

6 Mortality differences by occupation

Occupation is a commonly used indicator of socioeconomic position (Liberatos et al. 1988; Berkman & Macintyre 1997; Krieger et al. 1997) and there now exists a large overseas literature documenting an association between occupation and mortality (Blakely 2002; Gregorio et al. 1997; Davey Smith et al. 1998). This evidence typically shows that persons employed in manual (blue-collar) occupations have higher mortality rates for most causes of death than their counterparts employed in managerial or professional occupations. Australian health researchers have also investigated the relationship between occupation and mortality (McMichael & Hartshorne 1980, 1982; Leeder et al. 1984; Gibberd et al. 1984; McMichael 1985; Dobson et al. 1991; Mathers 1994a; Bennett 1996; Burnley 1998, 1999), and these studies also show that death rates for most conditions are highest among blue-collar groups. A notable limitation of most of these earlier Australian studies was their near exclusive focus on occupational mortality among males. Occupational data on female decedents were not collected on death registration forms prior to the mid-1980s, and data collected in the years immediately after this period were very incomplete (Mathers 1994a) and hence too unreliable for any meaningful analysis to be undertaken.

In this chapter, we examine occupational mortality inequalities among males and females aged 25 to 54 years for the period 1998–2000. There are a number of potential sources of error and bias associated with the estimation of occupational inequalities which are outlined in more detail in the final section of this chapter. Briefly, our analysis was limited to persons aged 25–54 in an attempt to minimise any misclassification that might have arisen due to numerator or denominator inconsistencies. Restricting the age group to 25–54 is also consistent with the approach used by Mathers (1994a), thus allowing us to compare our findings with this earlier work. Error was also minimised by excluding decedents who were not in the workforce (e.g. the unemployed, home duties, retired, pensioners, and other miscellaneous groups) and members of the permanent defence force, diplomatic personnel of overseas governments, and members of non-Australian military forces stationed in Australia.

In this analysis, occupations were coded to the Australian Standard Classification of Occupations (ASCO) (ABS 1997b). ASCO is a skill-based measure that groups together occupations requiring similar levels of education, knowledge, responsibility, on-the-job training and experience. The occupational groupings are hierarchically ordered based on their relative skill levels, with those occupations having the most extensive skill requirements located at the top of the hierarchy (Turrell et al. 1994). As at 1998–2000, occupational information on death certificates (i.e. the numerator data) was coded in accordance with the first edition of ASCO, whereas occupation data collected from labour force surveys (i.e. the denominator data) were coded to the second edition of ASCO. Table 6.0.1 shows the major occupational groupings used in each edition.

Table 6.0.1: Australian Standard Classification of Occupations (ASCO) major groupings

ASCO First Edition	ASCO Second Edition
1. Managers and administrators	1. Managers and administrators
2. Professionals	2. Professionals
3. Para-professionals	3. Associate professionals
4. Tradespersons	4. Tradespersons and related workers
5. Clerks	5. Advanced clerical and service workers
6. Salespersons and personal services workers	6. Intermediate clerical, sales and service workers
7. Plant and machine operators, and drivers	7. Intermediate production and transport workers
8. Labourers and related workers	8. Elementary clerical, sales and service workers
	9. Labourers and related workers

The ASCO major occupation groups were subsequently re-categorised as follows:

ASCO First Edition (used for the numerator)

Managers, administrators & professionals	Groups 1, 2 and 3
White-collar	Groups 5 and 6
Blue-collar	Groups 4, 7 and 8

ASCO Second Edition (used for the denominator)

Managers, administrators & professionals	Groups 1, 2 and 3
White-collar	Groups 5, 6 and 8
Blue-collar	Groups 4, 7 and 9

The use of three broad occupational groupings allowed us to closely match the two different editions of ASCO, thus minimising any extraneous misclassification error. More generally, collapsing the original ASCO categories into three groups served to further dampen error resulting from other sources. Importantly, similar three-level classifications have been used by other Australian researchers, who have demonstrated that the categories are sufficiently sensitive to discriminate between occupation groups in terms of a range of health and social outcomes (Mathers 1994a; Bennett 1996; Turrell 2000c; Burton & Turrell 2000).

6.1 Occupational mortality inequalities among persons aged 25–54 years

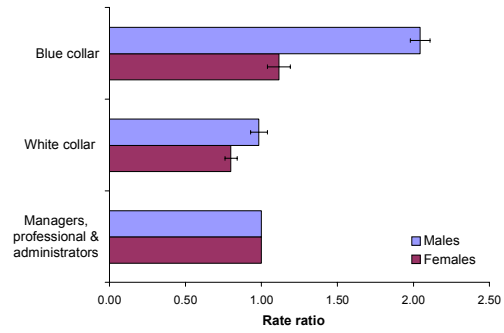
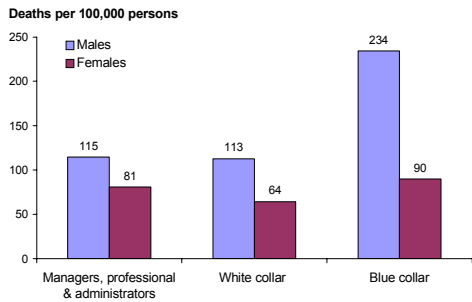
In 1998–2000, male blue-collar workers recorded an all-cause mortality rate of 234 deaths per 100,000 persons, whereas males employed in managerial, administrative and professional occupations recorded a rate of 115 deaths per 100,000 persons. This was a difference of 104%. The lowest male death rate (113 deaths per 100,000 persons), however, was observed among white-collar workers (Figure 6.1.1; Table 6.1.1). An identical mortality patterning was found among females, although the difference in all-cause death rates between the occupation groups was smaller than that observed for males.

Occupational differences were also found for a number of specific causes. Blue-collar workers, for example, had significantly higher death rates than managers, administrators and professionals for:

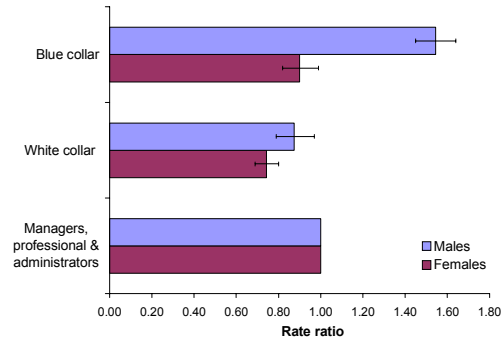
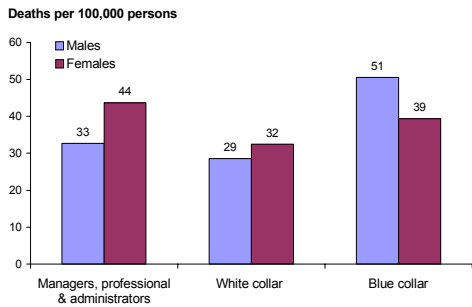
- all cancers: males 55% higher (18 more deaths per 100,000);
- diseases of the circulatory system: males 116% higher (24 more deaths per 100,000), females 74% higher (6 more deaths per 100,000);
- diseases of the respiratory system: males 129% higher (2 more deaths per 100,000), females 139% higher (2 more deaths per 100,000);
- diseases of the digestive system: males 212% higher (6 more deaths per 100,000); females 102% higher (2 more deaths per 100,000);
- accidents and injury: males 130% higher (55 more deaths per 100,000); and
- suicide: males 123% higher (23 more deaths per 100,000)

A more complicated specific-cause mortality pattern was found between managers, administrators and professionals, and white-collar workers. For some conditions, these groups had similar rates of death (e.g. lung cancer, diseases of the circulatory system); for other conditions white-collar workers experienced significantly higher death rates (e.g. diseases of the digestive system and liver among males). For other causes, white-collar workers recorded the lowest death rates (e.g. PYLL, all cancers, accidents and injury).

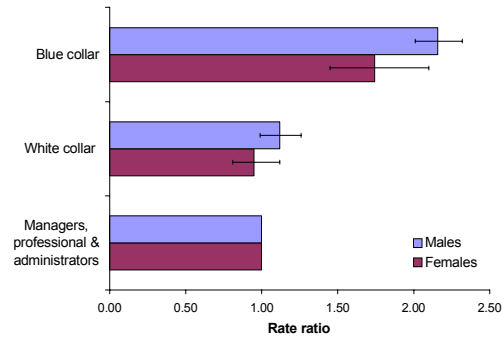
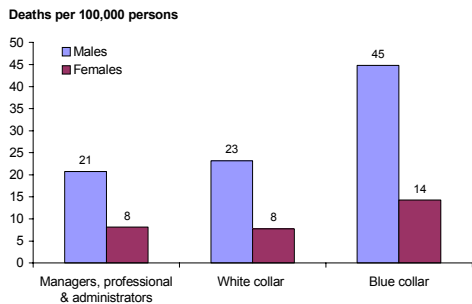
All causes



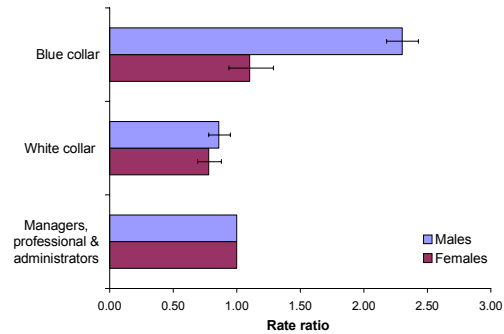
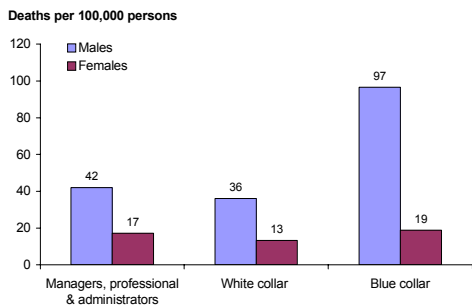
Cancers



Diseases of the circulatory system



Accidents and injury



Source: ABS mortality data.

