8-7-2006

Long-term trends in Indigenous deaths from chronic diseases in the Northern Territory: a foot on the brake, a foot on the accelerator

David P. Thomas
John R. Condon
Ian P. Anderson
Shu Q. Li
Stephen Halpin

See next page for additional authors

Follow this and additional works at: https://ir.lib.uwo.ca/aprci

Part of the Cardiovascular Diseases Commons, Other Public Health Commons, and the Respiratory Tract Diseases Commons

Citation of this paper:
https://ir.lib.uwo.ca/aprci/370
Authors
David P. Thomas, John R. Condon, Ian P. Anderson, Shu Q. Li, Stephen Halpin, Joan Cunningham, and
Steven L. Guthridge

This article is available at Scholarship@Western: https://ir.lib.uwo.ca/aprci/370
Long-term trends in Indigenous deaths from chronic diseases in the Northern Territory: a foot on the brake, a foot on the accelerator

David P Thomas, John R Condon, Ian P Anderson, Shu Q Li, Stephen Halpin, Joan Cunningham and Steven L Guthridge

ABSTRACT

Objective: To examine trends in Northern Territory Indigenous mortality from chronic diseases other than cancer.

Design: A comparison of trends in rates of mortality from six chronic diseases (ischaemic heart disease [IHD], chronic obstructive pulmonary disease [COPD], cerebrovascular disease [CVD], diabetes mellitus [DM], renal failure [RF] and rheumatic heart disease [RHD]) in the NT Indigenous population with those of the total Australian population.


Main outcome measures: Estimated average annual change in chronic disease mortality rates and in mortality rate ratios.

Results: Death rates from IHD and DM among NT Indigenous peoples increased between 1977 and 2001, but this increase slowed after 1990. Death rates from COPD rose before 1990, but fell thereafter. There were non-significant declines in death rates from CVD and RHD. Mortality rates from RF rose in those aged ≥ 50 years. The ratios of mortality rates for NT Indigenous to total Australian populations from these chronic diseases increased throughout the period.

Conclusions: Mortality rates from IHD and DM in the NT Indigenous population have been increasing since 1977, but there is evidence of a slower rise (or even a fall) in death rates in the 1990s. These early small changes give reason to hope that some improvements (possibly in medical care) have been putting the brakes on chronic disease mortality among Aboriginal and Torres Strait Islander peoples.

METHODS

We used the previously described long-term time series of death and population data for Indigenous people in the NT, extended to include 2001.1,2 Comparison death and population data for the total Australian population were purchased from the Australian Bureau of Statistics (ABS).

The dataset included deaths coded according to the revision of the World Health Organization's International classification of diseases used at the time (ICD-8 [8th revision] for deaths registered 1977–1978, ICD-9 for 1979–1996, and ICD-10 for 1997–2002). The ICD groupings for the six diseases in NT government publications were used.3 The comparability of deaths coded according to ICD-10 and ICD-9 was tested by means of an ABS sample of 34 780 Australian deaths coded according to both methods. The comparability factor (ICD-10 deaths/ICD-9 deaths) ranged from 93.4% to 105.1% for five of the six diseases. The much lower comparability factor of 68.8% for chronic RHD was based on a much smaller sample of deaths, and is of uncertain reliability.

All analyses were of the recorded single final underlying cause of death. Multiple causes of death, only available since 1997, were compared with the underlying cause from 1997 to 2001.

Statistical analysis

The annual change in the NT Indigenous mortality rate for each disease was estimated by means of Poisson regression models. The annual change in the ratio of the mortality rate of the NT Indigenous population to that of the total Australian population for each disease was estimated by means of negative binomial (rather than Poisson) regression models, as these data were found to be over-dispersed.

Models were built based on deaths from each of the six chronic diseases as the outcome variable, and the population for each age and sex group for each year as the exposure variable. Age was grouped in 5-year categories. Models tested variables for death year, sex, age, age squared (and a dichotomous variable distinguishing NT Indigenous deaths from total Australian deaths in the ratio trend models), and inter-

©The Medical Journal of Australia 2006
www.mja.com.au
action terms. Variables were deleted until the most parsimonious model was found.

