

Health Series
Number 8

**The
Epidemiology of
Cardiovascular Disease
in the ACT**

Carol Gilbert
Ursula White

Epidemiology Unit
Population Health Group
ACT Department of Health and Community Care

January 1997

ACKNOWLEDGEMENTS

This publication has drawn on the expertise and knowledge of several individuals and sections within the Department of Health and Community Care, Community Health Services, the Australian Bureau of Statistics, and the Australian Institute of Health and Welfare.

The authors are particularly grateful to colleagues in the Department of Health and Community Care including Dr Bruce Shadbolt and the staff of the Epidemiology Section for their support, advice and patience; the Performance Information Section for providing data; the Cardiology Units at The Canberra Hospital and Calvary Hospital; and the Public Affairs Section for publishing assistance.

The ACT Division of General Practice and the National Heart Foundation ACT also provided valuable advice.

A special thank you to Kelli Mimis for her excellent cover design.



©Australian Capital Territory, Canberra 1997

ISSN 1325-1090

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced without written permission from the Director, Publications and Public Communication, Department of Urban Services, ACT Government, GPO Box 158, Canberra ACT 2601.

Published by Publications and Public Communication for the Department of Health and Community Care's Epidemiology Unit and printed by the Authority of Nigel Hardiman, ACT Government Printer.
200 - 1/97 A4 (97/3030)

The ACT Government Homepage Address is: <http://www.act.gov.au>

Suggested citation: Gilbert C, White U (1997) *The Epidemiology of Cardiovascular Disease in the ACT*, Epidemiology Unit, ACT Dept of Health and Community Care: Health Series No 8, ACT Government Printer, ACT

TABLE OF CONTENTS

1. Introduction	5
2. Mortality	6
2.1 Projections of mortality to the year 2001	8
2.2 Years of potential life lost through cardiovascular disease mortality	9
2.3 Death rates for specific cardiovascular diseases	9
2.3.1 Coronary heart disease (ischaemic heart disease) - ICD9 (410-414)	10
2.3.2 Cerebrovascular disease (stroke) - ICD 9 (430-438)	13
2.3.3 Rheumatic heart disease - (ICD 390-398)	15
2.3.4 Hypertensive disease - (ICD 9 401-405)	15
2.3.5 Peripheral vascular disease - (ICD 441-444)	16
3. Morbidity	16
3.1 Hospital inpatient separations	16
3.1.1 Coronary heart disease	21
3.1.2 Cerebrovascular disease	21
3.1.3 Hypertension	23
3.1.4 Peripheral vascular disease	23
3.1.5 Rheumatic heart disease	24
3.2 Hospital average length of stay	24
3.3 1989-90 National Health Survey	28
4 Risk factors for cardiovascular disease	29
4.1 Identified groups at particular risk	31
4.2 Possible reasons for the reduction in mortality due to cardiovascular disease	35
4.3 Risk factor status of ACT residents	36
4.3.1 1989-90 National Health Survey	36
4.3.2 National Heart Foundation Risk Factor Prevalence Survey	37
4.3.3 National Drug Strategy Household Survey	37
5. ACT and national initiatives	39
5.1 National health goals and targets	39
5.2 National Cardiovascular Monitoring System	39
5.3 ACT health goals and targets	39
5.4 Cardiology Unit - The Canberra Hospital	40
5.5 Health Promotion Services	41
5.6 Cardiac Rehabilitation Unit - Calvary	42
5.7 Health Risk Management Service	42
5.8 ACT Health Centres	42
5.9 National Heart Foundation ACT	42
5.10 Heart Support Australia	43
5.11 ACT Division of General Practice	43
5.12 Alcohol and drugs	43
5.13 Data collection	44
6. Glossary	45
7. Appendix A: Methodologies	47
7.1 Years of potential life lost	47
7.2 Rates	47
7.3 Three year moving averages	48
7.4 Projections	48
7.5 Logistic Regression Analysis	48

8. Appendix B: Data limitations	49
8.1 Overall data	49
8.2 Mortality data	49
8.3 Hospital separations data	49
8.4 National Health Survey 1989-90	49
9. Appendix C: ICD-9 Classifications	50
10. References	51



TABLES

Table 1: Cost of CVD, by major sectors of expenditure, Australia, 1989-90 (\$'000)	6
Table 2: Hospital separations for CVD, principal & secondary diagnosis, ACT, 1991-95	19
Table 3: Number of hospital separations per individual for principal diagnosis of CVD, ACT, 1994/95	20
Table 4: Hospital separations, total length of stay & average length of stay for peripheral vascular disease, by sex, ACT, 1994/95	24
Table 5: Hospital separations (percent), for CVD & diabetes, ACT, 1991-1995	33
Table 6: Health & socio-economic status, Queanbeyan & Australian ATSIC Regions, National Aboriginal and Torres Strait Islander Survey, 1994	35
Table 7: Selected health risk factors, cardiovascular diseases, ACT, 1989-90	36
Table 8: 1989 Heart Foundation Risk Factor Prevalence Study results, by sex, Canberra	37
Table 9: ACT health goals and targets for cardiovascular diseases	40



FIGURES

Figure 1: Crude mortality rate for all cardiovascular diseases, by sex, ACT & Australia	7
Figure 2: Age-standardised mortality rates, all CVD, by sex, Australia & ACT, 1992, 1994, 1996	8
Figure 3: Crude death rate (smoothed) for all CVD, projections to the year 2001, ACT	8
Figure 4: Leading causes of death and YPLL, ACT, 1994	9
Figure 5: Crude mortality rates for CHD, by sex, ACT & Australia, 1985-94	11
Figure 6: Age- standardised mortality(a) rates for heart disease(b), by sex, ACT & Australia, total for three years around census years 1971 to 1991, and for 1992.	12
Figure 7: Crude death rate per 100,000 with projections to 2001, CHD, by sex, ACT	12
Figure 8: Crude mortality rates, cerebrovascular disease, by sex, ACT & Australia, based on 3 yr moving ave.	13
Figure 9: Age-standardised(a) mortality rates, cerebrovascular disease, by sex, ACT & Australia, total for three years around census years 1971 to 1991, and for 1992.	14
Figure 10: Crude death rate, cerebrovascular disease per 100,000 with projections, by sex, 1985-2001, ACT	15
Figure 11: Hospital inpatient separations for cardiovascular & other causes, ACT, 1994/95	17
Figure 12: Hospital inpatient separations (%), CVD and other diseases, by country of birth, ACT residents, 1994/95	18
Figure 13: Breakdown of ACT hospital separations for various cardiovascular diseases, 1994/95	18
Figure 14: Percentage separations, by cardiovascular causes, by sex, ACT hospitals, 1994/95	19
Figure 15: ACT hospital inpatient separations, by principal diagnosis of CVD, by age, by sex, 1994/95	20
Figure 16: ACT hospital separations for principal diagnosis of CHD, by age, by sex, 1994/95	21
Figure 17: ACT hospital separations for principal diagnosis of cerebrovascular disease, 1994/95	22
Figure 18: Percentage distribution of vascular outpatients, by age, by sex, 1975-1993	24
Figure 19: Total days (%) spent in hospital, by various cardiovascular diseases, ACT hospitals, 1994/95	25
Figure 20: Length of stay, ACT hospital separations for principal diagnosis of CVD, by sex, ACT, 1994/95	25
Figure 21: Average length of stay in hospital, by CVD cause, by sex, ACT hospitals, 1994/95	26
Figure 22: Length of stay, ACT hospitals, for CHD, by sex, 1994/95	27
Figure 23: Length of stay, ACT hospitals, for cerebrovascular disease, by sex, ACT, 1994/95	27
Figure 24: Smoking status, ACT, 1985-95	38

THE EPIDEMIOLOGY OF CARDIOVASCULAR DISEASE IN THE ACT

1. Introduction

Cardiovascular disease (CVD) or diseases of the circulatory system can be described as all diseases relating to the heart and blood vessels.¹ The main conditions highlighted in this document include, cerebrovascular disease, hypertension and coronary heart disease, diseases of the pulmonary circulation, peripheral vascular disease, diseases of the arteries, veins, lymphatics, rheumatic disease and other circulatory conditions.

Cardiovascular disease is a high priority health issue in the community since a large proportion of those dying or utilising both acute and other health care support and services are in fact suffering from various cardiovascular diseases or comorbidities associated with cardiovascular diseases. Lifestyles are often affected by it, resulting in disability and/or deterioration in quality of life. Cardiovascular disease accounted for 40 per cent of all deaths in the ACT in 1994 and 22 per cent of years of potential life lost (Refer Section 2.2). Because of the importance of the impact of cardiovascular disease, national and ACT health goals and targets have been developed and are currently being implemented (Refer Section 5).

Major issues related to cardiovascular disease include the considerable social and financial costs associated with it.

Mathers (1991)² estimated the increase in health expectancies at birth which would result from the elimination of the major disease groups. He estimated that, if cardiovascular disease could be eliminated, the second highest number of years of disability-free life expectancy savings for males and females could be achieved. If the disease was eliminated, there would be the greatest gain (of all diseases removed) in quality-adjusted life years. This implies that, if cardiovascular disease could be eliminated, huge amounts of current disability would also be eliminated and people could enjoy healthy lives to a greater extent.

Although the ideal of eliminating cardiovascular disease has not, and could not realistically, be achieved, there have been considerable advances in the prevention and treatment of the disease in Australia in recent years. These are discussed in Section 4 on risk factors.

In terms of approximate financial costs, cardiovascular disease accounted for a massive \$4,000 million in Australia in 1989-90 (57% of which were direct costs, 43% indirect costs)³. The major areas accounting for those costs are illustrated in Table 1:

Table 1: Cost of CVD, by major sectors of expenditure, Australia, 1989-90 (\$'000)

Cardiovascular disease	Direct costs			Indirect costs			Total
	Hospital	Other	Total direct	Sick leave	Foregone earnings	Total indirect	
Ischaemic heart	333,645	148,340	481,985	131,074	540,372	671,445	1,153,430
Other heart	187,496	245,280	432,776	73,026	134,133	207,159	639,935
Cerebrovascular	154,849	332,211	487,060	45,786	122,891	168,676	655,737
Peripheral vascul.	72,642	47,969	120,611	24,328	35,153	59,481	180,092
Hypertensive	20,444	445,154	465,598	382,590	13,116	395,706	861,304
Rheumatic heart	10,418	4,583	15,001	5,503	15,913	21,416	36,417
Other	145,855	99,162	245,017	134,953	20,541	155,496	400,512
Total	925,349	1,322,699	2,248,048	797,260	882,119	1,679,379	3,927,427

Source: AIHW, MEEM Project as reported in *Cardiovascular Health in Australia, A Review of current activities and future directions*, Dept of Health, Housing, Local Govt & Community Services, 1994

Since current research suggests that cardiovascular risk factors in childhood predict adult heart disease, it is imperative that attention to reducing such cardiovascular risk factors in children (not just older people) is given⁴ (refer 4.3).

This publication aims to give as detailed an analysis as possible, given the data available, on overall cardiovascular diseases in the ACT and the specific conditions including coronary heart disease and stroke. This will provide planners with further information on which to base priorities for interventions to improve both current and future services in the ACT.



2. Mortality

The Australian study conducted by the WHO MONICA Project (refer Section 6: Glossary) found that, over a ten year period (1984-93), mortality rates for cardiovascular disease declined significantly. This was due to mortality rates from coronary heart disease (also known as ischaemic heart disease), and cerebrovascular disease (also known as stroke) declining by over 50 per cent in males and females. There were no significant changes in other heart disease mortality rates.⁵ A report just released by the National Heart Foundation in Australia supports these findings.⁶

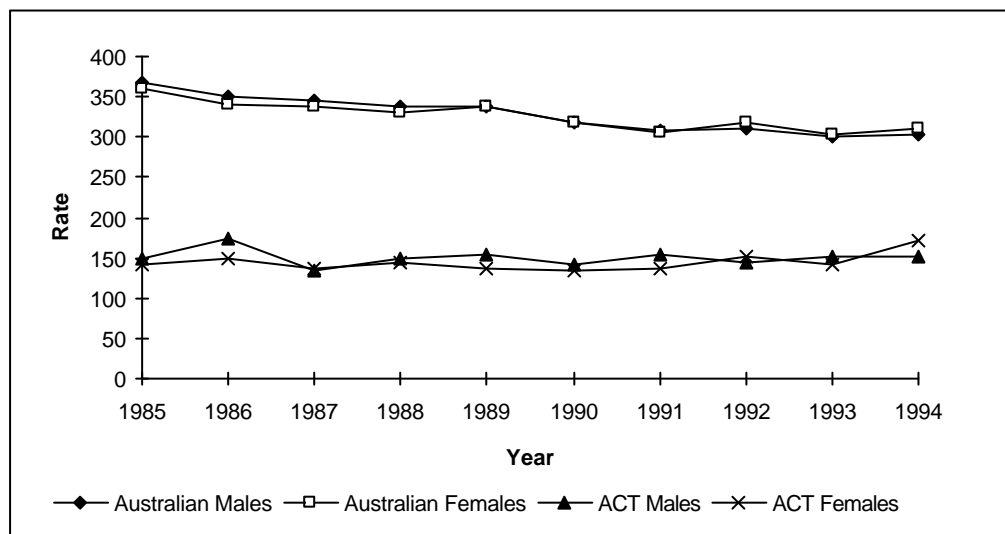
Cardiovascular disease, which ranks as the highest cause of death in Australia, accounted for 43.3 per cent of deaths from all causes in 1994. (24.1% of all deaths were caused by coronary heart disease and 10.1% of all deaths by cerebrovascular disease).⁷

Although there has been an overall reduction in deaths from cardiovascular disease in Australia since the 1970s, the disease continues to be a major contributor to mortality.⁸

In the ACT, cardiovascular diseases accounted for 485 (40%) of the 1,222 ACT deaths recorded in 1994. Of these deaths there were 263 deaths (54%) due to coronary heart disease and 111 (23%) due to cerebrovascular disease.⁹ There has actually been no major change in the death rate for cardiovascular diseases over the last seven years (refer Figure 1). This is a result of the relatively young population in the ACT. However, with the expected gradual ageing of the population, the crude death rate is likely to slowly increase unless there are major improvements in terms of preventive measures or medical breakthroughs.

When expressed as crude mortality rates, the ACT rates are considerably lower than for Australia - as shown in the time series in Figure 1.

Figure 1: Crude mortality rate for all cardiovascular diseases, by sex, ACT & Australia



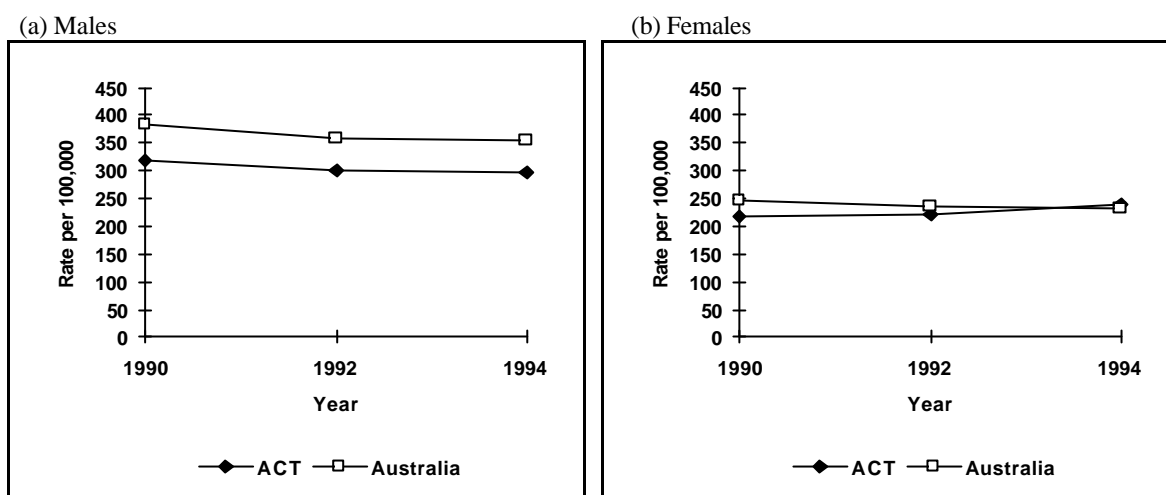
Source: *Causes of Death Australia*, ABS Publications Catalogue No. 3303.0
Estimated Resident Population By Sex and Age States and Territories of Australia, ABS Publications No. 3201.0

In 1994 in the ACT, male and female cardiovascular death rates per 100,000 population were 151 for males and 172 for females compared to Australian males at 304 and females at 311. The ACT female rate for 1994 rose by 30 from 142 per 100,00 in 1993 to 172 in 1994. This could be the effect of an ‘outlier year’. It will be important to monitor future years to ensure this is not a permanent increase.

Age standardisation, using the 30 June 1991 Australian population, brings the 1994 ACT rates closer to those of Australia, with 298 (ACT) compared to 356 (Australia) for males and 240 (ACT) compared to 232 for females (Refer Figure 2). This implies that the differences in crude rates for females can mostly be attributed to the ACT having a younger population. For males however, a significant component is not due to age, but other factors. It can be seen that ACT males and females have smaller cardiovascular disease differentials than the Australian average.

The age-standardised rates for ACT females rose (refer Figure 2b), however, this rise may be just an anomaly caused by the nature of an area of small size and its fluctuations. It will be important to analyse future data to ensure that the increase is not maintained or continued.

