Differential Trends in the Compression of Mortality:

Assessing the Antecedents to Current Gaps in Health Expectancy in New Zealand

by
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INTRODUCTION: THE 'BIG PICTURE'

- This paper addresses a major issue: that we are measuring Health Expectancy (HEs) for older people in particular at the late stages of an epidemiologic transition, that many may have experienced at earlier phases of their life-cycles – as Marti Parker said "are they anomalies?" They are the hardy survivors !!
- In a plural society we are dealing with two or more very different sorts of anomalies.
- Thus this paper's underlying assumption is that the *Timing, Durations and Paths* of the different epidemiologic transition play a major role in determining differentials in current HEs
- We ask how how past events, period and cohort, affect present health status gaps

INTRODUCTION: AIMS OF PAPER

- 1. Do socio-economic (here ethnic) gaps in HEs (1996-2006) have antecedents in the different trajectories followed by ethnic groups during their epidemiologic transitions?Thus nested into the epidemiologic transitions, esp. different timing and patterns of shifts from communicable to non-communicable causes of death, and the (age) force of mortality/gains in survival.
- 2. What are the effects on current HEs of the different experiences that cohorts have had?
- 3. Are we dealing with ethnic differences in compression effects only, or also with longevity extension?

EMPIRICAL RATIONALE FOR PAPER

- Observed
  - HE gaps by ethnicity
  - NZ like other Western Developed Countries, but --
  - Differential survival patterns by ethnicity
  - The dominance of mortality (paper Luisa Frova *et al*)
- Context
  - NZ very multicultural; 1/3 of population of non-European origin: 15% Maori (cf % Aborigine or Native Norh American); 9% Asian (similar to Australia); 8 % Pasifika; 1% African etc
  - But most time years 1840 (became colony) only Maori and Pakeha (European); to maintain continuity divide here into Maori and Non-Maori (most years until 1980 mainly Pakeha)

