National Health Priority Areas Report

Cardiovascular health

A report on heart, stroke and vascular disease

1998

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Executive summary

This report on cardiovascular health is one of a series of biennial reports to Australian Health Ministers on each of the five National Health Priority Areas (NHPAs). It is part of a process that involves various levels of government and draws on advice from non-government sources, with the primary goal of reducing the incidence and impact of heart, stroke and vascular disease in Australia.

Overview of heart, stroke and vascular disease in Australia

Heart, stroke and vascular disease comprises all diseases of the heart and blood vessels including coronary heart disease, stroke, heart failure and peripheral vascular disease, that are caused by a damaged blood supply to the heart, brain and legs. These conditions share a number of major risk factors, which include behavioural risk factors such as tobacco smoking, physical inactivity, poor nutrition and high consumption of alcohol, and physiological risk factors such as high blood pressure, elevated blood lipids, overweight and obesity, and diabetes.

Existing prevention strategies and advances in treatment have contributed to a significant decline in heart, stroke and vascular disease in Australia over the past 30 years. The downward trend in death rates is occurring among both males and females, and is more rapid than falls in mortality overall. This continuing decline suggests that the disease is largely preventable, and that significant further gains could be made using existing knowledge.

However, heart, stroke and vascular disease is still the largest cause of premature death and death overall in Australia, accounting for 42 per cent of all deaths in 1996, and its health and economic burden exceeds that of any other disease. It is a leading cause of morbidity, accounting for 8 per cent of all hospital separations each year and 12.5 per cent of all problems managed by general practitioners. The total direct cost of heart, stroke and vascular disease, estimated at $3,719 million, represented 12 per cent of the total health care costs for all diseases in 1993–94.

Of the cardiovascular conditions, coronary heart disease is the major cause of death in those aged less than 70 years, and stroke is one of the principal causes of serious long-term disability. Since these diseases particularly affect older Australians, their public health impact will increase with the progressive ageing of the population. Currently, Australians aged 65 years or more comprise 12 per cent of the population, but account for about two-thirds of cardiovascular health care costs. It is expected that rising levels of treatment with drugs and other medical interventions will place increasing demand on the health care system over the next several decades. At the same time, there needs to be more emphasis on reducing disability and improving quality of life among older Australians.

Comparison with other countries indicates that there is much room for further improvement in the cardiovascular health of Australians. Internationally, Australia ranks ninth lowest out of 29 Organisation for Economic Cooperation and Development (OECD) countries in age-standardised mortality for all heart, stroke and vascular disease. Even so, these rates are still 61 per cent higher than for Hong Kong (among males) and 65 per cent higher than for France (among females). For coronary heart disease, the major cause of death in Australia, the death rates are approximately five times greater than those in Japan and three times those in France.

Certain groups in the population have significantly higher mortality from heart, stroke and vascular disease than other groups. Indigenous Australians die from heart, stroke and vascular disease at nearly twice the rate of the total population. There are differences in the health profiles of Australians living in urban, rural and remote areas, and in those of differing socio-economic status as well. There is a clear need to reduce the impact of heart, stroke and vascular disease on less advantaged groups.

Progress towards national goals and targets

Under the NHPA initiative, progress towards reducing the health problem is measured by time trends in risk factor prevalence, and morbidity and mortality. This report documents results for a set of 22 indicators for cardiovascular health, and eight risk factor indicators that are relevant to other NHPAs as well as to the health of Australians in general.

There have been positive outcomes in a number of areas for which trend data are available. Death rates for coronary heart disease and stroke, in the total population (including rural and remote areas) have decreased. The prevalence rates for tobacco smoking and high blood pressure have continued to fall. However, there has been little change in recreational physical activity levels over the past 20 years. The prevalence of overweight and obesity continues to rise. In addition, it seems unlikely that current efforts in Indigenous populations will allow a real prospect of achieving nationally agreed targets for mortality, morbidity or risk factors.

Approaches to heart, stroke and vascular disease

Prevention

There is immense potential for prevention to improve the cardiovascular health of Australians. A range of evidence suggests that high levels of heart, stroke and vascular disease can be reduced dramatically, given enough time and effort. Approaches to cardiovascular prevention will have benefits that go considerably beyond cardiovascular health, because the behavioural and physiological risk factors for heart, stroke and vascular disease often also play a large role in the development of other common conditions such as cancer and diabetes.

The great challenge for prevention is to turn this theoretical scope into practice, maintaining the favourable trends in reducing some risk factors and reversing worsening trends in others. Another challenge is to attend to the social, economic and environmental conditions that can influence the level of risk factors, as well as other social and psychological aspects that can affect cardiovascular health.

There are a number of Australian examples of the beginnings of success in health promotion, such as the reduction in tobacco smoking, which have been due to a combination of legislative, educational and economic approaches. However, there are many opportunities to decrease smoking further and to promote physical activity, good nutrition, the reduction of overweight and obesity, and successful management of risk factors. While the health sector should take the lead in preventive actions, it will ensure more lasting effects if it forms long-term partnerships and alliances with other sectors.

Work is in progress at the Commonwealth, State and Territory and regional levels to establish such partnerships, improve the infrastructure for primary prevention and coordinate health promotion activity across major health issues.

Management

The management of patients with heart, stroke and vascular disease aims to reduce mortality and morbidity and improve quality of life. To reduce mortality, strategies should relieve symptoms, reduce complications and identify and treat patients at high risk of further events. Emergency treatment is critical for those suffering acute events such as heart attack or stroke. For those with more stable symptoms, there is a wide range of tests to confirm the diagnosis, guide management and assess prognosis. Options for treatment include drug therapy and a range of other interventions.

Long-term management of heart, stroke and vascular disease involves secondary prevention to modify risk factors and continuing medical treatment to reduce risk factor levels and control symptoms. Rehabilitation is an important part of the long-term management of coronary heart disease and stroke.

Despite continuing advances in the management of heart, stroke and vascular disease, in many areas there is a substantial gap between accepted best practice and usual practice, as reflected in the following points.

- Too few eligible patients with heart attack, unstable angina or stroke receive appropriate drug therapy, despite its demonstrated effectiveness in randomised controlled trials.

- There are currently insufficient stroke units nationwide, and access to a stroke unit is not available to all eligible patients.

- There is wide variation in use of, and techniques employed with, interventions such as cardiac surgery and coronary angioplasty in Australia, with limited access to facilities and specialists causing long waiting times in some States.

- Comprehensive specialist management programs for heart failure have been shown to decrease costly hospital re-admissions, but have been set up in only a few centres. Current funding mechanisms do not facilitate coordinated 'shared' care of patients with heart failure or severe peripheral vascular disease.

- Although cardiac rehabilitation has been shown to have both short and long-term benefits, rates of participation in cardiac rehabilitation programs are less than desirable. There is insufficient current capacity to treat all eligible patients, routine referral is not a standard practice and a proportion of patients who are referred do not attend.

- Stroke rehabilitation services vary greatly between geographical areas, with clustering in some areas and few or no services available in others. While a range of factors improve outcomes of stroke rehabilitation, there is no standardised approach to identifying people who will benefit from rehabilitation.

The development and endorsement of guidelines to encourage evidence-based practice are being continued by the Commonwealth, through the National Health and Medical Research Council, with the involvement of non-government organisations and specialist colleges. It is essential to have an appropriate infrastructure for the regular review, dissemination and implementation of clinical practice guidelines. At present, little is known about the impact of guidelines on use rates, health outcomes or costs.

Research

Both the Commonwealth Government and State/Territory Governments and non-government organisations contribute to research funding for heart, stroke and vascular disease in Australia. However, the major organisations that support grants for cardiovascular research can now provide funding for only about 25 per cent of applications despite ranking most of the projects as worthy of funding. Recent experiences with private industry partnerships highlight opportunities for substantial industry funding from multinational companies to support clinical research.

Special populations

Cardiovascular mortality or disease burdens are higher or more problematic among Indigenous Australians, in remote areas of the country, and among socio-economically disadvantaged groups. There is considerable overlap between these groups and they share some factors that contribute to their greater risk, such as higher rates of smoking and some other risk factors and reduced access to prevention programs and treatment services. For these populations, it is particularly important to tackle the underlying causes of inequalities in health, through intersectoral action and changes in public policy.

Indigenous Australians

Despite the higher levels of mortality and morbidity in the Indigenous population, programs for prevention are fragmented and there are no clearly identified sources of funding for such programs at an appropriate scale.

While there will be gains from improved access to treatment, there is even greater potential from improved primary and secondary prevention. These services should not be seen as competitive and need to be adequately funded under a balanced, comprehensive and coordinated approach.

Rheumatic heart disease represents a significant and entirely preventable cause of morbidity and mortality among Indigenous Australians. Organised primary health care is essential for the control of rheumatic fever.

Remote populations

Access to health services is a problem for most people living in remote areas. Distance is a major factor, with poor roads and unreliable communication systems contributing to the isolation.

The difficulties of recruiting and retaining health professionals in remote areas are generally understood. Professional and geographical isolation, continuing education and overwork, accommodation and transport all have an impact on staff and ultimately on delivery of services.

As well as addressing service delivery issues, there is a need to improve supplies of affordable fresh fruit and vegetables in remote areas. This may require subsidies, reduction of transport costs, grants for upgrade of storage facilities and support for production of locally grown produce.

Socio-economically disadvantaged people

Health inequalities are caused by the interplay of risk factors and social and economic circumstances. Policy initiatives to address health inequalities require coordination across sectors of government, and should aim to:

- improve living and working conditions;

- reduce poverty and unemployment; and

- influence people's health-related attitudes and behaviours, through sensitive interventions that combine education and support with action at other policy levels, and improve access to health and social services according to need.

Monitoring and information management

Monitoring disease trends and differentials and applying technology to improve information management will help to address a number of issues raised in this report.

The National Centre for Monitoring Cardiovascular Disease is developing an integrated information system that will cover major aspects of prevention, management and mortality for individual heart, stroke and vascular diseases, as well as monitoring differences between population groups. There is an urgent need for a national risk factor prevalence survey, which includes taking a blood sample from participants.

More generally, a range of evolving technologies should be explored for their usefulness in improving information management, in the following areas:

- unique patient identifiers to facilitate record linkage;

- further evaluation of portable medical records (health care cards);

- support for increasing the use of computerised clinical records in general practice;

- further development of telemedicine and telehealth, focused on areas of clinical need; and

- use of information technology to facilitate education of health professionals working in remote regions.

Opportunities and future directions

Given the size of the burden it imposes and the extent of knowledge on which to base further endeavours, there is great potential to improve the health of all Australians through changes in cardiovascular health. It is likely that interventions in the cardiovascular area will also have an impact on other major public health problems.

Executive summary

Achieving this potential improvement in cardiovascular health will require new approaches and sometimes new systems to support them. There is still a great challenge to achieve adequate funding, integration of effort and long-term strategic planning. This action will involve governments at all levels, the private sector, and non-government and community organisations.

Governments have a number of broad levers at their disposal to foster better programs and practice and to discourage inappropriate practice. A number of these levers could be employed within the following priority areas for cardiovascular health.

- Establishing a secure long-term **national focus on heart, stroke and vascular disease** from which policies and activities can emanate. National approaches exist for other NHPAs, and major achievements have occurred with other national programs such as HIV control and screening for cervical cancer. A similar multi-disciplinary approach should be established to help coordinate the prevention and guide the management of heart, stroke and vascular disease. There should also be provision for regular review of progress and future opportunities.

- **Coordinating primary prevention** across NHPAs. The primary prevention messages relating to health and lifestyle across the major health issues are virtually the same. National action in these areas will be most effective if there is coordination across different program areas, consistent health messages and adequate funding. The National Public Health Partnership and preliminary work on a National Primary Prevention Strategy should contribute much to this area. Currently, there is no funding infrastructure in place to address coordination issues. However, a number of innovative proposals could be further explored which could draw together processes and principles established under existing arrangements.

- Establishing a **national mechanism for development, review and imple-mentation of best practice guidelines**. The Commonwealth is likely to maintain overall responsibility for developing clinical practice guidelines and also identifying areas of inappropriate practice. However, it should be recognised that many of the issues central to implementing change in practice are service design issues and require the involvement of State and local government and non-government groups to ensure high uptake. A nationally coordinated process to ensure regularly updated, systematic reviews and guidelines are available should be linked to local planning and quality improvement processes for implementation.

- Ensuring that any national focus on heart, stroke and vascular disease includes a **specific focus on stroke**. The area of stroke has received less emphasis and funding than coronary heart disease. Any national program for coordinating the prevention and management of heart, stroke and vascular disease should include a specific focus on stroke, to address additional stroke-related issues across the continuum of care.

- Tackling the underlying causes of **inequalities in health among populations** with worse cardiovascular health than the general population, particularly the Indigenous population, but also remote area and socio-economically disadvantaged groups. A key aim of public policy in the next millennium must be to design cross-sectoral interventions that improve the health of these populations and reduce gaps in health status. Government policy initiatives at all levels need to be examined for their likely impact on the health of disadvantaged populations.

- **Continuing and expanding the activities of the National Centre for Monitoring Cardiovascular Disease**. Regular collections of survey data on risk factors, including lifestyle and biomedical risk factors of public health significance, are needed to help direct and evaluate preventive activities.

Introduction

Background

This report on cardiovascular health is one of a series of biennial reports to Health Ministers on each of the five National Health Priority Areas (NHPAs) — cancer control, injury prevention and control, cardiovascular health, diabetes mellitus and mental health. This report is being released concurrently with reports on diabetes mellitus and mental health. Reports on cancer control and injury prevention and control were released in mid-1998 (DHFS & AIHW 1998a; 1998b).

Although each report covers a group of discrete diseases or conditions and the recommended strategies for action are often specific in nature, the NHPA initiative recognises the role played by broader population health initiatives in realising improvements in the health status of Australians. Public health strategies and programs that target major risk factors such as smoking may benefit several priority areas, for example cardiovascular health and cancer.