Figure 2: Age-standardised mortality rates, all CVD, by sex, Australia & ACT, 1992, 1994, 1996



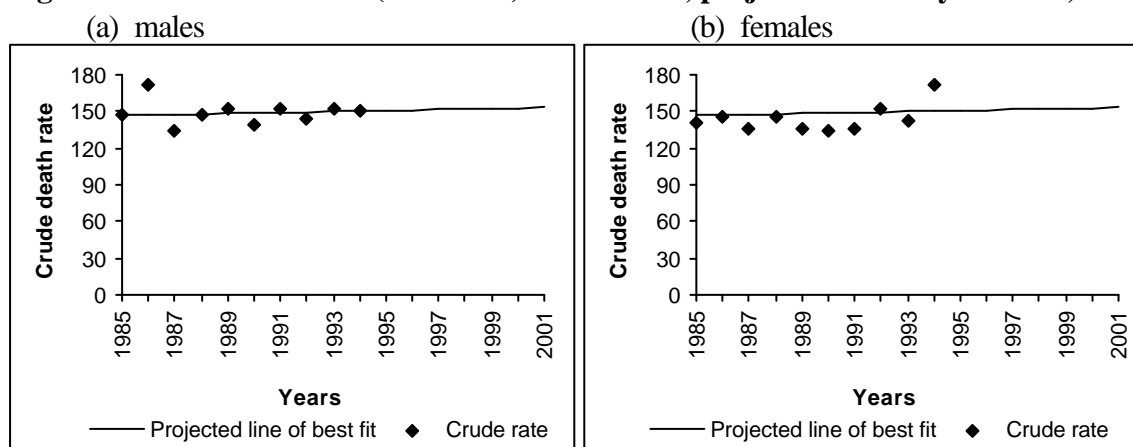
Source: *Australia's Health Series*, Australian Institute of Health & Welfare.

2.1 Projections of mortality to the year 2001

Crude death rates for both sexes for all cardiovascular diseases have increased slightly over the period 1985 to 1994. In 1994 however, there was an unusually high number of deaths (257 deaths in 1994 compared to 211 in 1993) for all cardiovascular disease in females. The overall trend for both sexes is for an increase in the five years to 2001, with the female death rate increasing at a faster rate than the male death rate. This will be influenced by the fact that the ACT has an ageing population and, since females tend to outlive males, the female rate will rise more quickly than that of males.

Using the projected best line of fit for crude rates for cardiovascular disease (Figure 3) to work back and calculate the absolute number of deaths, we get the following results. In 1985 there were 186 male deaths and 169 females deaths, increasing to 231 for males and 233 for females in 1995. It is predicted that there could be 249 male deaths and 267 female deaths from cardiovascular diseases for usual residents of the ACT in the year 2001 (using population forecasts from the ACT Chief Ministers Department).

Figure 3: Crude death rate (smoothed) for all CVD, projections to the year 2001, ACT



Note: crude rates are per 100,000

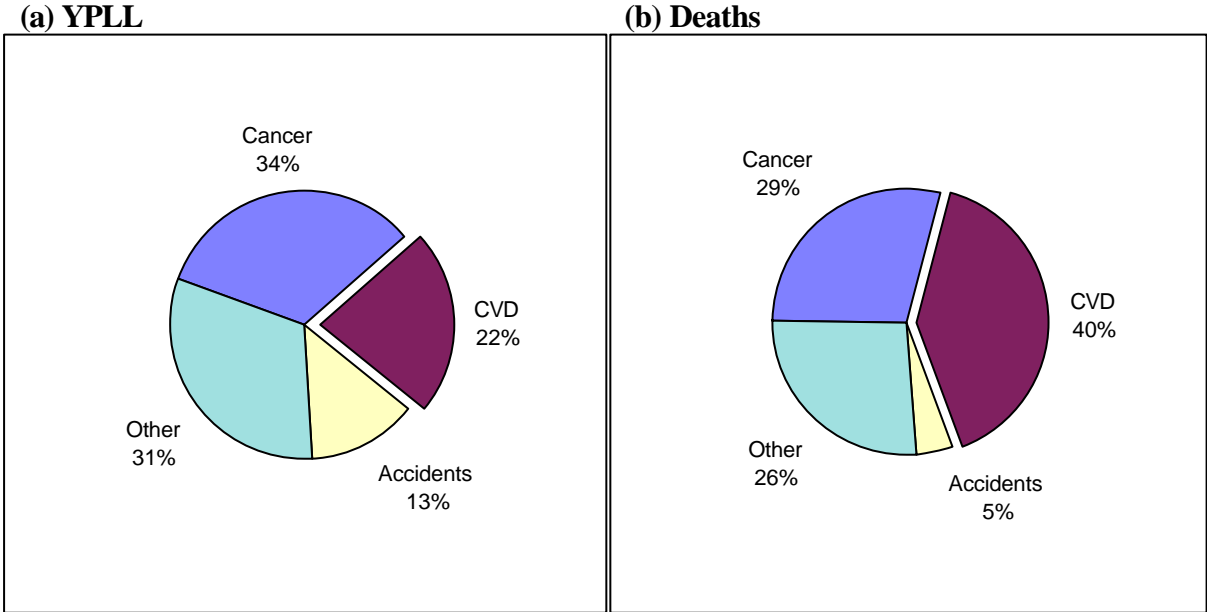
Source : ABS: *Causes of death Catalogue No 3303.0*

2.2 Years of potential life lost through cardiovascular disease mortality

The estimation of years of potential life lost (YPLL) can assist those working on health service provision by providing a clearer picture of overall needs. Refer Appendix A for methodology.

As a result of early deaths, there were 13,103 years of potential life lost in the ACT in 1994. 2920 (22%) YPLL were caused by cardiovascular diseases. Of these, 1,831(14%) years were for coronary heart disease and 597 (5%) years for cerebrovascular disease. It can be noted from Figure 4 that, although cardiovascular disease accounted for the highest proportion of deaths in the ACT in 1994, it only accounted for the third highest YPLL. This is due to the fact that, with the introduction of innovative drug, lifestyle and physical therapies and the development of more effective medical interventions, people with heart disease are tending to live longer and thus, not lose large amounts of potential years of life.¹⁰

Figure 4: Leading causes of death and YPLL, ACT, 1994



Source: ABS Causes of death data 1994, unpublished.

2.3 Death rates for specific cardiovascular diseases

Although the overall cardiovascular disease death rates for males and females are similar, Figures 5 to 10 show that the make-up of these rates vary. Males have a higher coronary heart disease death rate while females have a higher cerebrovascular and other circulatory disease death rate.

2.3.1 Coronary heart disease (ischaemic heart disease) - ICD9 (410-414)

Coronary heart disease (CHD) is the most common form of cardiovascular disease. It occurs when arteriosclerosis (thickening of the walls, loss of elasticity) causes blockage to one or more of the coronary arteries which supply the heart with blood. A *heart attack* occurs when the coronary artery is completely blocked. This is known as *coronary occlusion*. Where the blockage causes some heart muscle to die it is known as *myocardial infarction*.¹¹

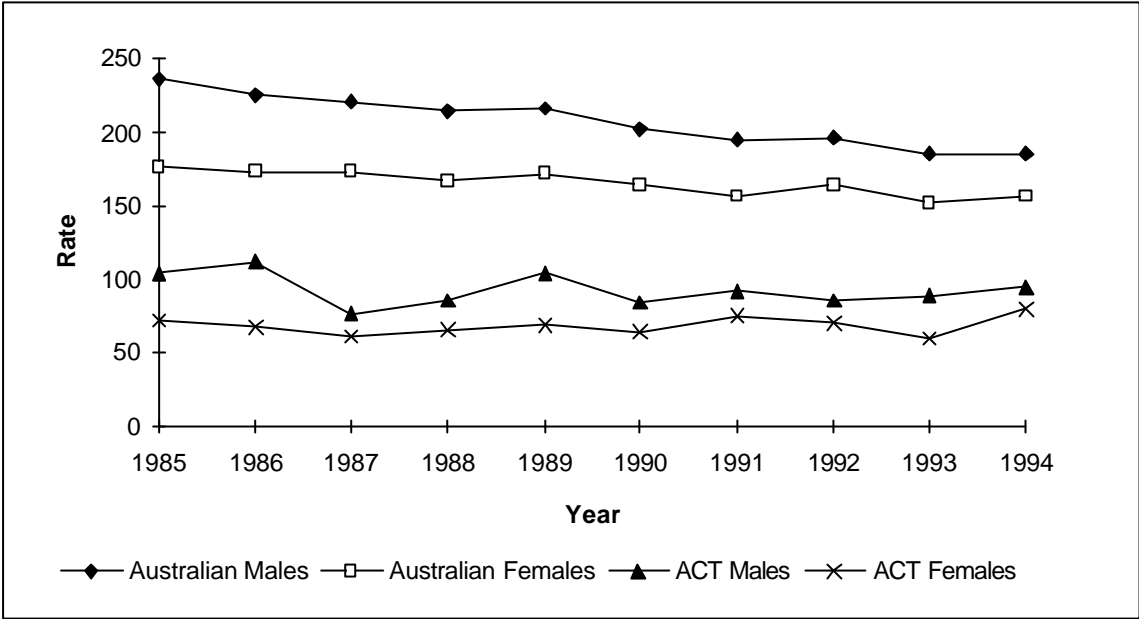
Coronary heart disease has the highest proportion of all deaths from circulatory diseases. It continues to be one of the leading causes of death in Australia accounting for 24 per cent of all deaths in 1994. In that year, there were 16,515 males and 14,058 females in Australia and 144 males and 119 females in the ACT, who died from CHD. Of those with CHD, 10,240 deaths in Australia including 161 deaths in the ACT, were attributable to acute myocardial infarction (AMI).¹²

Coronary heart disease has been a focus of worldwide attention because of large decreases in mortality rates over the past 20 years or more in most industrialised regions of the world. The explanation for these decreases is still a matter for conjecture. Most researchers attribute the reasons for improvement, to improved prevention and management of modifiable risk factors (eg smoking, cholesterol, blood pressure).

Although incidence and mortality of coronary heart disease (CHD) have been declining for a number of years, they still have a considerable effect on the Australian and ACT health profiles. AMI is a major contributor to this overall effect. These declines in death rates are reflected in decreases in total person years of life lost and the increase of total expectation of life at birth. However, the proportion of cardiovascular disease deaths due to CHD during this period, increased slightly for both males and females.¹³ Although the decline for males is greater, the Australian mortality rate for males is nearly 50 per cent more than that for females.

In Australia, the proportion of males and females aged less than 70 years and dying from CHD, has decreased. This means less premature mortality from CHD.¹⁴ These figures are greater for CHD than for all other causes of mortality, which indicates that people are either dying of other diseases or are dying later.

Figure 5: Crude mortality rates for CHD, by sex, ACT & Australia, 1985-94

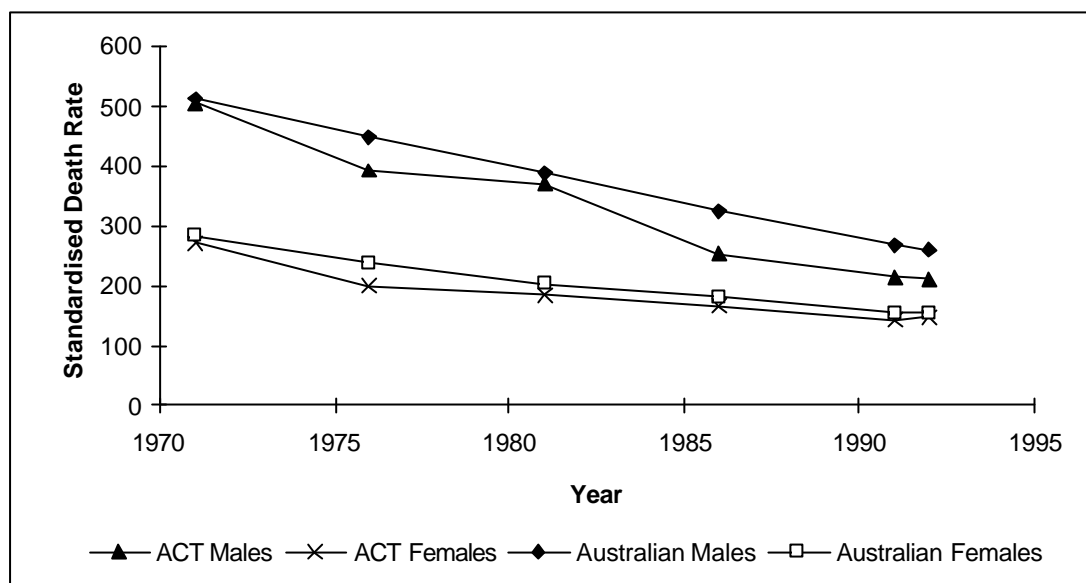


Source: ABS *Causes of death*, Catalogue No 3303.0, 1985-94

When comparing the mortality rate of the ACT with that of Australia over the last 10 years, it can be seen that ACT rates are far lower than those for Australia (Figure 5). As for all cardiovascular diseases, this can largely be attributed to the ACT’s younger population.

Since ACT age-standardised data for coronary heart disease over time are currently unavailable, a time series has been utilised for heart disease (Refer Figure 6). This will give a good indication of age-standardised rate for coronary heart disease as it is the major contributor to these rates. If you remove the differences in age patterns by calculating age-standardised rates, the differences in rates between Australia and the ACT are reduced considerably. Nevertheless, the ACT male rates are still significantly below those of Australian males:

Figure 6: Age- standardised mortality(a) rates for heart disease(b), by sex, ACT & Australia, total for three years around census years 1971 to 1991, and for 1992.



(a) per 100,000

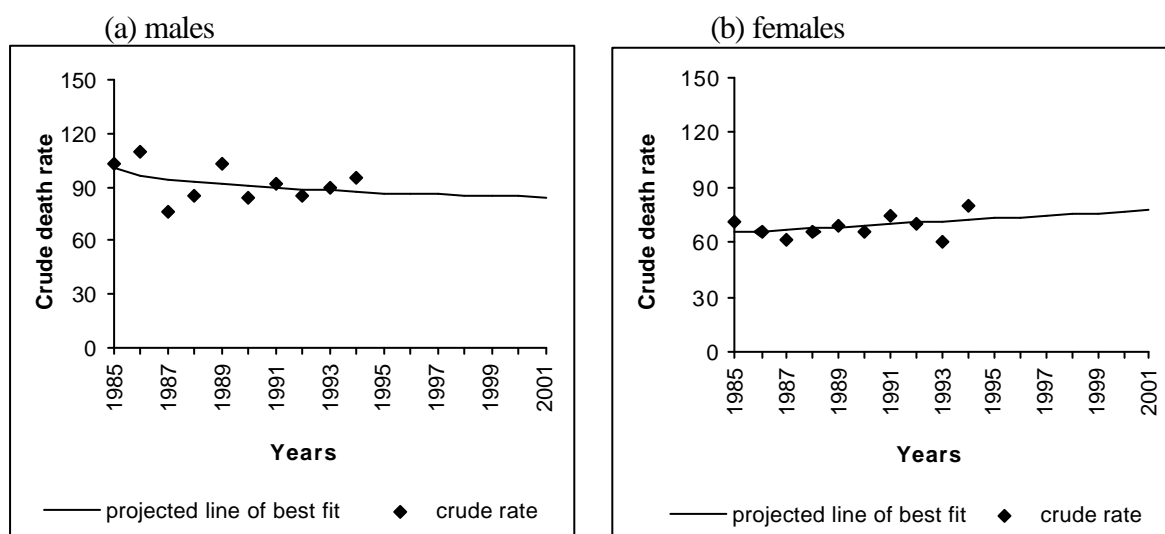
(b) includes rheumatic, hypertensive, pulmonary and other heart disease

Source: *Trends in Mortality*, National Centre for Epidemiology & Population Health, Catalogue No 3303.0

Projections of mortality due to coronary heart disease to the year 2001

ACT death rates for CHD appear to be decreasing slightly for males and increasing slightly for females. Projecting these trends into the future we could expect 137 male and 125 female deaths for ACT residents with CHD in the year 2001. However, given the fluctuation of ACT rates over time and assumptions made with data projections (refer Appendix B), these figures should be treated with caution and revised as new data become available.

Figure 7: Crude death rate per 100,000 with projections to 2001, CHD, by sex, ACT



Source : ABS: *Causes of death* Catalogue No 3303.0

2.3.2 Cerebrovascular disease (stroke) - ICD 9 (430-438)

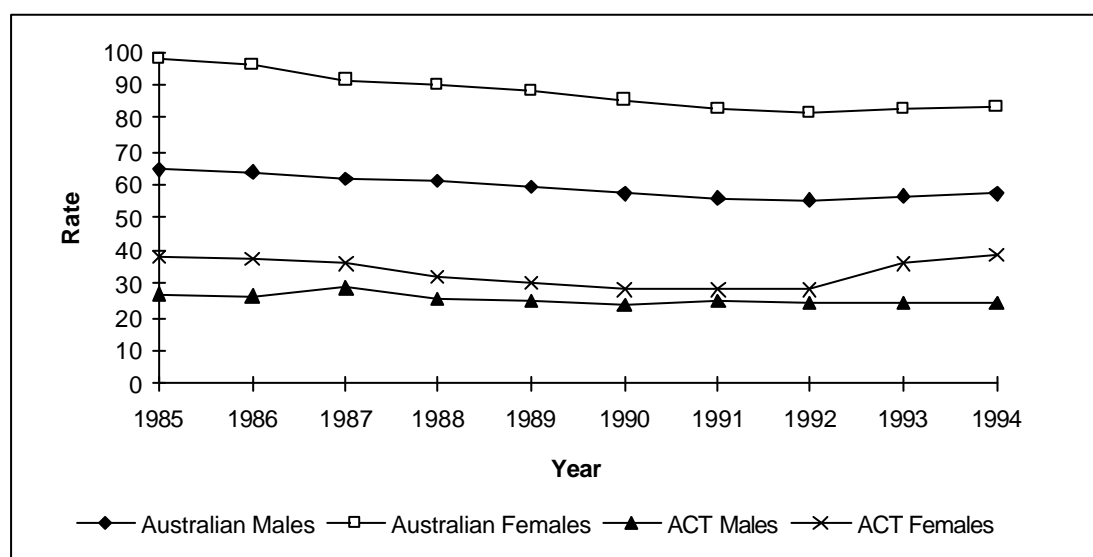
Cerebrovascular disease, commonly referred to as stroke, is analogous to a heart attack. In both cases, the main problem is arteriosclerosis which narrows and damages an artery. In cerebrovascular disease however, the main artery affected is the carotid artery in the neck. The resultant stroke is characterised by the bursting or blocking of a vessel supplying blood to the brain.¹⁵ There is consequential brain damage resulting in impaired or complete destruction of physical functions such as speech or mobility, or even death, depending on the severity of the episode.

Australian age-adjusted death rates have steadily declined for all age groups for cerebrovascular disease. In 1993 they were 64 per 100,000 population for males and 59 for females. (In 1974 male rate was 159 and female rate 150). The National Heart Foundation estimated that the declining death rate from cerebrovascular disease in people aged 20 to 69 resulted in more than 53,000 lives saved during the period 1968 to 1992.¹⁶ One exception to the decline is the Indigenous female rate of death due to cerebrovascular disease, which has doubled from 1985 to 1994.¹⁷ The gap between Indigenous females and non-Indigenous females has also widened.