The estimates of change in the NT Indigenous mortality rate over the entire 25-year period were calculated by raising the estimated annual change to the power of 24: the number of years less one. Dummy variables were added to each model to estimate the annual change in rates and ratios in the first half of the period (1977–1989) compared with the second half (1990–2001), and the effect of the change to ICD-10 on annual change in the NT Indigenous death rates. A sensitivity analysis of the effect of different cutpoints on the comparison between the first and second halves of the period was also performed. The effect of possible coding changes within circulatory diseases was assessed by building models for all circulatory diseases combined, and for all circulatory diseases other than IHD, CVD and RHD.

To show trends graphically, mortality rates were directly age-standardised and sex-standardised to the estimated NT Indigenous population on 30 June 2001, with the year of death described by means of five 5-year groups.

Stata software (version 8.2, StataCorp, College Station, Tex, USA) was used for statistical analyses. A more detailed technical report about methods and results is available from the first author.

Ethical approval

The project was approved by the Human Research Ethics Committee of the Menzies School of Health Research and the NT Department of Health and Community Services, and by its Aboriginal Ethics Subcommittee.

RESULTS

In the 25 years from 1977 to 2001, the six chronic diseases caused 2747 deaths among NT Indigenous and Torres Strait Islander people, comprising 29.7% of NT Indigenous deaths from 1977 to 2001.

Trends in NT Indigenous death rates

Over the 25 years, NT Indigenous mortality rates increased significantly for IHD and DM and fell significantly for COPD (Box 1). There were decreases in CVD and RHD mortality, but these were not statistically significant. RF mortality trends were different for younger and older people. The mortality rate decreased for those aged less than 50 years, but increased for those aged 50 years and older; both trends were statistically significant, but there were only 35 deaths from RF among people aged under 50 years. The change in coding from ICD-9 to ICD-10 did not appear to significantly modify, and thus explain, these mortality trends.

There were differences in the mortality trends for the six diseases between the 1980s and 1990s (Box 2). For COPD, mortality increased before 1990, but decreased thereafter. Mortality from IHD and DM increased throughout the period 1977–2001, but the rate of increase slowed significantly after 1990. Similar differences between the 1980s and 1990s were found in CVD and RHD death rates, but these differences were not statistically significant. The differences between the two periods were not sensitive to changing the end date of the first period.

A third of circulatory disease deaths (755/2315) were from causes other than IHD, CVD and RHD. There was no statistically significant estimated annual change in all deaths from circulatory disease, but the annual 3.1% decline in deaths from circulatory diseases other than IHD, CVD and RHD was statistically significant.

Trends in the comparison of NT Indigenous and total Australian death rates

Trends in both the NT Indigenous and total Australian death rates are shown in Box 3. From 1977 to 2001, the Australian direct standardised rates fell for IHD, CVD, RHD

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischaemic heart disease</td>
<td>+ 5.7 (2.7 to 8.8)</td>
<td>+1.1 (– 1.3 to 3.5)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>+ 3.5 (0.5 to 6.7)</td>
<td>– 5.7 (– 8.6 to – 2.6)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>+ 0.3 (– 3.3 to 4.0)</td>
<td>– 1.3 (– 4.9 to 2.5)</td>
<td>0.5</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>+ 13.5 (7.2 to 20.2)</td>
<td>+3.2 (– 0.4 to 6.9)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Rheumatic heart disease</td>
<td>+ 5.9 (0.4 to 11.7)</td>
<td>+1.6 (– 4.2 to 7.6)</td>
<td>0.3</td>
</tr>
<tr>
<td>Renal failure</td>
<td>– 6.5 (– 10.7 to – 2.0)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Age &lt; 50 years†</td>
<td>– 6.5 (– 10.7 to – 2.0)</td>
<td>– 79.8</td>
<td></td>
</tr>
<tr>
<td>Age ≥ 50 years†</td>
<td>+ 3.3 (0.8 to 5.7)</td>
<td>+117.2</td>
<td></td>
</tr>
</tbody>
</table>

* Estimated by Poisson regression models. † There were only 35 NT Indigenous deaths from renal failure among those aged < 50 years from 1977 to 2001, so estimated average annual changes for this age group should be interpreted with caution.