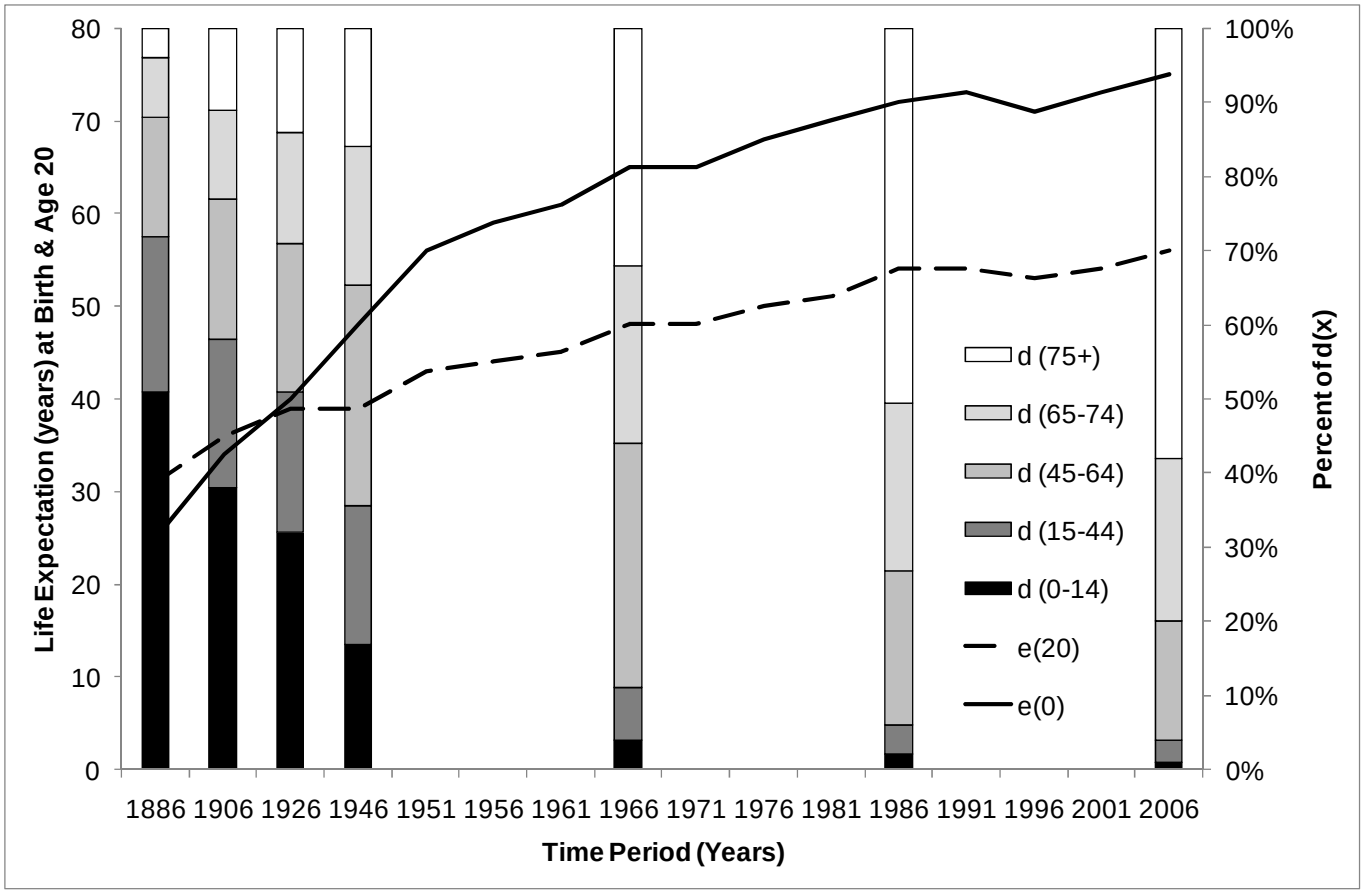
NEW ZEALAND: HISTORY, SOCIAL POLICY: I

- Colony, 1840; Dominion 1906; **no segregation** or related policies (eg vote Maori men 1867; Maori women – and all women – 1893); in principle all policies applied to all, but hard to deliver for Maori as rural and isolated. Yet high levels of intermarriage and interaction.
- Non-Maori had highest e(0) in world until inter-war period, as James Vaupel' paper noted
- No history of "apocalyptic" diseases such as malaria or smallpox – but Maori had no immunity to introduced "childhood" communicable disorders (eg measles) or tuberculosis. Peter Panum's reports on measles in the Faroe Is (1846) could apply to the first national epidemic to hit Maori (1854).

NEW ZEALAND: HISTORY, SOCIAL POLICY: II

- Early welfare state (eg free compulsory education 1877, for all; 1890s effective “socialist” measures; full-scale welfare state 1938, applied to all)
- But neo-liberal restructuring 1980s and 1990s destroyed much of welfare state
- 1901 Department of Health, with Maori Hygiene Division, staffed by famous Maori Drs – Sir Maui Pomare; Sir Peter Buck (Te Rangihiroa) -- effected “Alma Ata Declaration (WHO, 1978)”-type community health programmes 70 years earlier !!!
- 1940s – 1960s very activist targeted programmes under welfare state; health policy nested into social policy.
- Let’s now have an overview of the two major New Zealand epidemiologic transitions

Figure 1: Maori Females Life Expectancy (Years) at Birth and at Age 20 years, and Percent of all Deaths Occurring at Ages 0-14, 15-44, 45-64, 65-74, and 75+ (Period Life-Tables)