Stroke still accounts for nearly one in four of all cardiovascular deaths (23% in the ACT in 1994), representing the second highest cause of death attributable to cardiovascular disease.

There were 111 deaths in the ACT caused by stroke in 1994; 72 females and 39 males. (86.5 per cent of these deaths were in people 65 years and over). Crude rates over time show the ACT has a lower rate than that of Australia. This is mostly due to the younger population in the ACT. Given the erratic nature of graphing small sample data such as for the ACT, changes based on 3 year moving averages are shown for cerebrovascular disease below. (For methodology, refer Appendix A). However, there is still some fluctuation for females in 1993 and 1994 due to a higher number of deaths in 1994. This may be an outlier year and will continue to be monitored.

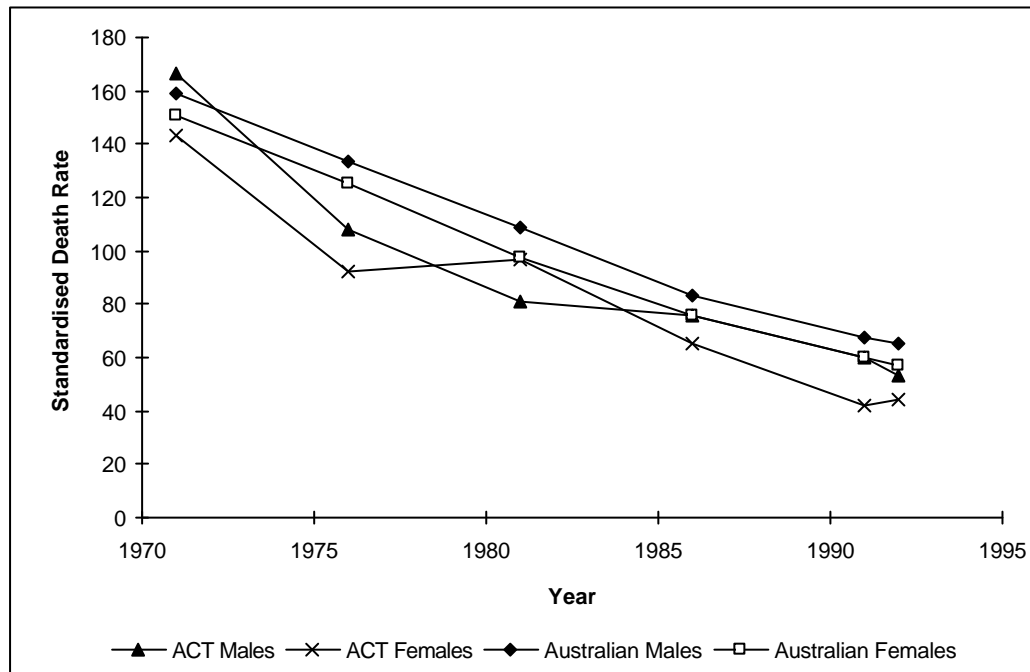
Figure 8: Crude mortality rates, cerebrovascular disease, by sex, ACT & Australia, based on 3 yr moving ave.



Source: ABS *Causes of Death*, Catalogue No. 3303.0, 1985-94

Looking at the age-standardised rates for cerebrovascular disease over the last 20 years or so there has been a dramatic decline both in ACT and Australian rates. Again, age-standardisation explains much of the variation between the ACT and Australia and the variability in ACT rates is explained by smaller numbers.

Figure 9: Age-standardised(a) mortality rates, cerebrovascular disease, by sex, ACT & Australia, total for three years around census years 1971 to 1991, and for 1992.



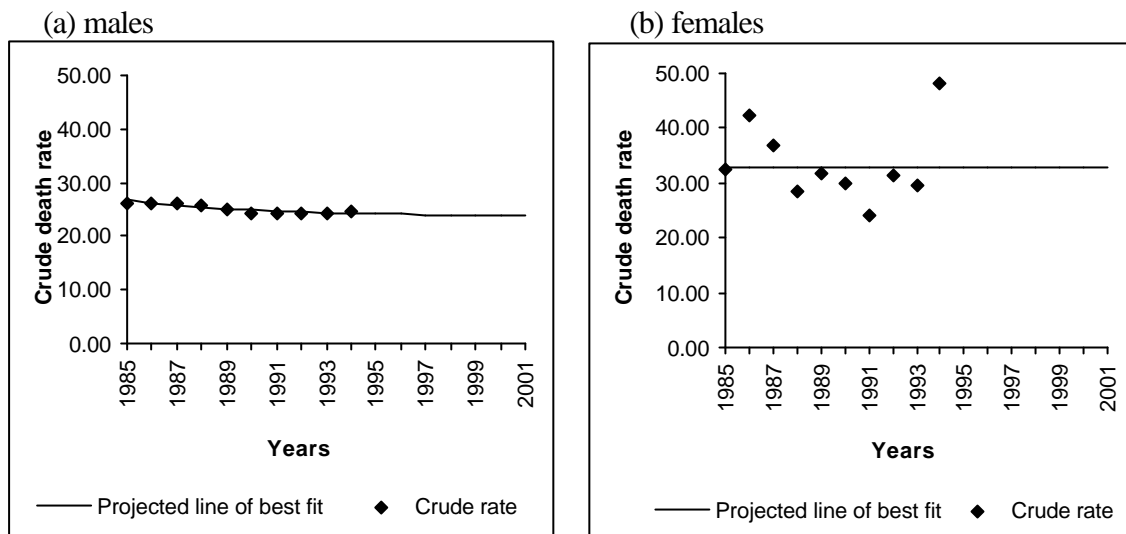
(a) per 100,000

Source: *Trends in Mortality*, National Centre for Epidemiology & Population Health. Catalogue No 3303.0

Projections of mortality due to cerebrovascular disease to the year 2001

As Figure 10 shows, male death rates have remained fairly constant and will remain so in the near future to 2001. Female rates on the other hand showed an increase from 1992 to 1994. That rate is expected to return to a constant lower rate to the year 2001. This rate will remain higher than the male rate however.

Figure 10: Crude death rate, cerebrovascular disease per 100,000 with projections, by sex, 1985-2001, ACT



Source : ABS *Causes of death*, Catalogue No 3303.0

2.3.3 Rheumatic heart disease - (ICD 390-398)

This disease occurs as a result of childhood rheumatic fever which damages the heart valves. It has been described as a classical disease of poverty in that its spread depends on the spread of streptococcal throat infections which is made easier by poor sanitation and slum conditions.¹⁸ Refer Section 4.1 for discussion on Indigenous people and rheumatic heart disease.

Australian age-adjusted death rates have steadily declined for all age groups for rheumatic heart disease. In 1993 the rate was 1 per 100,000 population for males and 2 per 100,000 for females. (In 1950 the male rate was 22 and the female rate 18). Female death rates have been higher than for males since the 1960s.^{19 20}

2.3.4 Hypertensive disease - (ICD 9 401-405)

This disease is caused by high blood pressure. Some health professionals prefer to call it a condition rather than a disease. It is associated with obesity, excessive salt intake, excessive alcohol intake, lack of exercise and diabetes. Because it may be present for years before any symptoms arise, it has been referred to as a 'silent killer'.²¹

Australian age-adjusted death rates have steadily declined for hypertensive disease. In 1993 they were 6 per 100,000 population for males and also 6 for females. (In 1950 male rate was 57.2 and female rate 51.4).^{22 23} There were 15 deaths from hypertensive disease in the ACT in 1994 (3 males, 12 females).

2.3.5 *Peripheral vascular disease - (ICD 441-444)*

This disease is caused by blocked blood flow to the limbs (mainly legs and feet). This causes pain during movement and can result in gangrene if blood flow is seriously reduced. Major risk factors are smoking, hypercholesterolemia, hypertension, obesity and diabetes. The disease does not typically cause death, but is associated with other diseases which are more likely to lead to death.

Data on prevalence for peripheral disease are not available in Australia. Some estimates of morbidity are made in the following section.



3. Morbidity

Various surveys and research carried out by government and non-government bodies and analysis of public and private hospital activity data, give a broad profile of the service utilisation associated with cardiovascular disease.

A report just released by the National Heart Foundation in Australia²⁴ states that, although the number of people having heart attacks or strokes has remained stable over the past 30 years, the episodes are occurring later in a person's life. It estimates that almost one in eight Australians (approximately 1 million men and 1.3 million females) have some form of cardiovascular disease. This would equate to approximately 16,348 males and 21,252 females in the ACT.

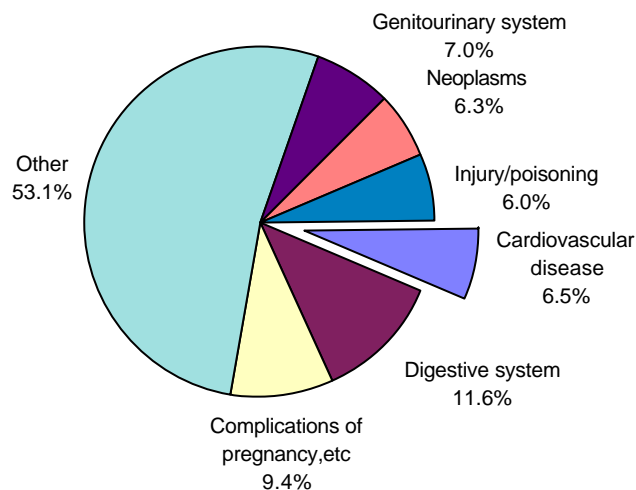
3.1 *Hospital inpatient separations*

Hospital separations data are collected routinely from the four ACT hospitals (The Canberra Hospital, Calvary Public, Calvary Private, John James Memorial Private). It should be noted that data include interstate patients. In the case of cardiovascular disease, interstate patients account for approximately 26 per cent of separations. This is a considerably higher percentage than for interstate separations for other reasons (18%).

Hospital separations data provide a measure for acute morbidity. However, caution needs to be applied when using hospital data in this manner. For instance, work completed by the WHO MONICA project in Newcastle (refer Glossary) indicates that the number of hospital discharges coded as acute myocardial infarction (ICD9 410) will overestimate the true number of heart attacks²⁵. Therefore, it would be better to view the hospital morbidity data as a reflection of service utilisation in order to assist in the planning of future services. Reservations in using hospital separation data for this purpose and other data concerns can be found in Appendix B and in discussion concerning cerebrovascular disease.

In 1994/95 there were 4883 principal diagnosis *cardiovascular disease* separations (2813 males, 2070 females) which accounted for approximately 6.5% of all hospital inpatient separations (Figure 11). This proportion is a reduction on previous years (eg 1992/93 it was 7.3%).

Figure 11: Hospital inpatient separations for cardiovascular & other causes, ACT, 1994/95

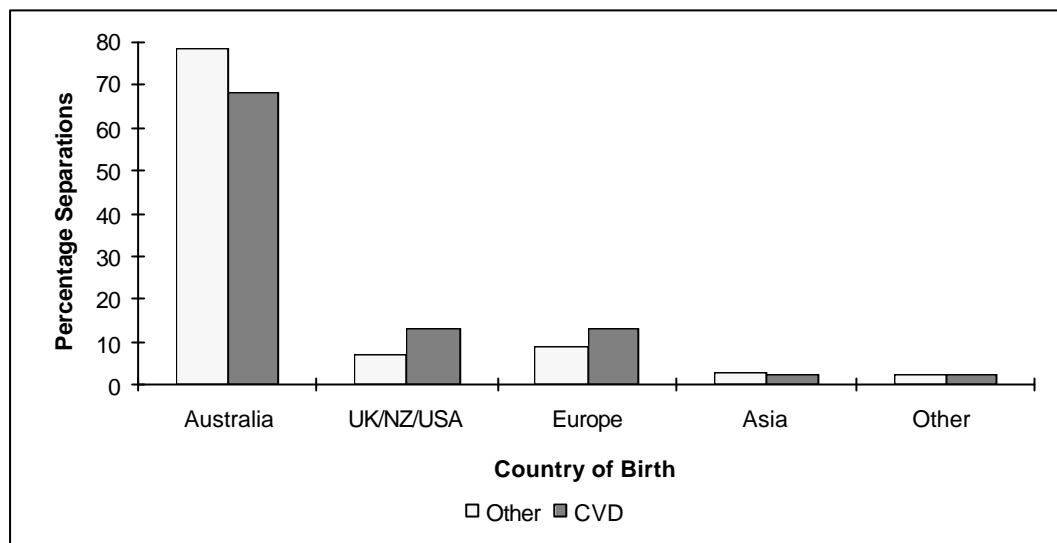


Source: ACT Hospital Morbidity Data Collection

People identifying as *Aboriginal or Torres Strait Islander* accounted for only 0.4 per cent of separations for cardiovascular disease (13 females and 8 males). This low number may be due to a reluctance to visit institutions rather than an indication of need. It may also be because the Indigenous population is relatively young and may not, therefore, experience severe cardiovascular disease. However, age of onset is also young. Refer Section 4.1 for discussion on this identified group at particular risk of having heart disease.

Of ACT hospital separations (excludes those living outside the ACT) in 1994/95, those separated with CVD had a different *country of birth* profile to those separated with other diseases. A breakdown of the proportions by country of birth for those separated with the principal diagnosis CVD and other is given below (Refer Figure 12). Of these separated from hospital, logistic regression analysis showed those born in the UK/NZ/USA were 1.3 times more likely to separate with a principal diagnosis of CVD than other diseases ($\beta=0.2428$, $p<.005$) after adjusting for age and sex. (Refer to 7.5 for methodology), whereas those whose country of birth fell into the category 'other' were less likely to separate with CVD. Other country of birth groups showed no significant differences.

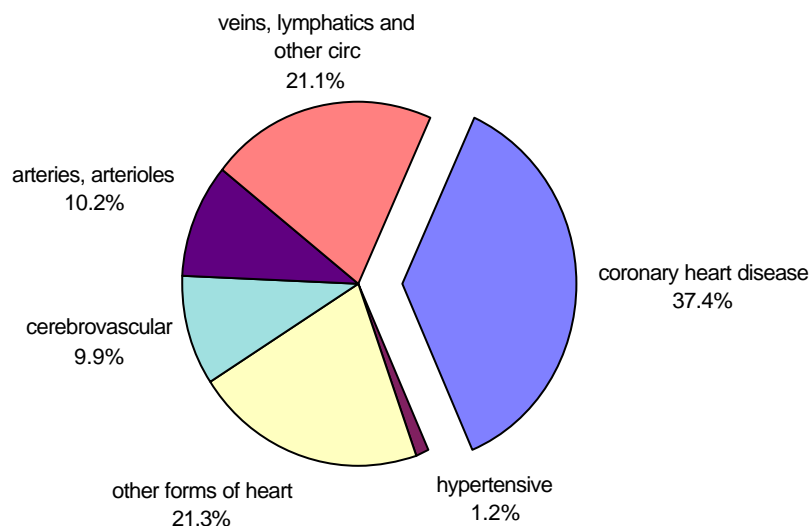
Figure 12: Hospital inpatient separations (%), CVD and other diseases, by country of birth, ACT residents, 1994/95



Source: ACT Hospital Morbidity Data Collection

The following figure shows the breakdown of cardiovascular separations into the various cardiovascular causes. It can be seen that coronary heart disease accounts for the largest proportion of all cardiovascular separations.

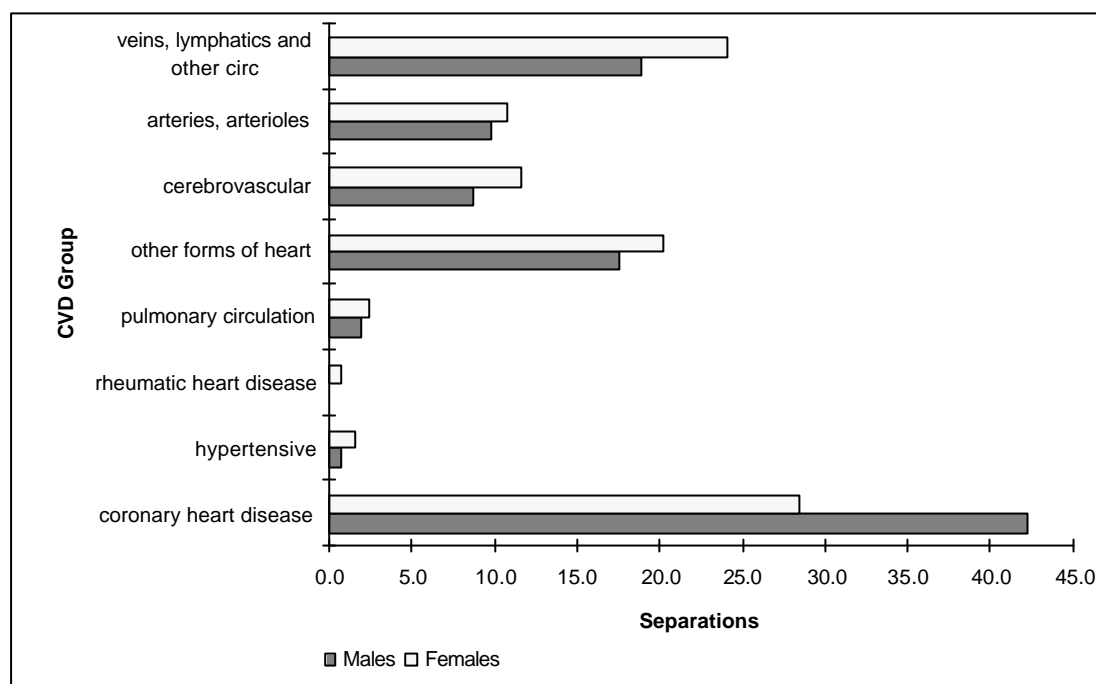
Figure 13: Breakdown of ACT hospital separations for various cardiovascular diseases, 1994/95



Source: ACT Hospital Morbidity Data Collection

Figure 14 expands on the information contained in Figure 13 for males and females 1994/95. It can be seen that males had a high proportion of coronary heart disease separations, but that for other cardiovascular diseases, the male/female ratio was fairly even, with females slightly higher than males:

Figure 14: Percentage separations, by cardiovascular causes, by sex, ACT hospitals, 1994/95



Source: ACT Hospital Morbidity Data Collection

In 1994/95, there were 4072 cases where CVD was a secondary diagnosis. The major principal diagnoses for these cases were symptoms involving the respiratory system (194), intestinal disorders (188), pneumonia (105), cataract (102), osteoarthritis and allied disorders (100), chronic airway obstruction (97), and diabetes mellitus (81).