This report on cardiovascular health is part of an encompassing NHPA process that involves various levels of government and draws on expert advice from non-government organisations, with this report's primary goal being to reduce the impact of heart, stroke and vascular disease on the Australian population.

The National Health Priority Areas initiative

Current international comparisons of life expectancy indicate that the health of Australians is among the best in the world and should continue to improve with continued concerted efforts across the nation. The NHPA initiative emphasises collaborative action between the Commonwealth Government and State and Territory Governments, the National Health and Medical Research Council (NHMRC), the Australian Institute of Health and Welfare (AIHW), non-government organisations, appropriate experts, clinicians and consumers. It recognises that specific strategies for reducing the burden of illness should be holistic, encompassing the continuum of care from prevention through treatment and management to rehabilitation, and should be underpinned by evidence based on appropriate research.

By targeting specific areas that impose high social and financial costs on Australian society, collaborative action can achieve significant and cost-effective improvements in the health of Australians. The diseases and conditions targeted through the NHPA process were chosen because they are areas where significant gains in the health of Australians can be achieved.

From National Health Goals and Targets to National Health Priority Areas

The World Health Organization (WHO) published the *Global Strategy for Health for All by the Year 2000* in 1981 (WHO 1981). In response to this charter, the *Health for All Australians* report was developed and represented Australia's 'first national attempt to compile goals and targets for improving health and reducing inequalities in health status among population groups' (Health Targets and Implementation Committee 1988). The 20 goals and 65 targets focused on population groups, major causes of sickness and death, and risk factors.

A revised set of targets was published in the *Goals and Targets for Australia's Health in the Year 2000 and Beyond* report (Nutbeam et al 1993). Goals and targets were established in four main areas — reductions in mortality and morbidity;

reductions in health risk factors; improvements in health literacy; and the creation of health-supportive environments. However, this framework was not implemented widely.

The *Better Health Outcomes for Australians* (DHFS 1994a) refined the National Health Goals and Targets program. The focus of goals and targets was shifted to four major areas for action — cancer control, injury prevention and control, cardio-vascular health, and mental health. As a corollary to this, Australian Health Ministers also adopted a national health policy which committed the Common-wealth Government and State and Territory Governments to develop health goals and targets in the priority health areas and re-orient the process towards popula-tion health.

In 1995, it was recognised that there were a number of fundamental shortcomings of the National Health Goals and Targets process, principally that there were too many indicators (over 140 across the four health priority areas), there was a lack of emphasis on treatment and ongoing management of the disease/condition, and there was no national reporting requirement. In implementing a goals and targets approach, emphasis was placed on measures of health status and reduction of risk factors. However, no nationally agreed strategies were developed to promote the change required to reach the targets set.

This led to the establishment of the current NHPA initiative. Health Ministers agreed at their meeting in July 1996 that a national report on each priority area be prepared every two years, to give an overview of the impact on the health of Australians in these areas, allowing time for major changes in health indicator status to become apparent. These reports would include a statistical analysis of surveillance data and trends for a set of agreed national indicators. It was also agreed that diabetes mellitus should become the fifth NHPA.

The *First Report on National Health Priority Areas 1996* (AIHW & DHFS 1997), a consolidated report on progress in all the priority areas, was presented to Health Ministers in August 1997.

Development of the report

The National Health Priority Committee (NHPC) appointed an Expert Advisory Group to oversee the development of the report, with the assistance of five Working Groups in the areas of:

- cardiac and vascular disease;
- stroke;
- primary prevention;
- Indigenous and remote populations; and
- information management.

The report was developed in consultation with the Commonwealth Government and State and Territory Governments, with the AIHW through its National Centre for Monitoring Cardiovascular Disease and NHPA Monitoring Team, and with a wide range of those active in the field of cardiovascular health, including consumer groups, peak community groups and health care professionals.

Purpose and structure of the report

This report on cardiovascular health builds on the *First Report on National Health Priority Areas 1996* (AIHW & DHFS 1997). The *First Report* provided baseline data and underlying trends in the five NHPAs. This report updates these data and trends as well as reporting on progress and identifying opportunities for further improving the cardiovascular health of Australians.

A concern with the cardiovascular health sections of the *Better Health Outcomes* report (DHFS 1994a) and the *First Report* was a focus on coronary heart disease alone. This report considers coronary heart disease, stroke and vascular disease, and also highlights the need to improve the cardiovascular health of populations at higher risk.

Chapter 1 provides an overview of heart, stroke and vascular disease in Australia, including the current extent and cost of the problem, the main conditions within heart, stroke and vascular disease, the major risk factors for heart, stroke and vascular disease, and long-term trends in heart, stroke and vascular disease over time.

Chapter 2 summarises the current status of NHPA cardiovascular indicators for which data were available for reporting in 1998, including newly developed indicators on stroke.

Chapter 3 discusses primary prevention in Australia and examines the inter-relationships between the many interventions that constitute the primary prevention of heart, stroke and vascular disease. The roles of various groups are considered and examples of primary prevention activities currently in progress around Australia are described.

Chapter 4 comprises discussion of the diagnosis, treatment and management of the major forms of heart, stroke and vascular disease, secondary prevention and rehabilitation, and examples of treatment and rehabilitation programs currently in progress in Australia.

Chapter 5 illustrates the potential for further reductions in heart, stroke and vascular disease if effective preventive and treatment strategies are successfully applied.

Chapter 6 looks at issues in cardiovascular health in the Indigenous population, in Australians living in remote areas, and in those who are socio-economically dis-advantaged. These populations should be particular targets for activity.

Activities of the National Centre for Monitoring Cardiovascular Disease, aspects of information management that are likely to affect future progress and the funding and scope of research into heart, stroke and vascular disease in Australia are discussed in Chapter 7.

The report concludes with a consideration of possible strategies for improving cardiovascular health in the Australian context, and proposes a way forward that aims to build on Australia's record in the areas of prevention and management (Chapter 8).

1 Overview

Cardiovascular health is a great test case for Australia's future well being. In recent decades, Australians have enjoyed greater life expectancy and a lower prevalence of some risk factors for heart, stroke and vascular disease. Australia and other developed countries have also made major advances in preventing heart, stroke and vascular disease and treating it once it occurs.

Despite this, heart, stroke and vascular disease is still the largest cause of premature death and death overall in Australia (and the world). Its health and economic burden exceeds that of any other disease. As well, Australia's very success in prevention and treatment poses new challenges to health care and the allocation of resources. Since age is the greatest risk factor for heart, stroke and vascular disease, advances in treatment and management are likely to shift the burden of the disease to higher age groups. This age-associated shift in disease focus, in combination with growing numbers of older Australians, is likely to add considerably to health care costs over the next several decades.

Because the actual number of patients with heart, stroke and vascular disease is expected to increase dramatically over the next few decades, the burden of heart failure and stroke in particular, but also heart attack, is likely to increase. This will require a stronger focus on preventing disability and enhancing quality of life in the ageing population, in addition to the emphasis on falls in mortality.

Certain groups in the population have significantly higher mortality from heart, stroke and vascular disease than other groups, particularly Indigenous Australians and those of lower socio-economic status. There is a clear need to reduce heart, stroke and vascular disease mortality in less advantaged groups.

It is now agreed that most of the premature deaths and much of the morbidity caused by heart, stroke and vascular disease are preventable. Furthermore, since heart, stroke and vascular disease shares risk factors with several other diseases and conditions, the health gains can be extended further. A number of major types of cancer (Australia's other main source of illness and premature death) share important and preventable risk factors with heart, stroke and vascular disease. These include tobacco smoking, physical inactivity, a diet high in fats and overweight. The latter three are also important in the prevention and management of the most common form of diabetes, another leading cause of mortality and morbidity in Australia. This suggests that prevention can occur on a broad front and bring even wider gains than those relating only to cardiovascular health.

1.1 Profile of heart, stroke and vascular disease

Heart, stroke and vascular disease comprises all diseases of the heart and blood vessels. The disease is also known as cardiovascular disease, or circulatory disease.[1] It includes coronary heart disease, stroke, heart failure and peripheral vascular disease, that are caused by a damaged blood supply to the heart, brain and legs. The main underlying cause of heart, stroke and vascular disease is a

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1 Chapter IX (Diseases of the Circulatory System) of the WHO international classification of diseases (1998a) includes acute rheumatic fever, chronic rheumatic disease, hypertensive disease, ischaemic (coronary) heart disease, cerebrovascular disease and peripheral vascular disease.

process known as atherosclerosis that clogs blood vessels. It is most serious when it affects the blood supply to the heart, causing angina or heart attack, or to the brain, which can lead to a stroke.

Extent of the problem[2]

Under the NHPA initiative, progress towards reducing the problem is measured by time trends of risk factor prevalence, morbidity and mortality.

Prevalence

Based on self reports during the 1995 National Health Survey, an estimated 2.8 million people aged 18 years and over (21 per cent of the Australian population in that age group) have had a recent and/or long-term cardiovascular condition (ABS 1997a).

The prevalence of heart, stroke and vascular disease conditions increases with age, from 4 per cent among 18 to 24 year olds to 61 per cent among those aged 75 years and over. The conditions are more prevalent among females (23 per cent) than males (19 per cent), explained partly by the higher prevalence of hypertension among females. The difference in rates between the two sexes is much smaller when age standardised.

Mortality

Heart, stroke and vascular disease is the leading cause of death among Australians, accounting for 53,990 deaths (26,550 males; 27,440 females), or 42 per cent of all deaths in 1996 (Figure 1.1). Although deaths from heart, stroke and vascular disease are a much smaller proportion of all deaths among males (39 per cent) than among females (45 per cent), males are more likely to die from heart, stroke and vascular disease prematurely. The male death rate is higher in most age groups, but the differential between the sexes declines with increasing age (Mathur & Gajanayake 1998).

Indigenous people suffer higher heart, stroke and vascular disease death rates, at twice the rate of non-Indigenous Australians (Anderson et al 1996). Over the period 1994–1996, heart, stroke and vascular disease accounted for 28 per cent of all deaths of Indigenous persons, in comparison to 42 per cent in the total population. This is because Indigenous people tend to die much younger than other Australians, and the comparative age-specific rates were much higher in the Indigenous population (Mathur & Gajanayake 1998).

Certain other groups in the population also have higher heart, stroke and vascular disease death rates than the total Australian population. For example, people from lower socio-economic groups are more likely to die from heart, stroke and vascular disease than those from higher socio-economic groups. People born in Australia also have higher heart, stroke and vascular disease death rates than those born overseas.

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2   Unless otherwise indicated, data on epidemiology and risk factors in this chapter were provided by the AIHW.

Figure 1.1: Causes of death, Australia, 1996

Cardiovascular 42%

Other 3%
Infectious/parasitic 1%
Genitourinary 2%
Nervous system 2%
Mental disorders 3%
Digestive 3%
Endocrine/nutritional 3%
Injury/poisoning 6%

Cancers 27%

Respiratory 8%

Source: AIHW National Mortality Database.
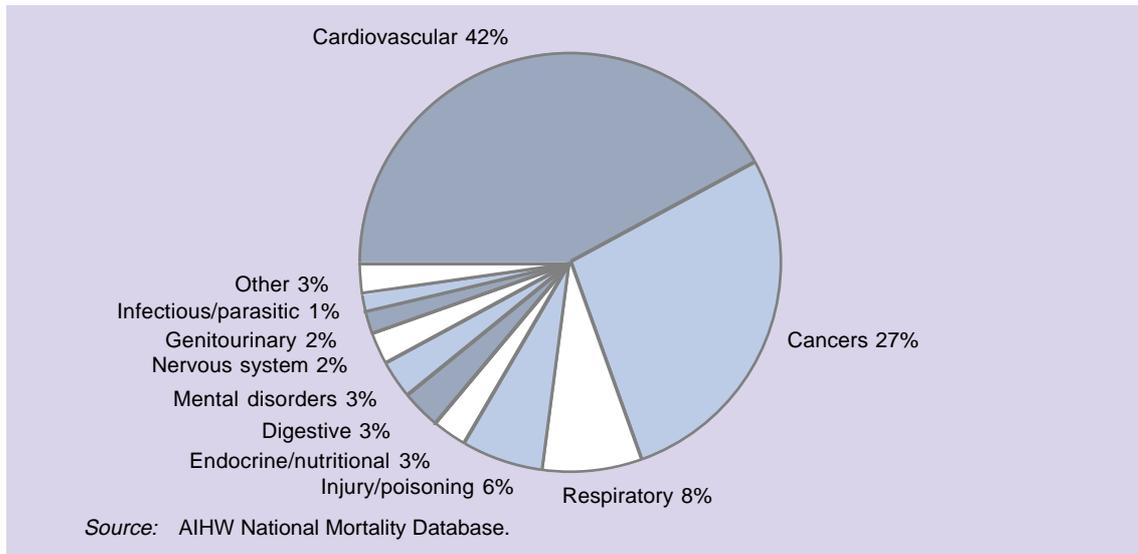
Most cardiovascular deaths are caused by coronary heart disease and stroke (Figure 1.2). While coronary heart disease accounted for 55 per cent of all heart, stroke and vascular disease deaths in 1996, stroke was the underlying cause of death for 24 per cent of these deaths.