Figure 6.1.1: Age-standardised mortality rates and rate ratios by occupation and sex, selected causes of death, persons aged 24–54 years, 1998–2000

Table 6.1.1: Age-standardised mortality rates and rate ratios by occupation and sex, persons aged 25–54 years, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>All causes</i>				
Managers, professionals & administrators	114.6	1.00	80.7	1.00
White-collar	112.5	0.98	64.5	0.80***
Blue-collar	234.2	2.04***	90.0	1.12***
<i>PYLL^(b)</i>				
Managers, professionals & administrators	39.8	1.00	27.1	1.00
White-collar	37.3	0.94*	21.7	0.80***
Blue-collar	80.0	2.01***	31.6	1.17***
<i>Potentially avoidable deaths</i>				
Managers, professionals & administrators	72.2	1.00	51.3	1.00
White-collar	74.8	1.04	41.1	0.80***
Blue-collar	153.5	2.13***	56.1	1.09*
<i>Cancers (C00–C97)</i>				
Managers, professionals & administrators	32.7	1.00	43.7	1.00
White-collar	28.6	0.87*	32.4	0.74***
Blue-collar	50.6	1.55***	39.4	0.90*
<i>Cancer of the digestive organs (C15–C26)</i>				
Managers, professionals & administrators	10.4	1.00	8.1	1.00
White-collar	8.7	0.84	5.7	0.70***
Blue-collar	14.1	1.36***	6.7	0.83
<i>Colon cancer (C18)</i>				
Managers, professionals & administrators	3.1	1.00	3.2	1.00
White-collar	2.6	0.82	2.2	0.59**
Blue-collar	3.4	1.08	2.2	0.68*
<i>Melanoma of skin (C43)</i>				
Managers, professionals & administrators	2.8	1.00	1.8	1.00
White-collar	2.2	0.79	2.1	1.19
Blue-collar	3.4	1.21	1.3	0.71
<i>Lung cancer (C33, C34)</i>				
Managers, professionals & administrators	3.9	1.00	3.5	1.00
White-collar	4.1	1.05	2.9	0.85
Blue-collar	9.9	2.55***	5.3	1.52**
<i>Breast cancer (C50)</i>				
Managers, professionals & administrators	—	—	15.4	1.00
White-collar	—	—	10.2	0.66***
Blue-collar	—	—	10.9	0.71***
<i>Cancer of the female genital organs (C51–C58)</i>				
Managers, professionals & administrators	—	—	4.3	1.00
White-collar	—	—	3.4	0.78*
Blue-collar	—	—	4.3	1.00
<i>Brain cancer (C71)</i>				
Managers, professionals & administrators	3.5	1.00	2.8	1.00
White-collar	2.3	0.65*	1.3	0.47***
Blue-collar	4.3	1.23*	2.3	0.80
<i>Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)</i>				
Managers, professionals & administrators	5.2	1.00	3.6	1.00
White-collar	4.2	0.81	3.2	0.91
Blue-collar	6.0	1.15	3.6	1.00

(continued)

Table 6.1.1 (continued): Age-standardised mortality rates and rate ratios by occupation and sex, persons aged 25–54 years, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>Mental and behavioural disorders due to psychoactive substance use (F10–F19)</i>				
Managers, professionals & administrators	3.3	1.00	1.1	1.00
White-collar	3.1	0.95	1.1	1.03
Blue-collar	12.0	3.69***	1.6	1.41
<i>Diseases of the circulatory system (I00–I99)</i>				
Managers, professionals & administrators	20.8	1.00	8.2	1.00
White-collar	23.2	1.12	7.8	0.95
Blue-collar	44.8	2.16***	14.3	1.74***
<i>Ischaemic heart disease (I20–I25)</i>				
Managers, professionals & administrators	13.8	1.00	2.6	1.00
White-collar	15.3	1.11	2.6	1.01
Blue-collar	29.9	2.16***	5.4	2.08***
<i>Acute myocardial infarction (I21)</i>				
Managers, professionals & administrators	6.5	1.00	1.4	1.00
White-collar	7.9	1.22	1.2	0.89
Blue-collar	13.3	2.05***	3.0	2.21***
<i>Cerebrovascular diseases (I60–I69)</i>				
Managers, professionals & administrators	2.8	1.00	3.0	1.00
White-collar	3.2	1.13	2.5	0.82
Blue-collar	5.6	2.00***	3.8	1.26
<i>Diseases of the respiratory system (J00–J99)</i>				
Managers, professionals & administrators	1.6	1.00	1.5	1.00
White-collar	2.1	1.31	2.0	1.30
Blue-collar	3.7	2.29***	3.6	2.39***
<i>Chronic lower respiratory disease (J40–J47)</i>				
Managers, professionals & administrators	0.9	1.00	1.0	1.00
White-collar	1.3	1.50	1.3	1.35
Blue-collar	2.1	2.49***	2.1	2.16**
<i>Diseases of the digestive system (K00–K93)</i>				
Managers, professionals & administrators	2.9	1.00	1.7	1.00
White-collar	4.8	1.63***	1.7	0.96
Blue-collar	9.2	3.12***	3.5	2.02***
<i>Diseases of the liver (K70–K77)</i>				
Managers, professionals & administrators	2.1	1.00	1.2	1.00
White-collar	4.2	1.99***	1.2	0.93
Blue-collar	7.2	3.45***	2.5	2.01**
<i>Accidents and injury (V01–Y98)</i>				
Managers, professionals & administrators	42.0	1.00	17.1	1.00
White-collar	36.0	0.86**	13.3	0.78***
Blue-collar	96.7	2.30***	18.8	1.10
<i>Transport accidents (V01–V99)</i>				
Managers, professionals & administrators	11.2	1.00	5.1	1.00
White-collar	7.3	0.65***	3.9	0.76*
Blue-collar	23.2	2.07***	5.3	1.03

(continued)

Table 6.1.1 (continued): Age-standardised mortality rates and rate ratios by occupation and sex, persons aged 25–54 years, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>Suicide (X60–X84)</i>				
Managers, professionals & administrators	18.4	1.00	6.5	1.00
White-collar	18.1	0.98	5.6	0.85
Blue-collar	41.0	2.23***	7.2	1.11

(a) Deaths per 100,000 persons.

(b) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Table 6.1.2 presents the number and percentage of deaths that would have been avoided in 1998–2000 if blue-collar workers experienced the same mortality rate as their counterparts in managerial, administrative and professional occupations. Among males, an estimated 5,642 deaths could have been avoided, and among females, 100 deaths. The small number of potentially avoidable deaths among females reflects the fact that, for many causes of death, blue-collar workers experienced similar or significantly lower rates of death than females employed in managerial, administrative or professional occupations (see Table 6.1.1).

Table 6.1.2: Excess mortality by occupation and sex, persons aged 25–54 years, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Number ^(a)	Per cent ^(b)	Number ^(a)	Per cent ^(b)
All causes	5,642	33.7	100	2.6
Cancers (C00–C97)	864	20.6	–60	2.9
Lung cancer (C33, C34)	291	41.7	27	13.3
Diseases of the circulatory system (I00–I99)	1,153	35.2	78	16.7
Stroke (I60–I69)	133	32.2	13	8.3
Diseases of the digestive system (K00–K93)	300	50.0	23	21.7
Accidents and injury (V01–Y98)	2,534	40.0	9	1.2

(a) Total number of deaths that would have been avoided if blue-collar workers experienced the same mortality rate as managerial, administrative or professional workers.

(b) Percentage of deaths that would have been avoided if blue-collar workers experienced the same mortality rate as managerial, administrative or professional workers.

Source: ABS mortality data.

6.2 Summary and discussion

This examination of the relationship between occupation and mortality has produced evidence that is difficult to summarise in general terms and, by extension, to interpret and understand. Arguably, the clearest mortality pattern was for male blue-collar workers: compared with managers, administrators, and professionals, this group had significantly higher death rates for all causes, and for the majority of specific causes. Differences in death rates between these two groups were especially large for lung cancer (155%, 6 more deaths per 100,000), mental and behavioural disorders due to psychoactive substance use (269%, 9 more deaths per 100,000), diseases of the digestive system (212%, 6 more deaths per 100,000) and diseases of the liver (245%, 5 more deaths per 100,000). Significantly higher death rates among male blue-collar workers have been reported in most other Australian studies investigating the relation between occupation and mortality. The large difference in death rates between male blue-collar workers

and managers, administrators, and professionals was reflected in the excess mortality estimates that were calculated, which showed that 5,642 deaths could have been avoided in 1998–2000 if the death rate among males employed in blue-collar jobs was equivalent to that of their counterparts in managerial, administrative, and professional occupations. The relationship between occupation and mortality was less clear and consistent for males employed in white-collar jobs. For many conditions, white-collar employees, and managers, administrators, and professionals, had very similar rates of death, whereas for PYLL, all cancers, brain cancer, total accidents and injury, and transport accidents, death rates among white-collar workers were significantly lower, and for diseases of the digestive system and liver, death rates were significantly higher among white-collar workers.

Among females, the patterning of occupational mortality was both similar to and different from that observed for males. Females employed in blue-collar jobs experienced significantly higher all-cause death rates than female managers, administrators, and professionals, and for a number of specific causes. Typically, the size of these mortality differentials was smaller than that found among males (although deaths from acute myocardial infarction and diseases of the respiratory system were notable exceptions). By contrast, death rates among female blue-collar workers were similar to or significantly lower than those among managers, administrators, and professionals for all cancers, and for most specific types of cancers (e.g. breast and colon), with the exception of lung cancer. Other studies have also reported higher death rates from breast and colon cancer among females employed in higher status occupations or from socioeconomically advantaged backgrounds (Faggiano et al. 1994; Smith et al. 1996; van Loon et al. 1995). The mixed and variable mortality patterning between female blue-collar workers and managers, administrators, and professionals was reflected in their excess mortality data. Specifically, higher death rates among blue-collar workers for some conditions, and lower death rates for others, seemingly had an overall equalising effect, such that when all deaths were considered in total, it showed that only 100 deaths could have been avoided in 1998–2000 if death rates among female blue-collar workers were equivalent to those of females in managerial, administrative, and professional occupations. Finally, when death rates between female white-collar workers and managers, administrators, and professionals were examined, we found that, for the majority of causes, death rates were similar or significantly lower among white-collar employees.