Table 2 shows a reduction over time in the proportion of separations with a principal diagnosis of CVD and a corresponding increase in the proportion of diagnoses with CVD as a secondary diagnosis (for all diagnoses where CVD is identified). There have been substantial changes and refinements to coding practices during this time which may account for the changes.

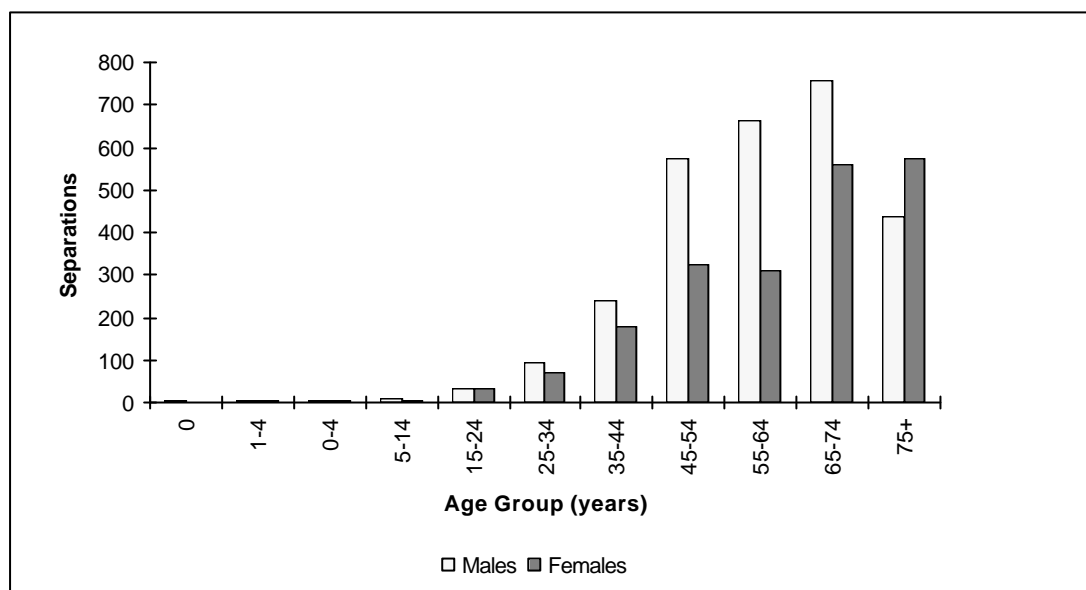
Table 2: Hospital separations for CVD, principal & secondary diagnosis, ACT, 1991-95

	91/92		92/93		93/94		94/95	
	number	%	number	%	number	%	number	%
CVD - principal	4307	66.8	4820	68.2	4440	63.4	4883	54.5
CVD - secondary	2143	33.2	2249	31.8	2562	36.6	4072	45.5
Total	6450	100	7069	100.0	7002	100	8955	100

Source: ACT Hospital Morbidity Data Collection

Figure 15 shows the age and gender breakdown of hospital separations. The possibility of hospital admission increases with age, particularly after 45 years of age and peaks at the 65 to 74 age group for both males and females. Male separations then decline due to increased mortality, but female separations continue to be high. Females tend to live longer, and therefore require hospitalisation more than males in the later years.

Figure 15: ACT hospital inpatient separations, by principal diagnosis of CVD, by age, by sex, 1994/95



Source: ACT Hospital Morbidity Data Collection

To a certain extent, the efficacy of cardiovascular disease management can be evaluated by considering the levels of re-admission to hospital.

Table 3: Number of hospital separations per individual for principal diagnosis of CVD, ACT, 1994/95

No. of separations per individual	No. of individuals	Total separations
1	3911	3911
2	351	702
3	46	138
4	16	64
5	4	20
6	1	6
42	1	42
Total	4330	4883

Source: ACT Hospital Morbidity Data Collection

The above table indicates that 419 individuals (9.7%) had more than one separation during the year.

If you consider separations over a four year period (July 1991 to June 1995), 84.9% of individuals with a principal diagnosis of cardiovascular disease had only one separation. Conversely, 15.1% had more than one separation.

Of all cardiovascular separations, 193 people (4% of separations) separated due to death.

Specific heart diseases

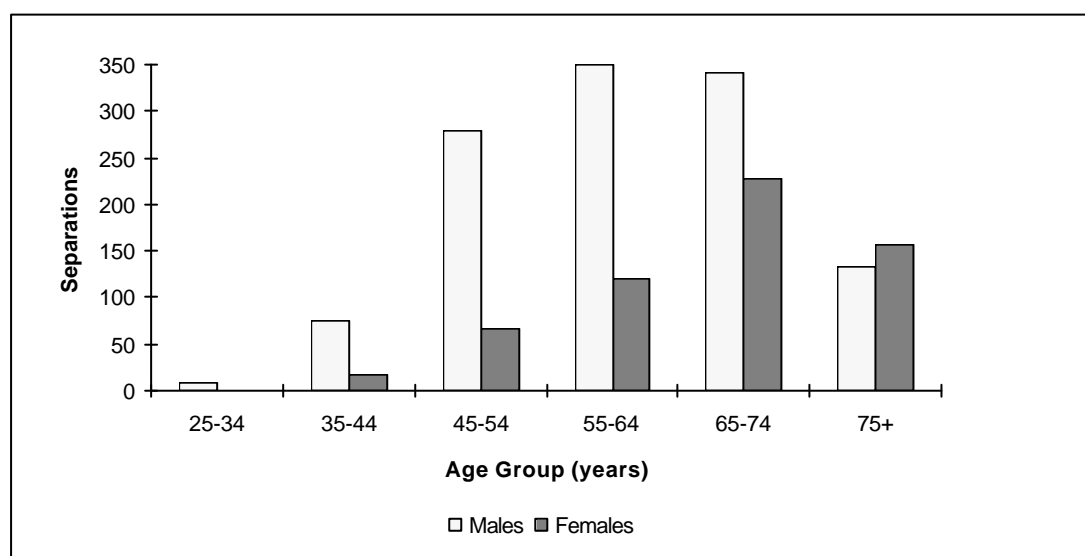
As can be seen from the following findings, hospital separation profiles are not uniform for the various heart diseases:

3.1.1 Coronary heart disease

There were 1777 separations for coronary heart disease (CHD) in ACT hospitals in 1994/95 (1188 males, 589 females). This equates to over 36 per cent of all cardiovascular disease separations. Of these, 408 (34%) male and 168 (29%) female separations were non-ACT residents. The separation rate was 514 per 100,000 for male and 281 for female ACT residents (excludes non-ACT).

Figure 16 shows the number of hospital separations for people with a principal diagnosis of coronary heart disease in the ACT in 1994/95. It can be seen that male separations are greatest between the ages of 45 and 74 years. Females on the other hand, have a peak at age 65 years and over.

Figure 16: ACT hospital separations for principal diagnosis of CHD, by age, by sex, 1994/95



Source: ACT Hospital Morbidity Data Collection

3.1.2 Cerebrovascular disease

Non-fatal stroke is responsible for considerable levels of illness and disability among survivors.⁶ Hospital morbidity data are one way to try and estimate the prevalence of the problem of cerebrovascular disease. However, it is difficult to gauge the true incidence by using these data alone, since many people experiencing a stroke do not go to hospital, but are treated in the community. A population study conducted in Perth in 1994 in conjunction with the World Health

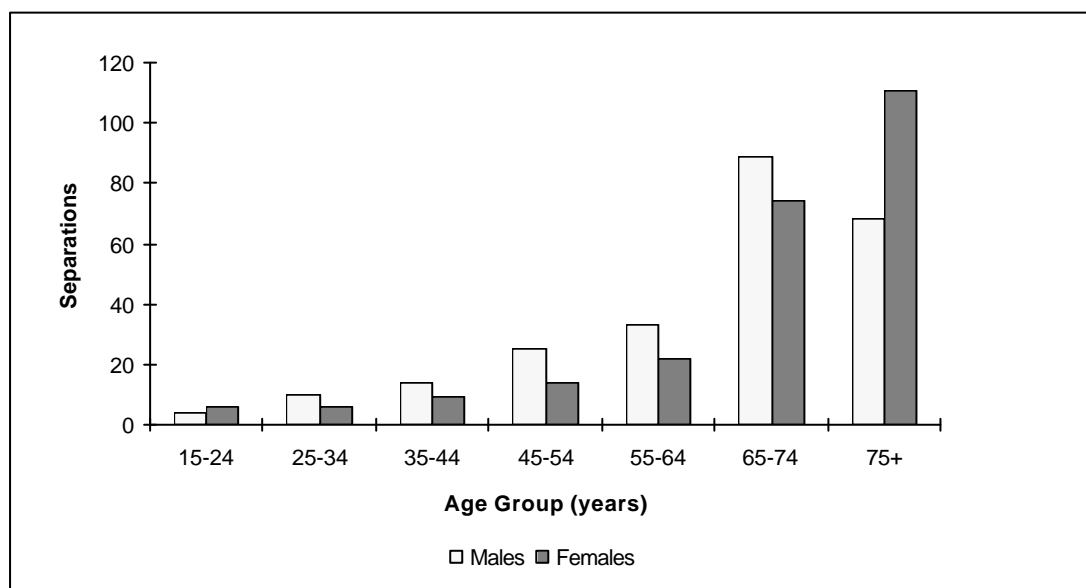
Organisation (WHO) MONICA Project (refer Glossary), estimated that 20 per cent of all strokes in Perth were managed either at home or in a nursing home. The likelihood of a patient being admitted to hospital after a stroke, decreased significantly with increasing age. Although 88 per cent of patients suffering a stroke under 65 years of age were admitted to hospital, 62 per cent of patients over 85 years were not.²⁶

Data on community treatment is incomplete or unavailable in the ACT.

There were 485 separations for cerebrovascular disease in ACT hospitals in 1994/95 (243 males, 242 females). This equates to 9.9 per cent of cardiovascular disease separations. Of these, 58 (24%) males and 47 (19%) females were non-ACT residents. The separation rate was 130 per 100,000 for male and 122 for female ACT residents (excludes non-ACT).

Figure 17 shows the number of hospital separations for people with a principal diagnosis of cerebrovascular disease in the ACT in 1994/95. It can be seen that males have a high number of separations between the ages of 65 and 74 years. Females on the other hand, have a peak at age 65 years and over. Generally speaking, males predominate in the number of separations until aged about 74 when females predominate.

Figure 17: ACT hospital separations for principal diagnosis of cerebrovascular disease, 1994/95



Source: ACT Hospital Morbidity Data Collection

Cerebrovascular disease: research

A population study conducted in Perth in 1994 in conjunction with the World Health Organisation (WHO) MONICA Project (refer Glossary), found that the standardised rate of all strokes for men in the study was 190 per 100,000 persons and 109 for women. There is no reason to suppose that ACT percentages would be greatly different to those found in Perth. If you apply the Perth standardised rates to the ACT population, the estimate of incidence is approximately 288 men and 163 women. Although this is a comparatively small number, it has serious implications for planning of health services in the ACT, since these people will most likely have high care and rehabilitation needs.

With regard undetected cerebral infarction, sometimes referred to as *silent cerebral infarction*, there is some evidence to suggest that a number of people will experience such an infarction without it ever being diagnosed, or not until a major episode occurs and the person is examined fully. A study conducted in Japan (Fujikawaki T et al, 1993) examined silent cerebral infarction in patients with presenile and senile major depression.²⁷ It found that over half (51.4%) of patients with presenile-onset major depression and the majority (93.7%) of patients with senile-onset depression had evidence of silent cerebral infarction. It was concluded that major depression could be organic depression related to silent cerebral infarction. This has a major impact on treatment options. It also adds to the estimated number of people who have strokes in the population.

3.1.3 Hypertension

The risk of both coronary disease and stroke increases as the level of blood pressure increases. On average, people with hypertension have a two to four fold increased risk of cardiovascular disease than other people of the same age.²⁸

The National Heart Foundation Risk Factor Prevalence Study (1989) showed that 18 per cent of men and 14 per cent of women aged 20 to 69 years were hypertensive in Australia. Of these people, 52 per cent of men and 31 per cent of women were not on medication for the condition. The proportion of people who were hypertensive increased with age.²⁹

The National Health Survey 1989-90 found that 5.5% of ACT residents reported a recent and/or long-term condition of hypertension as opposed to the national average of 9.0%. However after adjusting for age and sex, ACT residents reported significantly lower incidence of recent hypertension than the national average, but a similar incidence of long-term hypertensive conditions.

There is a relationship between hypertension and socio-economic status. Aboriginal people are particularly at risk. Single women and women with partners but no dependants have lower rates of hypertension than women with partners and dependants.³⁰

In the ACT, there were only 57 separations for hypertension. This equates to 1.2 per cent of all cardiovascular disease separations.

3.1.4 Peripheral vascular disease

There is no readily available data on prevalence of peripheral vascular disease (PVD) in Australia. If rates found in two studies in Edinburgh (Scotland) and the USA are applied to Australia, estimated prevalence of the disease would be 180,000-190,000 and around 160,000 respectively. Approximately 900 amputations related to PVD are performed each year in Australia.³¹

A summary of ACT hospital separations with PVD is given in Table 4. This table mainly highlights inpatients who are typically those patients requiring surgery. Most patients with PVD are treated by the outpatient clinic.

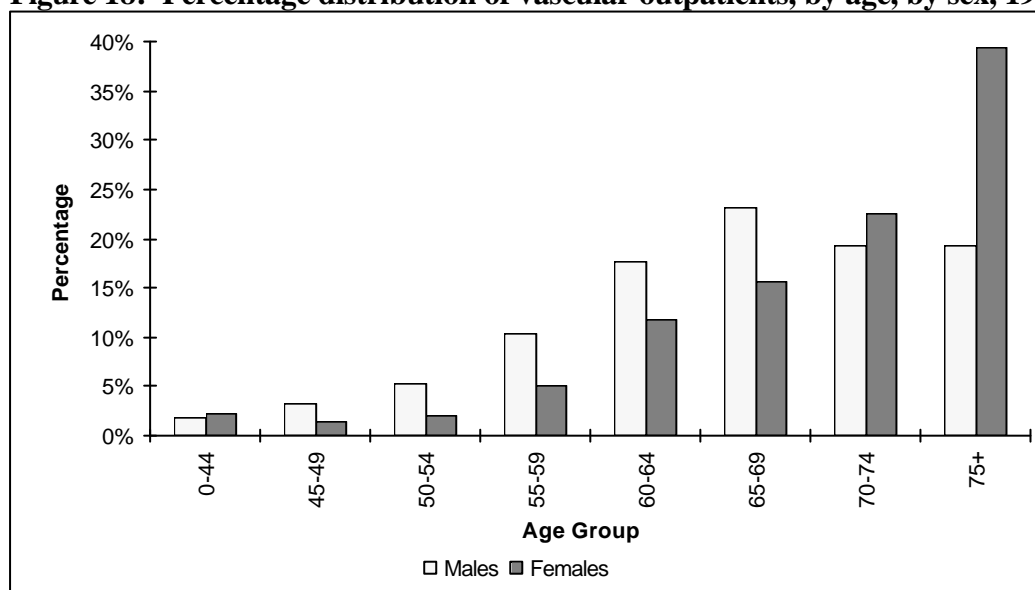
Table 4: Hospital separations, total length of stay & average length of stay for peripheral vascular disease, by sex, ACT, 1994/95

	Males	Females	Total
No. of Separations	94	60	154
ALOS (days)	8.21	6.1	7.39
TLOS	772	366	1138

Source: ACT Hospital Morbidity Data Collection

The vascular outpatient clinic at Woden Valley Hospital keeps its own database. Information includes demographics, risk factors upon presentation and disease severity. Records were entered for 1034 patients (620 males, 414 females) treated for PVD during the period 1975-1993. A brief summary of their age-sex distribution is given below (refer Figure 18). Of those females presenting to the clinic the numbers increase with age, peaking at 39% for those over 75, whereas of those males presenting the peak is 23% for the 65-69 group with around 20% in each of the groups from 60-64 to 75+.

Figure 18: Percentage distribution of vascular outpatients, by age, by sex, 1975-1993



Note: This information does not give the number of visits made by patients.

Source: Vascular Outpatient Unit, Woden Valley Hospital

3.1.5 Rheumatic heart disease

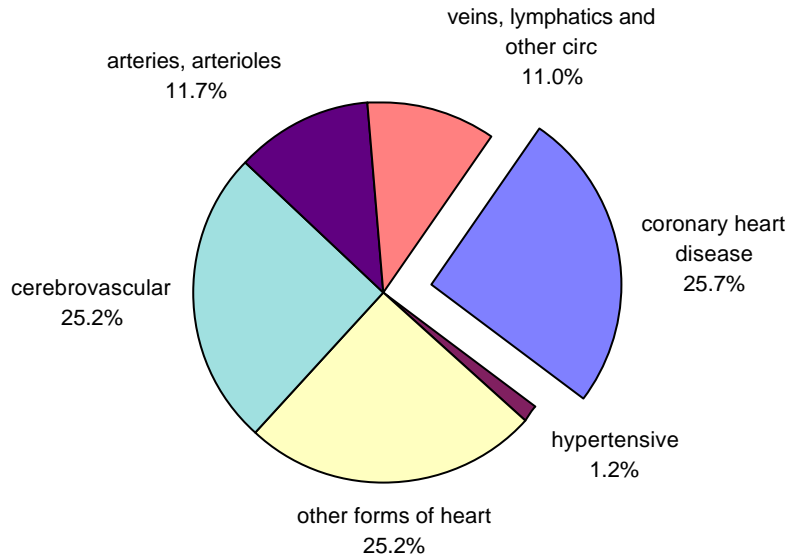
There were only twenty separations for rheumatic heart disease in 1994/95 in the ACT. This equates to approximately 0.4 per cent of all cardiovascular disease separations. The average length of stay was less than one day.