Figure 1.2: Deaths due to heart, stroke and vascular disease, Australia, 1996

Other
12%

Rheumatic fever and
rheumatic heart disease
1%

Peripheral vascular disease
4%

Heart failure
5%

Coronary heart disease
55%

Stroke
24%

Source: AIHW National Mortality Database.
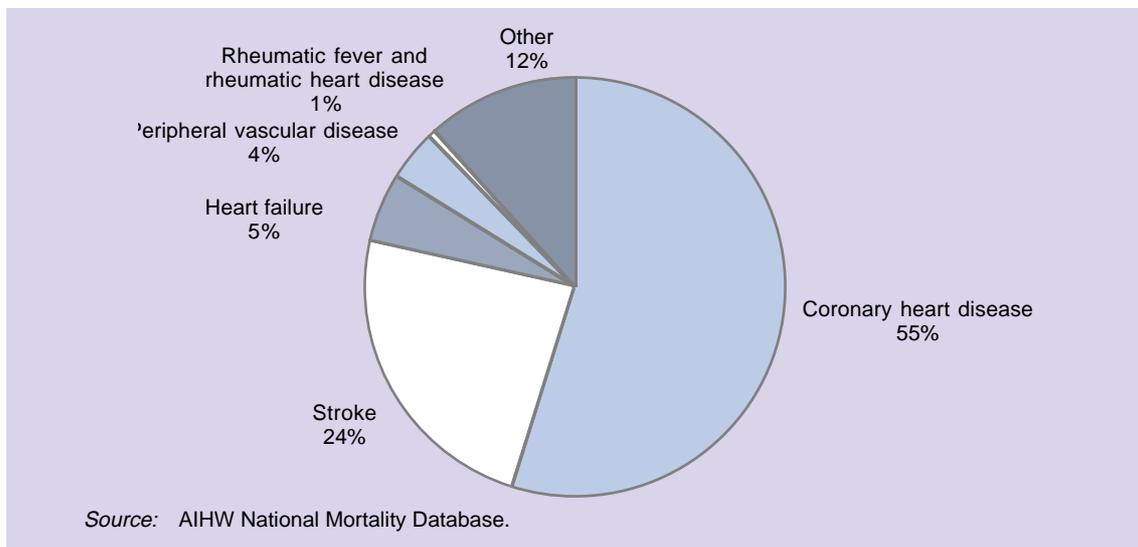
Morbidity associated with heart, stroke and vascular disease is difficult to quantify fully. Hospital separations and visits to general practitioners are two major sources of information for determining the magnitude of heart, stroke and vascular disease morbidity.

Hospitalisation

In 1996–97, over 421,000 hospital admissions were listed with heart, stroke and vascular disease as the principal diagnosis. This represents 8 per cent of all hospital separations, which is higher than the proportion for any other NHPA. Heart, stroke and vascular disease is also listed as an additional diagnosis in several other hospital separations. The average length of hospital stay for a

principal diagnosis of heart, stroke and vascular disease is high — 5.9 days compared with an average of 4.2 days for all hospital stays in 1996–97.

The cardiovascular conditions that account for most hospital admissions are coronary heart disease, stroke and heart failure (Figure 1.3). However, these represent only 60 per cent of all separations with heart, stroke and vascular disease as a principal diagnosis.

Figure 1.3: Admissions to hospital for heart, stroke and vascular disease, Australia, 1996–97

Other 37%

Coronary heart disease 37%

Rheumatic fever and rheumatic heart disease 0.5%

Peripheral vascular disease 3%

Heart failure 10%

Stroke 12%

Source: AIHW National Hospital Morbidity Database.
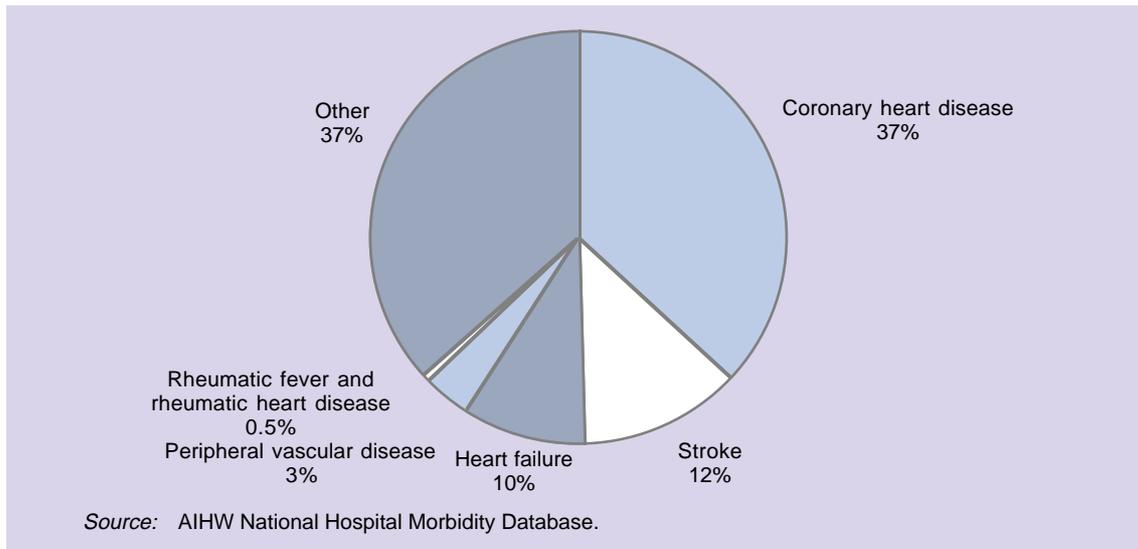
Visits to general practitioners

In 1990–91, cardiovascular conditions were the second most frequently managed set of problems in general practice after respiratory conditions, accounting for 12.5 per cent of all problems managed (Bridges-Webb et al 1992). Approximately 14 per cent of cardiovascular problems managed were new problems.

For both males and females, the average number of cardiovascular problems managed per 100 visits increases with age (Figure 1.4). In the younger age groups (< 25 years), there is little difference between males and females in the rate for problems managed. Between the ages of 25 and 74 years, males have higher rates of cardiovascular problems managed per 100 encounters than females. However, from age 75 years onwards, the rate of cardiovascular problems managed becomes higher for females than males.

Hypertension is the most common condition managed in general practice (Sayer et al 1994). In 1990–91, it accounted for 6.4 per cent of all problems managed. Only 5 per cent of all hypertension problems managed were new, reflecting the chronic nature of hypertension.

Other frequently managed cardiovascular conditions are heart failure, 'other and chronic coronary heart disease', angina and stroke. For each of these conditions, the average number of problems managed per 100 encounters increases with age, and males tend to have higher rates of problems than females.

Figure 1.4: General practice consultations for heart, stroke and vascular disease, age-specific rates, 1990–91

Problems managed per 100 encounters

Source: Waters et al (1998), derived from the Australian Survey of Mortality and Treatment in General Practice, 1990–91.
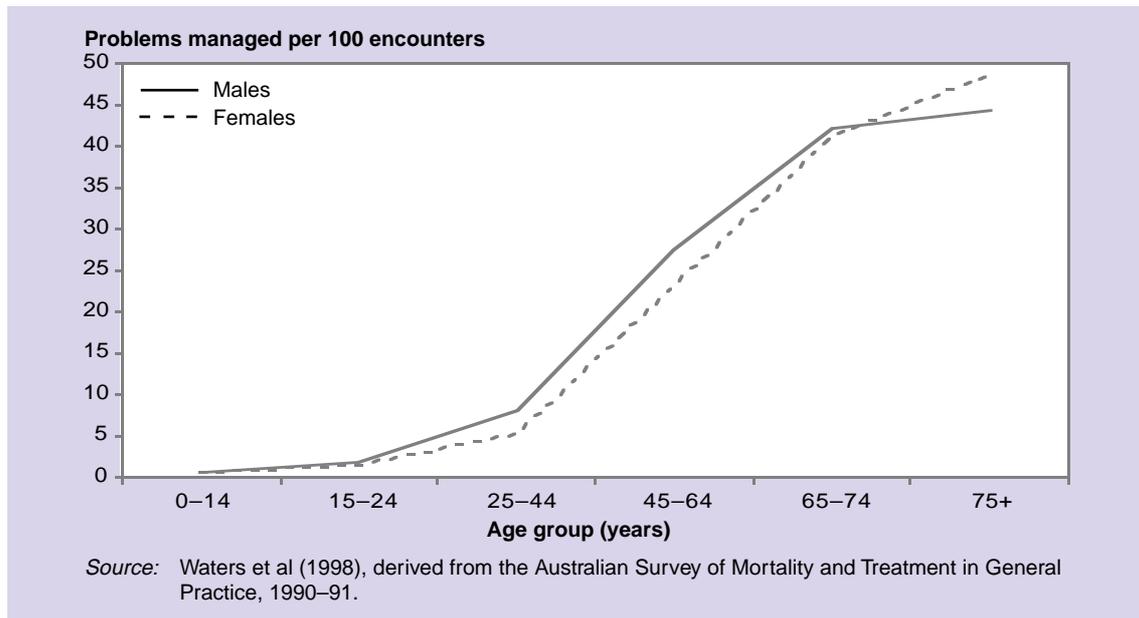
Disability

The burden of heart, stroke and vascular disease is most evident in disability. About 2 per cent of Australian males and females are disabled by the disease (Mathers 1997). While all types of heart, stroke and vascular disease compromise a person's full functioning, stroke is one of the most prominent causes of disability.

Stroke is the cause of nearly 25 per cent of all chronic disability in Australia. About one-third of people who have a stroke are permanently disabled, with some degree of paralysis of one side of the body, difficulty in communicating, or a range of other problems that may affect their quality of life and their ability to function in society.

International comparisons

Although death rates from heart, stroke and vascular disease in Australia have more than halved since the 1950s, the rates remain high compared with other developed countries (de Looper & Bhatia 1998).

Among Organisation for Economic Cooperation and Development (OECD) countries, Australia ranks the ninth lowest out of 29 countries in age-standardised death rate for heart, stroke and vascular disease. In 1992, the rates were 61 per cent higher (males) than for Hong Kong and 65 per cent higher (females) than for France.

Australia's relative ranking is worse for coronary heart disease. In 1992, the death rate for coronary heart disease among Australians was more than five times that in Japan (Figures 1.5 and 1.6). This gap remains despite more than 50 per cent reduction in rates among both males and females over the past 40 years in Australia.

Overview

Figure 1.5: Age-standardised male death rates for coronary heart disease in OECD countries, various years (1989–94)

Number of deaths per 100,000 population

Notes: Based on most recent data (various years 1989–1994).

Rates adjusted to the World Standard Population.

Source: AIHW.
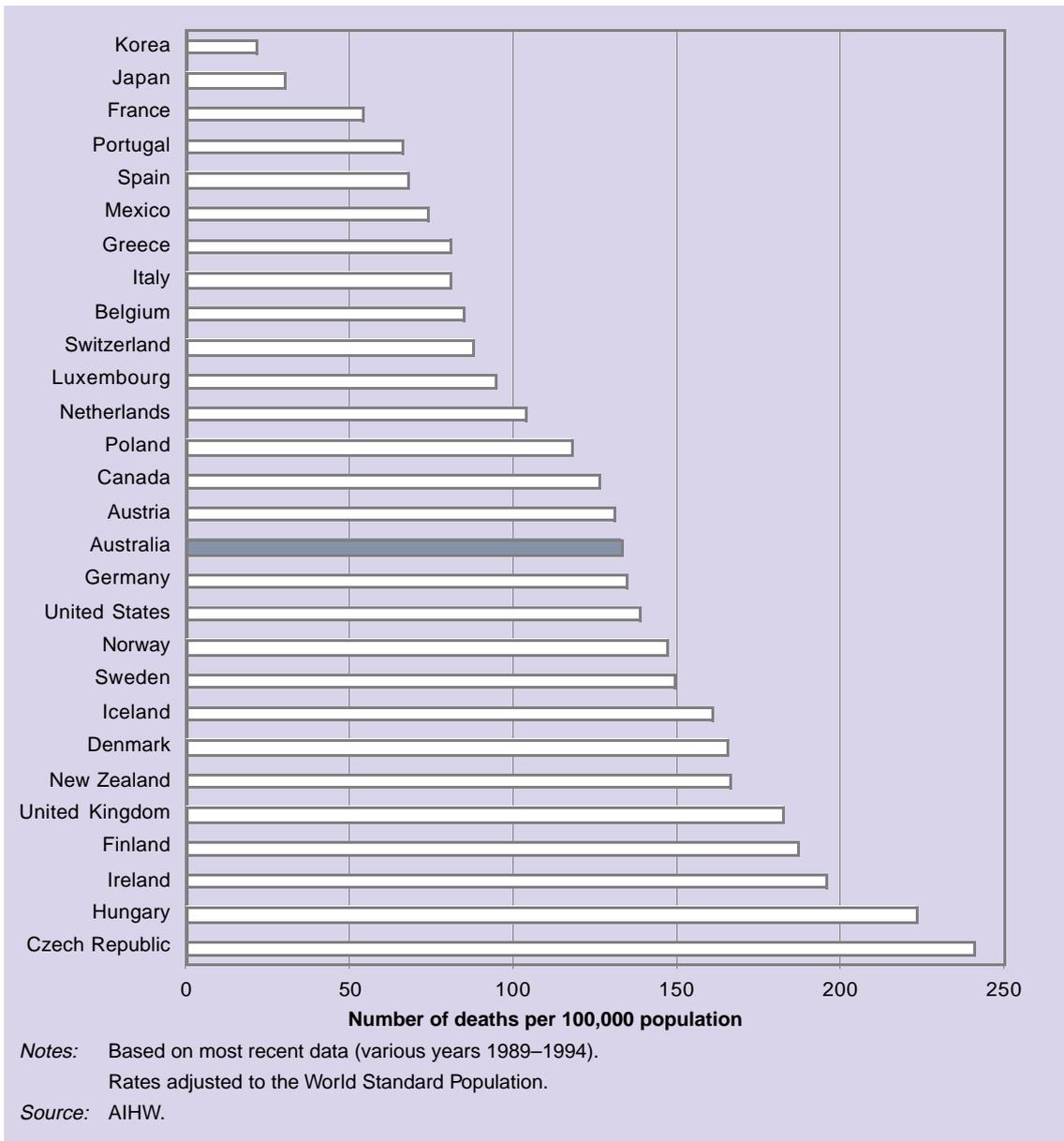
Figure 1.6: Age-standardised female death rates for coronary heart disease in OECD countries, various years (1989–94)

Notes: Based on most recent data (various years 1989–1994).