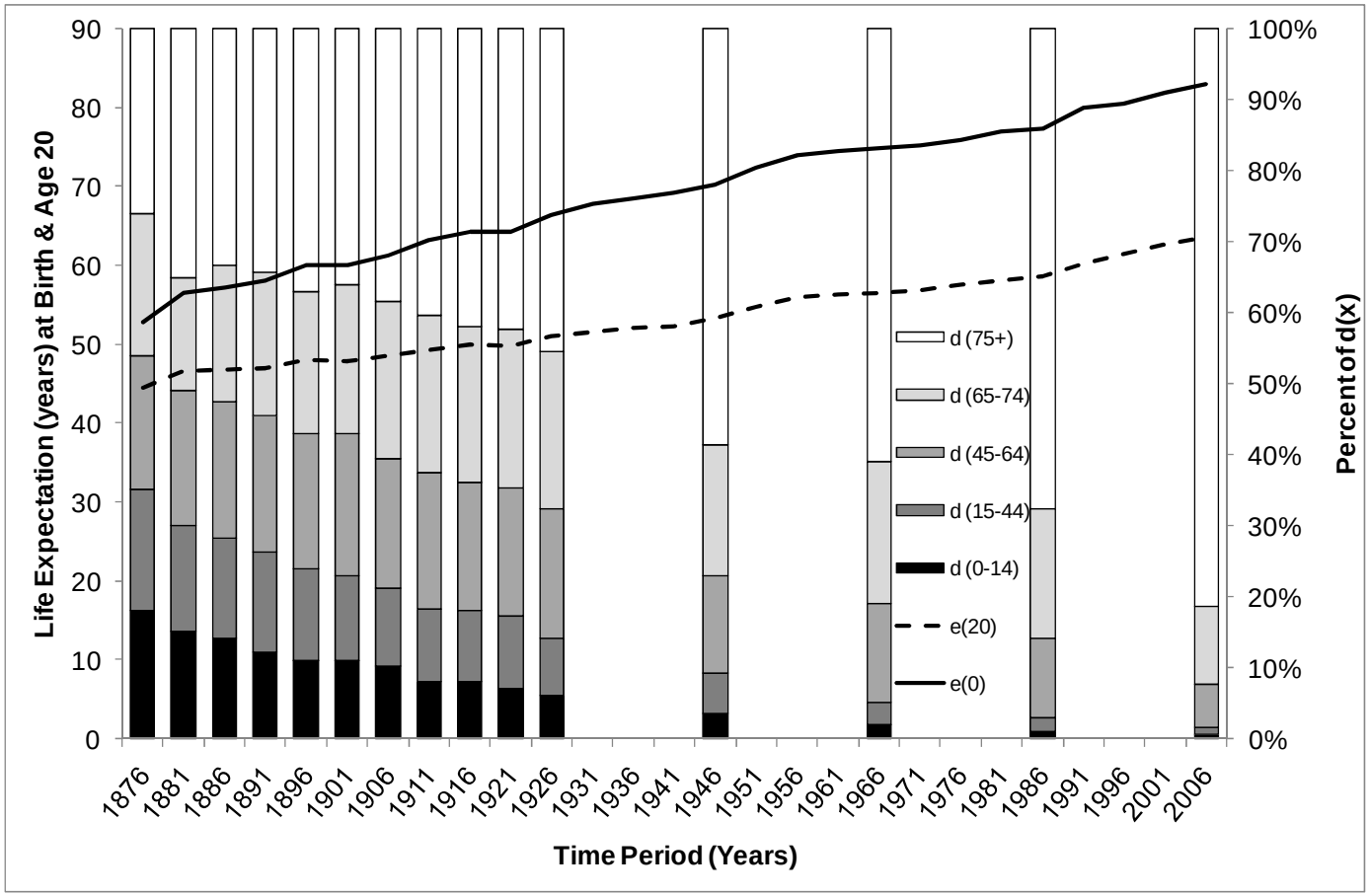


Sources: Computed directly by Ian Pool and Jit Cheung from vital data and censuses, 1945 on are from official tables. Prior to that adjusted official data (1926-1941), or indirect estimates described in Pool (1991: pass).

Note: Maori data are highly unreliable until about 1936, becoming satisfactory only from 1945 on.

These are based on life table deaths, *d(x)*: the number of any cohort dying at a given age group, *x*. The percent of *d(x)* at ages below 45 years are so few (<5%) in recent decades that they are difficult to discern on this graph.

Figure 2: Non-Maori Females Life Expectancy (Years) at Birth and at Age 20 years, and Percent of all Deaths Occurring at Ages 0-14, 15-44, 45-64, 65-74, and 75+ (Period Life-Tables)



Sources: Computed directly by Ian Pool and Jit Cheung from vital and census data, or drawn from official series.

Note: These are based on life table deaths, d(x): the number of any cohort dying at a given age group, x. The percent of d(x) at ages below 45 years are so few (<5%) in recent decades that they are difficult to discern on this graph. The data for d(1876) are the average of tables computed for census dates 1874 and 1878, Thereafter, with the exception of 1931, 1941 (when no census was taken) and 1946 (when the census had been taken 6 months earlier in 1945), all censuses are carried out in March/April of years ending in digits 1 and 6.

MEASURING COMPRESSION: I

Analysis of males, as our example here

SLK Cheung *et al* (citing Lexis *et al*) identified 3 dimensions to compression: ***Horizontalisation***, ***Verticalisation*** and ***Longevity Extension***

But measuring these is rather problematic – we "bootstrapped"

Cheung S et al recommend the mode and 4 STDs around the mode, following Kannisto's rule of indices "free from fixed age and %-ile determinations"

We breached Kannisto's rule, by using percentile-based distributions of *l(x)* and *d(x)*, and modes of *d(x)* for quinquennial age-groups

