkinson, Sporle, & Kiro, 2002). Table 8 below present adjustment ratios that quantify this numerator-denominator bias for the 1980s and 1990s. The ratios are calculated by dividing:

- the number of decedents in the three years following each census night that self-identified as the stated ethnic group on census data

by:

- the number of decedents in the three years following each census night that were identified as the stated ethnic group on mortality data.

The more the adjustment ratio is greater than 1.0, the greater the undercounting of deaths for that ethnic group. The reason we present adjustment ratios is that they can simply be multiplied by previously calculated mortality rates to obtain the mortality rate adjusted for numerator-denominator bias. Finally, we only present some of the possible adjustment ratios that can be calculated by using different combinations of census and mortality data ethnic classifications. The system we use parallels the (above described) best practice for calculating mortality rates at each period. That is, we used sole census counts for 1986 and 1991 (and an approximation of 'sole' that has been used by health researchers for the 1981 census of 'half or more' ethnic origin) and prioritised census ethnic counts for 1996. For mortality data, there was no choice in the first three periods, and a prioritised schema for 1996-99. For both Mäori and Pacific groups, the ratios are considerable greater than 1.0 at all ages throughout the 1980s and 1990s. Thus, previously estimated mortality rates for Mäori and Pacific people (even using best practice) had been considerably underestimated. Conversely, non-Mäori non-Pacific mortality rates had been modestly over-estimated. Following the September 1995 change to ethnic recording on mortality data, and a parallel shift to prioritised census counts, numerator-denominator biases were largely reduced.

Table 8: Adjustment ratios for numerator-denominator bias (comparing mortality and census data) during the 1980s and 1990s

	Period	**1981-1984**	**1986-1989**	**1991-1994**	**1996-1999**
	Census ethnicity definition	Half or more	Sole	Sole	Prioritised
	Mortality ethnicity definition [a]	-	-	-	Prioritised
Mäori	0-14 yrs	1.52	1.57	1.80	1.08
	15-24 yrs	1.35	1.53	1.55	1.13
	25-44 yrs	1.19	1.47	1.35	1.10
	45-64 yrs	1.12	1.31	1.31	1.05
	65-74 yrs	1.12	1.18	1.23	1.07
Pacific	0-14 yrs	1.94	1.48	1.55	1.01
	15-24 yrs	1.39	1.76	1.61	1.11
	25-44 yrs	1.58	1.77	1.87	1.06
	45-64 yrs	1.53	1.95	1.67	0.98
	65-74 yrs	1.53	1.58	1.64	0.95
non-Mäori non-Pacific	0-14 yrs	0.89	0.90	0.84	0.95
	15-24 yrs	0.94	0.92	0.91	0.93
	25-44 yrs	0.96	0.92	0.91	0.96
	45-64 yrs	0.98	0.96	0.94	0.99
	65-74 yrs	0.99	0.99	0.98	0.99

a. There was no option for mortality data up to the end of 1995, hence the dashes.

Complex ethnicity, ancestry and social disparities

Returning to the main theme of this paper, until recently concerns about correctly characterizing health experiences for sole, mixed and total ethnic groups were unrealistic

goals in the face of major concerns described above about numerator-denominator bias. However, among non-health researchers there has been some limited use made of complex ethnicity and ancestry responses when analysing disparities between Mäori and non-Mäori in New Zealand.[14]

In a 2000 paper, Gould reports on work he carried out using 1981 census data on average per capita incomes for three groups. They were: Mäori (then defined as half or more Mäori blood); those with some, but less than half Mäori blood; and non-Mäori. Gould found that the income of Mäori was just under 74% of that of non-Mäori, but for those defined as having less than half blood it was over 92%. Using 1986 census data, he found that the proportions of the population in the 20-24 age group who lacked any school qualifications were 64% for sole Mäori, 26% for sole European and near the middle, 41%, for those recording Mäori and European responses. Using 1991 data, he then went onto look at some basic ancestry/ethnicity interactions. As an example, he calculated the proportion of men in managerial and professional occupations. He found that 14.8% of non-Mäori men were in this occupational group, 11.8% for those of Mäori ancestry but not ethnicity, 8.5% of those recording Mäori and European ethnicity, and 5% for those recording sole Mäori. While acknowledging not knowing the reasons behind the finding, he reported that "[d]egree of "Maoriness", whether this is conceived in biological or ethnic terms, forms a continuum" with a negative correlation between this socio-economic outcomes" (p. 13).

In a number of papers Chapple (1999, 2000) and Chapple and Rea (1998) divided the wider Mäori ethnic group into two groups, "sole Mäori" and "mixed Mäori". In his 2000 paper, Chapple raised the idea that the disadvantage amongst Mäori is concentrated in a particular subset, that is those who identify only as Mäori; who have no educational qualifications; and who live outside of major urban centres.[15] As Baehler (2002) notes, the idea that a particular sub group are "truly disadvantaged" parallels the work of Wilson (1987) in the U.S.

Kukutai (2003), using her system of self prioritisation, has shown those individuals who identify as both Mäori and non-Mäori, but more strongly with the latter, tend to be socially and economically much better off than all other Mäori. In contrast, those who identify more strongly as Mäori, had socio-economic and demographic attributes similar to those who only record Mäori as their ethnic group. Based on these data, Kukutai argues that the key differences within the wider Mäori ethnic group are between those who identify primarily as non-Mäori and all others. Thus, she suggests social policy makers should not put much weight on the two categories "Mäori only" and "Mäori plus other ethnic group(s)". A simplistic, but incorrect, interpretation of Kukutai's research is that she is suggesting that if Mäori became "less Mäori" they would, on average, be more

[14] In contrast, there has been no exploration of outcomes for sole Pacific Peoples versus those recording more than one ethnic group nor within the wider Asian ethnic group.