            Rates adjusted to the World Standard Population.

Source: AIHW.
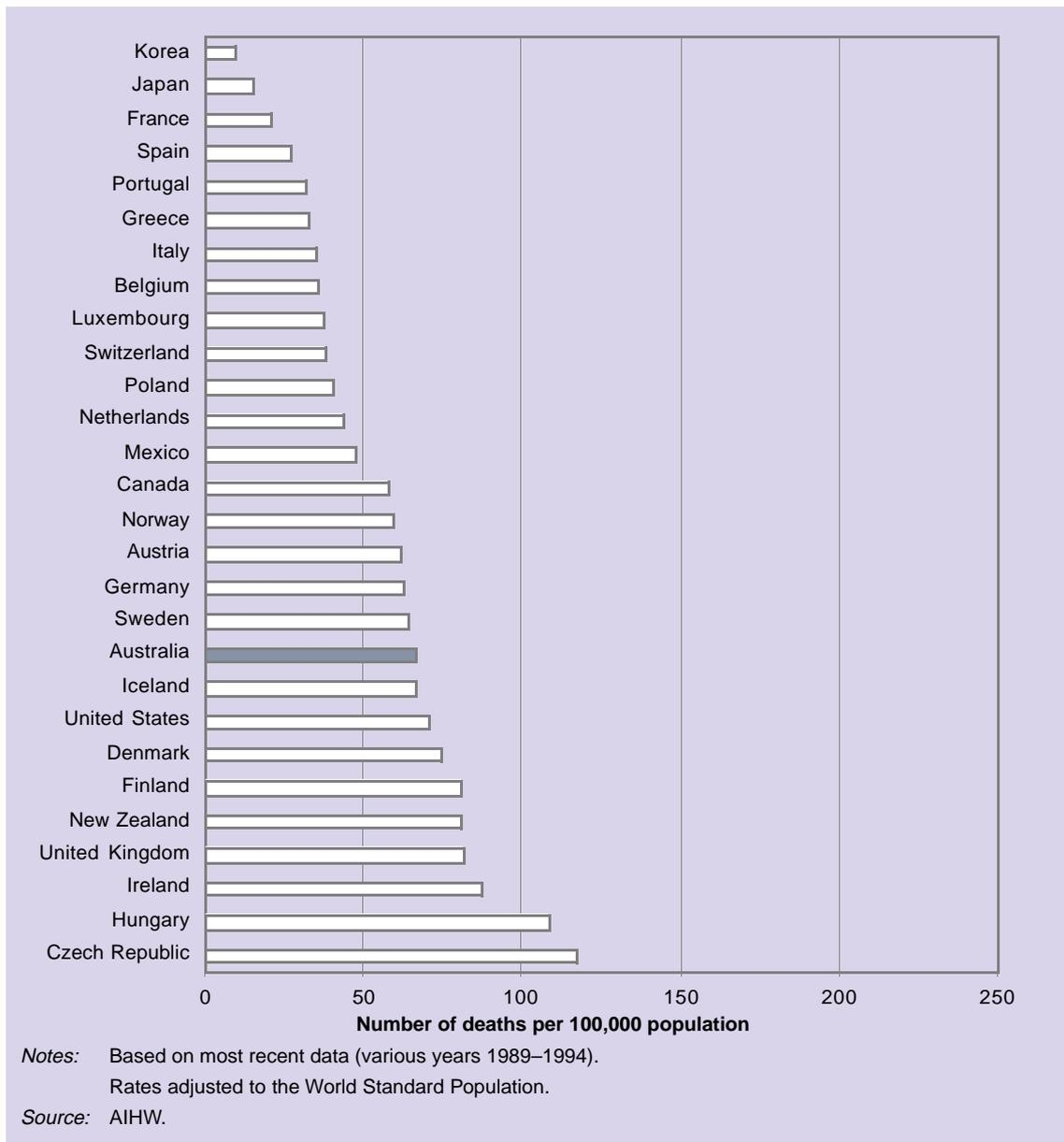
Starting from a low base, Australia has also made significant improvement in reducing death rates for stroke. Nonetheless, death rates for stroke are higher in Australia than in Canada, the United States, Switzerland and France among the OECD countries. In particular, in Switzerland where access of stroke patients to dedicated stroke units is virtually universal, the stroke death rates have declined by more than two-thirds since 1950–1954 (Victorian Stroke Strategy Taskforce 1998; de Looper & Bhatia 1998).

Although international comparisons of death rates may be influenced by differences in coding practices between countries, these benchmarks clearly indicate that there is potential for further lowering the death rate for heart, stroke and vascular disease in Australia. In particular, reductions in Japan and Sweden suggest that much more of the mortality from heart, stroke and vascular disease in Australia is preventable.

Specific diseases

Profiles of various heart, stroke and vascular diseases and conditions based on incidence, prevalence, hospitalisation and mortality are given below.

Coronary heart disease

Coronary heart disease includes conditions such as heart attack[3] and angina caused by blockages in the coronary arteries which supply blood to the heart muscle. It is the most common cause of sudden death.

In 1995–96, the incidence of coronary events in Australia, mainly heart attacks, was estimated at 421 per 100,000 among males aged 35–69 years, and 137 per 100,000 among females of the same age. Of these, about 65 per cent were non-fatal heart attacks (AIHW 1998a). Almost 156,000 hospital separations were on account of coronary heart disease, representing 3 per cent of all hospital separations in 1996–97.

In about 25 per cent of cases, the first clinical manifestation of coronary heart disease is fatal. This highlights the importance of effective prevention and early treatment. In 1996, coronary heart disease was the major cardiovascular cause of death, accounting for 23 per cent of all deaths.

Stroke

Stroke is the most important manifestation of cerebrovascular disease. A stroke occurs when an artery supplying blood to a part of the brain suddenly becomes blocked or bleeds. This causes a loss of function of part of the brain and impairment in any or all of a range of functions including movement of body parts, planning, communication and swallowing.

About 85 per cent of strokes are *ischaemic*, due mainly to atherosclerosis affecting arteries leading from the heart, or arteries in the neck or brain. Another cause is clots that travel from the heart, usually as a result of atrial fibrillation or heart attack. About 15 per cent of strokes are *haemorrhagic*, caused by bleeding within the brain or on its surface.

The prevalence of stroke in Australia per year is estimated at 40,000 events, about half of which occur in people aged over 75. For almost 52,000 hospital episodes in 1996–97, stroke was listed as the principal diagnosis, accounting for 1 per cent of all hospitalisations. It was the leading cardiovascular condition in terms of average length of stay in hospital in 1996–97 (10.5 days).

Nearly 25 per cent of those who suffer a stroke die as a consequence of the stroke within one month, and altogether one-third die within 12 months (Donnan et al 1997; Anderson et al 1993a; 1993b). Stroke accounted for almost 10 per cent of all deaths in Australia in 1996.

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3   In this report, the term 'heart attack' is used rather than the medical term 'myocardial infarction'. A heart attack is the clinical event of sudden death or chest pain which signifies that one of the heart's arteries has suddenly become blocked by a blood clot. Myocardial infarction refers to the actual death of heart muscle that so often results from the blockage. However, the process of muscle death takes several hours to become irreversible. Before emergency clot-dissolving treatment (thrombolysis) became available, all heart attacks (coronary events) became myocardial infarction or sudden death but that is no longer so.

Death rates for stroke are continuing to decline, by 3.4 per cent per year among males and 3.8 per cent among females (based on trend analysis of 1985–1996 mortality data), although there is some suggestion that the decline in the death rate for stroke may be slowing (Jamrozik 1997).

Heart failure

The term heart failure is used when the heart cannot pump blood well enough to meet the body's normal needs. The causes of heart failure include heart attack, hypertension or a damaged heart valve. When it causes swelling of the ankles and lung congestion it is termed congestive heart failure. It is usually serious but can be successfully treated with drugs.

Reliable data on the prevalence of the condition in Australia are not available but there were almost 41,000 hospitalisations with heart failure as the principal diagnosis in 1996–97, representing 0.8 per cent of all hospital separations. Heart failure accounted for 2 per cent of all deaths in 1996.

Peripheral vascular disease

Peripheral vascular disease involves a reduced blood supply or impaired return of blood affecting the extremities. This ranges from asymptomatic disease, through pain on walking, to pain at rest and limb-threatening ischaemia that can lead to amputation.

In 1996–97, there were almost 14,000 hospitalisations with peripheral vascular disease as the principal diagnosis, representing 0.3 per cent of all hospital separations. Peripheral vascular disease is estimated to have caused almost 2 per cent of all deaths in 1996.

Abdominal aortic aneurysm

Abdominal aortic aneurysm is an abnormal ballooning out of the aorta (the main artery leading from the heart) below the renal arteries. This progresses gradually and usually asymptomatically over many years.

The prevalence of potentially life-threatening abdominal aortic aneurysm is estimated at 0.8 per cent in males aged 65–79 years and less than 0.2 per cent in females (Nicholls et al 1992). The incidence of this condition appears to have risen over the last two decades (Norman et al 1991; Semmens et al 1998).

Acute rheumatic fever and rheumatic heart disease

Childhood and adolescent attacks of Group A streptococcal throat infections can lead to acute rheumatic fever. The damage this can do to heart valves and other parts of the heart is known as rheumatic heart disease, which may cause serious problems in the acute stage as well as later in life.

Rheumatic heart disease is now rare in Australia generally but its prevalence among Indigenous people living in remote regions of the country (especially the Top End of the Northern Territory) is high (10–24 per 1,000 in the Indigenous population compared to less than 1 per 1,000 in the general population). Similarly, annual incidence rates of acute rheumatic fever are estimated to range from 3 to 12 per 1,000 in the Indigenous population compared to less than 0.05 per 1,000 in the general Australian population.

Overview

In 1996–97, there were almost 2,000 hospital separations with rheumatic heart disease as the principal diagnosis. Acute rheumatic fever and rheumatic heart disease caused around 0.3 per cent of all deaths in 1996.

Risk factors

Increasing age, male gender and a family history are risk factors for heart, stroke and vascular disease that cannot be modified. There is also a range of risk factors that can be modified or managed. The range includes tobacco smoking, high blood pressure, high blood cholesterol, physical inactivity, overweight and obesity, high alcohol consumption, diabetes and non-valvular atrial fibrillation.

It is important to recognise that these risk factors are strongly influenced by the circumstances in which people live and work (see Section 6.3).

Table 1.1 lists the major established risk factors for coronary heart disease and stroke.

Table 1.1: Risk factors for coronary heart disease and stroke

Risk factor	Coronary heart disease	Stroke
Demographic and hereditary factors		
Age	✓	✓
Sex	✓	—
Family history of disease	✓	✓
Behavioural risk factors		
Tobacco smoking	✓	✓
Physical inactivity	✓	✓
Poor nutrition	✓	✓
High consumption of alcohol	✓	✓
Physiological risk factors		
High blood pressure	✓	✓
Elevated blood lipids	✓	✓
Overweight and obesity	✓	✓
Diabetes mellitus	✓	✓
Non-valvular atrial fibrillation	—	✓
Transient ischaemic attack	—	✓

Note: ✓ substantial evidence of association between the risk factor and the disease;
— no known association.

Tobacco smoking

There is a clear relationship between smoking and coronary heart disease (Prescott et al 1998), stroke (Robbins et al 1994), peripheral vascular disease (Krupski 1991) and abdominal aortic aneurysm (Lederle et al 1997). Passive smoking has also been associated with increased risk of heart disease (Kawachi et al 1997; Law & Hackshaw 1996; Lam & He 1997).

Because it can be prevented entirely in principle, and it approximately doubles the risk of dying of a heart attack, smoking is commonly regarded as the most important modifiable risk factor for heart, stroke and vascular disease.

Smoking cessation leads to a marked and rapid fall in the risk of heart, stroke and vascular disease (US Dept Health & Human Services 1990). The risk of a coronary event or stroke among former smokers has been reported to approach that of people who have never smoked within two to five years of cessation of smoking (Kawachi et al 1993; Negri et al 1994).

In Australia in 1995, an estimated 27 per cent of males and 20 per cent of females reported themselves as current smokers. Ex-smokers made up another 32 per cent of males and 23 per cent of females.

Physical inactivity

There is strong evidence that physical inactivity increases morbidity and mortality from coronary heart disease (especially heart attack and sudden death). The American Heart Association states that increasing levels of physical activity is as important in preventing coronary heart disease as lowering levels of cholesterol and blood pressure (Fletcher 1994). Evidence that physical activity plays a protective role against stroke is less clear, although such evidence is increasing (Stacco et al 1998; US Dept Health & Human Services 1996).

People who are physically inactive are almost twice as likely to die from coronary heart disease as those who are active (Berlin & Colditz 1990; Leon & Connett 1991). Physical inactivity also relates to other risk factors for heart, stroke and vascular disease, such as obesity, high blood pressure, total blood cholesterol and a poor cholesterol pattern (Blair 1997). There is evidence that an increase in physical activity over time is associated with a fall in levels of those risk factors (Young et al 1993).

The prevalence of physical inactivity is difficult to measure in population surveys. From various surveys, it is estimated that up to 50 per cent of Australians are physically inactive to a degree that carries a greater risk of heart, stroke and vascular disease.

High blood pressure

High blood pressure is a major risk factor for coronary heart disease, heart failure and stroke, with the risk increasing along with the level of blood pressure (Ashwell 1997; DHSH 1994b; Whelton 1994; Kannel 1991).