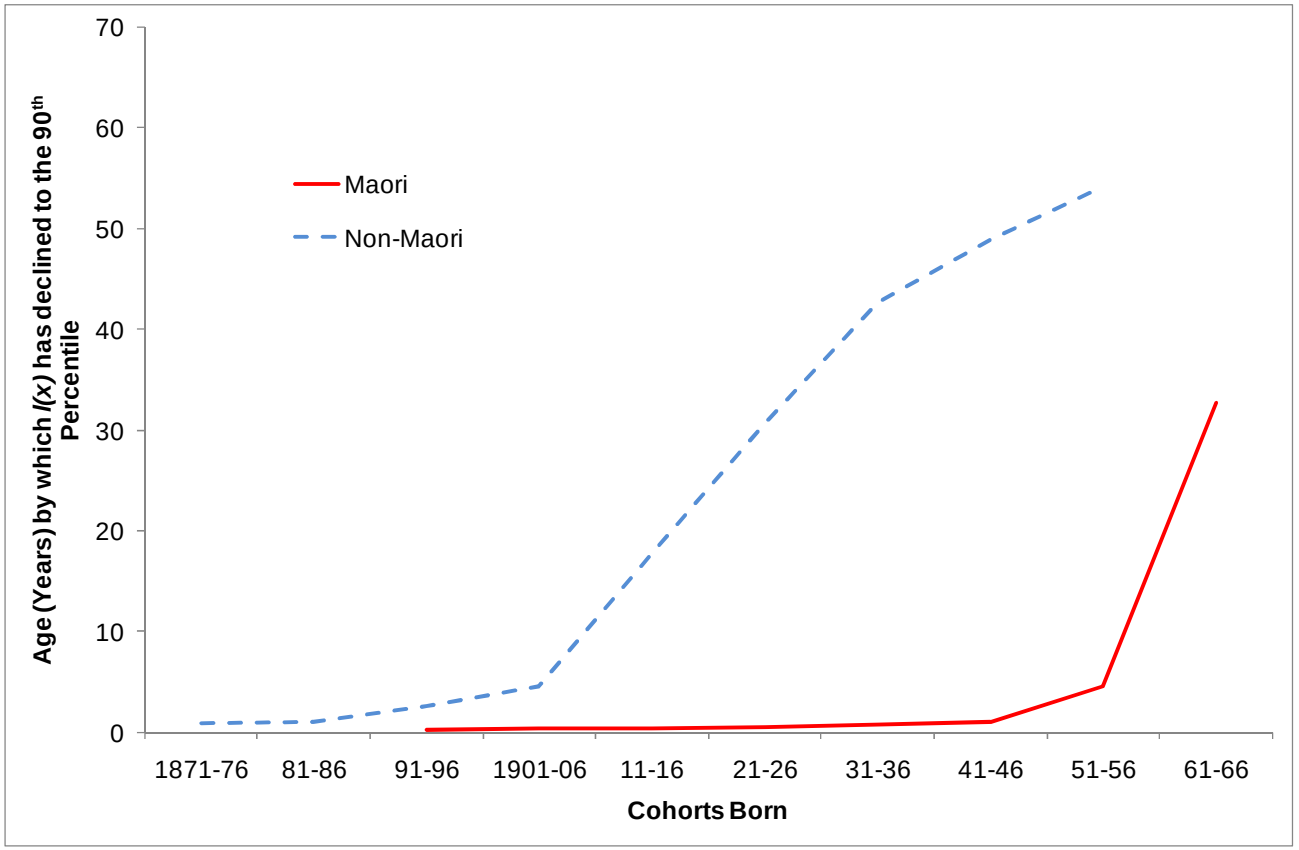
MEASURING COMPRESSION: II

- This was because for NZ a) data unavailable; b) age-reporting, esp. for Maori, bad (see Kannisto). Thus turned to modes, and %-tile-based d(x) and l(x).
- Also we did not use centenarian data: a) analysis showed that increased #s a function of (i) growth in birth cohort size, plus (ii) improved survival per cohort; b) also exaggeration of ages, esp. Maori; and c) do these data reflect only once-off transitions?
- Used 5-yr modal age-groups (M*x*), and found, in fact, that the d(x) modal spread at adult ages, SAM, ***significant, gently rounded*** and ***wide.***
- Cf Brown et als paper which uses d(x)
- Index = *d(SAMx)/l(15),*

where *d(SAMx) = d(AMx) + (dAMx+5) + (dMx-5)*,

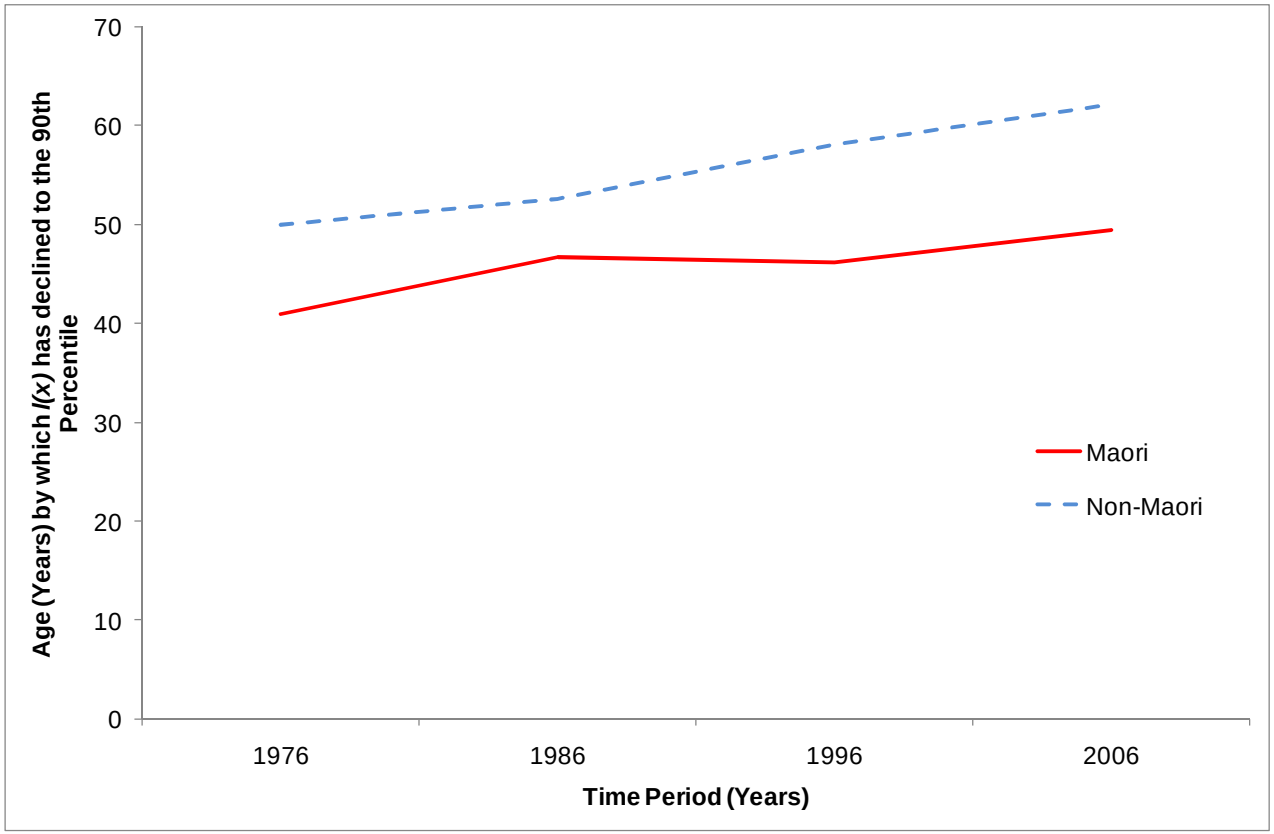
and where *AMx* = 5 year age-group.

