

Appendix A: Methods

Cardiac procedures in hospital

The cardiac procedures examined in this report are coronary angiography, coronary artery bypass grafts and percutaneous coronary intervention (PCI).

Coronary angiography

Coronary angiography (also known as coronary arteriography) gives a picture of the heart's arteries, known as the coronary arteries. It is used to diagnose coronary heart disease and is essential before either coronary artery bypass surgery or PCI.

Coronary artery bypass grafts (CABG)

Coronary artery bypass grafting (CABG) usually involves opening a patient's chest and using blood vessel grafts to bypass blockages in the coronary arteries and restore adequate blood supply to the heart muscle. The graft material is usually taken from the chest wall or veins in the patient's legs, or both. CABG is a treatment and not a cure for coronary artery disease, and there is a risk of recurrent disease. Re-operations are uncommon within the first 5 years but become more frequent later.

Percutaneous coronary intervention (PCI)

Percutaneous coronary intervention (also known as coronary angioplasty), as with coronary artery bypass surgery, is used to restore adequate blood flow through blocked coronary arteries. It involves inserting a catheter with a balloon into a narrowed coronary artery. The catheter is first inserted into a leg (or occasionally, arm) artery through the skin and then is threaded through the vessels back towards the heart and into the coronary arteries to the area of vessel blockage. The balloon is then inflated against the blocked area to create a wider passage for blood flow. The development of other catheter-based techniques, particularly stenting to the vessel wall at the site of the blockage, has reduced early acute closure of the coronary artery and restenosis.

PCI avoids the major trauma of CABG surgery because it does not require the opening of the patient's chest. However, the technique cannot be used to treat all patients with coronary artery obstruction.

Cause of death and hospital diagnosis classification

Australia uses the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) for coding of causes of death. For hospital diagnosis and procedures this international classification has been modified for Australia (ICD-10-AM – International Statistical Classification of Diseases and Related Health Problems, Tenth Revision,

Australian Modification). The table below lists the ICD-10 disease and procedure codes used in this report.

Table A1: Codes for deaths and hospital data used in this report

Disease codes	ICD-10 and ICD-10-AM codes
Coronary heart disease	I20–I25
Acute myocardial infarction	I21
Angina	I20
Cerebrovascular disease	I60–I69
Chronic rheumatic heart disease and other valve disorders	I05–I09, I34–I39
Hypertensive diseases	I10–I15
Heart failure	I50
<i>Cardiovascular disease</i>	<i>I00–I99</i>
High cholesterol	E78.0, E78.2
Chronic obstructive pulmonary disease (COPD)	J41–J44
Chronic renal failure	N18
Diabetes	E10–E14
Procedure codes	ICD-10-AM codes
Coronary angiography	38215–00, 38218–00, 38218–02 (block: 668)
Coronary angioplasty (without coronary stent)	35304–00, 35305–00 (block: 670)
Coronary artery bypass grafting	38497, 38500, 38503, 90201 (blocks: 672–679)
Coronary stenting	35310 (block: 671)

Rates

This report presents age-specific rates, crude rates and age-standardised rate ratios in examining the level of inequality between Indigenous Australians and other Australians. These analytical concepts are described below.

Age-specific rates

Age-specific rates were calculated by dividing the number of events (such as incidence, hospitalisations or deaths) occurring in each specified age group by the population at risk for the corresponding age group. The ABS Experimental Projections of the Aboriginal and Torres Strait Islander Population and the Australian Estimated Resident Population for the years 2002 and 2003 were used in calculating population-based rates.

Crude rates

Crude rates were calculated by dividing the total number of events (such as incidence, hospitalisations or deaths) by the total population at risk.

Age-standardised rate ratios

Age-standardised rate ratios for incidence and hospitalisations were used to remove the influence of age when comparing populations with different age structures. Excess number of events and excess % (measures of inequality impact) for all ages have also been age-standardised. In this report, indirect age standardisation has been used, as the Indigenous Australian population is relatively small and there is some uncertainty about the stability of age-specific rates. The 'other Australians' population has been used as the standard population and the Aboriginal and Torres Strait Islander population has been used as the study population in these analyses. The method used for indirect age standardisation entails three steps:

Step 1: Calculate the age-specific rates for each age group in the standard population.