3.2 Hospital average length of stay

Length of stay in hospital is generally a measure of acuity of illness. Average length of stay (ALOS) for cardiovascular disease was 6.3 days which is the third highest cause of ALOS after mental disorders and perinatal conditions. Although the proportion of separations caused by cardiovascular disease was only 6.5 per cent, the total days spent in hospital was 10 per cent of all hospital days. Figure 19 shows that just over half of the cardiovascular days were due to coronary heart disease and cerebrovascular

disease. Of the total number of days spent in hospital by patients who had cardiovascular disease, approximately 26 per cent were spent by patients who had coronary heart disease, and 25 per cent by those who had cerebrovascular disease.

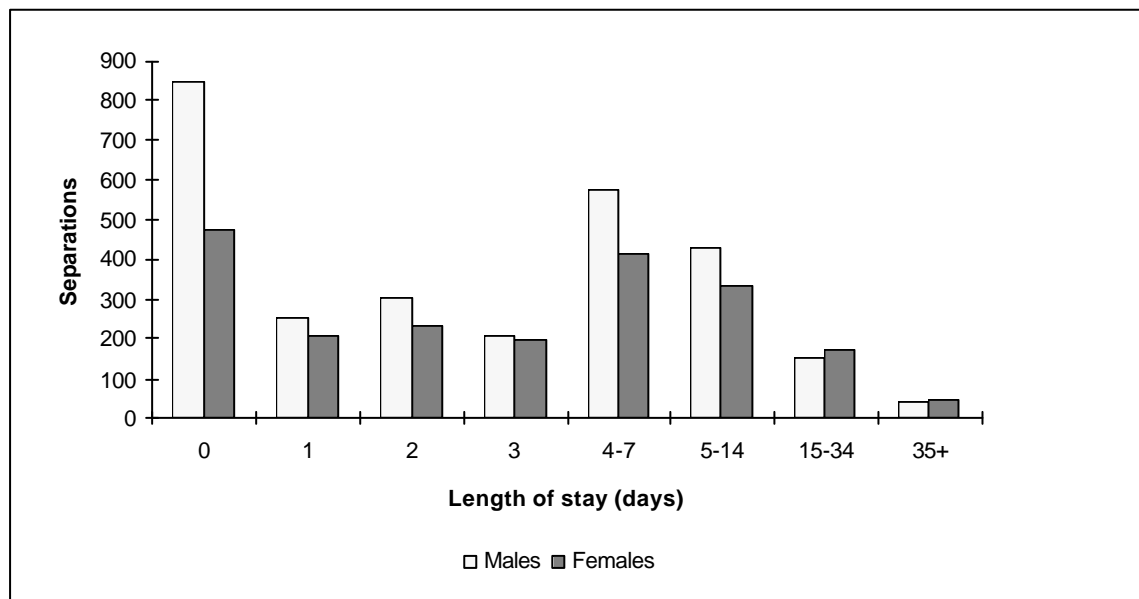
Figure 19: Total days (%) spent in hospital, by various cardiovascular diseases, ACT hospitals, 1994/95



Source: ACT Hospital Morbidity Data Collection

In terms of gender differences in length of stay, Figure 20 shows that a considerably higher number of males than females stay in hospital for less than one day, and a higher number of males stay in hospital between one and fourteen days than females.

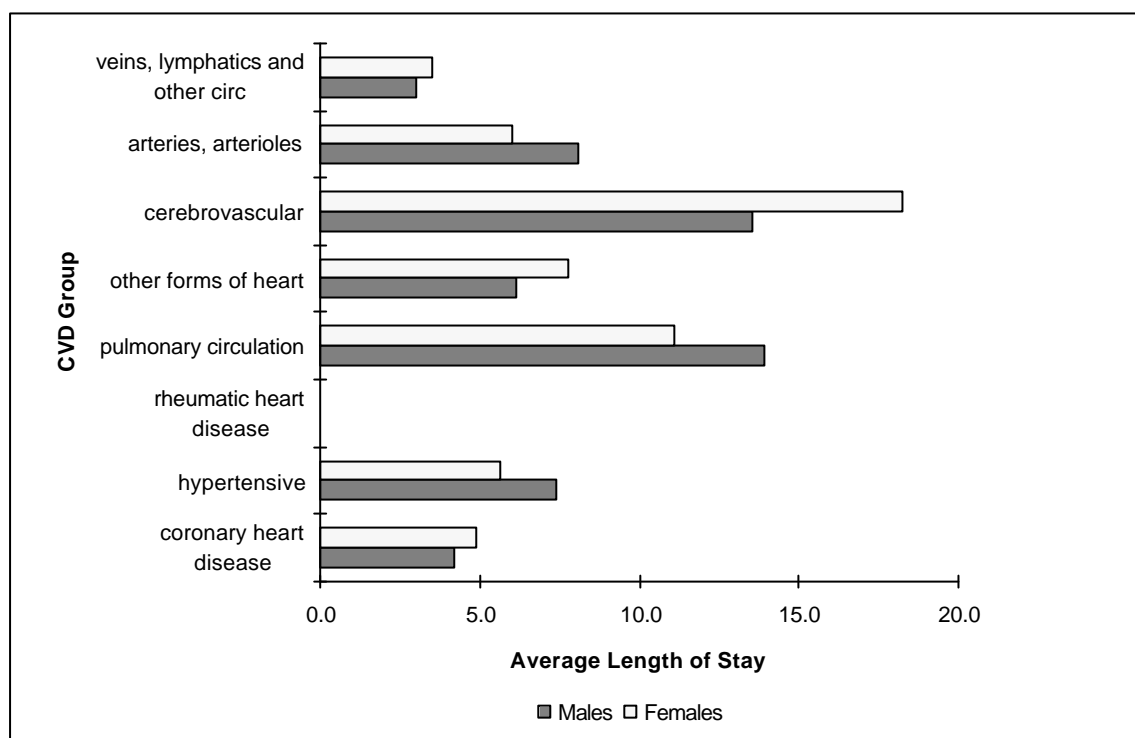
Figure 20: Length of stay, ACT hospital separations for principal diagnosis of CVD, by sex, ACT, 1994/95



Source: ACT Hospital Morbidity Data Collection

In terms of average length of stay spent in hospital (ALOS), the following figure shows the breakdown of ALOS into cardiovascular causes:

Figure 21: Average length of stay in hospital, by CVD cause, by sex, ACT hospitals, 1994/95



Source: ACT Hospital Morbidity Data Collection

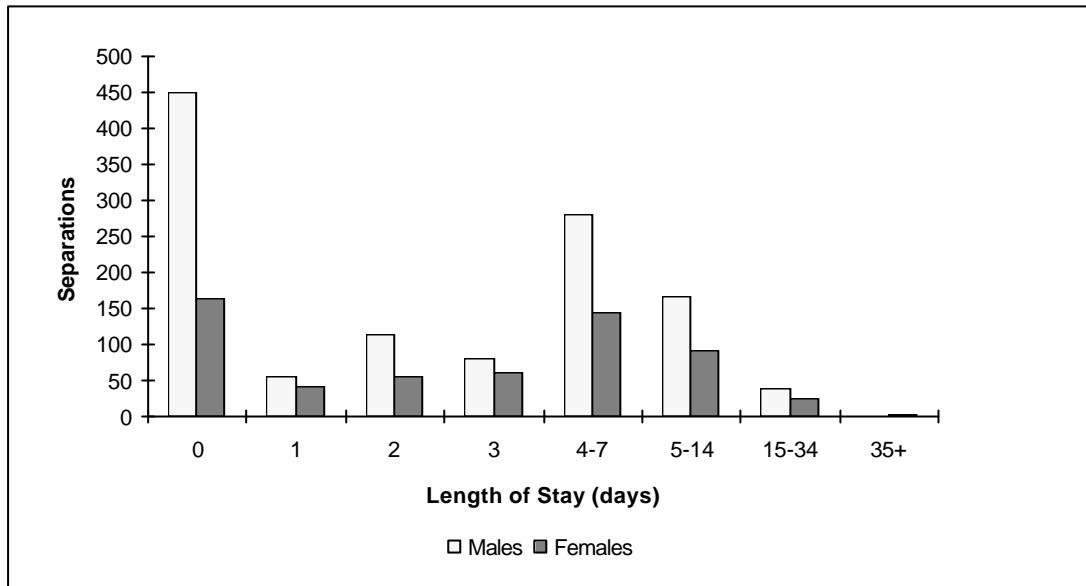
It can be seen from Figure 21 that cerebrovascular disease (especially females) and pulmonary circulation problems (especially males) account for the highest ALOS of all cardiovascular problems in ACT hospitals.

If one looks at Figure 21 in conjunction with Figure 14 (hospital separations, by sex, by various cardiovascular causes) it can be seen that males have substantially more separations for coronary heart disease with a slightly lower ALOS than females, which could be expected. Females on the other hand, have a slightly higher number of separations from cerebrovascular disease and ‘other forms of heart disease’ than males, but considerably longer lengths of stay, which would not be expected. It would appear that females suffering from these diseases require more extensive treatment than males. This is possibly due to the fact that females live longer than males, and are older when they need hospitalisation.

Coronary heart disease

In terms of average length of stay, males stayed 4.2 days and females 4.9 days with a person average of 4.4 days. The median length of stay for males was 2 days, for females 3 days, and for persons, 3 days. Figure 22 shows the distribution of the length of stay for males and females. It can be seen that, as for cardiovascular disease overall, males have a high number of separations lasting less than one day. Once again, this is likely to be because females presenting for treatment are older (refer 4.1).

Figure 22: Length of stay, ACT hospitals, for CHD, by sex, 1994/95



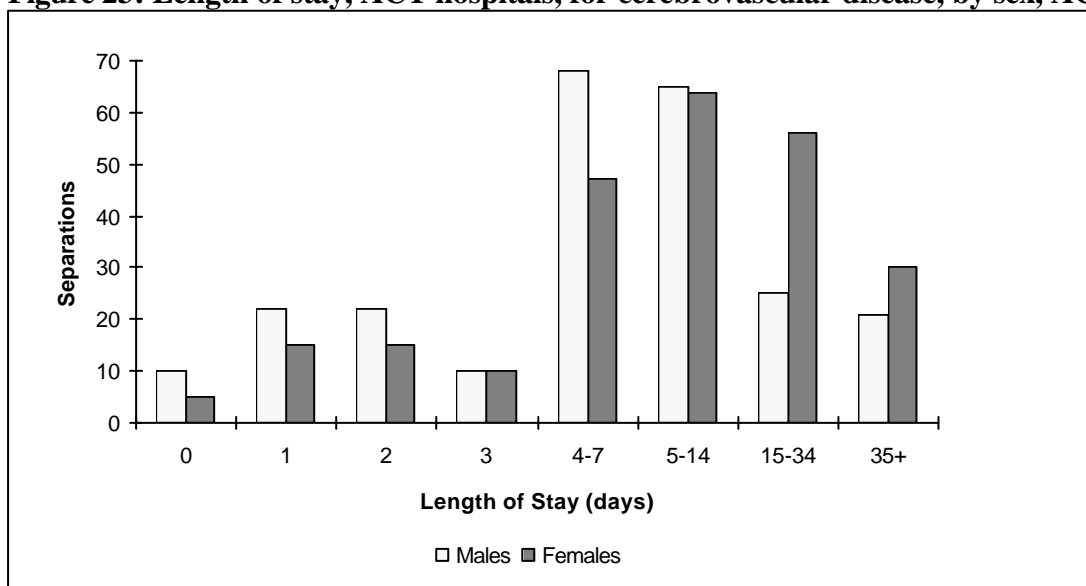
Source: ACT Hospital Morbidity Data Collection

Cerebrovascular disease

In terms of average length of stay, males stayed 13.5 days and females 18.2 days with a person average of 15.9 days. The median length of stay for males was 7 days, for females 10 days, and for persons, 8 days.

Figure 23 shows the total length of stay for males and females. It can be seen that, as for cardiovascular disease overall, males have a higher proportion of admissions than females, lasting less than one day. There is a likelihood of females who present being older and sicker than males.

Figure 23: Length of stay, ACT hospitals, for cerebrovascular disease, by sex, ACT, 1994/95



Source: ACT Hospital Morbidity Data Collection

Other Sources of Morbidity Data

Additional sources of morbidity data may be found in surveys carried out by government and non-government bodies including the national health surveys conducted by the ABS every five years. Unfortunately, not all such surveys have meaningful data available for the ACT.

3.3 1989-90 National Health Survey

In the 1989-90 National Health Survey, 9.0 per cent of ACT residents and 13.0 per cent of Australians reported having cardiovascular conditions. Those in the ACT and Australia reporting hypertension were 5.5 per cent and 9.0 per cent respectively. For heart disease they were 1.8 per cent and 2.6 per cent respectively.³²

Age-sex standardisation of those who indicated cardiovascular conditions³³ showed the ACT had a significantly better profile for hypertension, but a poorer profile for heart disease compared to those of Australia (refer Table 4).

Table 4: Selected health status indicators, cardiovascular diseases, ACT, 1989-90

Description	Persons(a) ACT	Ratios(b)	Comments
Health Status			
Recent illness(c)			
hypertension	10.7	69.7 *	lower than for Australia
heart disease	2.5	74.2	
Long-term conditions(d)			
hypertension	14.8	102.9	
all circulatory(e)	33.7	118.5 *	higher than for Australia.

(a) Persons who reported condition, '000 (b) Age-sex standardised ratios (c) Refers to medical conditions 2 weeks prior to being interviewed

(d) Refers to medical conditions which have lasted at least 6 months or which are expected to last 6 months or more. (e) includes varicose veins, etc.

* significantly different to Australia, with Australia as reference = 100.0

Source: 1989-90 National Health Survey Summary of Results, ABS Publication Catalogue No. 4364.0,

1989-90 National Health Survey Health Status Indicators, ABS Publication Catalogue No. 4370.0.

1989-90 National Health Survey as cited in Glover G and Woollacott T, *A Social Health Atlas of Australia*



4 Risk factors for cardiovascular disease

Risk factors operate throughout life and over the whole range of healthcare (primary and secondary prevention, diagnosis, intervention, rehabilitation, maintaining the best quality of life to death). Some are associated with the individual's constitution (genetic make-up) or behaviour, some with medical science and some with the environment.

Risk factors for diseases relating to the cardiovascular system, are of two types:

- ◇ those which may be prevented or modified (such as smoking); and
- ◇ those which cannot be altered (such as gender and age).

The exact role of each risk factor is difficult to determine due to the complex biological and statistical interrelationships among different risk factors. The fact that individuals with risk factors are more likely to experience cardiovascular disease is not however, in doubt. Also the fact that, the more risk factors a person has, the more likely they are to suffer cardiovascular disease.

It may be beneficial if morbidity and mortality for cardiovascular diseases, in particular heart disease, were reduced by the early detection of the disease through screening risk factors. However, to date there have been inconsistent findings on the benefits of such screening.³⁴

The most important modifiable risk factors associated with cardiovascular disease are smoking, hypertension, high blood cholesterol and triglycerides, raised blood pressure, and physical inactivity. Other factors shown to have a relationship with heart disease include obesity (especially abdominal fat), alcohol consumption and diabetes mellitus.^{35 36}

Bronner and colleagues conducted an extensive literature search into risks for cerebrovascular disease.³⁷ The conclusions were that major risk factors included hypertension, smoking tobacco, diabetes, obesity, sedentary lifestyles, and high consumption of alcohol. Increased consumption of fruit and vegetables appeared to reduce the risk, possibly through the action of anti-oxidants (beta carotene and vitamins C and E).

The National Heart Foundation³⁸ reports that:

- ◇ high blood cholesterol accounts for 30-40 per cent of all coronary heart disease deaths;
- ◇ high blood pressure accounts for 20-25 per cent of all coronary heart disease deaths; and
- ◇ smoking accounts for about 17 per cent of all coronary heart disease deaths (21% in males and 11% in females).

The National Heart Foundation also reported that, from 1980 to 1989, there was a marked decrease in average blood pressure in people of all ages, the proportion of cigarette smokers fell considerably and people with more than one risk factor decreased from 16% to 10% for men and from 11% to 7% for women. (There were no significant changes in cholesterol levels or the proportion of Australians exercising. There was an increase in the body weights of people with no corresponding increase in height - women were 3 kg heavier and men almost 2 kg heavier in 1989 than their counterparts in 1980).

There is also a consistent body of evidence to suggest that socio-economic status is strongly associated with cardiovascular morbidity and mortality. The prevalence of cardiovascular risk factors tends to be greater among those with less education, less income and less prestigious employment (or no employment at all).³⁹ An example would be the intake of saturated fats in one's diet. Several epidemiological studies have shown a correlation between the consumption of saturated fatty acids and coronary heart disease.⁴⁰ People from low socio-economic backgrounds appear to be more likely to have higher intakes of such fatty acids than people from high socio-economic backgrounds.

The presence of more than one risk factor can lead to greater risks of cardiovascular disease. As mentioned, there has been a trend towards a reduced prevalence of people having more than one of the major risk factors (smoking, high blood pressure, high blood cholesterol) however.⁴¹

All of these risk factors are potentially modifiable - even people with diabetes mellitus who manage their condition with sensible diet, physical activity and cessation of smoking, have considerable success in reducing complications such as heart disease.

The predisposing modifiable risk factors for cardiovascular disease are similar in young and old, and in men and women⁴². Many of the risk factors for heart disease may also be risk factors for other diseases, including cancer and asthma.

Some of the unmodifiable risk factors include:

- ◇ *Family history:* A family history of heart disease due to inherited raised cholesterol levels and raised blood pressure, and a tendency towards obesity and/or diabetes, is such a risk factor. It can be argued that, although a family history of heart problems weighs a person's chances towards having heart disease, a change in family culture and environment may reduce the chances considerably⁴³. The relative importance of the role of genetically inherited risk factors as opposed to family habits being passed on is unclear at this stage;
- ◇ *Gender:* Males are at greater risk of premature death from cardiovascular disease than females;
- ◇ *Age:* The risk of death from cardiovascular disease increases with age. Older people, especially those over 75 are at greatest risk;
- ◇ *Aboriginality:* Aboriginal females die at an age-specific rate 2.5 times higher than all Australian females, and Aboriginal males die at a rate 2.7 times high than for Australian males generally (refer 2.3). Indications suggest that the higher death rates are due to lifestyle factors (eg diet), rather than genetic factors;
- ◇ *Ethnic background:* Many immigrant groups have lower mortality rates than other Australians, but some have significantly higher death rates from cardiovascular disease than other Australians. Females over 45 years of age and born in Lebanon, Poland or New Zealand had death rates from cardiovascular disease above 100 in 1988-89 (reference where Australian born is 100). Males over 45 years from the same countries and from Malta and the Pacific also had rates above 100. Females over 55 years from Malta and the Pacific had similarly high rates. It is unclear as to whether the higher death rates are due to genetic or lifestyle factors (eg diet), or a combination of both.