4.1. ethical approval

The project was approved by the Human Research Ethics Committee of the Menzies

School of Health Research and the NT Department of Health and Community Services, and by its Aboriginal Ethics Subcommittee.

RESULTS

In the 25 years from 1977 to 2001, the six chronic diseases caused 2747 deaths among NT Indigenous and Torres Strait Islander people, comprising 29.7% of NT Indigenous deaths from 1977 to 2001.

Trends in NT Indigenous death rates

Over the 25 years, NT Indigenous mortality rates increased significantly for IHD and DM and fell significantly for COPD (Box 1). There were decreases in CVD and RHD mortality, but these were not statistically significant. RF mortality trends were different for younger and older people. The mortality rate decreased for those aged less than 50 years, but increased for those aged 50 years and older; both trends were statistically significant, but there were only 35 deaths from RF among people aged under 50 years. The change in coding from ICD-9 to ICD-10 did not appear to significantly modify, and thus explain, these mortality trends.

There were differences in the mortality trends for the six diseases between the 1980s and 1990s (Box 2). For COPD, mortality increased before 1990, but decreased thereafter. Mortality from IHD and DM increased throughout the period 1977–2001, but the rate of increase slowed significantly after 1990. Similar differences between the 1980s and 1990s were found in CVD and RHD death rates, but these differences were not statistically significant. The differences between the two periods were not sensitive to changing the end date of the first period.

A third of circulatory disease deaths (755/2315) were from causes other than IHD, CVD and RHD. There was no statistically significant estimated annual change in all deaths from circulatory disease, but the annual 3.1% decline in deaths from circulatory diseases other than IHD, CVD and RHD was statistically significant.

Trends in the comparison of NT Indigenous and total Australian death rates

Trends in both the NT Indigenous and total Australian death rates are shown in Box 3. From 1977 to 2001, the Australian direct standardised rates fell for IHD, CVD, RHD

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischaemic heart disease</td>
<td>+ 5.7 (2.7 to 8.8)</td>
<td>+1.1 (– 1.3 to 3.5)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>+ 3.5 (0.5 to 6.7)</td>
<td>– 5.7 (– 8.6 to – 2.6)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>+ 0.3 (– 3.3 to 4.0)</td>
<td>– 1.3 (– 4.9 to 2.5)</td>
<td>0.5</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>+ 13.5 (7.2 to 20.2)</td>
<td>+3.2 (– 0.4 to 6.9)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Rheumatic heart disease</td>
<td>+ 5.9 (0.4 to 11.7)</td>
<td>+1.6 (– 4.2 to 7.6)</td>
<td>0.3</td>
</tr>
<tr>
<td>Renal failure</td>
<td>– 6.5 (– 10.7 to – 2.0)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Age &lt; 50 years†</td>
<td>– 6.5 (– 10.7 to – 2.0)</td>
<td>– 79.8</td>
<td></td>
</tr>
<tr>
<td>Age ≥ 50 years†</td>
<td>+ 3.3 (0.8 to 5.7)</td>
<td>+117.2</td>
<td></td>
</tr>
</tbody>
</table>

* Estimated by Poisson regression models. † There were only 35 NT Indigenous deaths from renal failure among those aged < 50 years from 1977 to 2001, so estimated average annual changes for this age group should be interpreted with caution.

4.1. ethical approval

The project was approved by the Human Research Ethics Committee of the Menzies

School of Health Research and the NT Department of Health and Community Services, and by its Aboriginal Ethics Subcommittee.

RESULTS

In the 25 years from 1977 to 2001, the six chronic diseases caused 2747 deaths among NT Indigenous and Torres Strait Islander people, comprising 29.7% of NT Indigenous deaths from 1977 to 2001.

Trends in NT Indigenous death rates

Over the 25 years, NT Indigenous mortality rates increased significantly for IHD and DM and fell significantly for COPD (Box 1). There were decreases in CVD and RHD mortality, but these were not statistically significant. RF mortality trends were different for younger and older people. The mortality rate decreased for those aged less than 50 years, but increased for those aged 50 years and older; both trends were statistically significant, but there were only 35 deaths from RF among people aged under 50 years. The change in coding from ICD-9 to ICD-10 did not appear to significantly modify, and thus explain, these mortality trends.