A number of data limitations and potential sources of bias need to be considered when interpreting the findings of this analysis of occupation and mortality. The most important issue is bias that arises from the fact that the numerator and denominator data in the mortality analysis are drawn from different sources (Blakely 2002; Bennett 1996; Mathers 1994a; Lee et al. 1987). This bias can arise from any of the following:

- *Last or current occupation:* Occupation information collected from death registrations comprises the numerator data in mortality analysis. As part of the death registration process, information is sought about the decedent's 'last occupation': this may or may not reflect their primary lifetime occupation, as some people change jobs (often into less demanding lower socioeconomic positions) as retirement approaches. By contrast, occupation information forming the denominator was collected using data from ABS labour force surveys, which ask about a person's current job, or their job held in the previous week.
- *Collection and reporting of occupation data:* Information about the decedent's last occupation is usually provided by a relative or acquaintance, and the tendency is to report jobs that are more socially desirable, or to elevate (promote) the occupational position or status of the deceased. This practice tends to artificially inflate the mortality rates of higher socioeconomic occupations and thus moderate mortality differences between occupational categories (Bennett 1996). Sometimes, occupational data on the deceased are provided by an institutional official (e.g. nursing home staff) who may have limited information about the deceased's last occupation. By contrast, occupational data from ABS labour force surveys are

usually self-reported by the survey respondent, and elicited by a trained interviewer using standardised procedures for data collection and recording.

- *Coding of occupation using different classifications:* For the period 1998–2000, occupation data collected during the death registration process was coded in accordance with the ASCO first edition, whereas data from the ABS labour force survey were coded using the ASCO second edition.

These and other sources of error associated with the use of different data for the numerator and denominator have a tendency to attenuate rather than widen occupational mortality inequalities. Thus, estimates reported in this chapter are likely to be somewhat smaller than the 'true' magnitude of occupational differences in mortality. Moreover, our use of three broad occupation categories, and limiting the analysis to persons aged 25–54 years, would have helped minimise error resulting from misclassification.

We also need to consider the possibility that the occupational differences in mortality were not due entirely to occupation per se but, rather, to the confounding effects of other socioeconomic factors that are associated with occupation, such as education and income. Given that socioeconomic measures correlate, the use of occupation on its own may have produced mis-estimated mortality rates.

Aside from misclassification and confounding, what substantive factors might have contributed to the occupational differences in mortality that were found in this chapter? It is difficult to answer this question in general terms, or with any certainty, as the relationship between occupation and mortality often showed a different pattern depending on sex, cause of death, and the occupation groups being compared. Thus, it seems that we need to seek explanations for occupational differences that are more narrowly conceived, that are specific to a particular cause or group of causes with a similar aetiological profile, and that occur over a similar timeframe. For example, the significantly higher mortality rate for blue-collar workers for diseases of the circulatory system, lung cancer, diseases of the digestive system, and accidents and injury might reflect different exposures to physical and environmental hazards in the workplace (Lund & Bjerkedal 2001; Park et al. 2002), or longer-term adverse changes to physiological and biological functioning brought about by the sustained influence (often over many decades) of adverse psychosocial processes such as perceived lack of control, empowerment, and autonomy in the workplace (Whitehead 1995; Theorell 2000; Marmot et al. 1999). Occupational differences in mortality for chronic disease probably also reflect health behaviour differences: there is now a large body of research showing that manual blue-collar groups are more likely to smoke (Mathers 1994a; Turrell et al. 2002b), are less likely to engage in physical activity sufficient for the accrual of health benefits (Burton & Turrell 2000), and less likely to have food and nutrient intakes that are consistent with lower risk for the onset of chronic disease (Turrell et al. 2003; Turrell et al. 2002a). Somewhat differently, higher mortality rates for breast cancer among females in managerial, administrative, and professional occupations are believed to be due in part to reproductive factors – nulliparity, late age at first birth, and late age at menopause – each of which are risk factors for breast cancer (McPherson et al. 2000) and each are more likely to characterise women from higher socioeconomic backgrounds (Heck & Pamuk 1997; Liu et al. 1998; Pukkala & Weiderpass 1999; Kelsey & Bernstein 1996). Nutritional differences between socioeconomic groups in childhood (i.e. higher energy intakes among girls from advantaged backgrounds) have also been suggested as a possible contributor to increased breast cancer mortality among women from higher socioeconomic groups (Lawson 1999).

Many of the 'explanations' for occupational differences in mortality are based on associational evidence and/or informed speculation, and numerous patterns in the data are difficult to account for. How, for example, can we explain higher rates of colon cancer among females in managerial, administrative, and professional occupations, for this group has a dietary profile that would seemingly reduce the risk of this condition. Further, how can we account for the fact that, with the exception of lung cancer, the occupational mortality profile for males and females for other

forms of cancer is completely opposite in direction. This evidence seems to suggest that exposure to socioeconomic advantage and disadvantage has differential effects on men's and women's health. Clearly, we are still some way from disentangling the complex relation between occupation and mortality for many conditions. For some relationships, however, such as higher lung cancer rates among blue-collar workers, the links are clearer and more strongly evidence-based, and thus present opportunities for policies and interventions to reduce the inequalities.

7 Mortality differences by country of birth

Previous research has found that Australian residents born overseas have lower mortality rates for most causes of death than those born in Australia (Lee et al. 1987; Young 1992; Mathers 1994a; Singh & de Looper 2002; AIHW 2002). There are, however, a number of exceptions to this otherwise general and consistent pattern. Death rates due to lung cancer are reportedly higher among Australian residents from the UK and Ireland, as are death rates from breast cancer (Mathers 1994a; AIHW 2002). These studies have also shown that Australian residents born in Asia experience significantly higher mortality rates for diabetes mellitus.

This chapter examines the mortality profile of overseas and Australian-born residents aged 15–24, 25–64, and 65 years and over, for the period 1998–2000. As part of the death registration process, country of birth is coded in accordance with the ABS Standard Australian Classification of Countries (ABS 1998a). For this present analysis, country of birth was categorised into five birthplace groups as follows:

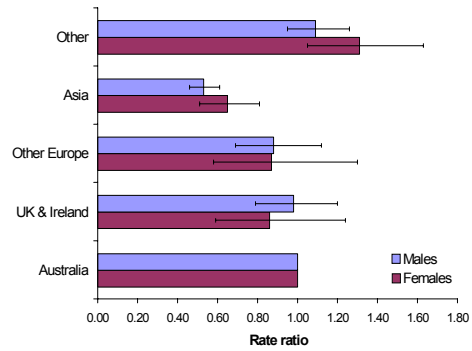
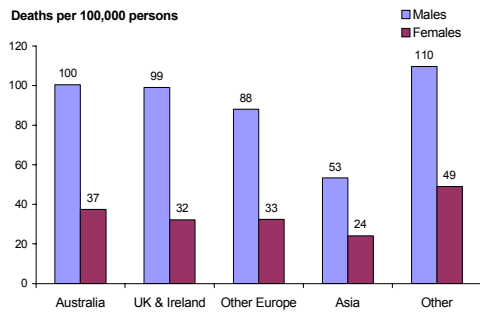
- Australia
- UK & Ireland United Kingdom and Ireland
- Other Europe continental Europe, including Eastern Europe, the former USSR and Baltic states
- Asia includes Northeast, Southeast and Southern Asia, the Middle East, and Northern Africa
- Other includes New Zealand, Oceania, North and South America, and Southern Africa

The use of these broad birthplace categories was necessary due to the small numbers of deaths for many individual countries. The categories are also consistent with those used in previous studies of mortality differentials by birthplace (Mathers 1994a; AIHW 2002), thus allowing us to compare our findings with this earlier work.

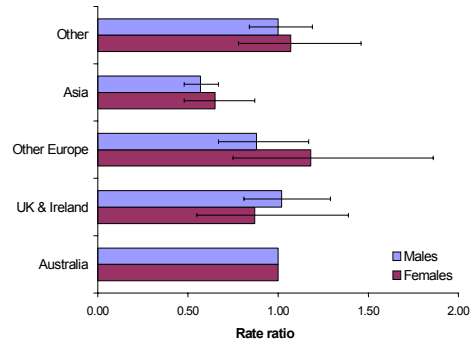
7.1 Persons aged 15–24 years

In 1998–2000, Australian residents aged 15–24 years who were born in the UK & Ireland, Other Europe or Asia experienced lower all-cause mortality rates than their Australian-born counterparts; however, only death rates among Asian-born residents reached statistical significance (Figure 7.1.1; Table 7.1.1). Residents from countries classified as ‘Other’ experienced higher all-cause death rates than the Australian-born, although the rates only reached statistical significance for females. Mortality rates for potentially avoidable causes of death, and accidents and injury, were significantly lower among Australian residents born in Asia (Table 7.1.1).

All causes



Accidents and injury



Source: ABS mortality data.

Figure 7.1.1: Age-standardised mortality rates and rate ratios, selected causes of death by country of birth, persons aged 15–24 years, 1998–2000

Table 7.1.1: Age-standardised mortality rates and rate ratios by country of birth, persons aged 15–24 years, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>All causes</i>				
Australia	100.5	1.00	37.5	1.00
UK & Ireland	99.1	0.98	32.2	0.86
Other Europe	88.1	0.88	32.6	0.87
Asia	53.4	0.53***	24.2	0.65***
Other	109.6	1.09	49.0	1.31*
<i>Potentially avoidable deaths</i>				
Australia	61.4	1.00	21.1	1.00
UK & Ireland	62.1	1.01	17.6	0.84
Other Europe	55.7	0.91	24.7	1.17
Asia	32.7	0.53***	13.5	0.64**
Other	60.9	0.99	24.7	1.17
<i>Accidents and injury (V01–Y98)</i>				
Australia	73.2	1.00	22.1	1.00
UK & Ireland	74.7	1.02	19.3	0.87
Other Europe	94.7	0.88	26.0	1.18
Asia	41.4	0.57***	14.2	0.65**
Other	73.1	1.00	23.5	1.07

(a) Deaths per 100,000 persons.