Of ACT hospital separations (excludes non-ACT) in 1994/95, those separated with CVD had a different country of birth profile to those separated with other diseases. Those born in the UK/NZ/USA were 1.3 times more likely to separate with a principal diagnosis of CVD than other diseases ($\beta=0.2428$, $p<.005$) after adjusting for age and sex, whereas those whose country of birth fell into the category 'other' were less likely to separate with CVD. Other country of birth groups showed no significant differences. (Refer Section 3.1 for details).

4.1 Identified groups at particular risk

◆ Older people

Cardiovascular disease represents a growing problem for the Australian population and the health system because of the increasing size of the aged population. Most deaths caused by heart disease occur in older age groups, especially in the over 75 year age group.

Some specific issues affecting older people are outlined below:

A project conducted in the Netherlands studied stroke incidence during the period 1979 to 1989 and developed projected estimates to the year 2005. It concluded that there was, and would continue to be, a declining rate of incidence for stroke. Prevalence rates for major stroke would decline among the *younger* age groups, but increase among the *oldest* because of increased survival in that group.⁴⁴

A report just released by the National Heart Foundation in Australia partly supports these findings.⁴⁵ It states that, although the number of Australian people having heart attacks or strokes has remained reasonably stable over the past 30 years, the episodes are occurring later in life.

Kannel and Vokonas (1992) maintain that, because the major risk factors predict *coronary* heart disease as efficiently in the elderly as in the young, and the decline in cardiovascular mortality has included the elderly, preventative efforts in the elderly population may have substantial potential benefit.⁴⁶

◆ Young people

Coronary artery disease begins in childhood with coronary artery lesions which cause arteriosclerosis occurring during childhood and early adulthood.⁴⁷ It would therefore seem beneficial to take appropriate measures to reverse or prevent risk factors at an early age.

An area currently being investigated is how risk factors surrounding childhood are linked to the risk of cardiovascular disease during later life. Tracking from childhood to adulthood has shown that more than 40 per cent of children in high risk groups (90th percentile) remain in these groups 10 to 20 years later. Research points to childhood as a critical period when dietary and lifestyle patterns are initiated. This has long-term implications for coronary heart disease risk in adult life. In fact, modifiable risk factors often occur in family clusters.

Intervention studies in children and adolescents show that these lifestyle-risk factors are controllable through education and dietary counselling of the individuals and their family. Equally important are emerging data in adults showing that long-term intervention, involving a reduction in these risk factors, contribute to a significant improvement in coronary perfusion⁴⁸. Hence a better awareness through education can lead to an improvement in coronary care.

There is some evidence to suggest that young people practising heavy alcoholic drinking for intoxication are at particular risk of triggering brain infarction (stroke).⁴⁹

◆ Gender and Coronary Heart Disease

Coronary heart disease is a major concern in the population, but until recently, attention has been largely focused on men. As heart disease is also a major health concern among women, attention is now being focused on women and their differences from men.

A picture of epidemiological differences between men and women with coronary heart disease is beginning to emerge in recent literature and studies:

- ◇ Women presenting in hospitals are more likely to be older and have prior history of hypertension and diabetes;
- ◇ Presentation in women is more likely to be angina pectoris than other CVD whereas men are more likely to present with acute myocardial infarction;^{50,51}
- ◇ Overall data show that there are less males and females presenting with acute myocardial infarction, although the decline is greater for males;⁵²
- ◇ The incidence of coronary artery disease is lower in pre-menopausal women than in men. Onset is earlier and the disease progresses more rapidly than in men. However, within 6-10 years after menopause, the rate in women reaches that of men;
- ◇ In terms of treatment, several studies (including one in the ACT⁵³) have shown that men are significantly more likely to receive invasive investigation and management than women. However, those women who have angiographies have less extensive and severe disease;^{54,55}
- ◇ Population-based studies have demonstrated that men have higher morbidity and mortality rates from coronary artery disease than women;⁵⁶
- ◇ Although women are less likely to be smokers, there is concern for women who do smoke. Some Australian studies show a more powerful association between lifetime smoking dose and severity in women, than in men;^{57,58}
- ◇ One Australian study also shows living alone to be an independent risk factor for poor prognosis after myocardial infarction. Women tend to live alone more than men;
- ◇ For women, cholesterol levels rise with age, with both cholesterol and triglycerides being good predictors of coronary heart disease, especially in older women. These risk factors have the same significance for men;
- ◇ There appears to be some debate regarding sex-related differences in short and long-term disease profiles. However, women do not appear to have significantly worse long-term prognosis during and following hospital discharge for acute myocardial infarction.⁵⁹

There are some risk factors which are only applicable to women. In particular the use of oral contraceptives and hormonal replacement therapy. Research shows there has been an increase in the risk of coronary heart disease for women using oral contraceptives, but with the advent of low-dose contraceptives, this side affect has been reduced. Women who use oral contraceptives regardless of the dosage, and who smoke, are far more likely to have coronary heart disease than other women.

Studies on hormone replacement therapy show a reduction in the risk of coronary heart disease, but this needs to be balanced against a possible increase in the risk in some cancers).⁶⁰

Although differences between the genders and gender-specific information are emerging there are still many unanswered questions. Better representation of women in clinical trials is beginning to occur and this will assist in developing a clearer picture.

◆ People with diabetes mellitus

There is a strong relationship between cardiovascular disease morbidity and mortality and diabetes mellitus.⁶¹ The National Health Survey 1989-90⁶² found that for people aged 45 and over, 42.6 per cent of those with diabetes or high blood sugar levels reported having long-term hypertension and 18.4 per cent reported having heart disease. People without diabetes or high blood sugar levels reported at levels of 19.2 per cent and 4.9 per cent respectively. The Survey also found that people with diabetes or high blood sugar levels over the age of 15 years, were more likely to be overweight or obese (risk factors for cardiovascular disease) than the population overall.

In many studies conducted in developed countries, it has been found that the risk for cardiovascular disease is increased two to four fold among diabetic people compared with non-diabetic persons. In addition, peripheral vascular disease is common in people with diabetes⁶³. Diabetes is associated with greater relative risk for cardiovascular disease among women than men⁶⁴.

Some indication of the prevalence of acute cardiovascular disease in people with diabetes in the ACT can be ascertained by analysing hospital separation data:

Table 5: Hospital separations (percent), for CVD & diabetes, ACT, 1991-1995

Separations	91/92	92/93	93/94	94/95
Where cardiovascular disease is principal or secondary diagnosis				
No diabetes	91.7	91.6	88.8	88.6
Diabetes	8.3	8.4	11.2	11.4
Total	100.0	100.0	100.0	100.0
Where cardiovascular disease is principal diagnosis				
No diabetes	93.3	93.1	90.4	89.7
Diabetes	6.7	6.9	9.6	10.3
Total	100.0	100.0	100.0	100.0

Source: ACT Hospital Morbidity Data Collection

It can be seen that over 10 per cent of separations with principal diagnosis of cardiovascular disease also have a secondary diagnosis of diabetes. This percentage is rising and confirms findings in Health Series Number 5⁶⁵. Conversely, 25 per cent of separations with a principal diagnosis of diabetes, have a secondary diagnosis of cardiovascular disease.

◆ Indigenous Australians

As for other Australians, cardiovascular disease is the leading cause of death for Indigenous Australians. Death is mainly caused by coronary heart disease, stroke and heart failure. Rheumatic fever complications are also responsible for death, especially among Aboriginal and Torres Strait Islander people living in remote areas.

The National Heart Foundation⁶⁶ reports that for young and middle aged Aboriginal and Torres Strait Islander adults, death rates from heart and blood vessel disease are 10 to 20 times higher than for other Australians. For Aborigines and Torres Strait Islander people generally, the death rate from cardiovascular disease is 2.4 times higher for males and 2.6 times higher for females than the general Australian population. One encouraging fact is that death rates among Aboriginal males has declined by almost 19 per cent in the period 1985-86 to 1991-92. Unfortunately, there has not been a similar fall for females.

Furthermore, a recently released publication⁶⁷ states that Indigenous males had a decrease in mortality from circulatory disease of approximately 2 per cent (which is approximately parallel to the decrease for non-Indigenous males). Females had a similar movement, but in the form of an increase (which widened the gap between Indigenous and non-Indigenous females), between 1985 and 1994.

As mentioned in Section 4.1, risk factors associated with heart disease bear a relation to lifestyle and socio-economic status. Indigenous people are at high risk of poor socio-economic status and are therefore at high risk of developing heart disease.

A study in Western Australia in 1989-91⁶⁸, found that tobacco smoking was responsible for 15.4 per cent of all deaths and 13.9 per cent of Aboriginal deaths (Of those who died, 49% of Aboriginal males and 48% of Aboriginal females, died before 55 years of age compared with 11% and 10% for non-Aboriginal people); and that alcohol consumption was responsible for 5 per cent of all deaths and 9.2 per cent of Aboriginal deaths (Of those who died 62% of Aboriginal males and 70% of Aboriginal females died before 55 years of age compared with 35% and 23% for non-Aboriginal people);.

The National Aboriginal and Torres Strait Islander Survey 1994⁶⁹ found that, in the Queanbeyan ATSI Region (which includes Canberra, Queanbeyan, Yass, Nowra, Batemans Bay and Eden), the following was reported:

Table 6: Health & socio-economic status, Queanbeyan & Australian ATSIC Regions, National Aboriginal and Torres Strait Islander Survey, 1994

	Queanbeyan region (%)	All Australian regions (%)
Experienced recent illness	44.8	41.2
Experienced long-term illness	42.4	34.8
Alcohol considered the main health problem in the area	46.1	58.8
Smokers	46.4	49.7
Diabetics	12	4
Asthmatics	19	13
Overweight or obese (Body mass index scores)	48	38
Income - government payments	51	55
- wages and salaries (over 15 years)	38	34
- average gross income for the region	\$295 pw	\$269pw
Education - attending school (5-18 years)	76	81.7
- with post school qualification (over 15 years)	16.4	16.9
Housing - rented accommodation	81	69
- rented from state or territory authorities	28	43
- dwelling on a sealed road	59.7	81.6

Source: *The National Aboriginal and Torres Strait Islander Survey 1994*⁷⁰

It should be noted that the data described above is for a region including several *coastal* and *rural* areas. The National Survey found that Aborigines and Torres Strait Islanders living in rural or remote areas had lower socio-economic and health status than urban people. This is clearly shown when you consider the category 'dwelling situated on a sealed road'. Almost all ACT residents live on sealed roads, but for the region, only 59.7 per cent do. Therefore, percentages for the ACT could be expected to be 'healthier' than those depicted above. People identifying as Aboriginal or Torres Strait Islander accounted for only 0.4 per cent of separations for cardiovascular disease (13 females and 8 males) in ACT hospitals in 1994-95. This low number may be due to a reluctance to identify or to visit institutions rather than an indication of need. It may also be due to the fact that the ages of the ACT Indigenous community are relatively young.

4.2 Possible reasons for the reduction in mortality due to cardiovascular disease

Reductions over recent years in mortality due to cardiovascular disease may be attributed to the reduction in smoking and blood pressure levels in people and improvements in medical care of them.⁷¹ Other factors may include,

- ◇ improved eating and lifestyle habits;
- ◇ greater awareness by people with genetic predisposition towards heart problems, of ways in which to reduce risks of heart disease;
- ◇ improved medical procedures and protocols for the treatment of heart problems; and
- ◇ improved technologies and equipment.

4.3 Risk factor status of ACT residents

4.3.1 1989-90 National Health Survey

In terms of risk status in the ACT, the 1989-90 National Health Survey showed the ACT to have the highest prevalence of smokers (30.3 per cent compared to a national average of 28.4 per cent) and a slightly lower than average number of ex-smokers (22.9 per cent compared to the national average of 23.2 per cent)⁷². The ACT had the highest number of males and females who had consumed alcohol prior to the interview - however, the average daily consumption was less than for the NT, Queensland and New South Wales and similar to the national average⁷³. ACT residents also had the highest number of those who exercised two weeks prior to interview with 71.7 per cent reporting exercise compared to 65.4 per cent of Australians⁷⁴.

Table 7: Selected health risk factors, cardiovascular diseases, ACT, 1989-90

Description	Persons(a)	Ratios(b)	Comments
Health Risk factors			
Smoking(c)			
males smoker	36.6	108.7	
females smoker	23.7	89.7	ACT reported lowest levels
total ACT smoker	60.3	100.3	
Alcohol consumption			
nil alcohol consumed	58.6	82.2*	nearly 20% less than national average
low level health risk	115.1	110.2*	significantly higher than national averages
medium level health risk	15.2	106.3	
high level health risk	10.3	112.3	higher than average, but not significant
Exercise			
those who did not exercise	57.6	83.2*	ACT had fewest undertaking no exercise.
low level exercise	68.4	110.2*	significantly higher than national average
medium level exercise	37.2	106.3	
high level exercise	35.9	112.3	
Height and weight(d)			
females underweight	16.1	89.1	
females overweight	15.6	85.8*	lowest overweight, almost 15% under ave.
males overweight	33.1	92.1	lowest of all states and territories

(a) Persons who reported condition, '000 (b) Age-sex standardised ratios (c) smoking is defined as regularly smoking one or more a day.

(d) underweight <20 kg/m², acceptable 20-25 kg/m², overweight 25-30 kg/m², obese > 30kg/m²

* significantly different to Australia, with Australia as reference = 100.0

Source: 1989-90 National Health Survey Summary of Results, ABS Publication Catalogue No. 4364.0,

1989-90 National Health Survey Health Risk Factors, ABS Publication Catalogue No. 4380.0.

1989-90 National Health Survey as cited in Glover G and Woollacott T, *A Social Health Atlas of Australia*

However, as can be seen in Table 7, after adjusting for age and sex, ACT residents had a better or similar risk factor profile to that of Australia. ACT females reported the lowest levels of smoking, and the ACT population had a significantly higher proportion of persons with low risk alcohol consumption, significantly fewer persons who did not consume alcohol at all and more residents who undertook exercise. There is concern that parts of the survey only capture those in the 18 and over age group as this may cover up problems concerning teenage alcohol abuse. It may also give a conservative estimate of teenage consumption.

Results from the National Health Survey 1995-96 will be available soon. It will be interesting to compare these with 1989-90 findings.

4.3.2 National Heart Foundation Risk Factor Prevalence Survey

The 1989 Heart Foundation Risk Factor Prevalence Study confirmed the results in the 1989-90 National Health Survey. Results however, are not directly comparable for a number of methodological reasons. The risk factor profile for Canberra shows residents have the highest prevalence of exercise participation during leisure time and that they rank well in terms of smoking and raised cholesterol. Both males and females have better overall risk factors profiles than other cities.⁷⁵ (refer Table 8).

Table 8: 1989 Heart Foundation Risk Factor Prevalence Study results, by sex, Canberra

Risk Factor	Prevalence % (a)	Prevalence ratio (b)	Rank in Australia(c)
Males			
Hypertensives	17.7	1.70	5
Raised cholesterol (d)	45.8	1.09	2
Cigarette smokers (f)	23.4	1.19	2
Overweight or obese	50.0	1.12	3
No exercise	20.9	1.00	1
Overall rank			1
Females			
Hypertensives	10.5	1.04	2
Raised cholesterol (d),(e)	41.1	1.16	3
Cigarette smokers (f)	17.5	1.26	2
Overweight or obese (g)	36.7	1.26	5
No exercise	24.7	1.02	1
Overall rank			1

(a) Age standardised over the range 20-69 year. (b) Ratio of prevalence to minimum prevalence. (c) For each risk factor, cities have been ranked from 1=lowest prevalence to 8=highest prevalence. Equal rank has been given when prevalence estimates are relatively close. (d) Nothing to eat or drink in the 12 hours before testing apart from water, black tea or coffee. (e) Excludes women taking the oral contraceptive pill.

(f) May also smoke cigars and/or a pipe and includes persons who smoke hand-rolled cigarettes. (g) Excludes pregnant women.

Source: 1989 Heart Foundation Risk Factor Prevalence Study, Survey No. 3 1989

4.3.3 National Drug Strategy Household Survey

An analysis of data from the National Drug Strategy Household Surveys 1985 to 1995 was performed to test whether smoking status in the ACT population was significantly different over time.⁷⁶ It was found that smoking status was significantly different ($\chi^2 = 108.4$; $df = 9$; $p < 0.001$).

As Figure 25 demonstrates, between 1985 and 1995, there has been a significant increase in the proportion of ACT people who never smoked. For instance, in 1985, 25 per cent of people had never

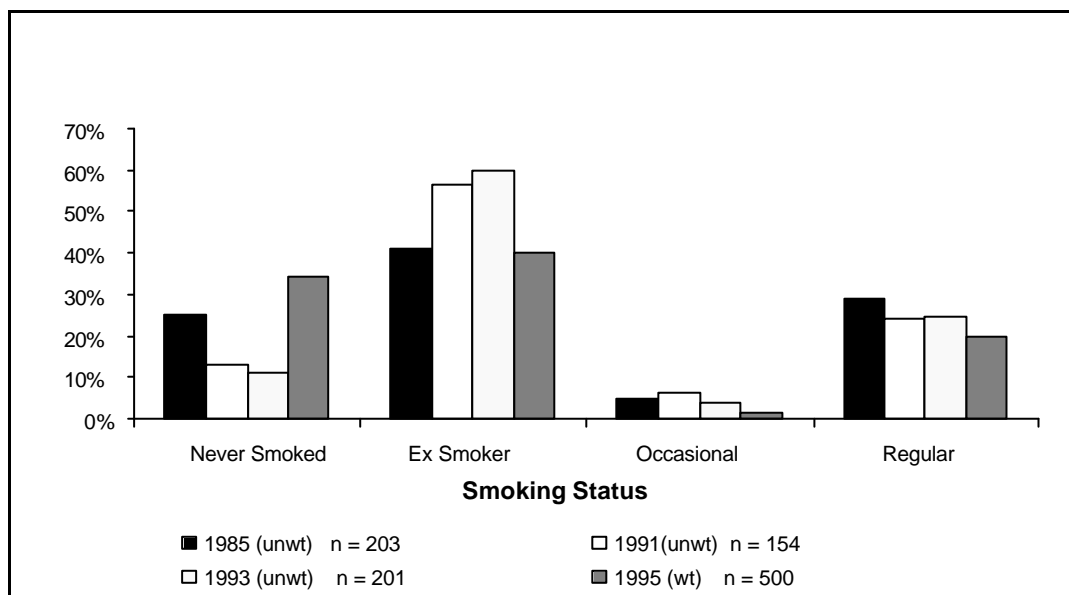
smoked compared to 34 per cent of people in 1995 ($z = 3.08$; $p < 0.001$); while in 1991, only 13 per cent of people never smoked and similarly in 1993, only 11 per cent of people had never smoked.