There were differences in the mortality trends for the six diseases between the 1980s and 1990s (Box 2). For COPD, mortality increased before 1990, but decreased thereafter. Mortality from IHD and DM increased throughout the period 1977–2001, but the rate of increase slowed significantly after 1990. Similar differences between the 1980s and 1990s were found in CVD and RHD death rates, but these differences were not statistically significant. The differences between the two periods were not sensitive to changing the end date of the first period.

A third of circulatory disease deaths (755/2315) were from causes other than IHD, CVD and RHD. There was no statistically significant estimated annual change in all deaths from circulatory disease, but the annual 3.1% decline in deaths from circulatory diseases other than IHD, CVD and RHD was statistically significant.

Trends in the comparison of NT Indigenous and total Australian death rates

Trends in both the NT Indigenous and total Australian death rates are shown in Box 3. From 1977 to 2001, the Australian direct standardised rates fell for IHD, CVD, RHD
and COPD, remained largely unchanged for DM, and increased for RF The ratio of NT Indigenous to total Australian mortality rates increased for all six diseases; this increase was statistically significant for all except COPD (Box 4).

**Underlying cause versus multiple causes of death**

In most of the deaths where RF was listed as one of the multiple causes of death in 1997–2001 (79%), it was not listed as the underlying cause of death. In such cases, the underlying disease was most likely to be listed as DM or IHD. This occurred less often in the other five chronic diseases.

**DISCUSSION**

It has previously been reported that NT Indigenous death rates from all non-communicable diseases did not change between 1977 and 2000 (there was a 5% increase which was not statistically significant).²

We have now shown that death rates from IHD and DM increased in the NT Indigenous population between 1977 and 2001, and that the gap between the NT Indigenous death rates and total Australian death rates is getting larger for six common chronic diseases. This is consistent with the popular perception that things have not improved for Indigenous peoples and that Australia is becoming less fair.

However, recent research on Indigenous mortality trends has reported more optimistic news. Statistically significant Indigenous mortality declines in the 1990s have been reported in non-communicable diseases (and circulatory diseases in particular) in Western Australia, and communicable diseases in males in WA and South Australia.⁶ Indigenous infant mortality declined in NT, WA and SA in the 1990s.⁶ Data are of insufficient quality to determine mortality trends in other states.⁶

Similarly, our comparisons between the two halves of the 25-year period give reason for hope. NT Indigenous death rates from all six chronic diseases were increasing more slowly (or even decreasing) in the 1990s compared with the 1980s. If this trend continues, we might see significant improvements in NT Indigenous chronic disease mortality when more data from the current decade are available.

The magnitude of the IHD, COPD and DM trends are all larger than the previously reported all-cause mortality trends in NT Indigenous people aged over 5 years. The largest estimated trends (in DM deaths and in COPD deaths in 1990–2001) were even greater than the reported fall in mortality in those aged under 5 years.²

**Data limitations**

Some misclassification of Indigenous status in the datasets probably occurred, but this is likely to be rare compared with other states and territories. Misclassification of underlying cause of death is known to be a problem in death registrations, including in the NT, deaths from circulatory and respiratory diseases were overcounted and endocrine diseases (mainly DM) were undercounted in a sample of 220 NT Indigenous deaths in 1992.⁷ However, no information is available on whether this misclassification of diseases was constant over the 25-year period.

The decline in the other circulatory disease deaths may indicate a trend in the classification of circulatory diseases away from these codes, perhaps even towards IHD codes, and so may account for some of the upward trend in IHD-coded deaths. We are not convinced by the most extreme explanation that would mean that NT Indigenous chronic disease mortality was only increasing for DM, with other death rates constant or falling. But if true, this would paint a less complex and even more optimistic picture of NT Indigenous chronic disease mortality. It seems more likely that the true IHD and DM trends, with their similar risk factors, were in parallel as coded.