[15] "Sole Mäori" are those who recorded only Mäori as an ethnic identity. "Mixed Mäori" reported Mäori as one ethnic identity, but also recorded a further identity (or identities). This is, of course, a form of prioritisation, given that the other ethnicity or ethnicities could have been given priority. For example, a person who recorded both European and Mäori ethnic groups could be labelled "mixed European".

successful socially and economically. This type of (mis)inference from the research has made some researchers cautious about reporting such data.

While not based on the ethnicity of individuals but instead the ethnicity of both partners in couples, labour force data from the 1991 census showed that for couples with a pre-school child the association between ethnicity and whether neither was in paid work related to the ethnicity of both partners (Callister 1996). The couples most likely not to be in work were those where both partners were from a Pacific Peoples group, closely followed by those where both were Mäori. The least likely were those where both were non-Mäori non-Pacific. Couples where just one partner was Mäori or Pacific were intermediary. However, those where one partner was Mäori and one from a Pacific group were worse off than those where the other partner was non- Mäori, non-Pacific. This analysis used prioritised ethnicity data, did not control for age or any other variable, and did not focus on the ethnicity of the child. But as already shown, children reporting both Mäori and European ethnic groups are more likely to be living in families where one partner reports Mäori ethnicity and one European ethnicity, than where both parents report only Mäori ethnicity. Labour market outcomes are a major factor in determining family resources, and family resources can then impact on children's health, education and home conditions. For example, in 1982 Fergusson, Horwood and Shannon reported that:

> …as a general rule children with two Pakeha parents fared best, from the material point of view, in most comparisons whereas those with two Maori or Pacific Island parents fared the worst; the group with one Polynesian and one Pakeha parent had results which lay between these extremes.

The different resources according to ethnic mix of couples can also be seen with net worth data drawn from the 2001 Household Savings survey (Statistics New Zealand 2002). While again using prioritised data, and not controlling for age, couples where both were Mäori had a mean net worth of $89,700, where both were non-Mäori this rose substantially to $348,700, and where one was Mäori and the other non- Mäori the figure was $203,600. Thus, extrapolating from the various studies cited, the material resources available to children most likely to report both Mäori and non-Mäori ethnicity, rather than just Mäori ethnicity, are likely to be considerably higher.

Overseas researchers have also been examining some of these issues. For example, Snipp (1988) looked at two groups in the US to both assess various socio-economic outcomes, and to explore issues of assimilation and discrimination. While recognising that measures of assimilation should ideally include a range of factors such as loss of culture and language, Snipp was restricted to measures available in census data. Using 1980 census data, he divided Native Americans into two groups. The first group was those who responded that they had Native American ancestry but cited a non-Native American race.[16] The second, smaller, group reported both Native American ancestry and race. In this research, Snipp tested two hypotheses (pg 4). These were:

[16] In this census only one racial group could be picked. This is therefore a form of self prioritisation.

- The more assimilated a Native American is, the more that she/he will have personal characteristics resembling the White population
- The more assimilated that a Native American is, the less likely she/he will experience racial discrimination

In testing these hypotheses, there was an assumption that the first group, those with Native America ancestry but not race, were more assimilated. He found that, although not identical to Whites, those Native Americans only recording descent were economically better off than those reporting both Native American ancestry and race. He then tested for discrimination in the labour market, using a number of measures of human capital. While discrimination is very difficult to identify, based on these data, he argues, that, at the time the study was carried out, while there were disadvantages, Native Americans were not seriously handicapped in the labour market by discrimination. He notes that the differences in outcomes were primarily due to differences in personal resources, particularly education.

This led Snipp to raise the question as to whether the discrimination was in fact in the education system, a question he did not deal with in this paper. Finally, Snipp concludes that the challenge to American Indian leaders and wider society is to find ways for Native Americans to gain the resources needed in the job market without sacrificing cultural traditions. That is, full participation in society without assimilation.

Ancestry and ethnicity are both of importance in this paper, and education has often been found to be a factor in not only labour market outcomes but also health outcomes. Therefore, before examining complex ethnicity and ancestry data relative to mortality in New Zealand, some ethnicity and ancestry data relative to educational outcomes are presented. This draws on 2001 census data and focuses on the 25-44 age group. This is not only an age group in which most people would have completed their formal education, but is also an age group used in the subsequent mortality analysis.

Table 9 to Table 12 rank the proportion of respondents who have no formal educational qualifications by measures of ethnicity and ancestry. The pattern that shows up in both the New Zealand and the US studies quoted above is repeated in these data. Overall, the data show that the more "Mäori" or "Pacific" the respondent is, the more disadvantage they face in educational outcomes. Or, conversely, the more "non-Mäori non-Pacific" the respondent, the more advantage they have in educational outcomes.

As always, these types of data raise issues about the institutional barriers that face Mäori and Pacific people, relative to non-Mäori non-Pacific people, in the education system. Based on these education data, one might expect a similar distribution of mortality rates by complex ethnicity for two reasons: 1) health may be viewed as another 'social outcome' that is highly likely to have a similar distribution by complex ethnicity to the education outcome; and 2) education (and more generally socio-economic position) is a major determinant of mortality that mediates (in part at least) the association between ethnicity and health.

Table 9: Highest level of qualifications for women aged 25-44 by ethnic groups(s), Ranked by the proportion with no formal qualifications, 2001

Ethnic groups	Number	Highest formal qualification (% within ethnic group)			
		No Quals	Secondary	Vocational	Degree
Sole non Mäori, non Pacific	422,493	14.4	43.3	23.8	18.5
Pacific/non Mäori, non Pacific	4,011	18.1	47.2	21.9	12.8
Mäori /Pacific/non Mäori, non Pacific	933	22.8	45.0	23.8	8.4
Mäori /non Mäori, non Pacific	28,053	25.9	42.1	22.4	9.6
Sole Pacific	22,752	28.7	52.4	14.4	4.5
Mäori /Pacific	1,059	33.4	40.2	20.1	6.2
Sole Mäori	41,850	46.1	32.0	17.0	4.9

This table excludes four or more ethnic combinations and those not stating their ethnic group
Source: Census of Population and Dwellings, Statistics New Zealand.