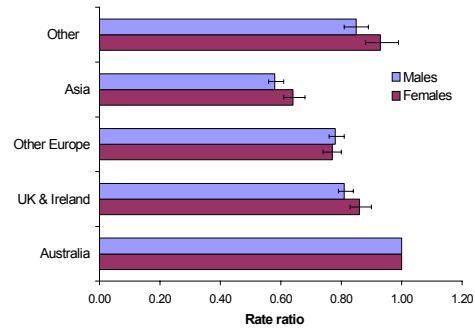
Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

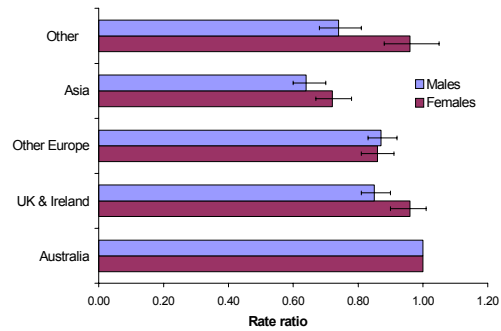
7.2 Persons aged 25–64 years

Overseas-born residents aged 25–64 experienced significantly lower all-cause mortality rates than the Australian-born in 1998–2000, with males and females from Asia exhibiting the lowest rates (42% and 36% lower than the Australian-born respectively) (Figure 7.2.1; Table 7.2.1). The overseas-born also experienced significantly lower mortality rates for most specific causes of death, including all cancers, colon and lung cancer, diseases of the circulatory system, diseases of the respiratory system, and accidents and injury. There were, however, a number of exceptions to this pattern: compared with Australian-born females, death rates among females from the UK and Ireland were 13% higher for breast cancer (3 more deaths per 100,000) and 52% higher for diseases of the liver (2 more deaths per 100,000); and 37% higher among females from 'Other' countries for cancer of the genital organs (3 more deaths per 100,000).

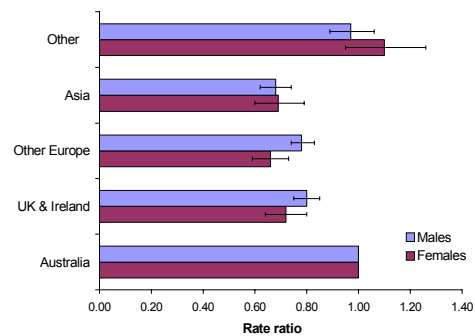
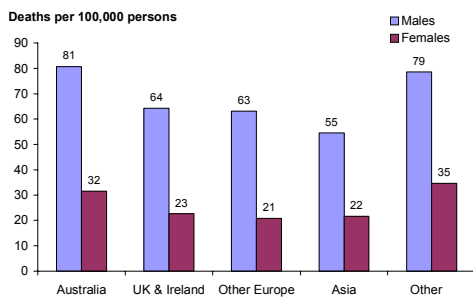
All causes



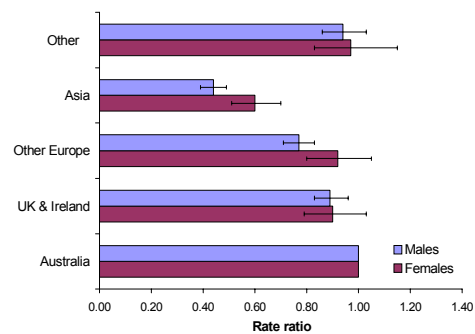
Cancers



Diseases of the circulatory system



Accidents and injury



Source: ABS mortality data.

Figure 7.2.1: Age-standardised mortality rates and rate ratios, selected causes by country of birth and sex, persons aged 25–64 years, 1998–2000

Table 7.2.1: Age-standardised mortality rates and rate ratios, persons aged 25–64 years by country of birth and sex, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>All causes</i>				
Australia	331.2	1.00	181.7	1.00
UK & Ireland	269.6	0.81***	157.0	0.86***
Other Europe	259.7	0.78***	139.4	0.77***
Asia	192.4	0.58***	117.0	0.64***
Other	281.2	0.85***	169.4	0.93*
<i>PYLL^(b)</i>				
Australia	81.0	1.00	42.6	1.00
UK & Ireland	72.8	0.90***	42.2	0.99
Other Europe	78.3	0.97*	42.8	1.01
Asia	41.7	0.51***	24.9	0.58***
Other	67.2	0.83***	37.0	0.87***
<i>Potentially avoidable deaths</i>				
Australia	214.6	1.00	113.9	1.00
UK & Ireland	174.5	0.81***	97.1	0.85***
Other Europe	168.6	0.79***	87.5	0.77***
Asia	121.3	0.57***	72.7	0.64***
Other	182.0	0.85***	105.2	0.92*
<i>Cancers (C00–C97)</i>				
Australia	106.6	1.00	87.6	1.00
UK & Ireland	90.9	0.85***	83.8	0.96
Other Europe	93.1	0.87***	75.2	0.86***
Asia	68.7	0.64***	63.4	0.72***
Other	78.7	0.74***	84.3	0.96
<i>Cancer of the digestive organs (C15–C26)</i>				
Australia	31.8	1.00	18.4	1.00
UK & Ireland	27.1	0.85***	15.2	0.83**
Other Europe	31.1	0.98	18.8	1.02
Asia	28.0	0.88*	16.9	0.92
Other	26.6	0.84*	16.8	0.91
<i>Colon cancer (C18)</i>				
Australia	10.8	1.00	7.9	1.00
UK & Ireland	7.6	0.70***	5.6	0.71**
Other Europe	8.2	0.75***	5.9	0.75**
Asia	4.4	0.40***	4.3	0.55***
Other	9.2	0.85	6.4	0.81
<i>Melanoma of skin (C43)</i>				
Australia	6.2	1.00	3.6	1.00
UK & Ireland	2.8	0.46***	1.6	0.44***
Other Europe	2.4	0.39***	1.0	0.28***
Asia	—	—	—	—
Other	4.0	0.64*	2.9	0.62
<i>Lung cancer (C33, C34)</i>				
Australia	24.1	1.00	12.2	1.00
UK & Ireland	22.0	0.91	12.8	1.05
Other Europe	23.4	0.97	7.9	0.65***
Asia	15.7	0.65***	8.2	0.67***
Other	17.3	0.72***	11.6	0.95

(continued)

Table 7.2.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by country of birth and sex, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>Breast cancer (C50)</i>				
Australia	—	—	22.8	1.00
UK & Ireland	—	—	25.9	1.13*
Other Europe	—	—	20.8	0.91
Asia	—	—	16.3	0.72***
Other	—	—	21.5	0.94
<i>Cancer of the female genital organs (C51–C58)</i>				
Australia	—	—	8.6	1.00
UK & Ireland	—	—	8.2	0.95
Other Europe	—	—	7.5	0.86
Asia	—	—	7.9	0.92
Other	—	—	11.8	1.37**
<i>Cancer of the brain (C71)</i>				
Australia	6.4	1.00	3.7	1.00
UK & Ireland	6.3	0.99	4.1	1.11
Other Europe	5.0	0.79*	3.5	0.94
Asia	2.6	0.41**	2.1	0.57*
Other	3.6	0.57**	3.4	0.93
<i>Cancer in the lymphoid, haematopoietic and related tissue (C81–C96)</i>				
Australia	10.8	1.00	7.9	1.00
UK & Ireland	11.2	1.04	6.3	0.80*
Other Europe	9.1	0.84*	6.8	0.86
Asia	8.9	0.83	5.3	0.67**
Other	11.7	1.08	8.0	1.02
<i>Mental and behavioural disorders due to psychoactive substance use (F10–F19)</i>				
Australia	9.8	1.00	2.6	1.00
UK & Ireland	9.0	0.92	2.4	0.92
Other Europe	6.2	0.63***	1.2	0.45**
Asia	3.5	0.36***	0.8	0.31***
Other	6.7	0.69**	2.0	0.77
<i>Diseases of the circulatory system (I00–I99)</i>				
Australia	80.7	1.00	31.6	1.00
UK & Ireland	64.2	0.80***	22.7	0.72***
Other Europe	63.1	0.78***	20.8	0.66***
Asia	54.5	0.68**	21.7	0.69***
Other	78.6	0.97	34.6	1.10
<i>Ischaemic heart disease (I20–I25)</i>				
Australia	55.4	1.00	15.5	1.00
UK & Ireland	45.5	0.82***	9.4	0.61***
Other Europe	44.1	0.80***	10.0	0.64***
Asia	37.8	0.68***	7.6	0.49***
Other	54.1	0.98	15.2	0.98
<i>Acute myocardial infarction (I21)</i>				
Australia	26.2	1.00	6.8	1.00
UK & Ireland	23.5	0.90*	4.4	0.65***
Other Europe	23.0	0.88**	4.1	0.61***
Asia	17.5	0.67***	3.4	0.51***
Other	29.1	1.11	7.4	1.10

(continued)

Table 7.2.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by country of birth and sex, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>Stroke (I60–I69)</i>				
Australia	10.1	1.00	7.4	1.00
UK & Ireland	7.6	0.75**	7.2	0.98
Other Europe	8.4	0.83*	4.9	0.67***
Asia	8.8	0.88	8.4	1.14
Other	10.3	1.02	8.5	1.15
<i>Diseases of the respiratory system (J00–J99)</i>				
Australia	13.5	1.00	10.1	1.00
UK & Ireland	9.0	0.67***	7.5	0.74**
Other Europe	5.8	0.43***	3.3	0.33***
Asia	4.9	0.36***	3.0	0.29***
Other	7.4	0.55***	7.7	0.76
<i>Chronic lower respiratory disease (J40–J47)</i>				
Australia	9.3	1.00	7.6	1.00
UK & Ireland	5.4	0.58***	5.5	0.73
Other Europe	3.6	0.38***	2.2	0.28**
Asia	2.9	0.32***	1.7	0.22***
Other	4.3	0.46***	5.2	0.68*
<i>Diseases of the digestive system (K00–K93)</i>				
Australia	13.5	1.00	6.0	1.00
UK & Ireland	12.2	0.91	7.1	1.18
Other Europe	11.0	0.82**	5.0	0.83
Asia	6.7	0.50***	1.8	0.31***
Other	10.4	0.77*	4.1	0.68*
<i>Diseases of the liver (K70–K77)</i>				
Australia	9.8	1.00	3.4	1.00
UK & Ireland	9.1	0.93	5.1	1.52***
Other Europe	8.8	0.90	3.3	0.99
Asia	4.7	0.47***	0.8	0.24***
Other	7.7	0.78	2.1	0.63
<i>Accidents and injury (V01–Y98)</i>				
Australia	73.5	1.00	21.1	1.00
UK & Ireland	65.4	0.89**	19.0	0.89
Other Europe	56.6	0.77***	19.4	0.77
Asia	32.2	0.44***	12.6	0.44***
Other	69.2	0.94	20.5	0.94
<i>Transport accidents (V01–V99)</i>				
Australia	16.7	1.00	5.2	1.00
UK & Ireland	16.9	0.77**	4.5	0.88
Other Europe	12.5	0.75***	4.6	0.89
Asia	8.8	0.53***	4.5	0.87
Other	17.4	1.05	4.8	0.94