Our analysis of the underlying cause of death, rather than multiple causes, does not adequately count the association of RF with many NT Indigenous deaths, because it is often not subsequently listed as the underlying cause of death.

The regression models provide the most accurate estimates of the 25-year trends as they use data from the whole period, rather than just comparing death rates at the start and end of the period (which is very sensitive to the endpoints chosen).⁸ However, the models and their estimates rely on the assumption that the annual percentage change in death rates is constant. This was most clearly untrue for COPD death rates, which increased and then fell. Box 2 and Box 3 indicate where these estimated 25-year trends do not appear to have been constant.

**Patterns in mortality trends**

The patterns of the different mortality trends of the six chronic diseases can be used to generate hypotheses about why these
changes have occurred. The length of the intervening period between changes in determinants and changes in chronic disease mortality is uncertain, may be quite long, and is likely to vary between diseases and between determinants.

**Smoking:** In the NT, 20% of Aboriginal adult deaths in 1986–1995 were attributed to smoking. COPD, IHD, lung cancer and CVD were the four leading causes. We have shown that COPD peaked in the 1980s and began to decline in the 1990s. Decreased smoking was not responsible, as three large surveys in 1986–1987, 1994 and 2002 showed little change in NT Indigenous smoking rates. Other possible reasons for the decline in COPD deaths include improved intrauterine growth, fewer childhood infections and less exposure to tobacco, improved nutrition and less overcrowding decades ago, and, more recently, better prevention and management of adult respiratory infections and acute exacerbations of COPD.

**Physical inactivity, poor diet and being overweight:** DM, IHD and CVD are the chronic diseases most associated with physical inactivity, poor diet and being overweight, and rates of death from IHD and DM in the NT Indigenous population had similar upward (although slowing) trajectories, and are the most similar of the six diseases. There are no long-term NT-wide trend data available to accurately describe changes in these behavioural determinants of disease.

**Primary and specialist care:** There is some evidence, at least among people with diabetes, that blood pressure screening and control are routinely occurring in NT Indigenous bush communities at similar levels to those in the non-Indigenous population. Reviews of randomised clinical trials show that blood pressure control leads to a reduction in mortality from CVD at least three times greater than that from IHD. This may explain the more modest changes in death rates from CVD than IHD among NT Indigenous people.

The considerable expansion of primary care (clinical, disease prevention and health promotion) services for Indigenous people in the NT from 1977 to 2001, combined with more recent increasing attention to chronic disease prevention and management, may have contributed to improving control of hypertension over the period.

Hospital care can prevent deaths from CVD or IHD by improving survival immediately after a stroke or acute myocardial infarction (AMI). Indigenous people experience significant and dangerous delays in access to NT hospitals after an AMI. NT Indigenous IHD hospital separation rates increased only slightly faster than IHD deaths from 1979 to 1991, whereas CVD hospitalisations nearly trebled when death rates were stable, possibly contributing to the better CVD than IHD mortality trends.

**Birthweight:** Low birthweight and poor infant growth are associated with chronic disease mortality, although the mechanisms and public health significance of this association remain contested. NT Indigenous birthweights improved over the study period, but it is not possible to describe with similar accuracy the birthweight trends of earlier periods, when those dying of chronic diseases in 1977–2001 were born.

**Underlying social determinants of health:** Accompanying (and often driving) the gradual improvements in access to health care have been enormous social, economic and political changes for Indigenous peoples in the NT since the political struggles of the 1960s. Changing experiences of racism and social exclusion in parallel with these political changes, together with improvements in absolute, but not relative, incomes and educational outcomes, may have helped reduce mortality from all diseases.

**Conclusion**

There is now evidence that the increase in death rates for all the chronic diseases examined is slowing, or even, as with COPD, beginning to fall. Some developments (possibly including improving access to medical care) have been putting the brakes on increasing chronic disease mortality, but it is not yet clear whether these positive changes will eventually lead to a fall in deaths from all chronic diseases. Now is not the time for giving up or changing everything because “nothing has worked”, but for investigating further what has worked, and for increased and sustained effort to ensure these early promises of the possibility of lasting improvements to Indigenous health are realised in the NT and beyond.

**REFERENCES**