Both systolic and diastolic blood pressures are predictors of heart, stroke and vascular disease at all ages (Kannel 1991), although systolic blood pressure is a stronger predictor of death due to coronary heart disease (Neaton & Wentworth 1992). When blood pressure is lowered by 4–6 mmHg over two to three years, it is estimated that the risk reduces by 14 per cent in patients with coronary heart disease and by 42 per cent in stroke patients (Collins et al 1990; Rose 1992).

In Australia in 1995, 17 per cent of men and 15 per cent of women over 18 years of age had high blood pressure and/or were on treatment for the condition.

Non-valvular atrial fibrillation

Non-valvular atrial fibrillation occurs in about 10 per cent of those over the age of 75 years (Lake et al 1989), and increases stroke risk about five-fold (Wolf et al 1978). Among people with non-valvular atrial fibrillation, anticoagulation with warfarin reduces the relative risk of stroke by about 70 per cent and aspirin reduces the risk by about 30 per cent (Atrial Fibrillation Investigators 1994).

Nutrition

Poor nutrition can have many effects that contribute to heart, stroke and vascular disease. The types and proportions of fat and fibre as well as the level of dietary sodium, potassium and other components can variously have a wide range of effects. Among these are effects relating to blood cholesterol, blood pressure and perhaps heart rhythm. However, although the effects of dietary components are complex and inter-related, the most important single factor for heart, stroke and vascular disease appears to be the amount of saturated fat consumed. A population's level of saturated fat intake is the prime determinant of its level of blood cholesterol and, as shown below, high blood cholesterol is a key factor in heart, stroke and vascular disease, especially coronary heart disease.

Studies show a positive relationship between an individual's total blood cholesterol level and risk of coronary heart disease as well as death (Kannel & Gordon 1970; Pocock et al 1989).

Many studies have demonstrated the significance of blood cholesterol components as risk factors for heart, stroke and vascular disease. Evidence that raised low-density lipoprotein (LDL) cholesterol, the main component of blood cholesterol, is positively associated with coronary heart disease comes from epidemiology, animal research, clinical trials and genetic studies (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults 1994; Ashwell 1997). Conversely, a high concentration of high density lipoprotein (HDL), another key cholesterol component, appears to provide some protection against coronary heart disease (Pocock et al 1989). There is substantial evidence that lowering total and LDL cholesterol levels will reduce the incidence of coronary heart disease (LaRosa et al 1990; Muldoon et al 1990; Shepherd et al 1995).

There are no recent national data to provide information on the levels of blood lipids or triglycerides among Australians. However, according to National Heart Foundation Risk Factor Prevalence Survey data, the average levels of total blood cholesterol in the Australian population in 1989 were high and a major health concern. Of people aged 20–69 years, 47 per cent of men and 39 per cent of women had blood cholesterol levels above 5.5 mmol/L (Risk Factor Prevalence Study Management Committee 1990).

Overweight and obesity

Obesity is associated with increased morbidity and mortality (Pi-Sunyer 1993), particularly from heart, stroke and vascular disease (Eckel 1997). Even a modest degree of excess body fat has been associated with a higher risk of hypertension (Yong et al 1993; Huang et al 1998) and diabetes (Colditz et al 1990), both of which

contribute to heart, stroke and vascular disease. Abdominal obesity has been found to be a better predictor of cardiovascular morbidity and mortality than overall obesity (Prineas et al 1993).

Evidence that reducing weight reduces mortality from heart, stroke and vascular disease is inconclusive. However, there is evidence that losing weight reduces the incidence and severity of risk factors such as high blood pressure, high blood cholesterol and diabetes (Rissanen et al 1991; Pi-Sunyer 1993).

In 1995, according to the National Nutrition Survey (ABS & HEALTH 1998), almost 64 per cent of males and 49 per cent of females over 18 years of age were overweight. Over 18 per cent of Australians were estimated as being obese.

High consumption of alcohol

Evidence from prospective studies indicates that heavy alcohol consumption is associated with increased mortality and morbidity from coronary heart disease and stroke (Hanna et al 1992). Moderate to heavy drinkers have an increased risk of stroke compared to non-drinkers and light drinkers (Stampfer et al 1988).

It is well documented that increased consumption of alcohol, particularly binge drinking, is related to an increase in blood pressure (Wakabayshi et al 1994). Each increment of 10 g of alcohol drunk per day appears to increase systolic and diastolic blood pressure by 1–2 mmHg (Ashwell 1997). However, moderate intake of alcohol appears to have a protective effect against coronary heart disease (Rimm et al 1996).

In 1995, over 6 per cent of males and 4 per cent of females (aged over 15 years) reported drinking alcohol at levels dangerous to their health.

Diabetes

People with diabetes have two to five times increased risk of developing heart, stroke and vascular disease (Zimmet & Alberti 1997). It is the most common cause of death in people with diabetes. It is estimated that about 4 per cent of Australians have diabetes (Amos et al 1997).

Potential risk factors

In addition to the established risk factors described above, several other genetic, behavioural and physiological risk factors have been identified for heart, stroke and vascular disease. Under current investigation in particular are antioxidants and homocystine, which may eventually suggest further approaches to primary prevention.

Heart, stroke and vascular disease comorbidity

Comorbidity, which refers to the occurrence of more than one disorder at the same time, is commonly found among people with heart, stroke and vascular disease. An individual may have more than one cardiovascular condition, or may have a cardiovascular condition in combination with other diseases. While some comorbidity is of unrelated diseases, it often results from common sharing of risk factors. The issue of comorbidity of heart, stroke and vascular disease in relation to other NHPAs is discussed below.

Cardiovascular health and other National Health Priority Areas

Cardiovascular health shares a number of risk factors with other NHPAs, particularly diabetes. Having one disease or condition can predispose to another. The NHPA conditions have many common roots in lifestyle, social factors and the environment, eg the contribution of obesity to both cardiovascular problems and diabetes. Reducing the levels of these factors requires similar interventions and will bring benefits across all the NHPAs, although the effectiveness of the interventions may vary for each condition.

The overlap between the various NHPAs has implications for their control, especially in determining whether health care is helping to create a smaller burden of disease. Substitute morbidity and mortality following successful intervention for a condition or disease may offset the benefits to the population as a whole. The rising trends in cancer incidence, in juxtaposition to declining cardiovascular mortality, is an example of such an overlap between NHPA diseases and conditions.

In terms of overall NHPA goals, collaboration between various strategies, particularly in the area of prevention, is likely to prove cost-effective.

Diabetes

Heart disease is common among people with diabetes. During the 1995 National Health Survey, about 15 per cent of those with diabetes reported having heart disease, at almost six times the rate noted among people without diabetes. In 1996–97, almost one in six hospital separations with coronary heart disease as any listed diagnosis also had diabetes recorded as an associated diagnosis. Heart disease appears earlier in life and is more often fatal among those with diabetes.

Diabetes is also an important cause of stroke, and people with diabetes may have a worse prognosis after stroke. Diabetes may accentuate the role of elevated blood pressure in stroke.

The incidence and prevalence of peripheral vascular disease in those with diabetes increase with the duration of the peripheral vascular disease. Mortality is increased among patients with peripheral vascular disease and diabetes, in particular if foot ulcerations, infection or gangrene occur.

Not only do heart, stroke and vascular disease and diabetes share common risk factors, but diabetes is an independent risk factor for heart, stroke and vascular disease. However, there is limited information on whether the presence of heart, stroke and vascular disease promotes diabetes in some way.

High blood pressure, high cholesterol and obesity are often present along with diabetes. As well as all being independent cardiovascular risk factors, when they are in combination with glucose intolerance (a feature of diabetes) and other risk factors such as physical inactivity and smoking, these factors present a greater risk for heart, stroke and vascular disease. Evidence is accumulating that high cholesterol and glucose intolerance, which often occur together, may have a common aetiological factor.

Despite these similarities, trends in cardiovascular mortality and diabetes incidence and mortality are moving in opposite directions. While the ageing of the population following reductions in cardiovascular mortality may have contributed to these contrasting trends, the role of other factors also needs to be clearly understood if common risk factor prevention strategies are to be considered.

Cancer control

Cancer mortality is also decreasing in Australia, reflecting changes in patterns of exposure to risk factors, changes in treatment and early detection techniques, and the use of medical services.

However, the incidence of cancer is on the rise in Australia. While some of this increase is attributable to population growth and increased rate of detection of some cancers, ageing of the population (following sustained reduced mortality from heart, stroke and vascular disease) over the past several years may have led to a substantial substitute effect.

The co-presence of both heart, stroke and vascular disease and cancer is not uncommon. However, there is no known common cause. The two groups of diseases also share several risk factors. The contribution of smoking to both diseases is well documented; obesity, heavy alcohol use and other risk factors may also contribute to both groups.

Injury prevention and control

The impact of external injuries upon cardiovascular outcomes is rarely quantified. Injuries may initiate incipient diseases or problems, including those that pre-dispose to heart, stroke and vascular disease. They may also force lifestyle changes that alter the cardiovascular health of the individual.

The presence of heart, stroke and vascular disease may affect recovery from an accident but there are limited statistics available to support this.

Mental health

Psychosocial disorders are one of the most difficult problems for physicians caring for those with chronic conditions such as heart, stroke and vascular disease.

Emotional problems following stroke have been reported for several decades. Post-stroke depressive disorders are common, often severe and lengthy if untreated. Depression is also a common problem associated with heart disease. Studies indicate that 10 to 20 per cent of patients with heart attack, heart failure and other forms of chronic heart disease have depressive symptoms. Almost 5 per cent may suffer from major depression.

Marmot et al (1998) and others have recently suggested physical and chemical mechanisms by which social and emotional factors cause coronary heart disease. Further evidence is required to support these suggestions.

1.2   Trends in mortality and prevalence

Mortality

There has been a substantial decline in heart, stroke and vascular disease mortality in Australia over recent decades (Figures 1.7 and 1.8). This trend in death rates continues among both males and females, and more rapidly than for non-cardiovascular mortality.

Figure 1.7: Trends in heart, stroke and vascular disease mortality among males, Australia, 1950–1996

Deaths per 100,000 population

Note: Age standardised to the Australian population at 30 June 1991.
Source: AIHW National Mortality Database.
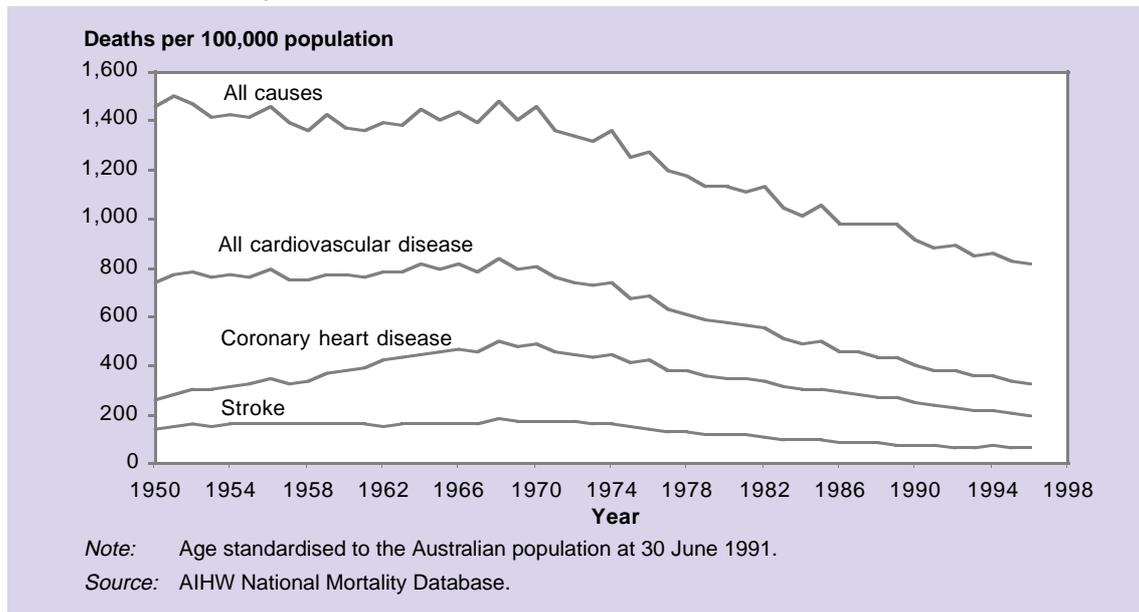
Figure 1.8: Trends in heart, stroke and vascular disease mortality among females, Australia, 1950–1996

Deaths per 100,000 population

Note: Age standardised to the Australian population at 30 June 1991.
Source: AIHW National Mortality Database.
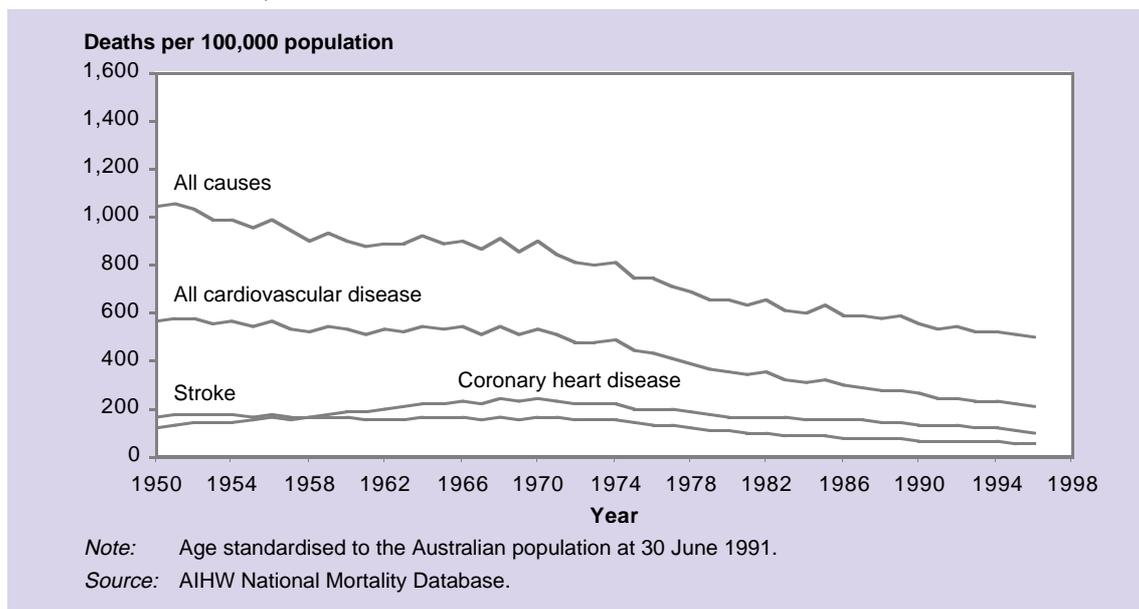
Between 1985 and 1996:

- Heart, stroke and vascular disease death rates declined with an annual average of 3.7 per cent for males and 3.6 per cent for females. The corresponding rates of decline for all causes of death were 2.2 and 1.9 per cent, respectively.