Table 10: Highest level of qualifications for women aged 25-44 by ancestral and ethnic responses, ranked by the proportion with no formal qualifications, 2001

Mäori ancestry and ethnic group	Highest formal qualification					
	No Quals	Secondary	Vocational	Degree	Total	N=
No Mäori ancestry/non Mäori ethnicity	14.3	43.7	23.5	18.5	100	413,778
Mäori ancestry/non Mäori ethnicity	24.3	44.4	22.0	9.3	100	17,007
Mäori ancestry/ Mäori ethnicity	36.9	36.7	19.5	6.9	100	69,333

This table excludes a range of other combinations including those who did not state their ancestry or their ethnic group. Respondents are counted in the Mäori ethnic group if at least one of their stated ethnic groups was Mäori. In addition, some respondents did not record Mäori ancestry but recorded an iwi response.
Source: Census of Population and Dwellings, Statistics New Zealand.

Table 11: Highest level of qualifications for men aged 25-44 by ethnic groups(s), Ranked by the proportion with no formal qualifications, 2001

Ethnic groups	Highest formal qualification					
	No Quals	Secondary	Vocational	Degree	Total	N=
Sole non Mäori, non Pacific	17.9	36.1	27.5	18.5	100	383,220
Pacific/non Mäori, non Pacific	21.3	43.3	22.2	13.3	100	3,204
Mäori /Pacific/non Mäori, non Pacific	29.1	40.2	21.7	9.1	100	762
Mäori /non Mäori, non Pacific	29.4	36.8	24.7	9.1	100	20,244
Sole Pacific	35.0	48.8	12.0	4.2	100	20,787
Mäori /Pacific	38.8	40.4	17.3	3.6	100	921
Sole Mäori	50.3	30.4	15.5	3.8	100	38,571

This table excludes four or more ethnic combinations and those not stating their ethnic group
Source: Census of Population and Dwellings, Statistics New Zealand.

Table 12: Highest level of qualifications for men aged 25-44 by ancestral and ethnic responses, Ranked by the proportion with no formal qualifications, 2001

Mäori ancestry and ethnic group	Highest formal qualification					
	No Quals	Secondary	Vocational	Degree	Total	N=
No Mäori ancestry/non Mäori ethnicity	17.9	36.6	26.9	18.6	100	371,019
Mäori ancestry/non Mäori ethnicity	28.0	37.1	25.8	9.2	100	13,674
Mäori ancestry/ Mäori ethnicity	42.3	32.9	19.0	5.8	100	57,381

This table excludes a range of other combinations including those who did not state their ancestry or their ethnic group. Respondents are counted in the Māori ethnic group if at least one of their stated ethnic groups was Māori. In addition, some respondents did not record Māori ancestry but recorded an iwi response.
Source: Census of Population and Dwellings, Statistics New Zealand.

Complex ethnicity, ancestry and mortality disparities

Recently health researchers have commenced examining differences in health status between varying ethnic classifications. Mortality rates and life expectancies adjusted for numerator-denominator bias have been published for the 1980s and 1990s (Ajwani, Blakely, Robson, Bonne, & Tobias, 2003b). For example, the life expectancy of the total Māori ethnic group (equivalent to prioritised Māori ethnic group) in 1996-99 was estimated at 66.3 years for males and 71.0 years for females (Table 13). The life expectancy at birth for the sole Māori ethnic group was 2.3 years less than for the total among both males and females. Put another way, the sole Māori ethnic group has higher mortality rates than the total Māori ethnic group. Given that the only difference between these two groups are those people self-identifying as Māori and at least one other ethnic group, it follows mathematically that this 'Māori plus other group' must have considerably lower mortality rates than the sole Māori group.

Table 13: Life expectancy at birth by ethnicity and sex adjusted for numerator-denominator bias, 1986-1999

Ethnic group	Life expectancy at birth
Males	
Māori - prioritised/total	66.3
Māori - sole	64.0
Pacific - prioritised	67.9
Pacific - sole	67.7
Non-Māori non-Pacific	75.7
Females	
Māori - prioritised/total	71.0
Māori - sole	68.7
Pacific - prioritised	74.2
Pacific - sole	73.9
Non-Māori non-Pacific	80.8

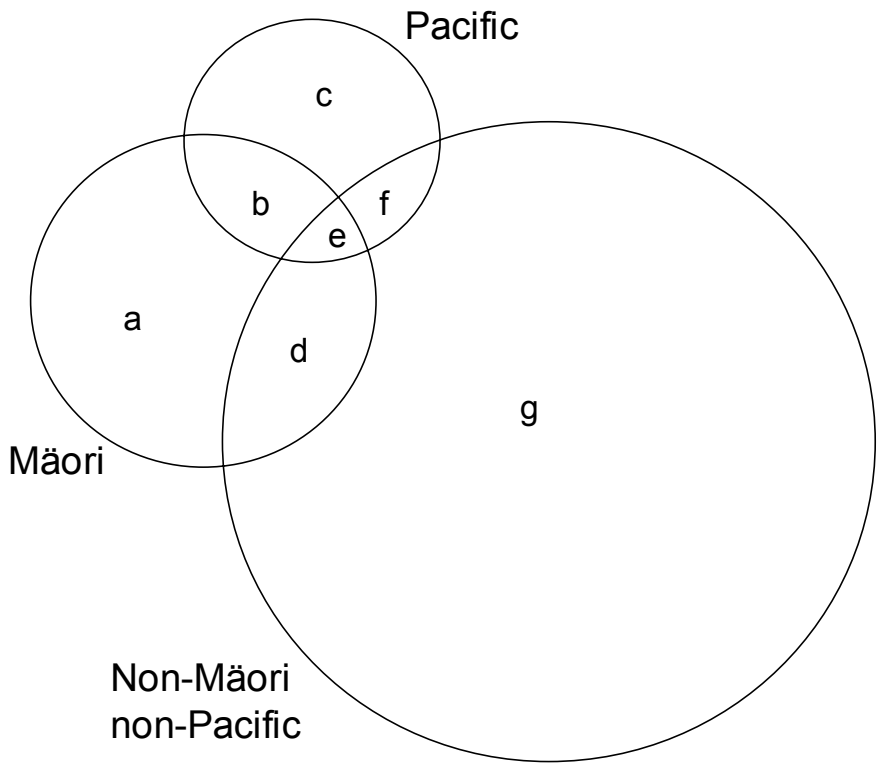
Source: Blakely T, Tobias M, Robson B, Ajwani S, Bonne M, Woodward A. Widening ethnic mortality disparities in New Zealand, 1981-99. Soc Sci Med, under review.
The estimates for Māori male life expectancy for 1996-99 are slightly higher than those published previously (0.5 yrs for prioritised and 0.4 yrs for sole series) (Ajwani, Blakely, Robson et al., 2003b), reflecting technical adjustments to the model (further information available on request from the authors).