(continued)

Table 7.2.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by country of birth and sex, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>Suicide (X60–X84)</i>				
Australia	31.2	1.00	7.5	1.00
UK & Ireland	29.7	0.95	6.4	0.86
Other Europe	24.9	0.80***	8.0	1.06
Asia	9.6	0.31***	4.3	0.57***
Other	26.5	0.85*	8.6	1.14

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

7.3 Persons aged 65 years and over

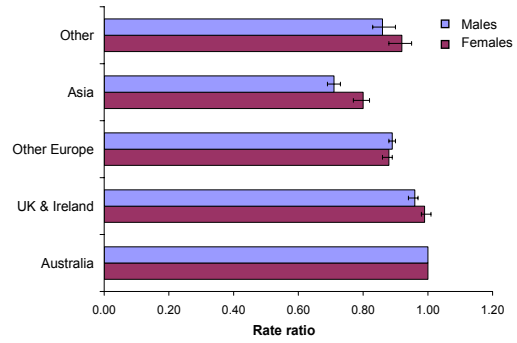
In this report, deaths among those aged 65 years and over are expressed as rates per 1,000 persons, which is consistent with the earlier (benchmark) work of Mathers (1994b).

In 1998–2000, Australian residents aged 65 years or more who were born overseas experienced significantly lower all-cause mortality rates than the Australian-born, with residents from Asia experiencing the lowest rates (Figure 7.3.1; Table 7.3.1). A similar pattern was observed for the majority of specific causes of death; however, mortality rates were significantly higher among overseas born residents for the following conditions:

- all cancers: females from UK & Ireland;
- cancer of the pancreas: females from Other Europe;
- lung cancer: males and females from UK & Ireland; males from Other Europe;
- endocrine, nutritional and metabolic disorders: males and females from UK & Ireland and Other Europe;
- diabetes mellitus: males and females from Other Europe and Asia, and females from Other countries;
- Alzheimer’s disease: females from UK & Ireland;
- diseases of the respiratory system: males and females from UK & Ireland;
- chronic lower respiratory disease: females from UK & Ireland;
- renal failure: females from Other Europe; and
- accidents and injury: females from Other countries.

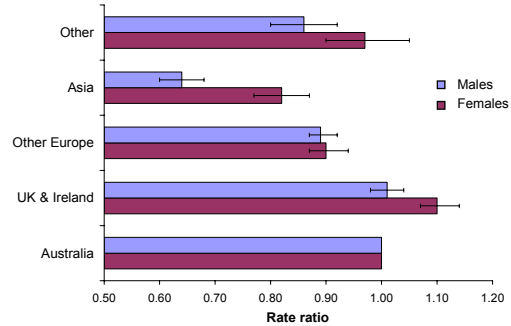
All causes

Deaths per 1,000 persons



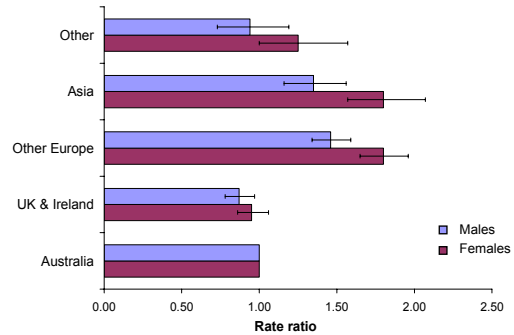
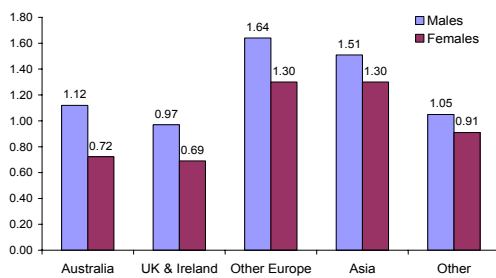
Cancers

Deaths per 1,000 persons



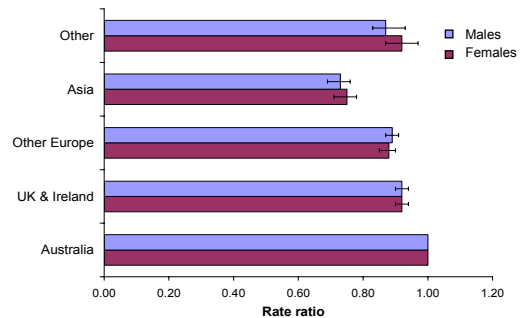
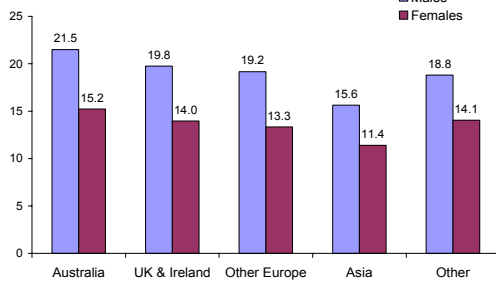
Diabetes

Deaths per 1,000 persons



Diseases of the circulatory system

Deaths per 1,000 persons



Source: ABS mortality data.

Figure 7.3.1: Age-standardised mortality rates and rate ratios, selected causes by country of birth and sex, persons aged 65 years and over, 1998–2000

Table 7.3.1: Age-standardised mortality rates and rate ratios, persons aged 65 years and over by country of birth and sex, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>All causes</i>				
Australia	50.52	1.00	32.38	1.00
UK & Ireland	48.26	0.96***	32.20	0.99
Other Europe	44.97	0.89***	28.36	0.88***
Asia	35.85	0.83***	25.80	0.80***
Other	43.69	0.86***	29.64	0.92***
<i>Cancers (C00–C97)</i>				
Australia	14.86	1.00	7.65	1.00
UK & Ireland	15.01	1.01	8.44	1.10***
Other Europe	13.25	0.89***	6.91	0.90***
Asia	9.52	0.64***	6.27	0.82***
Other	12.76	0.86***	7.44	0.97
<i>Cancer of the digestive organs (C15–C26)</i>				
Australia	3.95	1.00	2.37	1.00
UK & Ireland	3.97	1.01	2.34	0.98
Other Europe	3.85	0.97	2.29	0.96
Asia	2.98	0.76***	2.30	0.97
Other	3.61	0.91	1.95	0.82*
<i>Colon cancer (C18)</i>				
Australia	1.36	1.00	0.94	1.00
UK & Ireland	1.14	0.84***	0.76	0.80***
Other Europe	1.00	0.74***	0.69	0.74***
Asia	0.65	0.48***	0.55	0.59***
Other	1.03	0.76*	0.71	0.76*
<i>Cancer of the pancreas (C25)</i>				
Australia	0.58	1.00	0.46	1.00
UK & Ireland	0.64	1.09	0.52	1.11
Other Europe	0.65	1.12	0.55	1.18*
Asia	0.42	0.72*	0.51	1.10
Other	0.64	1.11	0.46	0.99
<i>Lung cancer (C33, C34)</i>				
Australia	3.27	1.00	1.14	1.00
UK & Ireland	4.18	1.28***	1.87	1.65***
Other Europe	3.48	1.06*	0.82	0.72***
Asia	2.39	0.73***	0.89	0.78**
Other	3.11	0.95	1.19	1.05
<i>Breast cancer (C50)</i>				
Australia	—	—	0.97	1.00
UK & Ireland	—	—	1.04	1.07
Other Europe	—	—	0.85	0.87**
Asia	—	—	0.68	0.70***
Other	—	—	1.15	1.18
<i>Cancer of the male genital organs (C60–63)</i>				
Australia	2.68	1.00	—	—
UK & Ireland	2.27	0.85***	—	—
Other Europe	1.62	0.61***	—	—
Asia	1.13	0.42***	—	—
Other	1.88	0.70***	—	—

(continued)

Table 7.3.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by country of birth and sex, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>Prostate cancer (C61)</i>				
Australia	2.66	1.00	—	—
UK & Ireland	2.24	0.84***	—	—
Other Europe	1.61	0.60***	—	—
Asia	1.11	0.42***	—	—
Other	1.85	0.69***	—	—
<i>Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)</i>				
Australia	1.36	1.00	0.85	1.00
UK & Ireland	1.26	0.92	0.82	0.96
Other Europe	1.40	1.02	0.85	0.10
Asia	1.07	0.79**	0.72	0.85
Other	1.37	1.00	0.90	1.06
<i>Endocrine, nutritional and metabolic diseases (E00–E90)</i>				
Australia	1.45	1.00	1.02	1.00
UK & Ireland	1.25	0.87**	0.98	0.96
Other Europe	2.02	1.40***	1.57	1.54***
Asia	1.77	1.22**	1.63	1.59***
Other	1.28	0.88	1.12	1.09
<i>Diabetes mellitus (E10–E14)</i>				
Australia	1.12	1.00	0.72	1.00
UK & Ireland	0.97	0.87**	0.69	0.95
Other Europe	1.64	1.46***	1.30	1.80***
Asia	1.51	1.35***	1.30	1.80***
Other	1.05	0.94	0.91	1.25*
<i>Diseases of the nervous system (G00–G99)</i>				
Australia	1.39	1.00	1.13	1.00
UK & Ireland	1.45	1.04	1.17	1.04
Other Europe	1.14	0.82***	0.79	0.70***
Asia	0.97	0.70***	0.63	0.56***
Other	1.31	0.94	0.95	0.84
<i>Alzheimer's disease (G30)</i>				
Australia	0.50	1.00	0.60	1.00
UK & Ireland	0.54	1.07	0.70	1.17**
Other Europe	0.37	0.74***	0.39	0.66***
Asia	0.21	0.42***	0.28	0.47***
Other	0.51	1.01	0.35	0.59**
<i>Diseases of the circulatory system (I00–I99)</i>				
Australia	21.48	1.00	15.22	1.00
UK & Ireland	19.75	0.92***	13.96	0.92***
Other Europe	19.17	0.89***	13.34	0.88***
Asia	15.64	0.73***	11.39	0.75***
Other	18.80	0.87***	14.05	0.92**
<i>Ischaemic heart disease (I20–I25)</i>				
Australia	12.42	1.00	7.46	1.00
UK & Ireland	11.70	0.94***	7.07	0.95***
Other Europe	11.16	0.90***	6.67	0.89***
Asia	8.83	0.71***	5.40	0.72***
Other	10.76	0.87***	6.88	0.92*