Figure 3: Horizontalisation: Age (Years) by which l(x) has declined below the 90th Percentile, Maori and Non-Maori Males, Cohort Life Tables



Notes: Projections for Non-Maori are more reliable than those for Maori, so are not reported for Maori.
The Non-Maori figure for 1951/56 is based in part on projections for the period 2001-06. Synthetic data (see next graph) exaggerate the level of percentiles at older ages, as the younger cohorts included in such tables have markedly better survival rates than true cohorts had had when they were younger.
The Statistics New Zealand (2006) full cohort tables for the average of the birth cohorts of 1901 and 1906 yield a lower value (1.4) than that shown here, but they are for the Total population and thus include Maori (0.4). At *l(5)* the full Total population tables are close to the Non-Maori used here, 87,793 vs 89,727 (Non-Maori) and 65,945. Reweighting the Maori and Non-Maori *l(5)* proportional to population yields 88,300, a difference of only 0.6%.

Figure 4: Horizontalisation: Age (Years) by which *l(x)* has declined below the 90th Percentile, Maori and Non-Maori Males, Period Life Tables



Note: Figures in brackets are adjusted results. For each population, the cohort figure is used to adjust the synthetic data to the cohort, where a reference year allows such an approximation (Maori = Cohort 1961-66/Synthetic 1996; Non-Maori = Cohort 1951-56/ Synthetic 2006). The adjustment was carried only as far as an adjacent date, as the underlying assumptions about distributions of mortality would become difficult to sustain beyond that.

Table 1: Age (Years) by which *l(x)* has declined to the 90th Percentile, Maori and Non-Maori Male, Cohort Life Tables, Periods of steepest Change

Maori	**1951-56**		**1956-61**		**1961-66**
cohorts	4.5		17.0		32.7
Non-Maori	**1901-06**	**1906-11**	**1911-16**	**1916-21**	**1921-26**
cohorts	4.5	9.3	17.8	22.7	30.7