Step 2: Apply these age-specific rates to the number in each age group of the study population and sum to derive the total expected number of cases for the study population.

Step 3: Sum the observed cases in the study population and divide this number by the expected number derived in Step 2 to calculate the rate ratio.

A rate ratio of 1 indicates the same number of observed cases as were expected, suggesting rates in the study and standard populations are similar. A result greater than 1 indicates more cases than expected. A result less than 1 indicates fewer cases than expected. For example, if there are twice as many deaths as expected (age-standardised rate ratio of 2.0) then the rate of death in Indigenous Australians can be assumed to be twice that of other Australians.

Inequality measures—worked example

There are a number of measures that can be used to indicate the level of health inequality between population groups. In this report we use the rate ratio, rate difference, excess and excess %. Further information on how these measures relate to each other and their interpretation are provided in the Chapter 2. Below is a summary of how these are calculated.

Figure A1 provides a hypothetical example of rates for a health outcome, where the rate for Aboriginal and Torres Strait Islander people is assumed to be 300 per 100,000 and the rate for other Australians is 100 per 100,000. The hypothetical population sizes are 500,000 for Indigenous Australians, and 10 million for other Australians. Figure A1 is used to explain the various inequality measures presented in this report.

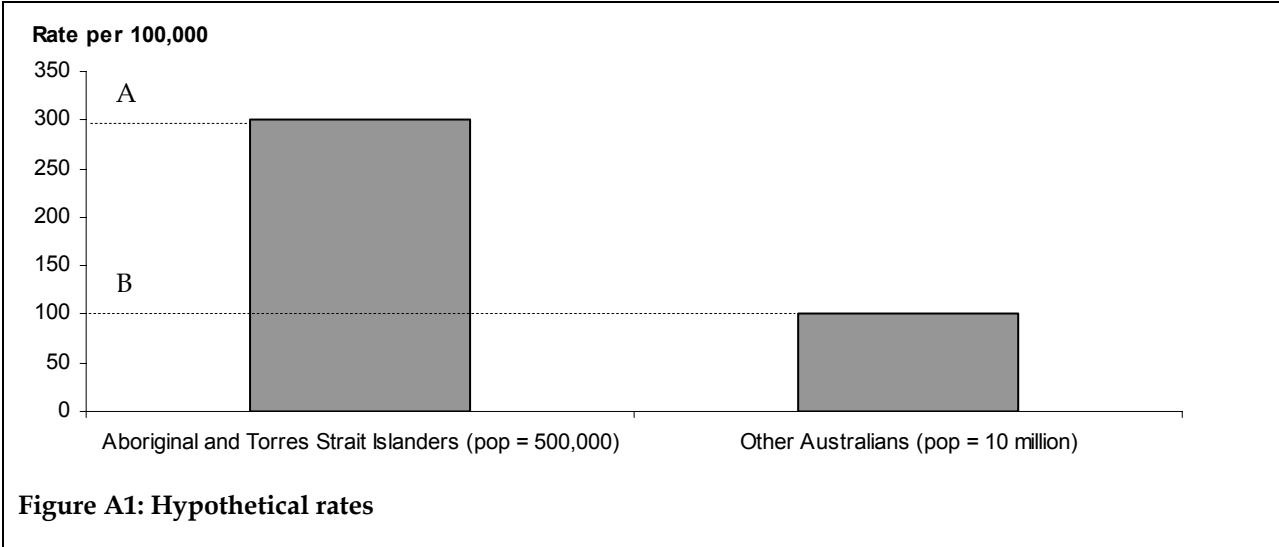


Figure A1: Hypothetical rates

Rate ratio: a ratio to indicate the relative gap

Calculation: Rate for Indigenous Australians divided by rate for other Australians
 $= A/B$

Worked example from hypothetical

$$\begin{aligned} A/B &= 300 \text{ per } 100,000 / 100 \text{ per } 100,000 \\ &= 3 \end{aligned}$$

Interpretation: the rate for Indigenous Australians is 3 times as high as for other Australians.