(continued)

Table 7.3.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by country of birth and sex, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>Acute myocardial infarction (I21)</i>				
Australia	6.95	1.00	4.26	1.00
UK & Ireland	6.61	0.95*	4.17	0.98
Other Europe	6.11	0.88***	3.80	0.89***
Asia	4.66	0.67***	2.98	0.70***
Other	5.76	0.83***	3.70	0.87**
<i>Pulmonary heart disease of pulmonary circulation and other forms of heart disease (I26–I52)</i>				
Australia	2.52	1.00	2.11	1.00
UK & Ireland	2.31	0.91*	1.89	0.90***
Other Europe	2.41	0.96	1.98	0.94
Asia	1.86	0.74***	1.47	0.70***
Other	2.44	0.97	1.73	0.82**
<i>Heart failure (I50)</i>				
Australia	1.04	1.00	0.95	1.00
UK & Ireland	0.97	0.93	0.85	0.90*
Other Europe	0.97	0.93	0.87	0.92
Asia	0.78	0.75**	0.75	0.79**
Other	0.85	0.81	0.78	0.82
<i>Stroke (I60–I69)</i>				
Australia	4.65	1.00	4.24	1.00
UK & Ireland	4.01	0.86***	3.79	0.89***
Other Europe	4.09	0.88***	3.50	0.82***
Asia	3.67	0.79***	3.54	0.83***
Other	3.92	0.84**	4.16	0.98
<i>Diseases of arteries, arterioles and capillaries (I70–I79)</i>				
Australia	1.33	1.00	0.79	1.00
UK & Ireland	1.32	0.99	0.70	0.88**
Other Europe	1.08	0.81***	0.58	0.73***
Asia	0.78	0.59***	0.49	0.61***
Other	1.23	0.92	0.77	0.98
<i>Diseases of the respiratory system (J00–J99)</i>				
Australia	5.25	1.00	2.68	1.00
UK & Ireland	5.17	1.16***	3.11	1.16***
Other Europe	3.61	0.56***	1.51	0.56***
Asia	3.15	0.61***	1.63	0.61***
Other	4.31	0.44***	1.19	0.44***
<i>Influenza and pneumonia (J10–J18)</i>				
Australia	0.94	1.00	0.71	1.00
UK & Ireland	0.95	1.01	0.78	1.09
Other Europe	0.76	0.81***	0.45	0.63***
Asia	0.54	0.58***	0.51	0.72**
Other	0.93	0.99	0.55	0.76*
<i>Chronic lower respiratory disease (J40–J47)</i>				
Australia	3.49	1.00	1.57	1.00
UK & Ireland	3.25	0.93*	1.85	1.18***
Other Europe	2.07	0.59***	0.66	0.42***
Asia	1.89	0.54***	0.72	0.46***
Other	2.66	0.76***	1.19	0.76**

(continued)

Table 7.3.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by country of birth and sex, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>Diseases of the digestive system (K00–K93)</i>				
Australia	1.45	1.00	1.11	1.00
UK & Ireland	1.37	0.94	1.15	1.40
Other Europe	1.25	0.86**	0.87	0.79***
Asia	1.03	0.71***	0.90	0.81*
Other	1.05	0.72**	0.87	0.78*
<i>Diseases of the genitourinary system (N00–N99)</i>				
Australia	1.17	1.00	0.86	1.00
UK & Ireland	1.04	0.89*	0.75	0.88**
Other Europe	1.22	1.04	0.84	0.98
Asia	1.01	0.86	1.00	1.16
Other	1.01	0.86	0.68	0.79
<i>Renal failure (N17–N19)</i>				
Australia	0.81	1.00	0.51	1.00
UK & Ireland	0.69	0.86*	0.46	0.90
Other Europe	0.88	1.09	0.53	1.05
Asia	0.78	0.97	0.71	1.40***
Other	0.70	0.87	0.49	0.97
<i>Accidents and injury (V01–Y98)</i>				
Australia	1.15	1.00	0.67	1.00
UK & Ireland	1.06	0.92	0.66	0.98
Other Europe	1.22	1.06	0.74	1.10
Asia	0.84	0.73**	0.63	0.93
Other	1.13	0.98	0.89	1.32*
<i>Falls (W00–W19)</i>				
Australia	0.17	1.00	0.12	1.00
UK & Ireland	0.17	0.98	0.10	0.87
Other Europe	0.15	0.89	0.08	0.71*
Asia	0.11	0.62	0.10	0.85
Other	0.19	1.09	0.14	1.13

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Persons aged 65–74 years, and 75 years and over

Overseas-born Australian residents aged 65–74 years, and 75 years or more, experienced significantly lower all-cause mortality rates than their Australian-born counterparts, with residents from Asia experiencing the lowest death rates. A similar pattern was observed for a number of specific conditions, most notably for diseases of the circulatory system. However, death rates among overseas-born residents were significantly higher for:

- all cancers: among males aged 75 years or more and females aged 65–74 and 75 years or more from UK & Ireland;
- diabetes mellitus: among males and females in both age groups from Other Europe and Asia, and females aged 65–74 from Other countries; and
- accidents and injury: among females aged 65–74 from Other countries.

Table 7.3.2: Age-standardised mortality rates and rate ratios, females aged 65–74 years and 75 years and over by country of birth, 1998–2000

	Males				Females			
	65–74 years		75 years and older		65–74 years		75 years and older	
	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio	Rate ^(a)	Rate ratio
<i>All causes</i>								
Australia	25.91	1.00	88.37	1.00	13.82	1.00	60.92	1.00
UK & Ireland	23.35	0.90***	86.57	0.98*	14.19	1.03	59.90	0.98*
Other Europe	22.50	0.87***	79.52	0.90***	11.34	0.82***	54.55	0.90***
Asia	18.22	0.70***	62.96	0.71***	10.60	0.77***	49.17	0.81***
Other	22.46	0.87***	76.35	0.86***	13.02	0.94	55.20	0.91***
<i>Cancers (C00–C97)</i>								
Australia	10.46	1.00	21.62	1.00	5.62	1.00	10.78	1.00
UK & Ireland	9.90	0.95*	22.86	1.06**	6.32	1.12***	11.70	1.09***
Other Europe	9.23	0.88***	19.44	0.90***	4.68	0.83***	10.34	0.96
Asia	6.35	0.61***	14.38	0.67***	4.03	0.72***	9.71	0.90**
Other	8.54	0.82***	19.24	0.89*	5.39	0.96	10.60	0.98
<i>Diabetes mellitus (E10–E14)</i>								
Australia	0.63	1.00	1.87	1.00	0.38	1.00	1.25	1.00
UK & Ireland	0.54	0.86	1.63	0.87*	0.33	0.86	1.25	1.00
Other Europe	0.85	1.34***	2.85	1.52***	0.61	1.62***	2.35	1.88***
Asia	0.99	1.55***	3.32	1.24*	0.69	1.83***	2.24	1.79***
Other	0.70	1.10	1.59	0.85	0.62	1.65**	1.34	1.07
<i>Diseases of the circulatory system (I00–I99)</i>								
Australia	9.07	1.00	40.57	1.00	4.43	1.00	31.82	1.00
UK & Ireland	8.03	0.88***	37.78	0.93***	3.98	0.90**	29.30	0.92***
Other Europe	8.26	0.91***	35.95	0.89***	3.83	0.86***	27.96	0.88***
Asia	7.13	0.79***	28.74	0.71***	3.42	0.77***	23.66	0.74***
Other	8.54	0.94	34.56	0.85***	4.25	0.96	29.13	0.92***
<i>Accidents and injury (V01–Y98)</i>								
Australia	0.66	1.00	1.91	1.00	0.29	1.00	1.26	1.00
UK & Ireland	0.53	0.80	1.87	0.98	0.27	0.94	1.25	0.99
Other Europe	0.66	1.00	2.07	1.09	0.34	1.19	1.35	1.07
Asia	0.43	0.65**	1.48	0.77*	0.33	1.15	1.08	0.85
Other	0.72	1.08	1.79	0.92	0.47	1.62*	1.53	1.22

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

7.4 Summary and discussion

Generally, in 1998–2000, Australian residents who were born overseas had a better mortality profile than the Australian-born. Irrespective of age, residents from the UK and Ireland, Other Europe, Asia, and countries classified as ‘Other’ experienced significantly lower mortality rates for all causes of death combined, and for most specific causes. These patterns concur with that reported in earlier investigations of the relationship between country of birth and mortality (Mathers 1994a, 1994b, 1996; AIHW 2002; Taylor et al. 1999; Powles & Gifford 1990; Easthope 1995; Strong et al. 1998b). A number of findings of this present study, however, ran counter to that observed in some of this previous work. Mathers (1994a), for example, using mortality data for the period 1985–87, found that males and females aged 25–64 from the UK and Ireland experienced significantly higher death rates from lung cancer than the Australian-born; whereas we found that lung cancer mortality rates between these countries were similar, possibly reflecting a convergence in rates of smoking in more recent decades. The AIHW (2002), using mortality data for the period 1997–1999, also reported significantly higher mortality rates for lung cancer among males and females from the UK and Ireland. Consistent across most studies conducted to date are findings showing that mortality from breast cancer is significantly higher among females from the UK and Ireland, and that diabetes mellitus is higher among Australian residents from Asia and Other Europe.