In the remainder of this paper we focus on actually quantifying the mortality rates for people identifying as belonging to two or more ethnic groups. Such calculations are not straightforward, and are prone to some error due to both small numbers and other methodological reasons that will become evident.

Methods to calculate mortality rates by complex ethnicity

In this paper we use two methods to present mortality rates during 1996-99 for various multiple ethnic (and ancestry) groupings.

Figure 1: Venn diagram of ethnic distribution



Method 1. The mortality rates previously published elsewhere(Ajwani, Blakely, Robson et al., 2003b) for the total (or prioritised) ethnic group is equal to the weighted sum of the sole and mixed (i.e. Mäori plus other ethnic group (b + d + e), or Pacific plus non-Mäori non-Pacific ethnic group (f)[17]), where the weights are the proportion of the prioritised ethnic group that are sole and mixed, respectively. Expressed mathematically:

$$R_p = \frac{N_s}{N_t} \times R_s + \frac{N_m}{N_t} \times R_m$$

Where:

R_p = Mortality rate among the prioritised ethnic group

Rs = Mortality rate among the sole ethnic group

R_m = Mortality rate among the 'mixed' ethnic group (i.e. Mäori = b + d + e; Pacific= f)

[17] Note that due to the prioritisation procedure, deaths of ethnic grouping 'b' or 'e' in the Venn diagram were not included in the prioritised Pacific ethnic group.

N_p = Census count of the prioritised ethnic group
Ns = Census count of the sole ethnic group
N_m = Census count of the 'mixed' ethnic group.

Solving for our rate of interest, the rate among the mixed group, we derive:

$$R_M = \frac{R_tN_t - R_sN_s}{N_m}$$

Using this method, and working within the confines of available data, we are able to calculate the following mixed rates:

- Mäori and at least one other ethnic group (b + d + e)
- Pacific and non-Mäori non-Pacific ethnic group (f)
- Non-Mäori non-Pacific and at least one other ethnic group (which may be Mäori or Pacific) (d + e + f).

Note that because the mortality rates previously published elsewhere (Ajwani, Blakely, Robson et al., 2003b) were for prioritised ethnic groups, it was not possible to back-calculate the mortality rate for Pacific and at least one other ethnic group (i.e. b + e + f). Finally, the sole Mäori, Pacific and non-Mäori non-Pacific rates have already been calculated previously.(Ajwani, Blakely, Robson et al., 2003b)

Method 2. It was possible to directly calculate mortality rates on the New Zealand Census-Mortality Study (NZCMS) data itself, for whatever group was of interest – within the bounds of statistical power. Whilst this method bypasses the need to use back-calculations on mortality rates determined using adjustment ratios for numerator-denominator bias, it is subject to other difficulties in addition to statistical power. Most importantly, not all mortality records could be linked to a census record in the NZCMS (approximately 20% in the 1996-99 census-mortality cohort (Hill, Atkinson, & Blakely, 2002)), opening the possibility of linkage bias. For the majority of applications using NZCMS data, any linkage bias is overcome by using weights during the analysis (Fawcett, Blakely, & Atkinson, 2002). For example, if 20 out of 30 Mäori males aged 45-64 living in moderately deprived socio-economic areas were successfully linked to a census record, then we applied a weight of 1.5 (i.e. 30/20) to each of these linked records to make them representative of the 30 eligible records. However, whilst these weights have been shown to give good estimates of the weighted number of deaths for major ethnic groups (see page 31-40 of (Fawcett, Blakely, & Atkinson, 2002)), their performance for mixed ethnic groupings has not been validated. In this paper, we use the W_AGETHADJ weights during the calculation of standardised mortality rates. (Calculations, not presented here, using the other NZCMS weights produced similar results.) An advantage of Method 2 is that we were also able to calculate mortality rates by Mäori ancestry.

We conducted Method 2 analyses at two levels of disaggregation for all age groups (1-14, 15-24, 25-44, 45-64 and 65-74 year olds). The first disaggregation was:

- Sole Mäori (a)

- Sole Pacific (c)
- Sole non-Mäori non-Pacific (g)
- Mäori and at least one other ethnic group (which could be Pacific) (b + d + e)
- Pacific and at least one other ethnic group (which could be Mäori) (b + e + f)
- Non-Mäori non-Pacific and at least one other ethnic group (which may be Mäori or Pacific) (d + e + f)

The second disaggregation was simply by ancestry:
- Mäori ancestry
- No Mäori ancestry.

We then disaggregated even further by ethnicity to each of the seven possible groups shown in the Venn diagram above (i.e. a to g). We only attempted this for 1-74 year old mortality rates combined due to small numbers of deaths in some groups.