- Coronary heart disease death rates declined 4.0 per cent per year among males and 3.6 per cent per year among females during that period. Deaths from heart attacks, the major contributor to coronary heart disease mortality, declined at an annual rate of 5.5 per cent among males and 4.7 per cent among females.

- Mortality from stroke declined 3.4 per cent per year among males and 3.8 per cent per year among females, and the decline occurred in all age groups.

- The rate of decline in death rates was faster in the younger age groups. For example, coronary heart disease death rate declined annually by 5.6 per cent for males and 6.2 per cent for females in the age group 25–74 years. The corresponding figures for stroke were 5.1 and 6.0 per cent respectively.

Disease prevalence

A comparison of the 1989–90 and 1995 National Health Surveys reveals an increase in the prevalence of heart, stroke and vascular disease conditions, from 174 per 1,000 adults (persons aged 18 years and over) to 209 per 1,000 adults. Hypertension was estimated to have increased by 17 per cent between the two periods; heart disease in comparison increased by about 5 per cent. The largest increase in reported prevalence was noted for 'other circulatory diseases' (which includes aortic aneurysm and peripheral vascular disease) which appears to have increased from 22 per 1,000 adults to 52 per 1,000 adults, an increase of 136 per cent (ABS 1997a).[4]

Several different factors may have contributed to this increase in the reported prevalence. While some of the increase is due to the ageing of the population, the increase may also be a reflection of heightened public awareness and improved medical diagnosis related to heart, stroke and vascular disease conditions (ABS 1997a). Even after removing the effect of the ageing of the population — by age and sex standardising the data — the prevalence rate increased from 180 per 1,000 adults to 209 per 1,000 adults between the two periods.

It is estimated that, compared with other groups of diseases, eliminating heart, stroke and vascular disease in Australia would result in the greatest gain in disability-free life expectancy. It would add five healthy years to the average life expectancy at birth for males and 2.7 healthy years for females (Mathers 1997). For individual diseases, eliminating coronary heart disease would achieve the greatest gain in healthy life expectancy at birth — an average of 2.4 years for males and 1.1 years for females. Similarly, eliminating stroke would lead to an additional 0.7 healthy years on average for males and 0.6 healthy years on average for females.

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4   Care should be taken in interpreting trends as changes in survey methods may affect comparability between the surveys.

1.3 Issues in heart, stroke and vascular disease

Increasing burden

Despite the downward trends in death rates, the burden of heart, stroke and vascular disease appears to be rising. The increase is mainly because the population is ageing, but also partly because of declines in heart, stroke and vascular disease death rates among younger age groups. This has important health care and resource implications.

Coronary heart disease, stroke, hypertension and heart failure are common conditions among older people. It is expected that their treatment with drugs and other medical interventions will place increasing demand on the health care system over the next several decades. At the same time, more emphasis will be needed on preventing and reducing disability and improving quality of life in this age group.

More than 2.2 million Australians in 1993–94 were aged 65 years or more. They were 12 per cent of the population, but accounted for about two-thirds of the cardiovascular health care costs. Over 50 per cent of these people were reported to have some form of heart, stroke and vascular disease.

Figure 1.9 shows projected numbers of older persons with certain cardiovascular conditions in Australia over the next 30 years, with an approximate two-fold increase in prevalence expected (Kelly 1997).

Figure 1.9: Projected numbers of older patients with certain heart, stroke and vascular conditions, Australia

Source: Kelly (1997).
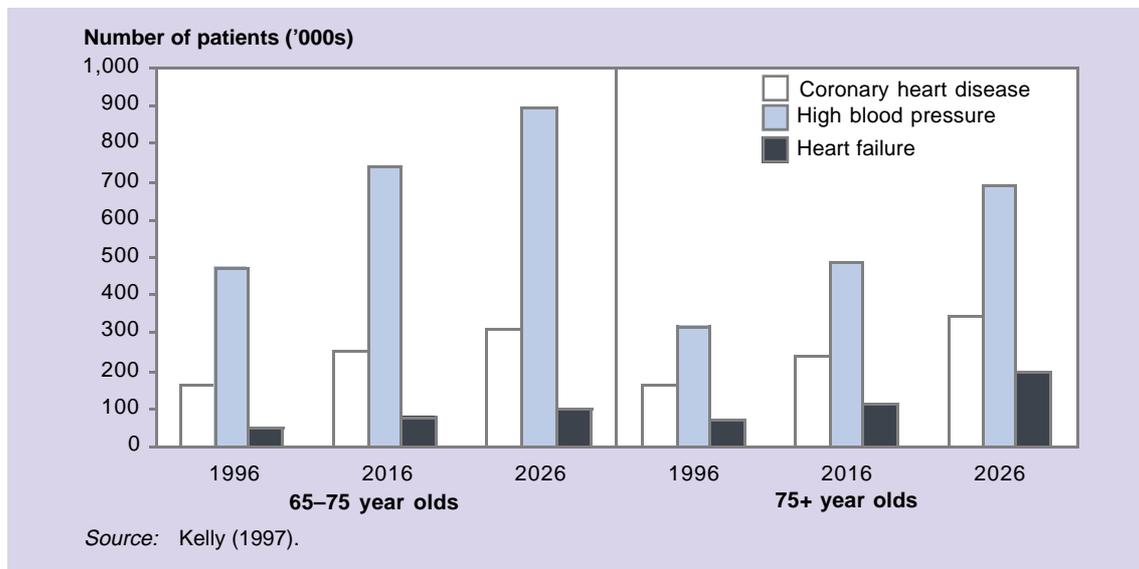
Similarly for stroke, it is expected that between 1996 and 2016 there will be a 69 per cent increase in new cases and a 45 per cent increase in the total cost of stroke (NHMRC 1997a).

Population groups at higher risk

Certain groups in the population have significantly higher risk of heart, stroke and vascular disease mortality than others (discussed in more detail in Chapter 6).

• Indigenous Australians die from heart, stroke and vascular disease at twice the rate of the non-Indigenous population. Among Indigenous adults of working age, the ratio is six to nine times higher for males and females respectively, with the greatest difference occurring in the younger age groups. Although heart, stroke and vascular disease death rates are declining among Indigenous females (5.2 per cent annually between 1991 and 1996), there has been no decline among Indigenous males over the same period (Mathur & Gajanayake 1998).

• People of lower socio-economic status are more likely to die from heart, stroke and vascular disease than are those from higher socio-economic levels. This difference existed throughout the 1970s and 1980s, and has persisted into the 1990s (Bennett 1996; Mathers 1994).

• Males in rural and remote areas are more likely to die from heart, stroke and vascular disease than those living in urban areas. For females, heart, stroke and vascular disease death rates show less difference across urban, rural and remote areas (Mathur & Gajanayake 1998; Strong et al 1998).

• Males are twice as likely to die from coronary heart disease than females, with males aged under 65 experiencing three to five times higher death rates than females. Age-standardised death rates for coronary heart disease among older females approach that of older males. For stroke, the difference between males and females is not as marked (Mathur & Gajanayake 1998).

Heart, stroke and vascular disease labour force

Comprehensive information on the labour force related to heart, stroke and vascular disease in Australia is unavailable. However, some information on the number of medical practitioners in cardiovascular and related specialities can be extracted from the Medical Labour Force Survey (AIHW 1997a). Medicare data also contain information regarding services provided in relation to cardiovascular conditions.

In 1995, there were an estimated 471 cardiologists, 84 cardiothoracic surgeons, 106 neurosurgeons and 122 vascular surgeons registered and practising in these respective fields as their main specialty. In addition, there were an estimated 71 general practitioners mainly practising in cardiology (AIHW 1997a).

Medicare data, which do not cover services to private patients in public hospitals or outpatient services by public hospitals, indicate that 473 cardiologists provided 1.7 million services in 1994–95, representing an average of 949 in-hospital and 2,646 out-of-hospital services per cardiologist. An estimated 90 cardiothoracic surgeons provided 63,000 services, amounting to an average of 408 in-hospital and 289 out-of-hospital services per practitioner. An estimated 94 neurosurgeons pro-vided 93,000 services, amounting to 305 in-hospital and 684 out-of-hospital services per practitioner. An estimated 119 practitioners performed 198,000 vascular procedures, representing 404 in-hospital and 1,258 out-of-hospital procedures per practitioner (Table 1.2) (AIHW 1996).

Table 1.2: Heart, stroke and vascular disease related Medicare providers and services, 1994–95

Specialty	Number of practitioners	Number of services ('000s)	Average number of services per practitioner	
			In hospital	Out of hospital
Cardiology	473	1,700	949	2,646
Cardiothoracic surgery	90	63	408	289
Neurosurgery	94	93	305	684
Vascular surgery	119	198	404	1,258

Source: Department of Health and Aged Care (unpublished data).

Substantial changes have occurred in medical education and training over the last decade, and it is likely that further changes will reflect the changing nature of heart, stroke and vascular disease and its management. A major impact of advances in medical technology and interventions is likely to be a reduction in the need for and duration of hospital stay for many clinical conditions. The rapidly changing nature of hospital practice, and increasing use of outpatient or community-based treatment programs, may also have an impact on the cardiovascular health labour force.

Health system costs of heart, stroke and vascular disease

Direct health care costs for heart, stroke and vascular disease were estimated at $3,719 million in 1993–94 (Mathers & Penm, in press). These include costs for inpatient and outpatient hospital services, nursing homes, medical services, pharmaceuticals, allied health services, research, other institutional items and administration, but do not include costs of ambulance services, community health services or medical aids and appliances. Indirect costs, such as those associated with lost production due to sickness and premature death, and intangible costs such as those due to pain, suffering, anxiety and bereavement, are also not accounted for.

In comparison with other major disease groups, heart, stroke and vascular disease ranked first in terms of direct costs, together with diseases of the digestive system (12 per cent). Other major disease groups accounting substantial proportions of health costs were: musculoskeletal conditions (10 per cent); mental disorders (8 per cent); injury and poisoning (8 per cent); respiratory diseases (8 per cent); cancers (6 per cent); and diseases of the genito-urinary tract (5 per cent).

Hospital expenditure for inpatients accounted for 41 per cent of the health care costs of heart, stroke and vascular disease. Pharmaceutical costs accounted for a further 20 per cent, while expenditure on nursing homes and medical services each accounted for approximately 15 per cent. Investment in prevention and screening activities amounted to only 0.3 per cent of the total cost of heart, stroke and vascular disease.

Coronary heart disease was the major contributor to the costs of health care for heart, stroke and vascular disease in 1993–94, accounting for 25 per cent ($894 million) of the total. Approximately one-fifth ($168 million) of the cost of coronary heart disease was attributable to acute heart attacks. Other major

contributors to the health care costs of heart, stroke and vascular disease in 1993–94 were: hypertension (22 per cent); stroke (17 per cent); and 'other forms of heart disease' (20 per cent), particularly heart failure (11 per cent).

In terms of specific sectors of expenditure for heart, stroke and vascular disease, coronary heart disease was the major contributor to hospital inpatient costs. Stroke dominated nursing home costs, while hypertension was the major contributor to medical, pharmaceutical, allied health professional and outpatient costs.

Overall, the health care costs of heart, stroke and vascular disease were similar for both sexes. The largest relative differences were for nursing home costs (higher for females) and hospital inpatient costs (higher for males).

The health care costs of heart, stroke and vascular disease increased with age for both sexes, with 65 per cent of the total spent on those aged over 64 years (Figure 1.10). The rise was particularly marked for hospital expenditure for admitted patients after age 64, and nursing homes after age 74.