The main reason for lower mortality rates among Australian residents born overseas is health selection (Mathers 1994a; AIHW 2002). Specifically, the Australian government requires that migrants meet strict health criteria prior to migration being authorised. Also, residents of overseas countries with poor health are less likely to have the financial resources or capacity needed to initiate or pursue a migration application. Other factors likely to contribute to lower death rates among the overseas-born include the protective effect of some lifestyle behaviours (e.g. diets low in saturated fat) and more favourable genetic constitutions. Importantly, the size of the mortality inequality between overseas and Australian-born residents is not constant but, rather, mortality rates among those born overseas tend to increase with length of residency such that, over time, differences in death rates by birthplace narrow. This process seems in part to be the result of migrants adopting the lifestyle behaviours and cultural practices of the host country. It may also be the case that some aspects of the culture and lifestyle of overseas-born Australians increase the risk of some types of mortality. Higher rates of breast and genital cancer among some migrant groups, for example, might reflect ethnic differences in health service use, the diffusion and uptake of health promotion and education information, lay symptomatology, or disease self-management (Jameson et al. 1999; Cheek et al. 1999).

8 Discussion and conclusions

The health of the Australian population improved markedly during the twentieth century (AIHW 1998, 2002; Dunn et al. 2002). For example:

- the toll of infectious disease was reduced sharply;
- life expectancy at birth continued to increase;
- since the late 1960s, death rates from coronary heart disease and stroke have declined; and
- in more recent years, we have witnessed a downward trend in deaths from lung, colorectal and breast cancer (AIHW 2002; Mathers et al. 1999).

Despite these (and other) improvements in population health, Australia at the end of the twentieth century still had considerable health inequalities. As this report has shown, during the period 1998–2000, death rates were strongly patterned by sex, geographic region, area socioeconomic disadvantage, occupation, and country of birth. Irrespective of age, death rates were highest for males, for persons living in Remote and Very Remote regions, for residents of socioeconomically disadvantaged areas, for blue-collar workers, and for the Australian-born. In this final chapter we present a summary of these findings, examine some possible explanations for the patterns observed, consider a number of issues of relevance for policy, and suggest some directions for the future monitoring of mortality inequalities in Australia.

Summary of mortality inequalities in Australia

Mortality inequalities by sex. Chapter 3 of this report examined mortality inequalities by sex, and found that males had a lower life expectancy at birth, and they experienced higher death rates for all causes, and for most specific causes. The smallest all-cause mortality inequality between the sexes was among infants and the largest was among adolescents and young adults. During the period 1985–1987 to 1998–2000, absolute death rates declined for both males and females in each age group. Relative mortality inequalities also declined: in 1985–1987, the difference in all-cause death rates between males and females aged 0–14, 15–24, 25–64 and 65 years or more was 35%, 177%, 92% and 61% respectively. The corresponding difference in death rates between males and females in 1998–2000 was 27%, 161%, 81%, and 55%. Among males and females aged 25–64, mortality inequalities since the mid-1980s also declined for all cancers, and diseases of the circulatory system.

As part of our analysis we also estimated the extent to which sex inequalities in death rates contributed to the total mortality burden in the general population. We found that if death rates among males aged 0–64 years could have been reduced to a level equivalent to those of similarly aged females, approximately 24,427 deaths would have been avoided in 1998–2000.

Mortality inequalities by geographic region. Chapter 4 of this report examined mortality inequalities by geographic region using the Accessibility/Remoteness Index of Australia (ARIA). Among persons aged 0–1, 0–14, 15–24, 25–64 and 65–74, death rates (for most conditions) followed a graded pattern across the ARIA categories, with rates being the lowest in areas classified as ‘Highly Accessible’ and highest in Remote/Very Remote areas. By contrast, a different mortality pattern was evident among persons aged 75 years and older: here, death rates were (with the exception of diabetes mellitus among females) significantly lower in Remote/Very Remote areas than in Highly Accessible areas. Our analysis also found that life expectancy was shorter among males and females from Remote/Very Remote areas, and that an estimated 4,639 deaths could have been avoided among persons aged 0–64 in 1998–2000 if all geographic regions in Australia had a mortality rate equivalent to that in Highly Accessible areas.

Possibly the most significant finding of our analysis of geographic differences in mortality was that the higher death rates in Remote/Very Remote regions, and to a lesser extent in Accessible and Moderately Accessible areas, were largely accounted for by the poorer mortality profile of Indigenous persons. For each age group examined, mortality rates were highest in Remote/Very Remote areas when based on deaths among all Australian residents (Indigenous and non-Indigenous). However, when Indigenous deaths were excluded, mortality rates in Remote/Very Remote areas were similar to those found in Highly Accessible areas. Indeed, in some cases, death rates in the former areas were actually lower than those found in the latter when based exclusively on deaths among non-Indigenous persons. Thus, what initially appeared to be mortality inequalities resulting from differences between urban and rural areas in terms of social and economic factors and access to services was largely due to the vastly different mortality experiences of Indigenous and non-Indigenous Australians (ABS & AIHW 2003). This finding, which is consistent with that reported in other studies (Coory 2003; Glover et al. 1999; AIHW 2002), raises important and difficult questions about how to best tackle geographic differences in mortality, and where to target our efforts and financial resources.

Mortality inequalities by area socioeconomic disadvantage. In Chapter 5, we examined the relation between mortality and socioeconomic status using the Index of Relative Socioeconomic Disadvantage (IRSD), which involved grouping Statistical Local Areas (SLAs) covering all states and territories into quintiles (20%) based on their IRSD score. As with other studies (Turrell & Mathers 2001; Mathers 1994a, 1994b, 1995, 1996; Glover et al. 1999), we found that socioeconomically disadvantaged areas experienced significantly higher mortality rates for most major causes of death, and that these differences were evident for males and females at every stage of the lifecourse: in infancy and childhood, adolescence and young adulthood, among the working aged, and well into late adulthood. Moreover, for each sex-age subgroup, mortality rates very often increased in a step-wise gradient from the least to the most disadvantaged quintile. Further, we estimated that in 1998–2000 approximately 16,752 male deaths and 6,485 female deaths would have been avoided among persons aged 0–64 years if all SLAs in Australia had an all-cause mortality rate equivalent to that in the 20% least disadvantaged areas.

As part of Chapter 5 we also examined trends in socioeconomic mortality inequalities for the periods 1985–1987 and 1998–2000. For males and females in each age group, death rates for most causes declined for all socioeconomic quintiles between the mid-1980s and the late 1990s. In terms of relative mortality inequality for all causes for males, the gap between the most and least disadvantaged quintiles widened for each age group. In terms of the absolute death rate however, differences between the top and bottom quintiles narrowed, except among males aged 15–24, where the difference in absolute all cause death rates per 100,000 persons actually widened between 1985–1987 and 1998–2000. Among females, relative mortality inequalities for all causes either decreased (among 0–14 year olds) or were stable over the two periods; and differences between the most and least disadvantaged quintiles in terms of absolute death rates per 100,000 persons declined for each age group.

Mortality inequalities by occupation. Chapter 6 examined the association between occupation and mortality among males and females aged 25–54 years. An implicit expectation when examining mortality inequalities by occupation is that one will find a clearly graded relation between occupation level and death rate, with rates being lowest among managers, administrators and professionals, intermediate for white-collar employees, and highest for blue-collar workers (reflecting in part underlying differences in other socioeconomic attributes such as education or income). Rarely, however, was this the case. The most consistent occupational patterning was between males employed in managerial, administrative and professional jobs and their blue-collar counterparts. Male blue-collar workers experienced significantly higher death rates for all causes and for most specific causes. The difference in death rates between these two occupational groups was especially marked for lung cancer, for deaths due to mental and behavioural disorders resulting from psychoactive substance use, diseases of the circulatory

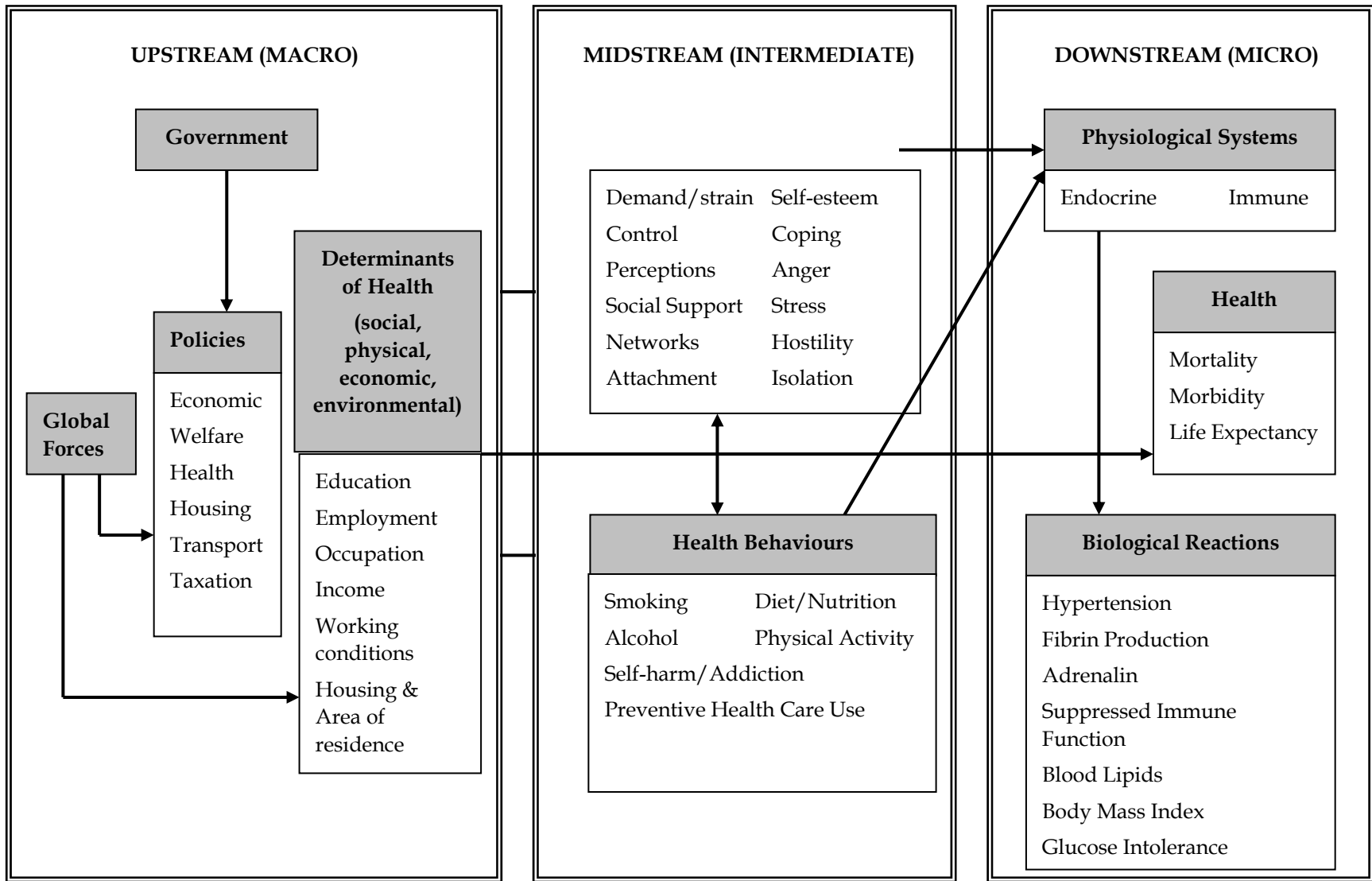
system, diseases of the respiratory system, diseases of the digestive system, accidents and injury, and suicide. Female blue-collar workers also experienced the highest death rates for a number of these conditions, although the difference between the occupation groups was usually smaller than for males.