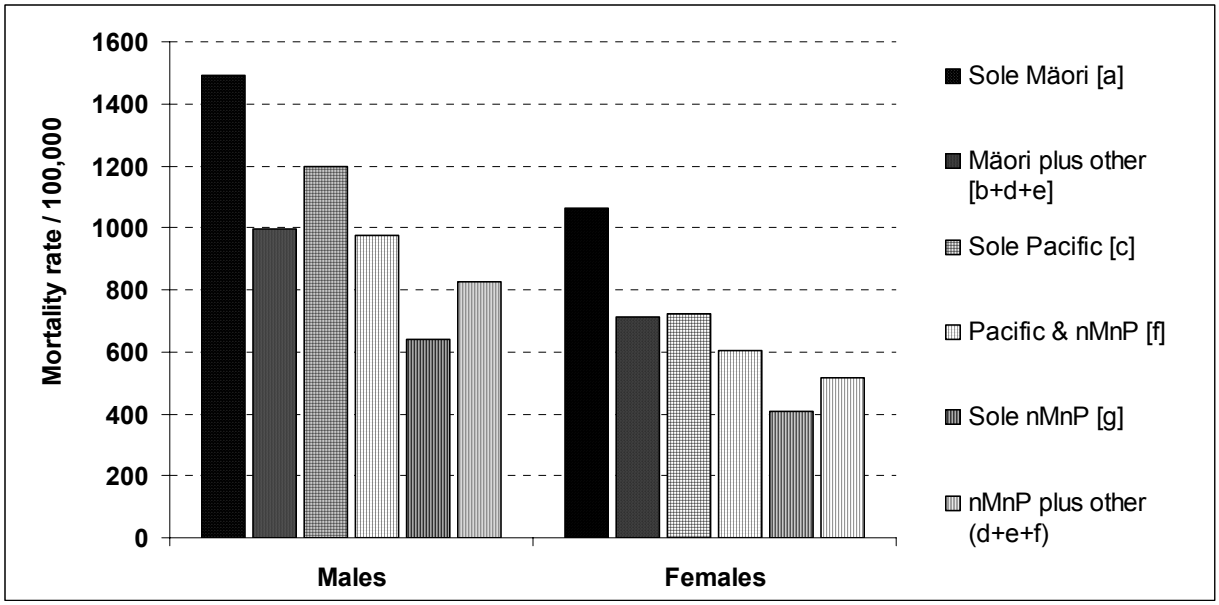
Finally, we also cross-classified ancestry and ethnicity into the three groups:
- Mäori ancestry and Mäori ethnicity (i.e. any self-identification as Mäori)
- Mäori ancestry and no Mäori ethnicity
- Neither Mäori ancestry nor ethnicity.

Regardless of whether one uses *Method 1* or *Method 2*, the numbers of deaths by age group in the mixed Pacific group (f alone for *Method 1*, and b + e + f for *Method 2*) are small by age group. Specifically, we estimated that between six and 40 weighted deaths were in each sex by age group strata. Given some inherent instability in the methods that may be accentuated with small numbers (let alone statistical imprecision), all mortality rate estimates by age for Pacific mixed ethnic groups in this paper must be treated with caution. All Mäori plus other ethnic groups, by age group, had at least 24 estimated deaths.

Results

Mortality rates for all ages combined and 1-74 year olds are shown graphically in Figure 2 and Figure 3 for *Method 1* and *Method 2*, respectively. Table 14 (page 34) presents the actual mortality rates and 95% confidence intervals by age group for *Method 2*.

Figure 2: Mortality rates per 100,000 by ethnic group for all ages during 1996-99, standardised for age to WHO standard population and adjusted for numerator-denominator bias (*Method 1*)



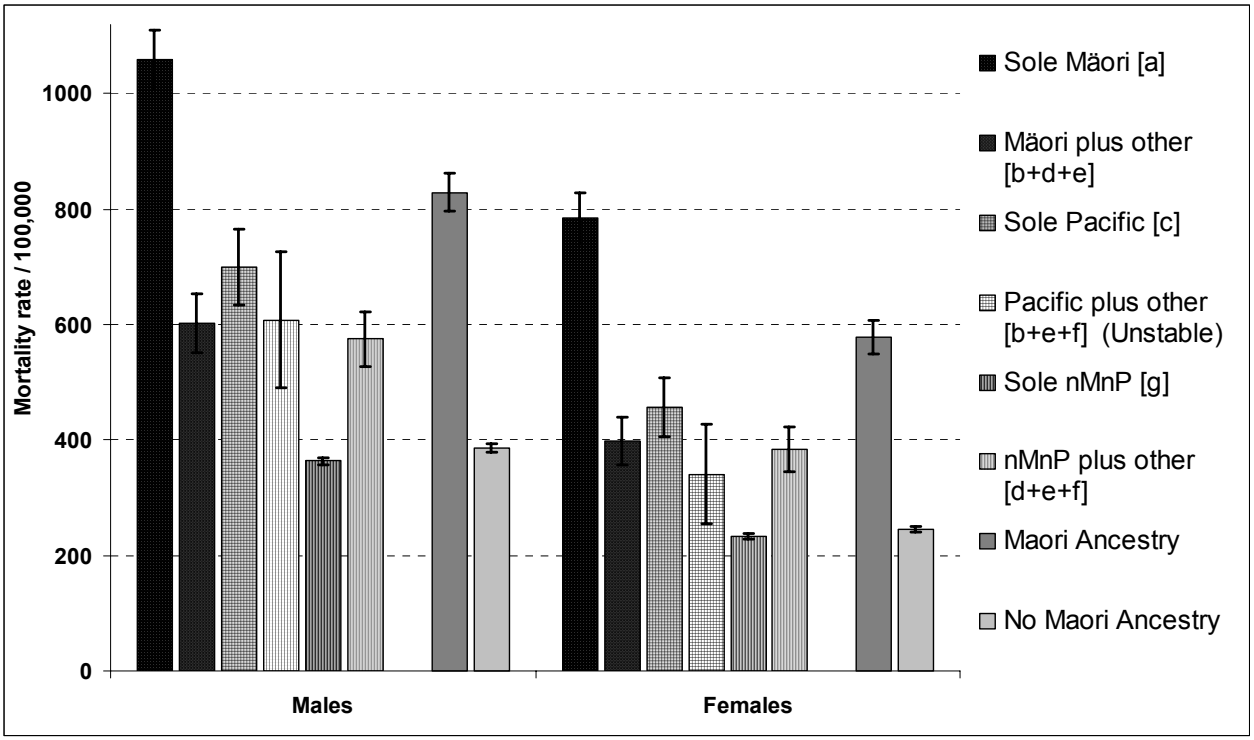
Sole non-Mäori non-Pacific rates from Tables 4 and 5 of Ajwani et al, 2003. Sole Mäori and sole Pacific rates from Table 7 and 8 of Ajwani et al, 2003. Other two rates calculated as per method described in this paper. Exact period of deaths was 1 January 1996 to 31 December 1999.