Figure 5: *(5)d(0)* (thousands), Maori and Non-Maori Males, Selected Years

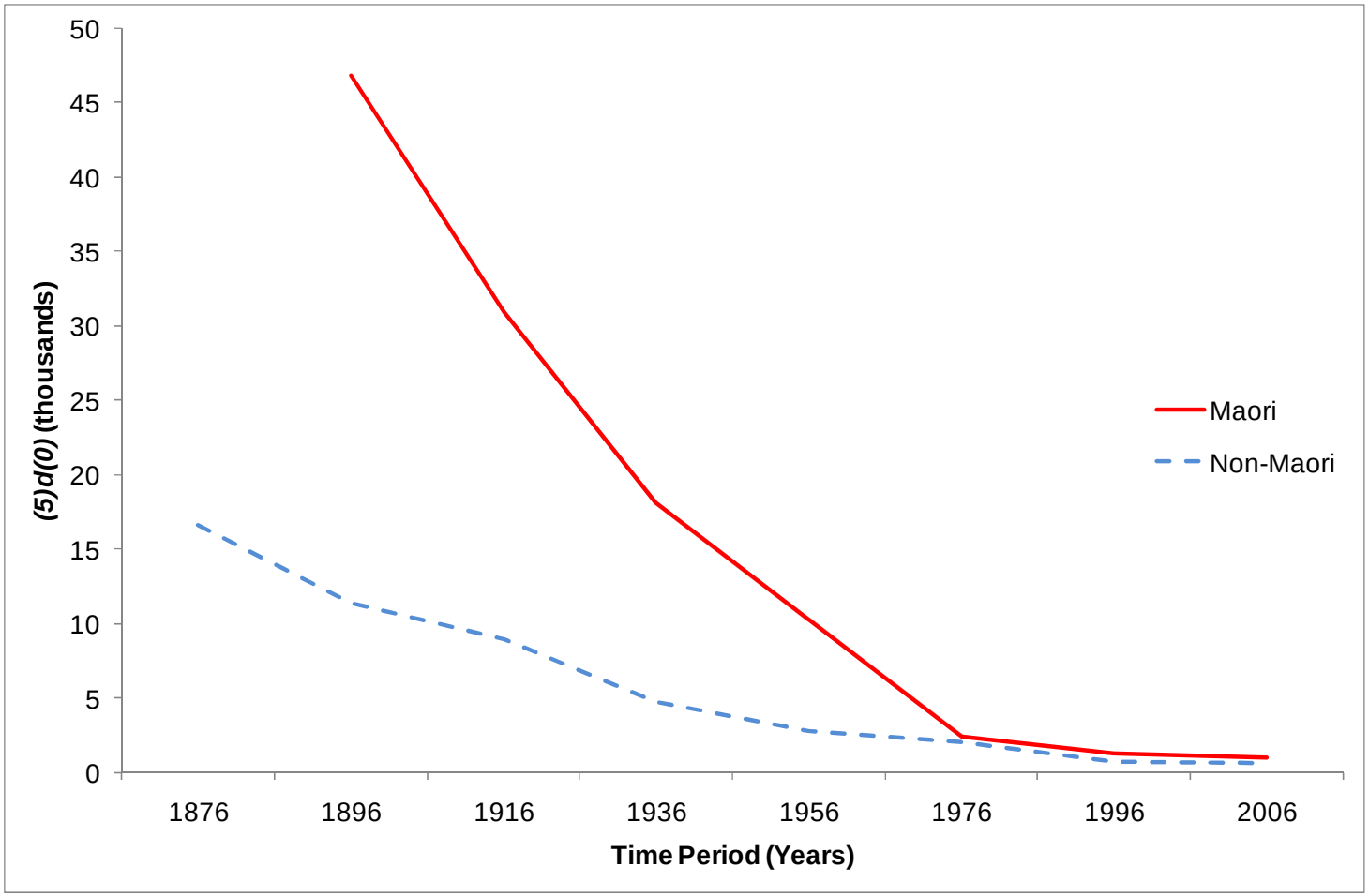