Rate difference: difference indicates the absolute gap

Calculation: Rate for Indigenous Australians minus the rate for other Australians
 $= A - B$

Worked example from hypothetical

$$A - B = 300 \text{ per } 100,000 - 100 \text{ per } 100,000 = 200 \text{ per } 100,000$$

Interpretation: for Indigenous Australians, there are 200 extra cases per 100,000 population compared with other Australians.

Excess: the number of cases that would have been avoided if the rate for other Australians applied to the Indigenous Australian population

Calculation: Rate difference converted to absolute number of cases
 $= (A - B) * \text{Indigenous population}$

This is equivalent to the observed number of cases for Indigenous Australians minus the expected number that would have occurred if the rate for other Australians had applied

$$\begin{aligned} &= \text{observed cases} - \text{expected cases} \\ &= A * \text{Indigenous population} - B * \text{Indigenous population} \end{aligned}$$

Worked example from hypothetical

$$\begin{aligned} A * \text{Indigenous pop} - B * \text{Indigenous pop} \\ &= 300/100,000 * 500,000 - 100/100,000 * 500,000 \\ &= 1,500 - 500 = 1,000 \end{aligned}$$

Interpretation: there were 1,000 cases that would have been avoided if the rate for other Australians had applied to the Indigenous population.

Excess %: the per cent of cases among Indigenous Australians that would have been avoided if the rate for other Australians had applied.

Calculation: Excess Indigenous cases as a percentage of all Indigenous cases
 $= (A - B) * \text{Indigenous population} / (A * \text{Indigenous population}) * 100$
 $= (A - B) / A * 100$

Worked example from hypothetical

$$\begin{aligned} (A - B) / A * 100 \\ &= (300 \text{ per } 100,000 - 100 \text{ per } 100,000) / 300 \text{ per } 100,000 * 100 \\ &= 200 / 300 * 100 = 67\% \end{aligned}$$

Interpretation: 67% of Indigenous Australian cases would have been avoided if the rate for other Australians had applied to the Indigenous population.

Appendix B: Statistical tables

Table B1: Population estimates for Qld, WA, SA, and NT, 2002–2003

	Indigenous Australians	Other Australians
Age group (years)		
25–34	90,311	2,036,915
35–44	70,007	2,176,575
45–54	43,964	2,007,236
55–64	22,260	1,467,362
65–74	10,699	955,713
75+	5,159	821,899
All ages^(a)	564,462	14,264,256

(a) Includes those aged less than 25 years.

Note: Indigenous population has been obtained from the Experimental Projections of the Aboriginal and Torres Strait Islander population at 30 June 2002 and 2003. Other Australians population has been estimated from the difference between the estimated resident population at 30 June 2002 and 2003 and the experimental projections of the Aboriginal and Torres Strait Islander populations (2002 and 2003).

Source: ABS 2003b, 2004a, 2004b.

Table B2: Number of hospitalisations with CHD as principal diagnosis by number of comorbidities in Qld, WA, SA and NT, 2002–2003

	Number of comorbidities			All CHD hospitalisations
	None	One or two	Three or more	
Indigenous Australians				
25–34	111	98	14	223
35–44	372	414	84	870
45–54	404	690	222	1,316
55–64	288	537	189	1,014
65–74	122	254	106	482
75+	68	91	50	209
All ages^(a)	1,374	2,087	665	4,126
Other Australians				
25–34	362	181	24	567
35–44	2,361	1,711	139	4,211
45–54	7,479	6,841	744	15,064
55–64	11,312	12,671	1,935	25,918
65–74	11,975	15,583	3,232	30,790
75+	13,101	19,100	4,316	36,517
All ages^(a)	46,624	56,094	10,391	113,109

(a) Includes those aged less than 25 years.