As expected, an inspection of Figure 2 and Figure 3 demonstrates that the rates calculated by *Method 1* for all ages are approximately 50% higher than calculated directly on NZCMS data by *Method 2* for 1-74 year olds. However, the pattern of mortality rates across the ethnic groupings is very similar for both methods, and both sexes. First, the mortality rate for the sole non-Mäori non-Pacific ethnic group was consistently the lowest mortality rate. Second, the sole Mäori mortality rate was two and a half to three times greater than the sole non-Mäori non-Pacific rate, and the Mäori plus other rate [b+d+e] was consistently mid-way between these two rates. Third, the sole Pacific mortality rates was nearly twice the sole non-Mäori non-Pacific rate, with the Pacific plus other ([f] in Figure 2 and [b+e+f] in Figure 3) intermediary – but tending to be closer to the sole Pacific mortality rate. Fourth, the non-Mäori non-Pacific plus other mortality rates are about a quarter higher than the sole non-Mäori non-Pacific mortality rates, approximating the other mixed ethnic group rates.

Simplifying, the mortality rates roughly fall into three groups:

- high: sole Mäori
- low: sole non-Mäori non-Pacific
- medium: all other ethnic groupings.

Figure 3: Mortality rates per 100,000 by ethnic group for 1-74 year olds during 1996-99, standardised for age to 1991 census population, calculated directly from NZCMS data (*Method 2*)



Calculated directly on NZCMS data, using the W_AgEthAdj weights (see Fawcett et al, 2002)(Fawcett, Blakely, & Atkinson, 2002). Exact period of follow-up was 6 March 1996 to 5 March 1999. Error bars are 95% confidence intervals.

Breaking the mortality rates down by age group (Table 14, *Method 2* only), and allowing for statistical imprecision (95% confidence intervals) and the instability of the Pacific plus other ethnic group mortality rates, all we can safely conclude is that the relative patterns seen above for 1-74 year olds combined were largely reproduced within age groups.

Calculation of mortality rates directly from NZCMS data (i.e. *Method 2*) also permits calculation of mortality rate by Mäori ancestry (last two bars for each sex in Figure 2, and last two rows for each sex in Table 14). The mortality rate of people with Mäori ancestry was consistently intermediary between the sole Mäori and Mäori plus other ethnic grouping. The mortality rate of people without Mäori ancestry was consistently similar to that for sole non-Mäori non-Pacific.

Table 14: Age-standardised all-cause mortality rates per 100,000 (95% confidence intervals) during 1996-99 by age group, calculated directly on NZCMS data (*Method 2*)

Ethnic group	Venn diagram	1-14 years	15-24 years	25-44 years	45-64 years	65-74 years	1-74 years
Males							
Sole Mäori	A	73 (53-93)	237 (184-290)	372 (324-419)	2,255 (2,106-2,405)	6,563 (6,003-7,124)	1,059 (1,008-1,110)
Mäori plus other	B+D+E	23 (14-33)	186 (141-230)	249 (204-295)	1,014 (873-1,154)	4,296 (3,693-4,899)	603 (552-654)
Sole Pacific	C	24 (9-39)	153 (98-208)	245 (193-297)	1,410 (1,226-1,595)	4,666 (3,898-5,433)	699 (634-765)
Pacific plus other *	B+E+F	44 (19-69)	166 (96-236)	209 (123-295)	1,240 (874-1,606)	3,874 (2,546-5,202)	609 (491-726)
Sole nMnP	G	24 (20-29)	102 (92-113)	125 (118-133)	601 (583-619)	2,741 (2,680-2,802)	364 (358-370)
nMnP plus other	D+E+F	26 (17-36)	188 (146-230)	251 (208-294)	950 (820-1,079)	4,043 (3,487-4,600)	575 (528-623)
Mäori Ancestry		44 (35-53)	204 (172-236)	297 (267-328)	1,670 (1,570-1,769)	5,399 (5,021-5,777)	830 (796-863)
No Mäori Ancestry		25 (21-29)	113 (101-125)	136 (127-144)	645 (625-664)	2,859 (2,793-2,925)	386 (379-393)
Females							
Sole Mäori	A	45 (29-60)	121 (86-156)	182 (154-211)	1,505 (1,385-1,624)	5,140 (4,655-5,625)	784 (738-829)
Mäori plus other	B+D+E	28 (18-39)	68 (44-92)	134 (107-161)	723 (612-833)	2,523 (2,083-2,963)	399 (357-441)
Sole Pacific	C	28 (8-47)	58 (27-89)	153 (117-189)	775 (645-906)	3,078 (2,534-3,623)	457 (406-508)
Pacific plus other *	B+E+F	19 (4-34)	21 (0-42)	167 (102-232)	698 (435-961)	1,821 (977-2,664)	341 (255-427)
Sole nMnP	G	19 (15-22)	43 (37-50)	63 (58-68)	397 (383-410)	1,589 (1,544-1,633)	233 (228-238)
nMnP plus other	D+E+F	27 (17-37)	59 (38-81)	132 (107-158)	687 (584-789)	2,460 (2,051-2,869)	385 (346-423)
Mäori Ancestry		31 (23-39)	90 (70-110)	150 (132-168)	1,117 (1,039-1,195)	3,720 (3,419-4,020)	579 (550-607)
No Mäori Ancestry		20 (17-24)	45 (38-53)	69 (64-74)	417 (402-432)	1,656 (1,607-1,704)	245 (240-250)

Calculated using the W_AgEthAdj weights (see Fawcett et al, 2002)(Fawcett, Blakely, & Atkinson, 2002). Exact period of follow-up was 6 March 1996 to 5 March 1999. Standard population was 1991 census population.