Figure 1.10: Costs of heart, stroke and vascular disease health care, Australia, 1993–94

Source: Mathers & Penm (in press).
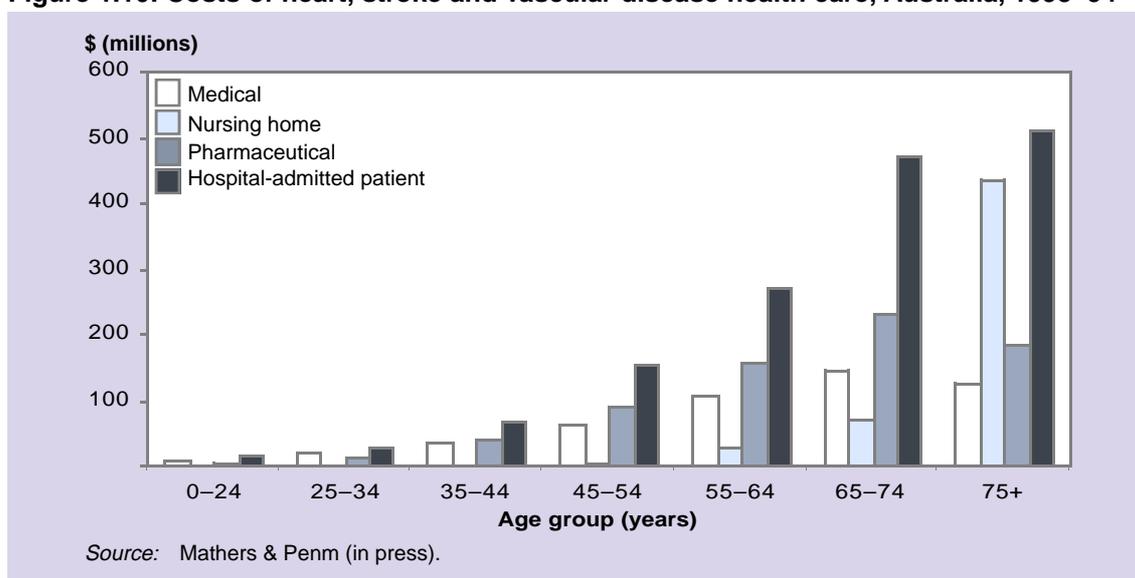
It is clear that heart, stroke and vascular disease places a heavy burden on society in terms of illness, disability and economic cost, despite the great improvements in death rates in recent decades. With an ageing population, the impact of heart, stroke and vascular disease is expected to remain a major concern. And yet much of this disease is preventable. Far too many Australians remain at higher risk of heart, stroke and vascular disease through tobacco smoking, physical inactivity, high blood pressure, high blood cholesterol and overweight. Effective treatment and continuing care of people with heart, stroke and vascular disease is also important in reducing case fatality rates and the recurrence of events such as heart attack and stroke.

Prevention and management of heart, stroke and vascular disease are discussed in detail in Chapters 3 and 4, and the potential for the most effective use of these strategies to further improve the cardiovascular health of Australians is discussed in Chapter 5. National indicators have been set for risk factor levels and for heart, stroke and vascular disease, and these are summarised in Chapter 2.

2 Indicators for cardiovascular health

The previous chapter provided a general overview of the cardiovascular health of Australians using data from routine administrative sources, regular and ad-hoc population surveys, and special studies and registers. However, the wide range of data presented does not give a systematic assessment of progress towards the overall NHPA goal of 'improving cardiovascular health by reducing heart disease, stroke and vascular disease, and their impact on the population'.

To do this, a concise set of priority indicators has been developed that recognises the complex process needed to improve health and the range of interventions involved. The approach offers an effective way of reporting progress towards the goal by using several strategic indicators. This chapter briefly describes the process of developing these indicators, and summarises current trends where there are data available for the indicators. The indicators are reported against more fully in Appendixes 1 and 2.

Although the report gives trends over time for many of the indicators for which suitable time-series information is available, progress towards targets has not been included in this report. The NHPC agreed to the revision of the set of cardio-vascular indicators given in the *First Report on National Health Priority Areas 1996* (AIHW & DHFS 1997). While most of the indicators have been developed for the first time, some of the coronary heart disease indicators included in the *First Report* have been redesigned to cover wider age ranges. In the case of risk factor indicators and targets, the NHPC is developing a set that applies to the range of NHPAs. This recognises the common causes of these areas and the scope for a general preventive approach.

A parallel process is currently underway to establish a new set of indicators with defined targets. This process will avoid the current plethora of targets and focus on one or two strategic, mapping indicators, with set targets, for each priority area. Progress towards these targets will be included in the next report to Health Ministers.

2.1 The development process

The *First Report on National Health Priority Areas 1996* (AIHW & DHFS 1997) documented progress against 10 of the 23 cardiovascular indicators for which there were adequate data. The working group that developed these indicators focused on coronary heart disease and recommended that indicators be developed later for stroke and other heart, stroke and vascular diseases, including those that are important to specific population groups (DHSH 1994a).

Indicators for cardiovascular health

The new set of indicators for cardiovascular health was developed by the Expert Advisory Group on Heart, Stroke and Vascular Disease, and its working groups, in collaboration with the National Centre for Monitoring Cardiovascular Disease at the AIHW. The work was conducted on behalf of the NHPC and included consultations with relevant groups. The development process was as follows.

- Priority indicators for stroke were identified from a list of over 80 potential indicators, compiled from the National Stroke Strategy report (Stroke Australia Task Force 1997) and supplemented from other Australian and international sources.

- The criteria for selection included feasibility of measurement, scientific validity, policy relevance, priority and data availability. A framework developed by a working party of the National Health Information Management Group was used to ensure that indicators were developed across the continuum of care (AIHW & DHFS 1997).

- The priority stroke indicators were merged with the existing indicators for coronary heart disease and recommendations were made for a composite set of priority indicators for cardiovascular health.

- The indicator set was further refined through consultation with specialist working groups covering primary prevention, cardiac and vascular disease, stroke, Indigenous and remote populations and information management.

- The indicator set was also considered by the Advisory Committee for the National Cardiovascular Monitoring System.

The result is a set of 22 indicators for cardiovascular health, endorsed by the NHPC, that covers coronary heart disease, stroke and peripheral vascular disease, and includes specific indicators for rural and remote area populations (Table 2.2).

A set of eight risk factor indicators, with relevance to chronic diseases in general as well as to heart, stroke and vascular disease, has also been endorsed by the NHPC. These indicators are relevant to other NHPAs as well (Table 2.1).

Data are available for all eight risk factor indicators and for 10 of the 22 indicators specific to cardiovascular health. For some of the indicators where there are no current data, development of the necessary data system or method is in progress to enable the indicators to be monitored.

Indicators of cardiovascular health for the Indigenous population have been included in the set of indicators proposed by the Office of Aboriginal and Torres Strait Islander Health (OATSIH) and endorsed by the Australian Health Ministers' Advisory Council (AHMAC). Progress against these indicators will therefore be reported separately.

2.2   Overview of indicators and trends

The indicator set of risk factors for heart, stroke and vascular disease and other chronic diseases is given in Table 2.1. The heart, stroke and vascular disease-specific indicators are described in Table 2.2.

Against each indicator is an assessment of whether the underlying trend is favourable or unfavourable, or increasing or decreasing. Suggestions are also offered as to how to interpret changes in the indicator over time (ie what factors influence the indicator).

More detailed information on each of the indicators, including data for previous years, is given in Appendixes 1 and 2. Appendix 3 discusses data and statistical issues.

Table 2.1: Indicators for monitoring risk factors for heart, stroke and vascular disease and other NHPAs

Indicator		Interpretation	Trend
1.1	Proportion of adults who smoke regularly, ages 18 or more	An indicator of the proportion of the population at increased risk of tobacco-related diseases and conditions. An outcome indicator for prevention efforts.	Favourable
1.2	Proportion of secondary school students who smoke, age 15	An indicator of the propensity of adolescents to start smoking. An indicator of future adult smoking rates.	Static
1.3	Proportion of adults not engaged in regular physical activity, ages 18 or more	An indicator of the proportion of adults at increased risk of illness through following a sedentary lifestyle. An outcome indicator for prevention efforts.	Marginally favourable
1.4	Proportion of adults who are overweight, ages 18 or more	An indicator of the proportion of adults at increased risk of illness through being overweight.	Unfavourable
1.5	Proportion of adults with high blood pressure and/or on antihypertensive treatment, ages 20–69	An indicator of the proportion of the population at increased risk of heart, stroke and vascular disease from high blood pressure.	Favourable
1.6	Mean blood pressure level, ages 20–69	An indicator of the population risk of heart, stroke and vascular disease from high blood pressure.	Favourable
1.7	Proportion of adults with high blood cholesterol, ages 20–69	An indicator of the population risk of heart, stroke and vascular disease from high blood cholesterol levels.	Recent trend data not available
1.8	Contribution of saturated fat as a proportion of total energy intake, ages 25–64	An indicator of the population risk of increased cholesterol levels and being overweight.	Favourable

Indicators for cardiovascular health

Table 2.2: Indicators for monitoring heart, stroke and vascular disease

Indicator		Interpretation	Trend
Coronary heart disease			
2.1	Incidence rates for myocardial infarction, ages 30–79	An indicator of the effectiveness of prevention of coronary heart disease.	Trend data not available
2.2	Median delay between the onset of chest pain and presentation for emergency care at hospital, all ages	An indicator of pre-hospital response time to a cardiac emergency. An indicator of uptake by the public of education messages.	Data not available
2.3	Time from presentation at emergency department to clinical and electrocardiogram assessment and administration of appropriate reperfusion therapy (thrombolysis or angioplasty), all ages	An indicator of in-hospital response time to a cardiac emergency.	Data not available
2.4	Hospital separation rates for principal diagnosis of unstable angina, ages 0–79	An indicator of the use of hospital resources (caseload, throughput) for unstable angina.	Increasing
2.5	Hospital separation rates for principal diagnosis of congestive heart failure, ages 0–79	An indicator of the use of hospital resources (caseload, throughput) for congestive heart failure.	Static
2.6	Proportion of cardiac patients who enter and complete a rehabilitation program, all ages	An indicator of the net effect of promoting rehabilitation programs and their availability.	Data not available
2.7	Proportion of patients who die, suffer myocardial infarction or undergo further revascularisation procedure (angioplasty or bypass surgery) within 12 months of angioplasty treatment for coronary heart disease, all ages	An outcome indicator for the efficacy of angioplasty for coronary heart disease.	Data not available
2.8	Proportion of patients who die, suffer myocardial infarction or undergo revascularisation at 28 days and 1 year after having undergone surgical treatment for coronary heart disease, all ages	An outcome indicator for the efficacy of surgical treatment for coronary heart disease.	Data not available
2.9	Proportion of people with mild/moderate/severe disability at six months following diagnosis of initial cardiac event, all ages	An indicator of the net effect of prevention on severity of the disease and effectiveness of therapy following a cardiac event.	Data not available
2.10	Death rates for coronary heart disease, ages 0–79	An indicator of the net effect of prevention and management of coronary heart disease.	Favourable
2.11	Death rates for coronary heart disease among rural and remote area residents, ages 0–79	An indicator of the net effect of prevention and management of coronary heart disease among people living in rural and remote areas.	Favourable

Table 2.2: Indicators for monitoring heart, stroke and vascular disease (continued)

	Indicator	Interpretation	Trend
Stroke			
3.1	Incidence rates for stroke, all ages	An indicator of the effectiveness of prevention of stroke.	Data not available
3.2	Median delay between the onset of stroke symptoms and presentation for emergency care at hospital, all ages	An indicator of pre-hospital response time to a stroke emergency. An indicator of uptake by the public of health education messages.	Data not available
3.3	Proportion of patients admitted to hospital with acute stroke who are managed in specialised stroke units (dedicated multidisciplinary teams), all ages	An indicator of the availability of specialised stroke units.	Data not available
3.4	Proportion of people whose main/underlying disabling condition is stroke, ages 25 or more	An indicator of the burden of stroke in the population.	Trend data not available
3.5	Proportion of people with mild/moderate/severe disability at six months following diagnosis of initial stroke event, all ages	An indicator of the net effect of prevention on severity of the disease and effectiveness of therapy following a cardiovascular event.	Data not available
3.6	Case fatality rate for stroke within 28 days, all ages	An indicator of the severity, emergency response and in-hospital management of stroke.	Data not available
3.7	Death rates for stroke, ages 0–79	An indicator of the net effect of prevention, treatment and manage-ment of stroke.	Favourable
3.8	Death rates for stroke among rural and remote area residents, ages 0–79	An indicator of the net effect of prevention, treatment and manage-ment of stroke among people living in rural and remote areas.	Favourable
Peripheral vascular disease and abdominal aortic aneurysm			
4.1	Hospital separation rates for major amputation due to peripheral vascular disease, ages 0–79	An indicator of the incidence of major amputation for peripheral vascular disease. An indicator of the incidence of severe cases of peripheral vascular disease.	Increasing
4.2	Hospital separation rates for emergency and elective surgery for abdominal aortic aneurysm, ages 0–79	An indicator of the incidence of major surgery for abdominal aortic aneurysm. An indicator of the incidence of severe cases of abdominal aortic aneurysm.	Static
4.3	Proportion of people with mild/moderate/severe disability at six months following diagnosis of initial vascular event, all ages	An indicator of the net effect of prevention on severity of the disease and effectiveness of therapy following a cardiovascular event.	Data not available

2.3   Summary of trends

This section summarises the information given in Appendixes 1 and 2 on those indicators of general and cardiovascular health for which national data are available. A summary of trends for selected indicators is given in Table 2.3.

Risk factors

Tobacco smoking

- The prevalence of smoking in the general population has been declining since the early 1980s and this trend has continued into the 1990s, although the rate of decline has slowed recently. About 27 per cent of adult males and 21 per cent of adult females, corresponding to some 3.2 million people, reported tobacco smoking in 1995.

- Among 15-year-old secondary school students, the prevalence of those who 'smoked last week' has remained relatively stable during the past 10 years, at around 24 per cent in males and 29 per cent in females.

Physical inactivity

- There was no change in physical activity patterns during the 1980s, and little change since then. Between 1989–90 and 1995, the prevalence of physical inactivity in the general population decreased slightly to about 34 per cent for both males and females. The prevalence of self-reported walking for recreation or exercise increased over this period.

Overweight

- The prevalence of overweight people increased steadily during the 1980s and this trend has continued in the 1990s. About 63 per cent of adult males and 48 per cent of adult females are currently overweight, based on physical measurements taken in the 1995 National Nutrition Survey (ABS & HEALTH 1998).

Hypertension

- During the 1980s, the prevalence of hypertension declined significantly in both sexes, a trend that has continued into the 1990s. In 1995, about 17 per cent of males aged 20–69 and 10 per cent of females of the same age reported having hypertension.