The ‘U’ shaped distribution for those who never smoked is counter balanced by a inverted ‘U’ shaped distribution among those who became ex-smokers between 1985 and 1995. The proportion of people giving up smoking in 1985 was not significantly different ($z = 0.28$; $p > 0.001$) to the proportion giving up smoking in 1995, being 40 per cent and 41 per cent respectively. On the other hand, in 1991 ($z = 4.06$; $p < 0.001$) and 1993 ($z = 5.62$; $p < 0.001$), a significantly greater proportion of people gave up smoking than in 1995, with 56 per cent 1991, and 60 per cent in 1993 giving up smoking.

Figure 25 also shows that the proportion of occasional smokers within the population between 1985 and 1995 has remained relatively low, ranging in prevalence from 2 per cent to 5 per cent.

In contrast, there has been a downward trend in the rate of regular smokers in the ACT. For example, the proportion of regular smokers in 1985 was significantly more than the proportion in 1995 ($z = 3.16$; $p < 0.001$). In 1985, 29 per cent of ACT people were regular smokers compared to 20 per cent of people in 1995.

Figure 24: Smoking status, ACT, 1985-95



Note: 1995 weighted proportional to the population.

Source: National Drug Strategy Household Survey



5. ACT and national initiatives

5.1 National health goals and targets

National health goals and targets for cardiovascular disease were developed and endorsed by health ministers in all states and territories in 1994. Concurrently, the ACT developed its territory specific goals and targets which are complementary to the national ones.

5.2 National Cardiovascular Monitoring System

One of the major recommendations in the national goals and targets development was to establish and maintain a national monitoring system for cardiovascular disease, its risk factors and management. Ongoing surveillance of risk factors and improved information on cardiovascular disease were also recognised as high priority areas in the National Health Information Development Plan published in 1995. As a result of these recommendations and extensive consultation and collaboration with states and territories, funding of \$1.66 million over three years was granted by the Commonwealth to enable the monitoring system to be established.

Consequently, the National Centre for Monitoring Cardiovascular Disease based at the Australian Institute of Health and Welfare, and an advisory committee with a broad membership including an Aboriginal and Torres Strait Islander representative, were established in January 1996. Regional Collaborating Centres will soon be identified to provide expert advice to the National Centre, assist with collection of information, and undertake methodological developments.

Projects underway include monitoring and reporting on trends and differentials in three areas: risk factors, prevalence of CVD and associated functional status, and in CVD mortality. Other projects are the monitoring of national goals and targets on CVD, determining the feasibility of using record linkages in the monitoring system, developing and promoting uniform standards, methods, procedures and definitions for CVD, and developing a national system of monitoring the treatment of people admitted to hospital with CVD.

5.3 ACT health goals and targets

The ACT Department of Health and Community Care developed health goals and targets for cardiovascular disease in 1994 after considerable deliberation and consultation with key stakeholders.⁷⁷ An implementation process for the Territory has been established and is being overseen by the Health Outcomes Reference Group.

The goals and targets are outlined in Table 9:

Table 9: ACT health goals and targets for cardiovascular diseases

Goal	Target
1. Increase coordination between ACT cardiovascular services and agencies	
2. Reduce mortality due to cardiovascular conditions	<ul style="list-style-type: none"> a) Reduce by 20% the ave. annual cardiovascular mortality rate for people aged 25-74 years b) Increase the proportion of adults who can recognise the symptoms of cardiac arrest & perform cardiopulmonary resuscitation to at least 40% c) Increase the proportion of people who present to hospital within one hour of onset of acute cardiovascular symptoms to at least 90% d) Increase the proportion of all staff working in health care environments who are proficient in cardiopulmonary resuscitation techniques to at least 100% of health care practitioners & 60% of non-clinical staff
3. Reduce the prevalence of cardiovascular risk factors in the community	<ul style="list-style-type: none"> a) Increase the proportion of adults who had their blood pressure measured within the previous 12 months, to 80% of males and 85% of females b) Reduce by 25% the proportion of adults who have plasma cholesterol levels 6.5mmol/L c) Increase to 80% the proportion of adults who report participation in regular leisure-time exercise
4. Improve the quality of life of people with cardiovascular conditions.	<ul style="list-style-type: none"> a) Ensure that all people who survive a heart attack, cardiac surgery or stroke are able to access a comprehensive rehabilitation program b) Increase to 75% the proportion of people who participate in a comprehensive rehabilitation program after a heart attack, cardiac surgery or stroke c) Increase the proportion of people who return to work within 6 months (for those who wish to, and for whom this is a realistic option), to 95% following cardiac surgery, and 80% following heart attack

Source: ACT Dept of Health, *ACT Health Goals and Targets for the Year 2000*, 1994

5.4 Cardiology Unit - The Canberra Hospital

The primary function of the Cardiology Unit at The Canberra Hospital is to treat patients presenting with heart disease. Acute conditions are treated by their Coronary Care Unit. In addition, the cardiology unit is involved in prevention, rehabilitation and a number of research projects as outlined below.

The Cardiology Unit at The Canberra Hospital, through its Cardiac Rehabilitation Section conduct a Heart Eductaion And Rehabilitation Training (HEART) Program which is sponsored by Health Promotion Services as discussed at 5.5. Staff involved include a cardiac specialist, a cardiac rehabilitation nurse consultant, a dietitian, an occupational therapist, the pharmacist, a physiotherapist, a

psychologist, a social worker and a remedial therapist. The program commences soon after a patient is admitted to hospital and continues throughout their stay. Educational and practical activities on heart disease and self-management of heart disease are part of this phase. It is followed by an outpatient exercise and education phase (Phase Two) which involves a supervised gym program, weekly discussion groups and weekly relaxation classes. Phase Three is a community based walking program administered by a cardiac nurse and physiotherapist for Heart Support Australia in conjunction with the hospital. The families of the clients are encouraged to participate in all three phases.

The Cardiology Unit is currently involved in a number of research projects including:

- A project investigating social circumstances and the socio-economic background surrounding persons where there is a delay in seeking medical attention and where death has occurred (where a person is admitted to hospital these details are already known);
- A survey of medical records in order to develop a profile of infective endocarditis.
- The Coronary Care Unit is involved in multicentre clinical trials known as "Gusto-trials".
- Involvement in a lipid trial being conducted by the National Heart Foundation.

It has recently been announced that the ACT Government will spend \$2.7 million to establish a *Cardiothoracic Unit* at The Canberra Hospital. The first patient is expected by June 1997. This funding will ensure that thoracic surgeons are attracted to the ACT and that a full service is offered to patients who have had to travel to Sydney for treatment. This will affect approximately 158 ACT residents and 150 people from surrounding districts per year.

5.5 Health Promotion Services

Health Promotion Services (HPS) at The Canberra Hospital conduct activities and programs for the community, hospital patients and the staff of the Department of Health and Community Care. Relevant programs which have a direct influence on cardiovascular disease prevention and recovery include:

- ◇ Consultations, either individual or group, concerning giving up smoking (Quits), healthy lifestyle, stress management and nutrition;
- ◇ Programmed activities such as relaxation classes at lunchtimes or as part of the Cardiac Rehabilitation Program, other lunchtime activities (recreational activities, social running group etc) and a Lifestyle Awareness Program (modules over 12 weeks);
- ◇ Monitoring and guidance services for blood pressure, height and weight (BMI) and blood sugar testing; and
- ◇ Informalised mediums such as the provision of information on a range of lifestyle issues, assistance with educative displays and promotion of specific activities being held at the hospital or in the community.

HPS program philosophy encompasses three main factors:

- ◇ Participants are assisted to evaluate their own behaviour in relation to their own health with the view to modifying, changing or maintaining lifestyle practices;
- ◇ Participants are encouraged to take an active role in decision making about their own health and lifestyles; and
- ◇ Participants are encouraged to learn how to solve their own lifestyle problems through assistance in dealing with obstacles to lifestyle behavioural change.

5.6 Cardiac Rehabilitation Unit - Calvary

Calvary hospital also has a cardiac rehabilitation unit. They offer similar services to those of the Canberra Hospital, but do not do Phase Three. They do however, supplement Phase Two, by having general practitioners (and representatives from Heart Support Australia) give educational talks and support to patients. (Refer 5.11)

5.7 Health Risk Management Service

This ACT Government service is offered for eight hours a week and is located at the City Health Centre. A health professional holds assessment days where people may come for half hour appointments and be assessed in areas such as blood pressure, blood sugar levels, cholesterol levels, weight etc. Follow up one to one sessions are offered to those needing further advice. The health professional also speaks to groups about lifestyle management and collaborates with the National Heart Foundation's Speakers Bureau. She liaises with other groups and assists them develop programs (eg the 12 week introduction to exercise program run in collaboration with the Retirees Activities Programs Group). The Service focuses on the on-going provision of resources for individuals interested in reducing risk factors to healthy living.

5.8 ACT Health Centres

The various health professionals at the health centres around Canberra offer short term courses and activities for people interested in reducing risk factors to healthy living. Some examples include walking groups, healthy lifestyle programs (body image, exercise, healthy eating etc), and a ten week program for people affected by stroke (information and exercises).

5.9 National Heart Foundation ACT

The National Heart Foundation ACT Division is active in promoting practical support for people with heart disease and in the prevention of heart disease in the community. Activities include distribution of educational materials and information, especially targeting risk behaviour and healthy lifestyle issues; developing guidelines for doctors such as those concerning hypertension and plasma lipids; sponsoring community activities such as Jump Rope for Heart, Dance for Heart and Swim for Heart (educational, recreational and fundraising); distributing a regular newsletter to members and interested people; establishing a Speakers Bureau (of trained, informed speakers who visit workplaces, organisations etc and speak on topics such as nutrition, physical activity, rehabilitation, stress, lifestyle change, gender related heart issues); and school based programs.

The current school program is funded by HealthPact (ACT Health Promotion Foundation) and involves educational and exercise components. Another school activity is a two year survey of secondary students. Phase One, involving 2500 year 8 students from government and non-government schools who completed a survey form on heart risk factor behaviour, has been completed. A database of adolescent lifestyles will be developed, on which future educational

targets will be identified. Depending on funding, Phase Two will involve surveying one school in each of the four ACT regions. Students will have individual cardiovascular assessments completed, advice given on healthy lifestyles and where appropriate, students at risk will be referred to medical practitioners. If students have high cholesterol and/or blood pressure, they will be tested six months later. This project will give information not currently available, on ACT adolescent health with regard cardiovascular disease risk.

5.10 Heart Support Australia

Heart Support Australia (formerly the Australian Cardiac Association) is a non-sectarian, non-political, non-profit organisation supporting people affected by heart disabilities. Its work is endorsed by the National Heart Foundation. It received \$6,000 in funding from the Department of Health and Community Care in 1994-95 to further its work.

Its ACT branch offers a free advisory counsellor service, free visits to patients in hospitals or who are housebound, support for families, regular meetings to provide education and support in maintaining positive lifestyles and regular newsletters to members and interested people.

5.11 ACT Division of General Practice

The ACT Division with assistance from Merck, Sharpe and Dohme, has developed an integration program which will assist general practitioners in their role in the secondary prevention of cardiovascular disease. It aims to promote activities in the areas of improved communication, resource development and GP education. Some of the activities undertaken to date include the development of a system at Calvary Hospital whereby GPs are notified when their patients are admitted to the Coronary Care Unit; GPs participate in the Calvary Rehabilitation Program by talking to patients about the role of the GP in the long-term management of cardiac patients; the development of materials for GPs such as lists of support services available, reminders relating to the management of blood pressure, cholesterol etc, and a patient held record card for distribution to patients; and educational seminars for GPs.

5.12 Alcohol and drugs

Grants not already mentioned above have been awarded to the Alcohol and Drug Foundation ACT (ADDinc) in 1994-95. \$549,838 was allocated to assist in programs to reduce alcohol and drug abuse in the Territory.

The Alcohol and Drug Service of the Department of Health and Community Care also run programs, such as smoking cessation programs, to reduce risk behaviours.

5.13 Data collection

The implementation of health goals and targets and the maintenance and improvements to service delivery will depend on the availability of base-line data on which to base evaluations of programs and interventions. Refinement and expansion of data collections have commenced in the ACT with the establishment of a new data bank in the emergency departments and outpatient clinics at The Canberra Hospital and Calvary Hospital. The data collection system has been installed and is compatible with the new NSW data system, thus allowing cross border comparisons. The system development was funded by the Commonwealth through the Ambulatory Care Reform Program and utilises the National Injury Surveillance data definitions and national emergency definitions which have been developed.

The *National Health Survey* is another excellent source of information. This will be particularly so for the 1995-96 survey, since the ACT had negotiated an extended ACT sample to ensure greater accuracy.

Another excellent method for collecting data is the *ACT Care Continuum and Health Outcomes of Hospital Inpatients Project*. This is a two year innovative pilot project, funded by the Commonwealth Department of Human Services and Health, which commenced in early 1995 and is being undertaken by the Epidemiology Unit of the ACT Department of Health and Community Care in collaboration with The Australian National University. The project involves investigating approximately 7,000 inpatients and their experiences prior to admission, during their hospital stay and up to six months after discharge. Questions regarding formal and informal service utilisation, costs across the care continuum and how to make better use of resources, and health outcomes including quality of life are being addressed. Data are collected through an interview questionnaire, a diary maintained by the patient and self-completion questionnaires complemented by existing data bases. The information collected will allow for the development of a profile of patient care and outcomes on which to base future planning for the enhancement of quality of care and relevance of health interventions.



6. Glossary

Age-sex standardisation - demographic technique for adjusting for the effects of age and sex between populations which allows comparisons between populations.⁴

Age-sex standardised ratio - The expected number of events is given by calculating the number of events which would have occurred if the rates for each age/sex group in a given population (the standard) were applied to the population of interest.³

Cardiovascular disease or circulatory disease can be described as all diseases relating to the heart and blood vessels.² Included are diseases such as rheumatic, hypertensive and coronary heart disease, cerebrovascular disease, diseases of the pulmonary circulation, peripheral vascular disease, diseases of the arteries, veins, lymphatics and other circulatory conditions. The ICD-9 classification for cardiovascular disease is ICD -9 390-459. Refer Appendix C.

Cerebrovascular disease, commonly referred to as stroke, is analogous to a heart attack. In both cases, the main problem is atherosclerosis which narrows and damages an artery. In cerebrovascular disease, the main artery affected is the carotid artery in the neck. The resultant stroke is characterised by the bursting or blocking of a vessel supplying blood to the brain.⁶

Crude death rate is the number of deaths per 1,000 population (unless otherwise stipulated) in a given year.⁴

ICD-9 refers to the International Classification of Diseases, ninth revision, as developed by the World Health Organisation. Details of disease classifications are at Appendix C.

Incidence refers to the number of instances of illness commencing, or of persons falling ill, during a given period in a specified population.¹

Infarction refers to the process leading to the formation or development of a localised or circumscribed area of ischaemic tissue cell destruction due to inadequate blood flow.⁸

Ischaemic heart disease, commonly referred to as coronary heart disease, is caused by one of the heart's blood vessels becoming badly blocked. This can result in a heart attack (refer myocardial infarction).⁵

Hypertensive disease refers to disease caused by high blood pressure.

Median is a measure of central tendency. It refers to the point between the upper and lower halves of the set of measurements.¹

Mortality is the relative number of deaths, or death rate, as in a district or community.²

Morbidity is the proportion of sickness in a locality.²

Myocardial infarction, commonly known as a *coronary* or *heart attack* is an attack where the victim experiences severe pain, and often feels giddy and nauseated. It is caused by one of the heart's blood vessels becoming so badly blocked that part of the heart is permanently damaged. Although the underlying blockage process takes several years, the final blockage occurs suddenly, so the heart attack occurs suddenly also.⁵

Perfusion refers to the introduction of fluids into tissues by their injection into blood vessels, usually veins.⁸

Peripheral vascular disease (PVD) is caused by blocked blood flow to the limbs (mainly legs and feet). This causes pain during movement and can result in gangrene if blood flow is seriously reduced.⁷

Prevalence refers to the number of instances of a given disease or other condition in a given population at a designated time.¹

Rheumatic heart disease occurs as a result of childhood rheumatic fever which damages the heart valves.⁷

Separation (from hospital) refers to when a patient is discharged from hospital, transferred to another hospital or other health care accommodation, or dies in hospital following formal admission.⁴

Sex differentials are the differences in rates between males and females.¹

Standardised death rate is the overall death rate that would have prevailed in a standard population, in this case the 1991 Australian population, if it had experienced at each stage the death rates of the population being studied.⁴

Statistically significant infers that it can be concluded on the basis of statistical analysis, that it is highly probable.

Stroke refer to *cerebrovascular disease*.

World Health Organisation MONICA Project: This is an epidemiological project whose aim is to MONItor trends and determinants of Cardiovascular diseases over a 10 year period (1984-93). It involved collection of data on all suspected heart attacks in the Perth (25-64 years age group) and Newcastle (25-69 years age group) regions and conducting risk factor surveys. The Perth Centre also conducted a stroke register for 18 months (1989-90).