Note: Comorbidities studied include diabetes, hypertensive diseases, high cholesterol, heart failure, chronic kidney failure, chronic obstructive pulmonary disease, chronic rheumatic heart disease or other valve disorders, and cerebrovascular disease.

Source: AIHW National Hospital Morbidity Database.

Glossary

Aboriginal A person who identifies as an Aboriginal and is accepted as such by the community in which he or she lives.

Aboriginal and Torres Strait Islander people and **Indigenous Australians** Terms used interchangeably when referring to people who have identified as Aboriginal and/or Torres Strait Islander.

Acute myocardial infarction (AMI) A condition where part of a person's heart muscle dies as a result of a blood clot that completely blocks the flow of blood to that part.

Additional diagnosis Conditions or complaints either co-existing with the principal diagnosis or arising during the episode of care.

Age standardisation A method of removing the influence of age when comparing populations with different age structures. Indirect age standardisation has been used in this report. A standardised ratio is calculated by comparing the actual number of events with the number expected if the age-specific rates in the 'other Australians' population applied to the Indigenous population. A ratio of greater than one indicates more events than expected, whereas a ratio of less than one indicates fewer events than expected.

Age-specific rate A rate for a specific age group. The numerator and denominator relate to the same age group.

Angina Temporary chest pain or discomfort when the heart's own blood supply is inadequate to meet extra needs, for example during exercise.

Case fatality An important outcome measure which quantifies the proportion of cases that are fatal within a specific time period. Overall case fatality used in this report relates to major coronary events and is calculated as the number of CHD deaths in the specified population divided by the sum of all CHD deaths and non-fatal hospital admissions for AMI (with length of stay of 3 days or more) for the period 2002–2003.

Cerebrovascular disease See *stroke*.

Chronic obstructive pulmonary disease (COPD) Serious, progressive and disabling long-term lung disease where damage to the lungs, usually due to both emphysema and chronic bronchitis, obstructs oxygen intake and causes increasing shortness of breath. By far the greatest cause is cigarette smoking.

Chronic renal failure Long-term condition where kidney function is lost progressively and irreversibly. End-stage renal disease is the final stage in the progressive deterioration of kidney function. In this situation, a person needs dialysis or a kidney transplant to remain alive.

Chronic rheumatic heart disease Long-term damage done to the heart muscle or heart valves by acute rheumatic fever. Acute rheumatic fever is a delayed complication of an untreated throat infection with group A streptococcus (GAS) bacteria. It can affect the heart valves, the heart muscle and its lining, the joints and the brain.

Comorbidity In this report this term is used to describe the existence of a select list of conditions recorded as an additional diagnosis on the hospital record.

Coronary angiography A diagnostic procedure which gives a picture of the heart's arteries.

Coronary artery bypass grafting (CABG) Surgical procedure using blood vessel grafts to bypass blockages in the coronary arteries and restore adequate blood flow to the heart muscle. Also see *percutaneous coronary intervention*.

Coronary heart disease (CHD) Its primary feature is insufficient blood supply to the heart itself. The two major clinical forms are *heart attack* (the insufficient blood supply is sudden and extreme) and *angina*. The underlying problem is atherosclerosis, a complex process where fatty and fibre-like deposits build up on the inner walls of the arteries, often forming plaques. CHD is also known as ischaemic heart disease.

Coronary stent A metal mesh tube that is expanded within an artery at a point of narrowing and left there to hold the artery open.

Crude rate Calculated by dividing the total number of events (such as incidence and hospitalisations) by the total population at risk.

Diabetes (diabetes mellitus) A chronic condition in which the body makes too little of the hormone insulin or cannot use it properly. This raises the blood level of the body's major energy source, the sugar glucose, and causes other widespread disturbance of the body's energy processes.

Excess number of cases An absolute measure of the impact of inequality calculated as the difference between the observed and expected number of cases. It represents the number of cases that would have been avoided if the rate for other Australians applied to the Indigenous population.