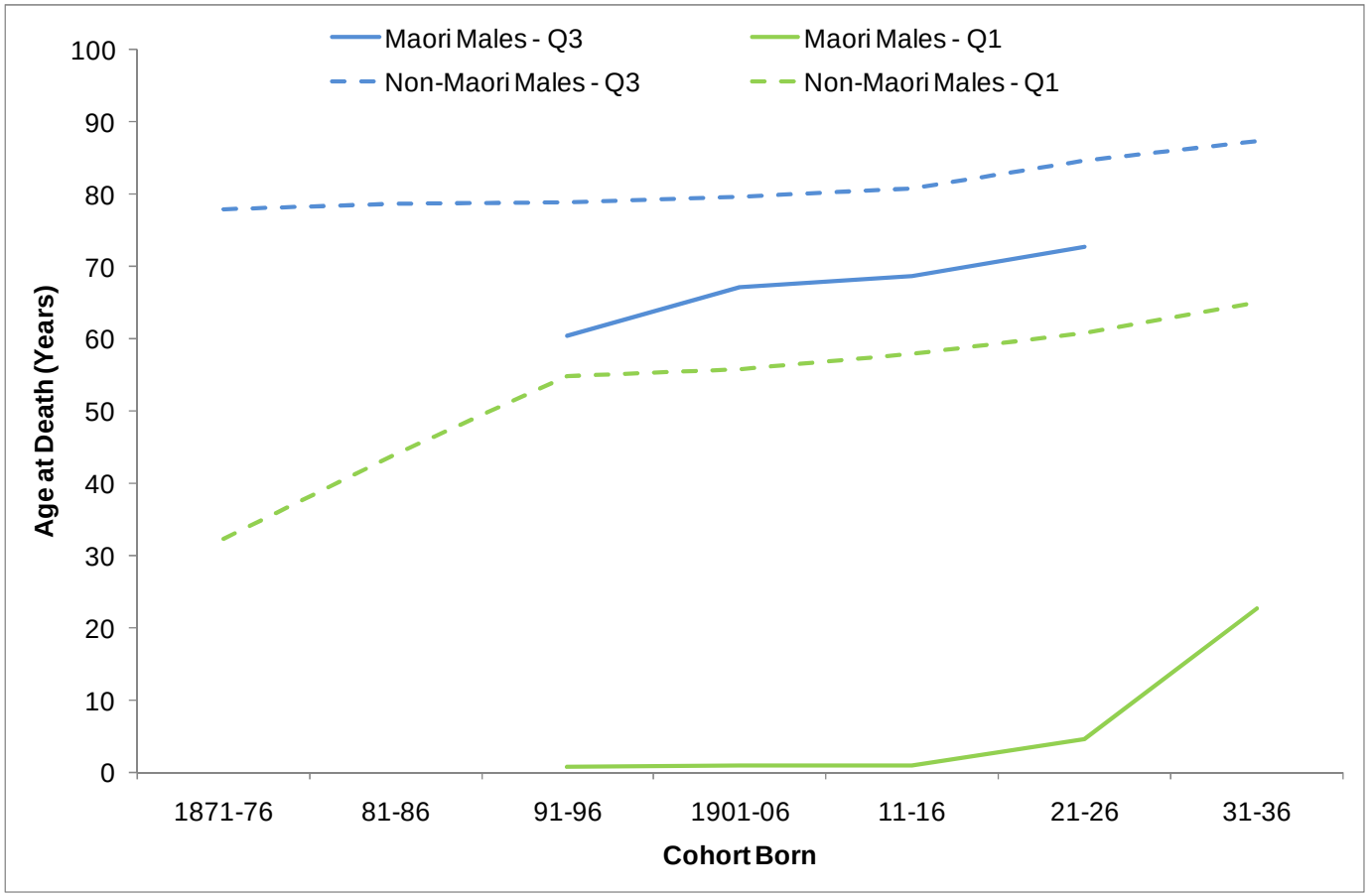
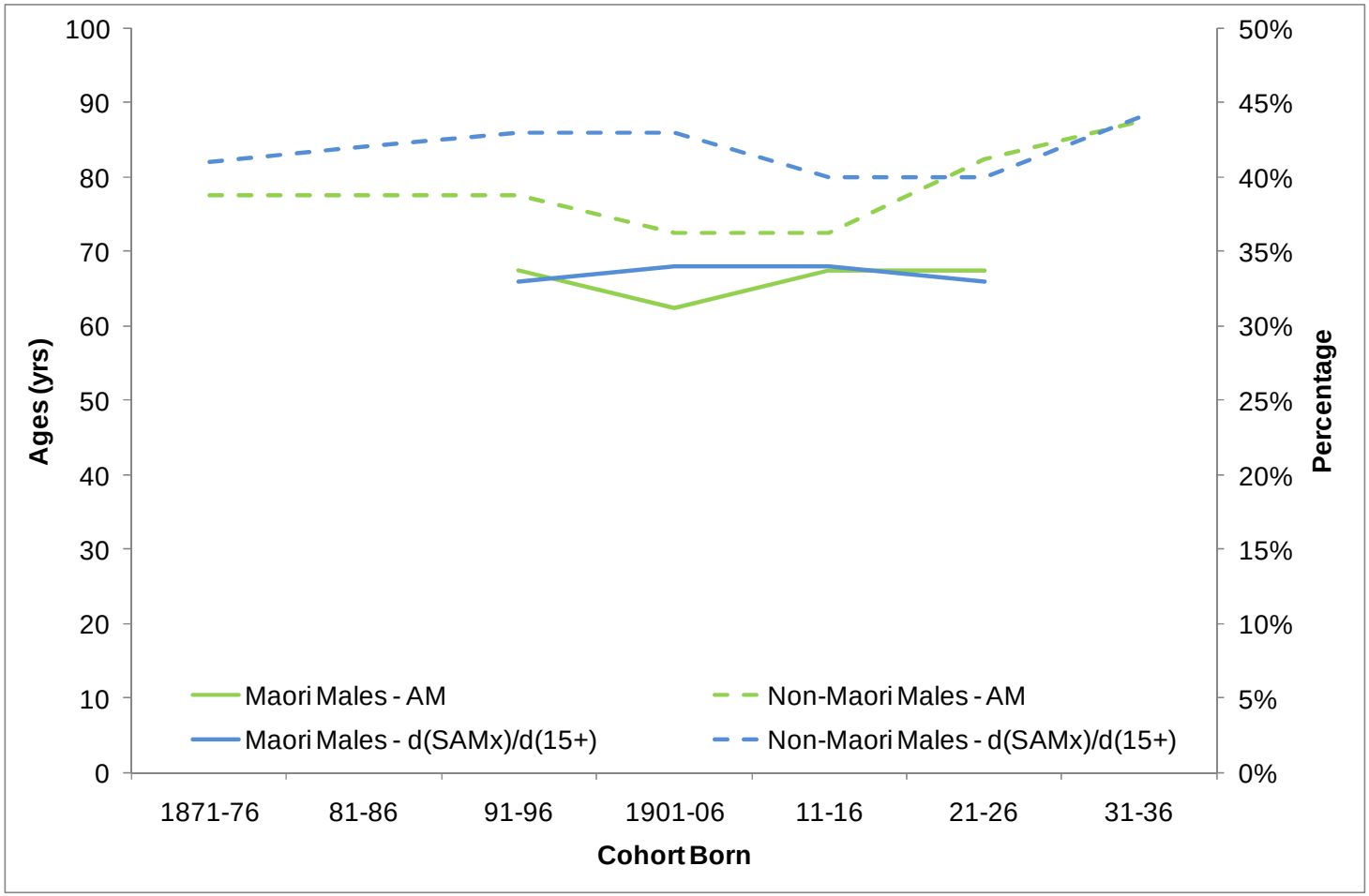