* The 'Pacific plus other' rates must be treated with considerable caution – especially by age group – due to small numbers that may exacerbate instabilities in the weighting method.

Table 15: Age-standardised all-cause mortality rates per 100,000 (95% confidence intervals) during 1996-99 for 1-74 year olds only, calculated directly on NZCMS data and for finer breakdowns of ethnicity (*Method 2*)

Group	Venn diagram	Males	Females
Ethnic group			
Sole Mäori	A	1,059 (1,008-1,110)	784 (738-829)
Sole Pacific	C	699 (634-765)	457 (406-508)
Sole non-Mäori non-Pacific	G	364 (358-370)	233 (228-238)
Mäori / Pacific	B	1,058 (687-1,428)	560 (262-858)
Mäori / non-Mäori non-Pacific	D	587 (536-639)	398 (356-441)
Pacific / non-Mäori non-Pacific	F	498 (376-619)	311 (216-406)
Mäori / Pacific / non-Mäori non-Pacific	E	690 (174-1,205)	271 (45-497)
Ancestry by ethnic group			
Mäori ancestry, Mäori ethnicity *		916 (876-955)	653 (619-688)
Mäori ancestry, no Mäori ethnicity		433 (379-488)	274 (233-316)
No Mäori ancestry, no Mäori ethnicity		385 (378-392)	244 (239-250)

Calculated directly on NZCMS data, using the W_AgEthAdj weights (see Fawcett et al, 2002)(Fawcett, Blakely, & Atkinson, 2002). Exact period of follow-up was 6 March 1996 to 5 March 1999.
* Any Mäori ethnicity.

Table 15 presents the mortality rates for 1-74 year olds for the full seven possible ethnic groupings that can be formed by the three ethnic groups of Mäori, Pacific and non-Mäori non-Pacific. Figure 4 presents this information graphically, but from the perspective of each of the three ethnic groups.

From the *Pacific* perspective, sole Pacific mortality rates are lower than those for Pacific plus Mäori, but greater than those for Pacific plus non-Mäori non-Pacific. The mortality rate for people identifying as all three ethnic groups is probably less than sole Pacific, but there is considerable imprecision.

From the *non-Mäori non-Pacific* perspective, sole mortality rates are less than any of the multiple ethnic combinations.

From the *Mäori* perspective, sole Mäori mortality rates are similar to or greater than those for the Mäori plus Pacific ethnic group, and certainly greater than for the Mäori plus non-Mäori non-Pacific ethnic group. The mortality rate for people identifying as all three ethnic groups is less than sole Mäori.

Figure 4: Mortality rates per 100,000 (95% confidence intervals) during 1996-99 for 1-74 year olds only, calculated directly on NZCMS data for disaggregated and mutually exclusive ethnic groups (*Method 2*)