Excess % A relative measure of the impact of inequality. It is calculated as the excess number of cases as a percentage of all Indigenous cases and is interpreted as the percentage of Indigenous cases that would have been avoided if the rate for other Australians applied to the Indigenous population.

Heart attack Life threatening emergency that occurs when a vessel supplying blood to the heart muscle is suddenly blocked completely by a blood clot. The medical term commonly used for a heart attack is *acute myocardial infarction*.

Heart failure When the heart cannot pump strongly enough to keep the blood circulating around the body at an adequate rate.

High blood cholesterol It is the main cause of the process by which the blood vessels that supply the heart and other parts of the body become clogged.

Hypertensive disease Disease occurring when high blood pressure (hypertension) is severe or prolonged enough to cause damage to the heart, brain or kidneys.

Incidence The number of new cases of a condition or disease occurring in a population within a specified time period.

Incidence of major coronary events Estimated as the sum of the number of non-fatal hospital admissions for AMI (with length of stay of 3 days or more) and the number of deaths recorded as CHD deaths.

Indigenous A person who identifies as Aboriginal and/or Torres Strait Islander and is accepted as such by the community with which he or she lives.

In-hospital fatality rate This refers to the proportion of hospitalised cases that die in hospital. In-hospital fatality for CHD used in this report is defined as the number of CHD deaths in hospital in those hospitalisations where CHD is the principal diagnosis divided by the number of hospitalisations with CHD as the principal diagnosis.

International Classification of Diseases The World Health Organization's internationally accepted classification of death and disease. The 10th Revision (ICD-10) is currently in use.

Length of stay Duration of hospital stay, calculated by subtracting the date the patient is admitted from the date of separation. All leave days, including the day the patient went on leave are excluded. A same-day patient is allocated a length of stay of 1 day.

Major coronary event An event that results either in an acute admission to hospital for acute myocardial infarction (AMI) with a length of stay of 3 days or more, or in death from CHD. It should be noted that this excludes admissions for unstable angina or for coronary revascularisation procedures where the principal diagnosis is not AMI.

Morbidity Refers to ill health in an individual and to levels of ill health in a population or group.

Mortality Death

Other Australians This term is used when referring to people that have not identified as Aboriginal and/or Torres Strait Islander. This group will include those people who have said they are non-Indigenous but may also include either Aboriginal and/or Torres Strait Islander people who have chosen not to identify as such or individuals for whom the relevant information was not collected.

Out-of-hospital fatality rate This refers to the proportion of cases that result in death without admission to hospital or after discharge from hospital. Out-of-hospital fatality used in this report is estimated as the total number of deaths from CHD less the number of CHD deaths in hospital in those hospitalisations where CHD is the principal diagnosis divided by the sum of all CHD deaths and non-fatal hospital admissions for AMI (with length of stay of 3 days or more). It should be noted that deaths occurring in the emergency departments of hospitals are included in this group, as these deaths occur before the formal admission to hospital takes place.

Overweight Defined as a body mass index 25 and over.

Percutaneous coronary intervention (PCI) Coronary angioplasty and coronary stenting when used together are referred to as PCI. It is used to restore adequate blood flow to blocked coronary arteries. Coronary angioplasty involves inserting a catheter with a balloon into a narrowed coronary artery. The balloon is then inflated against the blocked area to create a wider passage. Coronary stenting involves expanding a metal mesh tube within the artery to form a supporting structure to hold the artery open at the point where there is narrowing. Also see *coronary artery bypass grafting* and *coronary stent*.

Principal diagnosis The diagnosis established, after study, to be chiefly responsible for the patient's episode of care in hospital; that is, the main or primary diagnosis.

Rate difference Absolute measure of inequality which is calculated as the rate for Indigenous Australians minus the rate for other Australians.

Rate ratio Relative measure of inequality which is calculated as the rate for Indigenous Australians divided by the rate for other Australians. For the age-standardised case, it is the ratio of the observed to the expected number of cases had the rates for other Australians applied.