Mortality inequalities by country of birth. The final substantive chapter in this report (Chapter 7) compared the mortality profiles of overseas and Australian-born residents. In keeping with previous research (Strong et al. 1998b; Mathers 1994a, 1994b, 1996; AIHW 2002; Taylor et al. 1999; Powles & Gifford 1990; Easthope 1995), we found that, in most cases, Australian residents who were born overseas experienced significantly lower mortality rates. This pattern was evident for both males and females, and all age groups. The primary reason for the better mortality profile of the overseas-born is health selection. Persons applying to migrate to Australia need to meet strict health criteria, so that those who become Australian residents are usually among the healthiest from their country of origin, and clearly (as the mortality data suggest) healthier than the average resident of their country of destination. The results of this study, however, also showed that overseas-born residents experienced significantly higher mortality rates for a number of conditions, including cancer of the genital organs (females aged 25–64 from Other countries); diseases of the liver (females aged 25–64 from UK & Ireland); cancer of the pancreas (among females aged 65 years and over from Other Europe); lung cancer (among males and females aged 65 years and over from UK & Ireland, and among males from Other Europe); and diabetes mellitus (among males and females aged 65–74 and 75 years or more from Other Europe and Asia). Higher death rates for these types of conditions among the overseas-born may reflect such things as birthplace differences in health behaviours and risk factor prevalence, English language difficulties (affecting the comprehension and subsequent uptake of health promotion messages), and cultural customs influencing lay symptomatology, disease self-management, or help-seeking practices (i.e. use of health care services).

Explaining and reducing mortality inequalities in Australia

At present, our levels of understanding and extent of knowledge about the genesis and persistence of mortality inequalities are limited. However, with the exception of sex inequalities and country of birth inequalities which are due primarily to health selection effects, social factors appear to operate with all other inequalities (Eckersley et al. 2001). In previous work, (Turrell et al. 1999; Turrell & Mathers 2000; Turrell 2002), a conceptual framework has been proposed that attempts to identify the main determinants of these inequalities (Figure 8.1). Whilst this framework was originally compiled to help explicate the pathways and mechanisms linking socioeconomic factors and health (including occupation), it arguably has broader applicability and relevance to our understanding of mortality inequalities based on sex and geographic region. Each of the main contributors to mortality inequality are positioned in the framework according to whether they represent an upstream (macro), midstream (intermediate) or downstream (micro) determinant of health. The structure and flow of the framework (and the empirical evidence that underpins it) suggest that chronic disease mortality is ultimately a consequence of adverse biological reactions that occur as a result of changes or disruptions to the functioning of physiological systems. Thus, part of the poorer mortality profile of residents of disadvantaged areas, blue-collar workers, Indigenous persons, and males is due to more sustained and/or longer term adverse changes to physical and biological functioning. These changes are often initiated by psychosocial processes and health behaviours (acting independently and interdependently). These in turn are a consequence of differential exposure across the lifecourse to adverse social, physical, economic, and environmental circumstances, which are themselves influenced by things such as the actions and decisions of governments, the market, civic society, and broader global forces. The framework also indicates a more direct link between social factors and mortality resulting from accidents, injury, and violence.

Figure 8.1: A framework of the social determinants of health



Importantly, although the ordering and flow of relationships in the framework make the explicit claim that health inequalities are due fundamentally to social and economic factors impacting on health, it needs to be recognised that the relationships can potentially flow in the opposite direction. Specifically, health status can be a determinant of social position rather than vice versa. Healthy people are more likely to move up the social ladder, whereas the less healthy are more likely to experience downward social mobility. The net effect of this health-related mobility up and down the social hierarchy is to increase the mortality differential between groups, amplifying in particular the death rates of disadvantaged groups. Whilst there is no doubt that for some people poor health contributes to downward mobility, or makes upward mobility difficult, data from longitudinal studies show that the overall contribution of health selection to health inequalities is small (Blane et al. 1993; Power et al. 1996).

Whilst furthering our understanding of the determinants of mortality inequalities represents an important goal for public health, even more important (and challenging) is the development of policies, interventions, and other initiatives to reduce the inequalities. There now exists a growing body of literature on addressing health inequalities (Turrell et al. 1999; Turrell 2002c; Oldenburg et al. 2000a; Graham 2001; Sibthorpe & Dixon 2001; Acheson 1998; Benzeval et al. 1995; Gepkins & Gunning-Schepers 1996). A detailed discussion of this material lies outside the scope of this report – briefly, however, the approaches suggested fall into one or more of the following categories: changing macro-level social and economic policies; improving living and working conditions; involving local communities in health initiatives; changing health damaging behaviours; empowering individuals and strengthening their social and family networks; and improving the equity of the health care system (Oldenburg et al. 2000b). The conceptual framework also provides useful insights and raises issues that need to be considered as part of the development and implementation of policies and interventions to reduce mortality inequalities. These issues include (but are not limited to) the following:

- The identification of entry points: where do we intervene or direct our efforts? Efforts can be directed at upstream, midstream or downstream factors. Where we focus and concentrate these, however, has implications in terms of making a measurable impact on health inequalities. Attempts to tackle inequalities by focusing on upstream factors are likely to result in the greatest impact on population-wide disparities; however, societal-level changes are the most difficult to bring about, and the most politically sensitive. Policies and interventions that focus on midstream factors, by contrast, might benefit the groups or areas that are targeted, but they are unlikely to reduce health inequalities at the national level. Moreover, midstream efforts might improve psychosocial health, or result in behaviour change, but they are not likely to alter the social and economic conditions that gave rise to the problems in the first place. We could also focus our efforts at the micro level, via for example, health promotion information provided at GP visits. This approach, whilst important, probably only serves to improve individual health, and is not likely to impact in any discernible way on national-level health inequalities
- Whilst approaches will differ in their impact depending on where they are directed (upstream, midstream, or downstream), attempts to tackle health inequalities should focus simultaneously on macro, intermediate, and micro influences. Policies and interventions need to be implemented on a broad front (Acheson 1998).
- Evidence about the causes of socioeconomic health inequalities points to the need for a ‘whole of society’ approach to the problem. Health inequalities originate from societal-level conditions associated with housing, employment, education, income, transport, etc., and reducing inequalities will not be achieved exclusively (or even primarily) by actions taken within the health sector. An effective response to health inequalities will therefore require actions from all sectors, thus inter-sectoral collaboration and joined-up efforts are essential.

- To be maximally effective, efforts to tackle health inequalities should focus on both contexts and individuals, by taking a social-ecological approach to the problem. To date, policy and intervention efforts have largely been non-contextual, and targeted at individuals. This has had limited success in terms of reducing socioeconomic health inequalities. Indeed, an individualised, non-contextual approach may have actually widened health inequalities between social groups. For example, health promotion programs that attempt to change individual behaviour have been more effective among the socioeconomically advantaged (Whitehead 1995; Kawachi & Marmot 1998). This is because disadvantaged groups are often constrained by their social and economic circumstances that make behavioural change difficult.
- The need to adopt a lifecourse perspective, which explicitly acknowledges that many adult diseases, health behaviours, and psychosocial conditions have their origins in early life and are tied closely to the quality of the social, physical and economic environments that are experienced throughout life.
- Finally, while public (health) policy and interventions have apparently been effective in terms of improving average health, population-wide approaches do not necessarily alter the underlying health inequalities. This was amply demonstrated in this report, which showed that many health inequalities (measured relatively) remained unchanged or increased between 1985–1987 and 1998–2000, even though overall health status improved. This implies that national or large-scale efforts to improve population health need to be complemented by approaches that are specifically targeted at groups and areas with the poorest mortality profile.

In summary, this report has clearly demonstrated that there are considerable mortality inequalities in Australia based on sex, geographic region, socioeconomic disadvantage, occupation, and country of birth. It was also shown that deaths attributable to inequality contributed substantially to the total mortality burden in the general population, and that deaths resulting from inequality are potentially avoidable, and hence unnecessary. An overview of some of the possible pathways and mechanisms linking sex, geographic region, socioeconomic disadvantage, and occupation with mortality was also provided. Further, the report presented a brief discussion of some of the issues that need to be considered as part of the development and implementation of policies and interventions that are directed at narrowing the mortality gap between social groups. Future reports in this series will focus on health inequalities in morbidity, health-related behaviours, risk factor prevalence, and health service utilisation, and on measuring socioeconomic position in population health monitoring and health research.

Implications of this report's findings for the future monitoring of mortality inequalities

Given the magnitude of mortality inequalities in Australia, and in some cases their widening, it is concerning to observe that the monitoring of health inequalities in this country has to date been conducted in an episodic, ad hoc, and unsystematic manner (Turrell et al. 1999). Hence, important knowledge and information are lacking about the nature and extent of health inequalities, their patterning at national, state, and local levels, and trends over time. As a result, our capacity to address the problem, that is, to allocate resources cost-effectively, to identify priority groups, to develop and implement policies and strategies to reduce inequalities, is limited. What is required is a nationally coordinated monitoring system and research program for health inequalities, similar to that which exists in other countries (Mackenbach 1994; Mackenbach & Bakker 2002). The establishment of a health inequalities monitoring system and an associated research program would represent a significant advance in our efforts to narrow

the health inequalities that currently exist between many population subgroups, and to further improve the health of the population as a whole.