Years of Potential Life Lost (YPLL) is a measure of the relative impact of various diseases and lethal forces on society. (Refer 7.1). YPLL highlights the loss to society as a result of youthful or early deaths. The figure for YPLL due to a particular cause is the sum, over all persons dying from that cause, of the years that these persons would have lived had they experienced normal life expectation.¹

References

1. Last J, *A Dictionary of Epidemiology*, IEA, 1988
2. Delbridge A, Bernard JRL, *The Macquarie Concise Dictionary, 2nd Edition*, 1988, 1992
3. Glover J, Woollacott T. *A Social Health Atlas. ABS Catalogue No. 4385.0*, 1992.
4. Australian Bureau of Statistics definitions.
5. Better Health Commission, *Looking Forward to Better Health*, Vol 2, Canberra, AGPS, 1986
6. d'Espaignet ET, *Trends in Australian Mortality: diseases of the circulatory system, 1950-1991*, AIHW: *Mortality Series No 2*, Canberra, AGPS, 1993
7. Wise M, Graham-Clarke P, *Cardiovascular health in Australia, A review of current activities and future directions*, Dept Health, Housing, Local Govt & Community Services, AGPS, Canberra, 1994
8. *Blakiston's Gould Medical Dictionary*, Third Edition, McGraw_Hill Book Co, 1972



7. Appendix A: Methodologies

7.1 Years of potential life lost

Estimates of years of potential life lost (YPLL) were calculated for deaths of persons aged 1 to 75 years based on the assumption that deaths occurring between ages 0 and 76 years are considered untimely.

$$YPLL = \sum_x (D_x (76 - A_x))$$

A_x = Adjusted age at death. As age at death is only available in completed years the midpoint of the reported age was chosen (eg. age at death 34 years was adjusted to 34.5)

D_x = Registered number of deaths at age x due to a particular cause of death

YPLL was standardised for age using the following formula:

$$YPLL_s = \sum_x (D_x (76 - C_x))$$

where the correction factor C_x is defined for age x as:

$$C_x = \frac{N_{xS}}{N_S} \cdot \frac{1}{N_x} \cdot N$$

N = Number of persons aged 1-75 years in the 1993 population

N_x = Number of persons aged x years in the 1993 population

N_{xS} = Number of persons aged x years in the standard population

N_S = Number of persons aged 1-75 years in the standard population

The Australian population at 30 June 1991 was chosen as the standard population.

Estimates of YPLL by cause of death, as presented in Figure 4 indicate the number of years lost due to specific causes on the assumption that up to exact age 76 years the decedent would not have died from any other cause. YPLL therefore should not be used as a measure of gains in years of life expectancy should a cause of death be eliminated or reduced.

Reference: Australian Bureau of Statistics. *1993 Causes of Death Australia. Catalogue No. 3303.0.*

7.2 Rates

Rates per 100,000 are calculated as follows:

Rate = $N/P \cdot 100,000$ (where N = number of events and P = population at risk of experiencing the event).

7.3 Three year moving averages

The three year moving averages were calculated by taking the rate over three years.

$$\text{Rate } Y_2 = \frac{(N_1+N_2+N_3)}{(P_1+P_2+P_3)}$$

where N_i = number of events year i

where Y_i = year i

and P_i = population at risk year i

For end years the average of 2, rather than 3, years was taken.

7.4 Projections

The statistical package SPSS for Windows was used to smooth crude incidence/mortality rates using the T4252H smoothing technique.⁷⁸ Given the ACT's small numbers, the data were smoothed in order to remove any undue effects from outliers. Once the data was smoothed a line of best fit was calculated in order to best describe the data.

It is important to note that there are always underlying assumptions when projecting data. A few points to remember when interpreting the mortality and incidence projections are as follows:

- i. it is assumed there will be no change in population trends, (ie births, death and migration);
- ii. outside influences like treatment, lifestyle or other factors are not considered.

7.5 Logistic Regression Analysis

The SPSS computer package was used to run a logistic regression model. The mathematical equation is given below. By entering age, sex and country of birth in the model it adjusts for age and sex and then determines the odds of having CVD compared with other disease, given the country of birth.

Logistic Regression model

The mathematical equation for the logistic regression model is given by

$$\text{Prob } (y=j) = \frac{e^{x'\beta_j}}{[\sum_j e^{x'\beta_j}]}$$

where $j = 0,1,2,3,\dots,j$ and $j+1$ possible unordered outcomes can occur.

$$95\% \text{ C.I.} = \exp (\beta \pm 1.96 \times \text{S.E.})$$

$\exp (\beta)$ gives the odds ratio.



8. Appendix B: Data limitations

8.1 Overall data

- Generally, data sets contain small numbers of occurrences of particular events. The smaller the numbers, the more likely there is to have inexplicable fluctuations in results. One extra death may alter mortality and morbidity statistics dramatically in a small area like the ACT. Where changes in pattern from year to year are noted, time series and moving averages are utilised to ensure a more reliable analysis;
- There is no supplementary morbidity collection for diseases that can be treated outside the hospital system. For example by a GP, specialist, outpatient clinics or emergency. Therefore there is a heavy reliance on survey data;
- Relying on available survey data means that some information is updated only after a number of years. Disease profiles may not be static with an everchanging ACT population and important information may be lost during the period where data is not collected.

8.2 Mortality data

- There are inconsistencies in recording of cause of death (eg. a person may be recorded as dying from a heart attack rather than from the severe asthma attack which caused the heart attack);
- When looking at disease-specific rates over time it was not possible to age and sex standardise for some prior years. Therefore, crude rates were examined and extrapolated in 1994 findings.

8.3 Hospital separations data

- There are inconsistencies in coding hospital admissions (eg. a person may be coded as having chest pains as the principal diagnosis, but that condition could have been caused by an asthma attack - a different coder may have coded principal diagnosis as "asthma" with the heart condition as the secondary diagnosis);
- Hospital separations data only focus on acute or chronic conditions which require patients to be admitted to hospital;
- As there is quite a high proportion of non-ACT residents ($\approx 26\%$) separated from ACT hospitals and vice-versa it is difficult to look at hospital separations rates, as the ACT population cannot be used to calculate rates.

8.4 National Health Survey 1989-90

The Australian Bureau of Statistics (ABS) 1989-90 National Health Survey collected data from approximately 54,000 people living throughout Australia. The sample was designed so that the states and territories could be separately analysed. However:

- Until the 1995-96 survey, the sample size of respondents was very small in the ACT. This resulted in fluctuations in results and reduced reliability of findings.
- When responses were broken down into sub-groups (eg people aged under 18), the sample became even smaller resulting in more inaccuracies.
- It should also be noted that the Survey utilises a self-reporting format. Results represent respondents' perceptions, not necessarily health professionals' findings. It also depends in part, on the literacy of the respondents and their ability to understand English.

Since the last Survey was conducted in 1989-90, results are quite out-dated and should be interpreted with caution.

9. Appendix C: ICD-9 Classifications

ICD-9 refers to the International Classification of Diseases, ninth revision, as developed by the World Health Organisation. It is a nationally and internationally accepted form of classification and is used in this publication. The following classifications refer to cardiovascular diseases:

CARDIOVASCULAR DISEASES ICD 9 code 390-459

Coronary heart disease (ischaemic heart disease) ICD 9 code 410-414

Cerebrovascular disease (stroke) ICD 9 code 430-438

Rheumatic heart disease ICD 9 code 390-398

Hypertensive disease ICD 9 code 401-405

Peripheral vascular disease ICD 9 code 441-444



10. References

- ¹ Delbridge A., Bernard J.R.L (Editors),. *The Macquarie Concise Dictionary, 2nd Edition*. 1988
- ² Mathers C, *Health expectancies in Australia 1981 and 1988*, Canberra, AGPS, 1991
- ³ AIHW MEEM Project as reported in *Cardiovascular Health in Australia, A review of current activities and future directions*, Canberra AGPS, 1994
- ⁴ Berenson G, Srinivasan S, Shear C, Webber L, *The epidemiology of cardiovascular disease in childhood*, in *Cardiovascular Risk Factors in Childhood: Epidemiology and Prevention*, Hetzel B, Berenson G, 1987
- ⁵ Dept of Public health, Uni of WA, *Perth MONICA Project Data Book 1984-93*, February 1995
- ⁶ National Heart Foundation, *Heart and Stroke Facts 1996 Report*, Canberra, August 1996
- ⁷ AIHW, *Australia's Health 1996*, AGPS, 1996
- ⁸ Abraham B, d'Espaignet ET & Stevenson C (1995), *Australian Health Trends 1995*. AIHW
- ⁹ Australian Bureau of Statistics, *Causes of Death, Australia, 1994*, Catalogue No. 3303.0
- ¹⁰ op cit, National Heart Foundation, no. 6
- ¹¹ Dept Human Services & Health, *Cardiovascular Health in Australia: A review of current activities & future directions*, Canberra, AGPS, 1994
- ¹² op cit, ABS, no. 9
- ¹³ Waters A-M, Bennett S. *Mortality from cardiovascular disease in Australia*. AIHW: Cardiovascular Disease Series No 3, Canberra, AGPS, 1995
- ¹⁴ d'Espaignet ET, *Trends in Australian Mortality: diseases of the circulatory system, 1950-1991*, AIHW: Mortality Series No 2, Canberra, AGPS, 1993
- ¹⁵ Briscoe N, *Youth Suicide in the ACT*, ACT Dept of Health, 1994
- ¹⁶ op cit, Waters A-M, Bennett S, no. 12
- ¹⁷ Anderson P, Bhatia K, Cunningham J, *Mortality of Indigenous Australians, An occasional paper, 1994*, ABS & AIHW, Oct 1996, Cat.No. 3315.0
- ¹⁸ op cit, d'Espaignet ET, no. 13
- ¹⁹ op cit, d'Espaignet ET, no. 13
- ²⁰ op cit, Waters A-M, Bennett S, no. 12
- ²¹ op cit, d'Espaignet ET, no. 13
- ²² op cit, d'Espaignet ET, no. 13
- ²³ op cit, Waters A-M, Bennett S, no. 12
- ²⁴ op cit, Nat Heart Foundation, no. 6
- ²⁵ Boyle CA, Dobson AJ. *Morbidity from cardiovascular disease in Australia*, AIHW: Cardiovascular Disease Series No 2, Canberra, AGPS, 1995
- ²⁶ ibid
- ²⁷ Fujikawaki T, Yamawaki S, Touhouda Y, Dept of Neurology & Psychiatry, Hiroshima Uni Sch of Med, Japan, *Incidence of silent cerebral infarction in patients with major depression*, *Stroke*, 24(11):1631-4, Nov 1993
- ²⁸ Waters A-M, Bennett S, *Risk factors for cardiovascular disease, A Summary of Australian Data*, AIHW: Cardiovascular Disease Series No 1, Canberra, AGPS, 1995
- ²⁹ Risk Factor Prevalence Study Management Committee, *Risk Factor Prevalence Study, Survey No.3 1989*, Canberra, Nat Heart Foundation of Aust & AIHW, 1990
- ³⁰ ibid
- ³¹ op cit, Dept Human Services & Health, no. 10
- ³² Australian Bureau of Statistics, *1989-90 National Health Survey Cardiovascular and related conditions, Australia*, Catalogue No. 4372.0
- ³³ Glover J, Woollacott T, *A Social Health Atlas*. ABS Catalogue No. 4385.0, 1992
- ³⁴ op cit, Dept Human Services & Health, no. 10
- ³⁵ op cit, d'Espaignet ET, no. 13
- ³⁶ op cit, Dept Human Services & Health, no. 10
- ³⁷ Bronner L, Kanter D, Manson J, *Primary Prevention of Stroke*, *New Eng J Med*, 1995; 333:1392-1400
- ³⁸ op cit, National Heart Foundation, no. 6
- ³⁹ op cit, Dept Human Services & Health, no. 10
- ⁴⁰ Schrapnel W, Calvert G, Nestal P, Truswell A, for the Nat Heart Foundation, *Diet and Coronary Heart Disease*, *Med J of Aust*, Vol 156, Suppl May 4, 1992
- ⁴¹ op cit, Waters A-M, Bennett S, no. 27
- ⁴² Kannel WB, Vokonas PS, *Demographics of the prevalence, incidence and management of coronary heart disease in the elderly and women*, *Annals of Epidemiology*, 2(1-2):5-14, Jan-Mar 1992
- ⁴³ op cit, Dept Human Services & Health, no. 10

-
- ⁴⁴ Niessen LW et al, Dept of Public Health & Social Med, Erasmus Uni, Rotterdam, Netherlands, *Stroke trends in an ageing population*, Stroke, July; 24(7):931-9, 1993
- ⁴⁵ op cit, National Heart Foundation, no. 6
- ⁴⁶ op cit, Kannel WB, no. 40
- ⁴⁷ Berenson GS, Srinivasan SR et al. *The epidemiology of cardiovascular disease in childhood. within Hetzel BS, Berenson GS. Cardiovascular risk factors in childhood: Epidemiology and Prevention*. 1987 Elsevier Science Publishers B.V. (Biomedical Division).
- ⁴⁸ Cunnane, Stephen C. *Childhood origins of lifestyle-related risk factors for coronary heart disease in adulthood*, Nutrition and Health, 9(107-115), 1993
- ⁴⁹ I M et al, Dept of Neurology, Helsinki Uni., Finland, *Recent alcohol consumption, cigarette smoking and cerebral infarction in young adults*, Stroke 26(1):40-5, Jan 1995
- ⁵⁰ Pagely PR, Goldberg RJ. *Coronary Artery Disease in Women: A Population-Based Perspective*. Cardiology; 86:265-269, 1995.
- ⁵¹ Kitler ME. *Coronary disease: are there gender differences?* European Heart Journal, 15:409-417, 1994.
- ⁵² op cit, Pagely PR, Goldberg RJ, no. 48
- ⁵³ Gardner A, Jeffery I. *Gender Differences in the investigation and management of patients with coronary artery disease*. June, 1993.
- ⁵⁴ op cit, Pagely PR, Goldberg RJ, no. 48
- ⁵⁵ Kyriakidis M, Petropoulakis P, et al. *Sex differences in the anatomy of coronary artery disease*. J Clin Epidemiol. 48;723-730, 1995.
- ⁵⁶ ibid
- ⁵⁷ op cit, Pagely PR, Goldberg RJ, no. 48
- ⁵⁸ Wang XL, Tam C, et al. *Determinants of Severity of Coronary Artery Disease in Australian Men and Women*.
- ⁵⁹ op cit, Kitler ME, no. 49
- ⁶⁰ Hanson MJS. *Modifiable risk factors for coronary heart disease in women*. American Journal of Critical Care, 3(3);177-184,1994.
- ⁶¹ Gilbert C, Gordon C, *The Epidemiology of Diabetes Mellitus in the ACT*, Epidemiology Unit, ACT Dept of Health & Community Care, Health Series No. 5, ACT Govt Printer, 1996
- ⁶² Australian Bureau of Statistics, *1989-90 National Health Survey, Diabetes, Australia*, Catalogue No. 4371.0
- ⁶³ Balkau B, Vray M, Eschwege E, *Epidemiology of peripheral arterial disease*, J of Cardiovascular Pharmacology, 23 Suppl 3: S8-16, 1994
- ⁶⁴ Savage PJ, *Cardiovascular complications of diabetes mellitus: What We Know and What We Need To Know about Their Prevention*, Annals of Internal Med, Vol 124, No 1 (Part 2), January 1996
- ⁶⁵ op cit, Gilbert C, Gordon C, no. 59
- ⁶⁶ op cit, Nat Heart Foundation, no. 6
- ⁶⁷ Anderson P, Bhatia K, Cunningham J, *Mortality of Indigenous Australians, An occasional paper, 1994*, ABS & AIHW, Oct 1996, Cat.No. 3315.0
- ⁶⁸ Unwin C, Gracey M, Thompson N, *The impact of tobacco smoking & alcohol consumption on aboriginal mortality in WA*, Med J of Aust, 162(9): 475-8, May, 1995
- ⁶⁹ Australian Bureau of Statistics, National Aboriginal and Torres Strait Islander Survey 1994, *Detailed Findings*, Canberra, 1995, Cat. No.4190.9 with *Regional Overview for the Queanbeyan ATSI Region*, Cat. No. 4192.0.40.001
- ⁷⁰ ibid
- ⁷¹ Aust Institute of Health & Welfare, *Australia's Health, 1994: the forth biennial health report of the AIHW*, Canberra, AGPS, 1994
- ⁷² Australian Bureau of Statistics, *1989-90 National Health Survey, Smoking, Australia*, Catalogue No. 4382.0
- ⁷³ Australian Bureau of Statistics, *1989-90 National Health Survey, Alcohol Consumption, Australia*, Catalogue No. 4381.0
- ⁷⁴ Australian Bureau of Statistics, *1989-90 National Health Survey, Exercise, Australia*, Catalogue No. 4383.0
- ⁷⁵ National Heart Foundation & Aust Institute of Health, *Risk Factor Prevalence Study, Survey No 3, Cities Analysis*, 1989
- ⁷⁶ Gannon D, *Smoking Sttus in the ACT*, Epidemiology Unit, ACT Dept of Health & Community Care, Unpublished paper, Sept 1996
- ⁷⁷ ACT Dept of Health, *ACT Health Goals and Targets for the Year 2000*, ACT, 1994
- ⁷⁸ Velleman PF, Hoaglin DC, *Applications, Basics, and Computing of Exploratory Data Analysis*. Boston:Duxbury Press, 1981.

11. Health Series Publications

The Epidemiology Unit of the Department of Health and Community Care has developed an on-going health series of publications to inform health professionals, policy developers and the community on health status in the Territory. Information contained therein will assist in the development of appropriate policy and service delivery models, the evaluation of programs, and an understanding of how the ACT compares with Australia as a whole with regard health status.

- Number 1: *ACT's Health: A report on the health status of ACT residents*
Carol Gilbert, Ursula White, October 1995
- Number 2: *The Epidemiology of Injury in the ACT*
Carol Gilbert, Chris Gordon, February 1996
- Number 3: *Cancer in the Australian Capital Territory 1983-1992*
Norma Briscoe, April 1996
- Number 4: *The Epidemiology of Asthma in the ACT*
Carol Gilbert, April 1996
- Number 5: *The Epidemiology of Diabetes Mellitus in the ACT*
Carol Gilbert, Chris Gordon, July 1996
- Number 6: *Developing a Strategic Plan for Cancer Services in the ACT*
Kate Burns, June 1996
- Number 7: *The First Year of The Care Continuum and Health Outcomes Project*
Bruce Shadbolt, June 1996
- Number 8: *The Epidemiology of Cardiovascular Disease in the ACT*
Carol Gilbert, Ursula White, January 1997