Figure 6: Maori and Non-Maori Male Cohort Life-Table Verticalisation: Quartiles (Q1 and Q3) for Ages at Death



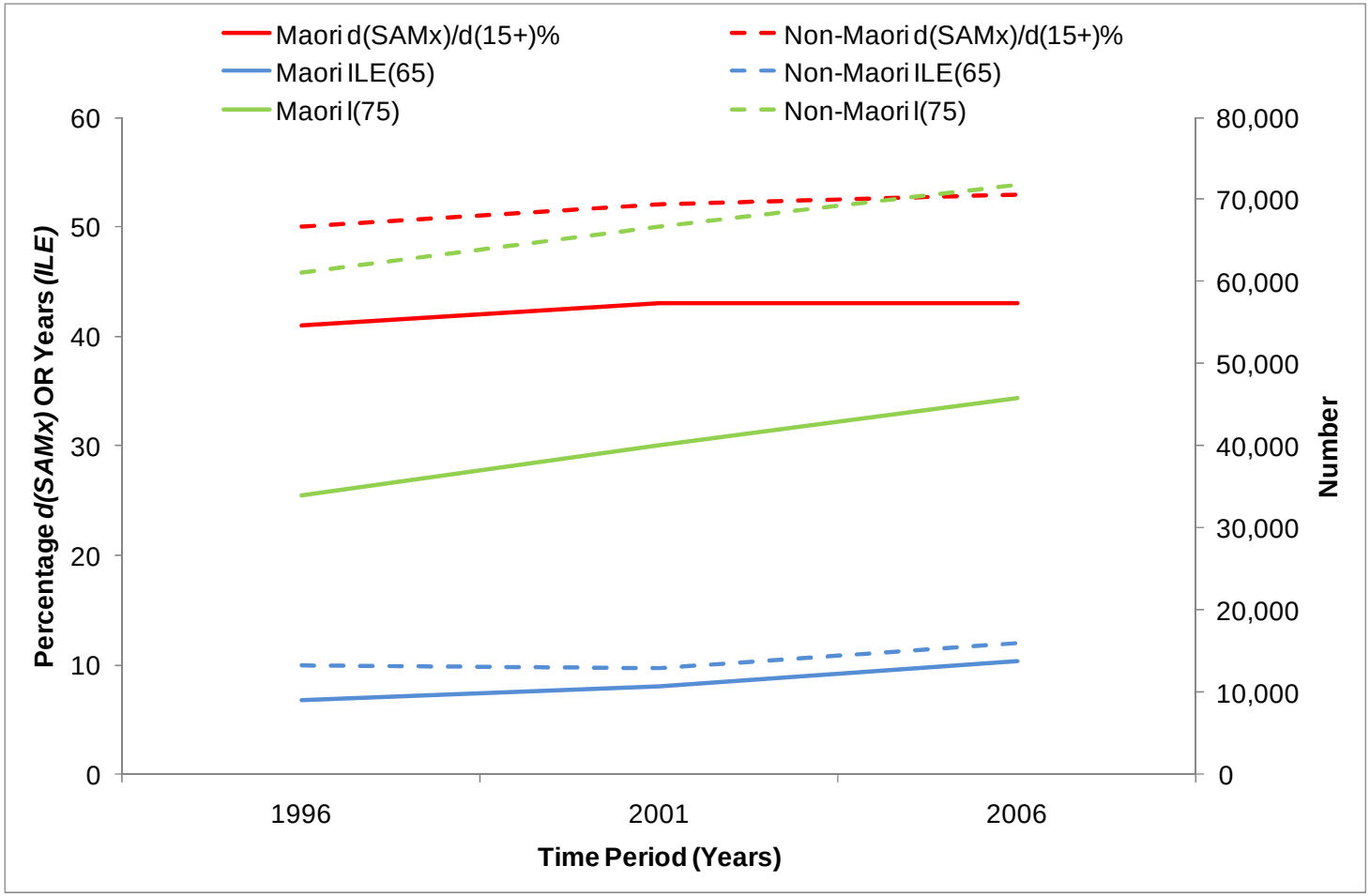
Note: *d(SAMx)* = *d(AMx)* + *(dAMx+5)* + *(dMx-5)*, where *x* = 5 year age-group.

Figure 7: Maori and Non-Maori Male Cohort Life-Table Verticalisation: Modal Adult Age at Death *d(x)* (AM) and Percent of Adult *d(x)* Spread around AM, *(d(SAMx)/d(15+)%)*



Note: *d(SAMx) = d(AMx) + (dAMx+5) + (dMx-5)*, where *x* = 5 year age-group.

Figure 8: Recent Maori and Non-Maori Period Data from Life Tables and Health Expectancies: *l(75)*, Percent of Adult *d(x)* Spread around Adult Mode (15+ yrs) (*d(SAMx)/d(15+)%*), and Independent Life Expectancy (ILE)



Notes: *d(SAMx) = d(AMx) + (dAMx+5) + (dMx-5)*, where *x* = 5 year age-group.
Independent Life Expectancy (ILE) - free from disability requiring assistance.
ILE data are from unpublished series, Ministry of Health. Because of risk of sampling and other statistical errors, Maori data for ILEs are not accepted as highly reliable.

DISCUSSION: I

- Gaps decreased over time
- Decreased more rapidly when interventions better planned and executed:
  - Early 20th century, community health programmes
  - 1940s-1960s, multipronged attack on communicable diseases, especially Tb; health policy nested into social policy
  - Early 2000s attack on non-communicable diseases, esp cardiovascular and determinants (eg diabetes); complex because co-morbidities abound.

DISCUSSION: II

- Conversely, policy can have negative consequences – neo-liberal restructuring of 1980s and 1990s – see Esping-Andersen (1999). Associated with failure to address cohort deterioration until 2000s.
- In 2000s interventions had to be complex. Because of less intervention in 1990s, presentation in 2000s often late, and older people with complex patterns of co-morbidity.
- IMR illustrates policy issues well. Neo-natal due to endogenous causes – Maori and Non-Maori often converged; for post-neonatal, due to exogenous, often socially determined causes, often gap maintained.

CONCLUSION: I

- 1. Different trajectories in epidemiologic transition produce different current HEs, and thus degree of epidemiologic polarisation in New Zealand.
- But HEs computed at old age are for a selected population, confounded by earlier cohort experiences. Thus Maori and Non-Maori seem close, yet old Maori are the residual survivors of higher mortality in past.
- Can indicate this by combining $_{L(x)}$ with $_{ILE}$. At 75-79 years, the critical ages for $_{d(x)}$ modes, Maori survival factor, computed this way is 28,303 (of the original $_{l(0)}$), but Non-Maori 41,302

CONCLUSION: II

- 2. Even during convergence, polities may require different intervention strategies for different sub-populations.
- 3. These will need also to take account of cohorts' differing exposures in the past to morbidity and mortality effects