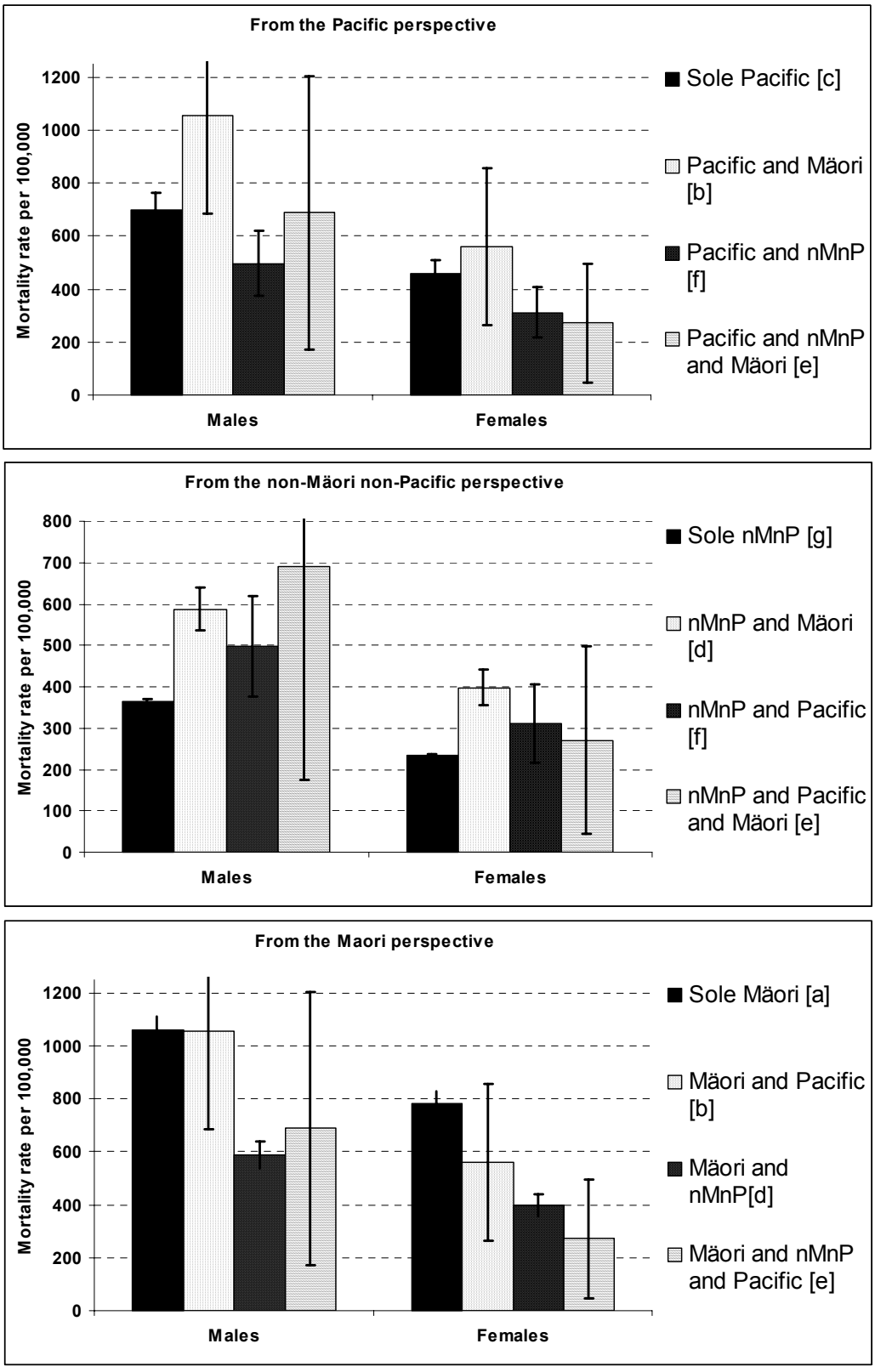


Table 15 also shows the mortality rates for the three possible cross-classifications of Mäori ancestry and Mäori ethnicity. The rates were clearly highest for the group with both Mäori ancestry and Mäori ethnicity. However, the rates for people with Mäori ancestry but not identifying with the Mäori ethnic group were only marginally higher than for those people identifying as having neither Mäori ancestry nor ethnicity.

Comment

Whilst this paper presents mortality rates by multiple ethnic groupings for the first time in New Zealand, it is a descriptive exercise only. For example, the analyses do not allow us to determine whether the intermediary position of the Mäori plus other ethnic group between sole Mäori and sole non-Mäori non-Pacific is due to a continuum of socio-economic advantage (a major determinant of health status), a continuum of health-damaging racism, or whether it is due to a continuum of other health determinants (e.g. cultural and/or health behaviours). The Pacific plus other ethnic grouping tended to also be intermediary between the sole Pacific and sole non-Mäori non-Pacific rates. Regarding the former socio-economic explanation, it is interesting however that the rankings of the ethnic groups by mortality (Table 15) coincide reasonably well with the rankings (albeit in 2001) by highest educational qualification (Table 9 and Table 11).

It must be noted that direct analyses on NZCMS data to calculate mortality rates by multiple ethnic groups may be prone to error. First, linkage of mortality records back to census records was not complete – especially for Mäori and Pacific people (Hill, Atkinson, & Blakely, 2002). We are confident that the weighting methodology we have developed for main analyses adjusts well for any linkage bias (Fawcett, Blakely, & Atkinson, 2002). However, it may not be as robust for the disaggregated presentation of ethnic mortality rates attempted in this paper. Therefore, one should focus more on the patterns presented in this paper (of which we are confident) rather than the exact mortality rates. The 95% confidence intervals do convey the lack of statistical precision of the mortality rates, but there may also be some additional systematic error for the smaller ethnic groupings.

There were a number of purposes in presenting these results. One is to stimulate discussion regarding the recommendations of Statistics New Zealand's Review of the Measurement of Ethnicity (RME). Already Sporle and Koea (2004: 4), in a paper entitled *Maori responsiveness in health and medical research: Key issues for researchers (part 1),* have cited the RME and note that "[a]s ethnicity is a self-defined concept, and the Census is (usually) self-completed, researchers should get participants to answer the question (if possible)." More importantly, in relation to our paper they go onto note that "[t]he researcher then needs to use the standard means of aggregating the results (especially multi-ethnic responses) into ethnic categories. Finally, it is also important for authors to describe the methods used when writing up the project." We have endeavoured to fit our results into most of the important standard new ethnic categories recommended by Statistics New Zealand, and have also tried to clearly lay out the methods used in doing this.

A second aim is to provide a launching point for further and more explanatory research. For example, future analyses using NZCMS data could attempt adjusting for socio-economic position – although the data may become too sparse. Also, the 2002 Health Survey contains questions on racism that aligned with multiple ethnic groupings may provide more information. However, statistical power is again likely to be limited.

A third aim was to assess how useful the complex ethnicity and ancestry data are. We do think they are useful when studying disparities (or any other social outcomes where ethnicity is considered to be of importance). However, in suggesting the use of more complex data we also agree with the conclusions of the authors of the new Population and sustainable Development website when they note that: [18]

> Careful analysis of total response data (which will give the total group of interest), together with analysis of the component combinations within the group, is a very powerful method of identifying diversity and dynamics within a group, and may assist in explaining trends.

Examining ethnicity data requires many lenses, and both total counts and more complex data provide a range of these. With the ethnic mix of society becoming more complex, as the data on younger people suggests it will, more sophisticated ways of conceptualising and analysing ethnicity data will be required.

Finally, an important aim of this paper is to encourage discussion and theorizing about the differences and disparities presented in this paper and, ultimately if they are to be overcome, discussion and theorizing about the reasons behind them. These are not just numbers, they represent the lives and, often premature, deaths of real people. In doing so a range of existing research may be helpful in a New Zealand context, including overseas literature on the "Hispanic paradox" (Franzini, Ribble, & Keddie, 2001), cultural versus socio-economic causes of ethnic disparities (Karlsen & Nazroo, 2002; Nazroo, 2003), Kaupapa Mäori research approaches (Bramley, Broad, Harris, Reid, & Jackson, 2003; Bramley, Riddell, Crengle, Curtis, Harwood, Nehua et al., 2004; Cram, Smith, & Johnstone, 2003), and research from within Pacific, Asian and other ethnic communities.

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[18] http://www.population.govt.nz/about-data/issues-with-ethnicity-data.htm

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