Revascularisation ('re-vesselling') Restoring adequate blood flow to the heart or other part of the body, usually after the supply has been reduced or blocked, as in *angina* or a *heart attack*. Revascularisation includes methods such as *PCI* and *coronary artery bypass graft surgery*.

Separation The formal process by which a hospital records the completion of treatment and/or care for an admitted patient.

Stroke When an artery supplying blood to the brain suddenly becomes blocked or bleeds. Often causes paralysis of parts of the body normally controlled by that area of the brain, or speech problems and other symptoms.

Torres Strait Islander A person who identifies as a Torres Strait Islander and is accepted as such by the community in which he or she lives.

Underlying cause of death The condition, disease or injury initiating the sequence of events leading to death, that is, the primary, chief, main or principal cause.

Unstable angina A form of *angina* that is more dangerous than normal angina but less so than a *heart attack*. It can feature chest pain that occurs at rest; and in someone who already has angina it can be marked by new onset of chest pain with exertion or pain that accelerates by coming on more easily, more often or for longer than previously.

References

- Abbot P & Close G 2002. Vascular health risks in the Aboriginal community: a cultural approach. *Australian Family Physician* 31: 605–10.
- Alter DA, Naylor CD, Austin PC & Tu JV 2001. Long-term MI outcomes at hospitals with or without on-site revascularisation. *JAMA* 285: 2,101–08.
- Australian Bureau of Statistics (ABS) 2003a. Causes of death. ABS cat. no. 3303.0. Canberra: ABS.
- ABS 2003b. Population by age and sex. ABS cat. No. 3201.0. Canberra: ABS.
- ABS 2004a. Experimental projections of the Aboriginal and Torres Strait Islander population, 1996 to 2006. ABS cat. no. 3231.0. Canberra: ABS.
- ABS 2004b. Population by age and sex. ABS cat. No. 3201.0. Canberra: ABS.
- Australian Bureau of Statistics & Australian Institute of Health and Welfare (ABS & AIHW) 2005. The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples. ABS cat. no. 4704.0. Canberra: ABS.
- Australian Institute of Health and Welfare (AIHW) 2004. Heart, stroke and vascular diseases – Australian facts 2004. AIHW cat. no. CVD 27. Canberra: AIHW and National Heart Foundation of Australia (Cardiovascular Disease Series no. 22).
- AIHW 2005a. Improving the quality of Indigenous identification in hospital separations data. AIHW cat. no. HSE 101. Canberra: AIHW (Health Services Series no. 25).
- AIHW 2005b. Australian hospital statistics 2003–04. AIHW cat. no. HSE 37. Canberra: AIHW (Health Services Series no. 23).
- AIHW: Davies 2003. Coronary revascularisation in Australia, 2000. Bulletin no. 7. AIHW cat. no. AUS 35. Canberra: AIHW.
- AIHW: Draper G, Turrell G & Oldenburg B 2004. Health inequalities in Australia: mortality. Health Inequalities Monitoring Series no. 1. AIHW cat. no. PHE 55. Canberra: Queensland University of Technology and AIHW.
- AIHW: Jamrozik K, Dobson A, Hobbs M et al. 2001. Monitoring the incidence of cardiovascular disease in Australia. AIHW cat. no. CVD 16. Canberra: AIHW (Cardiovascular Disease Series No. 17).
- AIHW: Mathur S 2002. Epidemic of coronary heart disease and its treatment in Australia. AIHW cat. no. CVD 21. Canberra: AIHW (Cardiovascular Disease Series No. 20).
- Breslow NE & Day NE 1987. Statistical methods in cancer research. Volume 2: The design and analysis of cohort studies. Lyon: International Agency for Research on Cancer.
- Brown A 2004. The context of indigenous cardiovascular disease. CARPA Newsletter 46 (March).
- Bunker S J, Colquhoun D M, Esler M D et al. 2003. Position statement. "Stress" and coronary heart disease: psychosocial risk factors, NHFA position statement update. *Medical Journal of Australia* 178(6): 272–6.
- Commonwealth Grants Commission (CGC) 2001. Report on Indigenous funding. Canberra: Commonwealth of Australia.

- Coory MD & Walsh WF 2005. Rates of percutaneous coronary interventions and bypass surgery after acute myocardial infarction in Indigenous patients. *Medical Journal of Australia* 182: 507–12.
- Cunningham J 2002. Diagnostic and therapeutic procedures among Australian hospital patients identified as Indigenous. *Medical Journal of Australia* 176: 58–62.
- Fisher D & Weeramanthri T 2002. Hospital care for Aboriginals and Torres Strait Islanders: appropriateness and decision making. *Medical Journal of Australia* 176(2): 49–51.
- Ford E & Cooper R 1995. Implications of race/ethnicity for health and health care use. Racial/ethnic differences in health care utilization of cardiovascular procedures: a review of the evidence. *HSR: Health Services Research* 30:1 (April 1995, Part 11): 237–52.
- Gruen R, Weeramanthri T & Bailie R 2002. Outreach and improved access to specialist services for indigenous people in remote Australia: the requirements for sustainability. *Journal of Epidemiology and Community Health* 56: 517–21.
- Khaykin Y, Austin PC, Tu KV & Alter DA. 2002. Utilisation of coronary angiography after acute myocardial infarction in Ontario over time: have referral patterns changed? *Heart* 88: 460–66.
- Knekt P, Alfthan G, Aromaa A et al. 2001. Homocysteine and major coronary events: a prospective population study amongst women. *Journal of Internal Medicine* 249: 461–65.
- Mackenbach JP & Kunst AE 1997. Measuring the magnitude of socio-economic inequalities in health: an overview of available measure illustrated with two examples from Europe. *Social Science and Medicine* 44(6): 757–71.
- National Health Performance Committee (NHPC) 2004. National report on health sector performance indicators 2003. AIHW cat. no. HWI 78. Canberra: AIHW.
- New Zealand Ministry of Health (NZ MOH) 2005. Decades of disparity II: socioeconomic mortality trends in New Zealand, 1981–1999. *Public Health Intelligence Occasional Bulletin* no. 25. Wellington: Ministry of Health.
- Paradies Y & Cunningham J 2002. Placing Aboriginal and Torres Strait Islander mortality in an international context. *Australian and New Zealand Journal of Public Health* 26: 11–16.
- Productivity Commission 2005. Impacts of medical technology in Australia. Research report. Melbourne: productivity commission.
- Rapola JM, Virtamo J, Ripatti S et al. 1997. Randomised trial of α -tocopherol and β -carotene supplements on incidence of major coronary events in men with previous myocardial infarction. *Lancet* 349: 1,715–20.
- Ring I & Firman D 1998. Reducing indigenous mortality in Australia: lessons from other countries. *Medical Journal of Australia* 169: 528–33.
- Robins SJ, Collins D, Wittes JT et al. 2001. Relation of Gemfibrozil treatment and lipid levels with major coronary events. *Journal of the American Medical Association* 285: 1,585–91.
- Rosengren A, Hawken S, Ôunpuu S et al. 2004. Association of psychosocial risk factors with risk of acute myocardial infarction in 11, 119 cases and 13, 648 controls from 52 countries (the INTERHEART study): case-control study. Published online September 3 2004 <http://image.thelancet.com/extras/04art8002web.pdf>.
- Rosenthal GE, Sarrazin MV & Hannan EL 2003. In-hospital mortality following coronary artery bypass graft surgery in veterans health administration and private sector hospitals. *Medical Care* 41(4): 522–35.
- Vagero D & Erikson R 1997. Comment: Socioeconomic inequalities in morbidity and mortality in western Europe. *Lancet* 350: 516.

Villareal RP, Lee V-V, Elayda MA & Wilson JM 2002. Coronary artery bypass surgery versus contrary stenting: risk-adjusted survival rates in 5,619 patients. Texas Heart Institute Journal 29: 3-9.