- Average blood pressure levels among adults decreased significantly in both sexes during the 1980s and this trend has continued into the 1990s.

High blood cholesterol

- Blood cholesterol levels remained stable during the 1980s. No national data have been collected in the 1990s to enable the examination of trends since 1989.

- In 1989, among those aged 20–69, 47 per cent of males and 39 per cent of females had high blood cholesterol levels, defined as 5.5 mmol/L or greater.

Saturated fat

- The contribution of saturated fat to total energy intake declined from 16 per cent in 1983 to under 13 per cent in 1995.

Coronary heart disease

Incidence

- It is estimated that in 1995–96, coronary events (essentially heart attacks and sudden deaths) occurred at a rate of 421 per 100,000 population among males aged 35–69, and 137 per 100,000 population among females of the same age. Reliable data for examining the trend in incidence are not available.

- Non-fatal episodes accounted for about 65 per cent of the total number of coronary events in 1995–96.

Hospitalisation

- During 1996–97, the age-standardised hospital separation rate for unstable angina was 337 per 100,000 males aged 0–79 and 166 per 100,000 females of the same age.

- Although there was an apparent increase in the rate of hospitalisation for unstable angina between 1993 and 1997, this may be partly due to changes in coding practice introduced in 1995.

- The age-standardised rate of hospital separations for congestive heart failure was 98 per 100,000 population in males aged 0–79 and 55 per 100,000 population in females of that age in 1996–97.

- There appears to have been little change in the rate of hospitalisation for congestive heart failure in the period 1993–1997, except for a fall in the last year among females.

Deaths

- There has been a downward trend in coronary heart disease mortality in the past three decades. Between 1985 and 1996, mortality from coronary heart disease declined by about 5 per cent per year among those aged 0–79.

- In 1996, there were 29,637 deaths due to coronary heart disease, with a rate of 195 per 100,000 males and 105 per 100,000 females of all ages.

- Among the Indigenous population, mortality from coronary heart disease is declining at a slower rate among males (1.1 per cent per year) but at a similar rate among females (7.7 per cent per year) compared with their non-Indigenous counterparts. In 1994–1996 Indigenous Australians were 1.6 times more likely to die from coronary heart disease than other Australians.

- Coronary heart disease mortality rates declined across urban, rural and remote areas over 1986–1996, but the fall among males has been less in remote areas. Mortality from this cause tends to be higher among males living in rural and remote areas than in urban areas. This difference is not apparent among females.

Stroke

Disability

- About 14,500 males and 17,100 females reported having been disabled by stroke in 1993, which is a prevalence rate of about 300 per 100,000 population.

- The Australian Bureau of Statistics (ABS) conducted a survey of disability in Australia during 1998, which will allow examination of the trend for this indicator.

Indicators for cardiovascular health

Deaths

- Stroke death rates have decreased over the past three decades. The annual fall in death rates in the period 1985–1996 was around 4 per cent among males aged 0–79 and about 5 per cent among females of the same age.

- There were 12,806 deaths due to stroke in 1996, with a rate of 66 per 100,000 males and 58 per 100,000 females.

- Death rates for stroke do not vary markedly across urban, rural and remote areas. Mortality due to stroke has fallen at a similar rate in all areas during the past few decades.

- Australia has one of the lowest rates of stroke-related deaths among OECD countries.

Vascular disease

Hospitalisation

- The rate of hospitalisation for amputation due to peripheral vascular disease has increased over the period 1993–1997.

- In 1996–97, the age-standardised hospital separation rate for major amputation for peripheral vascular disease was 3.6 per 100,000 males aged 0–79 and 1.2 per 100,000 females of that age.

- There was little change in hospital separation rates for surgery for abdominal aortic aneurysm between 1993 and 1997.

- Males and females aged 0–79 were hospitalised for surgery for abdominal aortic aneurysm at an age-standardised rate of 19.5 and 3.7 per 100,000 population, respectively, during 1996–97.

Table 2.3: Summary of trends of selected indicators

Favourable trend	Smoking rates in adults
	Blood pressure levels
	Contribution of saturated fat to total energy intake
	Coronary heart disease death rates
	Stroke death rates
Little or no change	Smoking rates in adolescents
	Participation in physical activity
Unfavourable trend	Prevalence of overweight or obesity
Insufficient data	Cholesterol levels
	Incidence of heart attack or stroke
	Disability rates
No national data	Time to hospital from symptom onset
	Use of rehabilitation programs
	Angioplasty or bypass surgery outcomes
	Case fatality rates

3 Primary prevention

3.1 Background

Heart, stroke and vascular disease is largely preventable. Prevention and medical treatment have both already played a major part in the advances in cardiovascular health seen in Australia in recent times. Treatment is expected to keep improving and playing a key role, but prevention offers even greater scope. Also, approaches to prevention of heart, stroke and vascular disease will help prevent several other major diseases because they share important risk factors and other causes.

This chapter focuses on primary prevention, namely strategies to reduce the onset of illness in the whole population, population groups or individuals. Secondary prevention, that is strategies to reduce the risk of further cardiovascular events in people with the disease, is covered in Chapter 4. Discussion below outlines the case for preventability, approaches and elements in prevention, and some examples of preventive activities in Australia. The chapter also discusses the evidence for health gains that can be made through risk factor reductions, and the evidence for the effectiveness of current interventions in reducing risk factor levels.

The case for preventability is supported by several lines of evidence. The case is circumstantial but strong.

- Rates of heart, stroke and vascular disease vary substantially across different countries, different population groups within the same country, and over time.

- These differences occur between countries and groups with similar quality of medical care. The differences in rates are so great that even if there are differences in care, they could explain only a very small part.

- Studies of migrant groups show that national rates of coronary heart disease are not genetically determined. The longer a migrant group is in a new country, the closer its rate moves towards the national level, and these changes can be rapid.

- There is evidence that risk factors such as high levels of blood cholesterol, tobacco smoking, high blood pressure and physical inactivity contribute to a large proportion of deaths from heart, stroke and vascular disease.

- It has been observed that some groups and individuals have the capacity to reduce their levels of risk factors, often markedly.

- Evidence from studies of populations and from trials shows that when risk factors are reduced, so are the rates of heart, stroke and vascular disease.

These points suggest that high levels of heart, stroke and vascular disease are not 'natural' and that in principle they can be changed considerably, given enough time and effort.

Other important points to be considered are that the cardiovascular risk factors are often linked, and add to each other's effects if they occur together in the same person. Several are also risk factors for other major diseases. For example, diet affects cholesterol level, blood pressure and weight. Physical activity influences weight and blood pressure. Weight also influences blood pressure. All these factors are important in both coronary heart disease and stroke. Smoking is a risk factor for these conditions as well as being a major risk factor for peripheral vascular disease. Also, these lifestyle factors can play a large part in diseases such as cancer and diabetes.

Primary prevention

Theoretically, this widens the scope for prevention even further and shows that a risk factor should not be viewed in isolation. Activities that reduce some risk factors will help reduce others and have benefits that go considerably beyond cardiovascular health.

The great challenge for prevention is to turn this theoretical scope into practice, and assess whether in a country such as Australia:

- risk factors can be avoided or reduced in virtually all people, not just many or most;

- favourable trends in smoking and blood pressure levels can be maintained or even accelerated; and

- Australians can become more physically active and the worsening trends in overweight can be reversed.

A further part of the challenge is to attend to the social, economic and environmental conditions behind people's daily lives. Recent research has examined social inequalities and the risks of death from all causes and heart, stroke and vascular disease. Even after allowing for the traditional risk factors of smoking, overweight and physical inactivity, socio-economic variables (such as income and geography) remain independently associated with the risk of death (Lantz et al 1998).

The actions of governments, businesses and industry can have a large effect on people's opportunities, attitudes and skills. Factors such as education, taxation, housing, urban design and conditions in the workplace can influence the level of risk factors as well as other social and psychological aspects that can affect cardio-vascular health. This is especially relevant to the inequalities seen in health, such as the larger rates of heart, stroke and vascular disease and its risk factors among Indigenous Australians and those of lower socio-economic status (AIHW 1998a).

To be most effective, therefore, prevention needs action on many fronts, not just by the health sector. Many can play a role, including of course the individual, but key groups are governments, non-government organisations and general practitioners.

Broadly speaking, prevention can be aimed at the whole population, at high-risk groups and at high-risk individuals. The approaches are complementary. The first aims to improve risk factor levels and wider factors in the population as a whole. It is based on the knowledge that by far the greatest number of disease cases occurs in that majority of the population who are not seen as 'at risk'; and that small changes in many healthy people can produce much greater community benefit than large changes in a few. The second approach aims at groups known to be at higher risk for socio-economic or other reasons. The third aims to detect individuals at higher risk and then to reduce that risk.

The methods of prevention are collectively known as health promotion. The main features of health promotion are its broad approach and its emphasis on setting up conditions that make healthy choices, healthier environments and health behaviours easier for individuals and communities.

Primary prevention can include a wide range of methods aimed at groups or individuals:

- general education of the public and of health professionals;

- 'healthy public policy' across sectors, where government decisions are set in the context of prevention and health promotion, and the health sector works with other agencies to promote health;

- regulation, such as controls on tobacco advertising and on food composition;

- incentives and disincentives, such as taxation to make less healthy products more expensive and initiatives to offer a broader, cheaper and widely available range of healthy foods;

- environments that encourage healthy behaviour, such as smoke-free restaurants and public spaces, parks, walkways and bicycle paths;

- identification of those at high risk, eg from family history or preventable risk factors;

- counselling and education of individuals at higher risk; and

- drug therapy for risk factors in some cases, eg for high levels of blood pressure or cholesterol.

It is clear that some of these methods rely most on health professionals such as general practitioners, whereas the other methods rely most on government at its various levels, and on changing the conditions that lead to ill health.

There are a number of Australian examples of the beginnings of success in health promotion, such as the reduction in tobacco smoking, which have been brought about by a combination of the legislative, educational and economic approaches listed above. However, there are numerous opportunities available to decrease smoking further and to promote physical activity, good nutrition, the reduction of overweight and obesity, and successful management of risk factors.

Examples of primary prevention activities by community and non-government organisations, general practitioners, States and Territories and the Commonwealth are given in Section 3.4.

3.2 Inter-relationships in health promotion

Health promotion and health outcomes

Health promotion can be viewed in terms of the methods (interventions) it uses and the results (outcomes) it achieves. These outcomes include:

- *health and social outcomes* such as mortality, morbidity, symptoms of disease or quality of life;

- *intermediate outcomes* such as biomedical risk factors or health behaviours that lie along the pathway between health and disease; and

- *health promotion outcomes* such as a favourable change in policy, environment, knowledge or behaviour that can work against a risk factor or disease.

These interventions and outcomes can be used as indicators of progress in prevention. In addition, a complex range of underlying social conditions put individuals or even populations at higher risk of heart, stroke and vascular disease. Figure 3.1 illustrates some of the linkages between health promotion practice and health outcomes.

Figure 3.1: Inter-relationships in health promotion

Health outcomes		**Social outcomes**	
Mortality	Disability	Quality of life	Equity
Morbidity	Functional status	Well being	Social handicap
Symptoms		Psychosocial health	
Intermediate outcomes/mediators			
Healthy lifestyles	Effective health services		Healthy environments
Health promotion outcomes			
Health literacy	Health public policy		
Social action	Intersectoral action		
Health promotion actions			
Education			
Social mobilisation			
Advocacy			

Source: Adapted from Nutbeam (1996).

Intermediate outcomes that contribute to improved health are: healthy lifestyles, including lifestyle-related risk factors for heart, stroke and vascular disease; health services, that are evidence-based and accessible to all population groups; and healthy environments that aim to make healthy choices easier.

The lower two rungs of the figure reflect health promotion practice, and the immediate outcomes of such actions. Outcomes such as intersectoral action and strategic planning, the development of healthy public policy, and a community level of health understanding and health literacy are necessary for the development and adoption of intermediate outcomes, health outcomes and social outcomes. The lowest rung, health promotion actions, describes some of the activities of practitioners that include facilitatory roles as well as the conduct of health promotion programs.

The pathways described here are not unique, but reflect mechanisms for how health promotion might contribute to better health and social outcomes for heart, stroke and vascular disease.

Partnerships and alliances with other sectors

The complex links in Figure 3.1 suggest great scope for coordination among the main agencies that contribute to improving health. While the health sector should take the lead in preventive actions, it will ensure more lasting effects and better serve the community if it forms long-term partnerships and alliances with other sectors. This would amount to a 'new system' for prevention that crosses normal boundaries between major agencies. It would include sectors such as education, planning, transport, agriculture and local government.

For example:

For smoke-free environments —	partnership between health, employer, employee and unions for provision of clean air in workplaces, sports grounds, restaurants and all public places.
For physical activity —	collaboration of the health, local government, education, sport and recreation, transport and sustainable development sectors for provision of environments, facilities and services conducive to physical activity.
For improved nutrition —	collaboration of health and food industries, education sector, employers and local government to promote healthy eating and consumer education, food labelling and the availability of healthier fast foods and processed foods.

Infrastructure for primary prevention

Increasing the emphasis on primary prevention will require an infrastructure for health promotion across the system (NHMRC 1997b). The components of an optimal health-promoting infrastructure include policy changes, the creation of health-promoting environments, increasing community involvement, personal risk factor change and influencing the health system to focus on preventive actions.

Infrastructure refers to systems for:

Development of public policy —	a policy framework that recognises the role of health promotion and primary prevention and facilitates development of partnerships and best practice.
Monitoring and surveillance —	information and intelligence about patterns of illness, risk conditions, community concerns and health.
Research and evaluation —	targeted to primary prevention issues, and changes to behaviour, environments, policies and systems.
Workforce development —	training, education and development of the primary prevention workforce and enhancing the preventive role of all health professionals.
Program delivery —	structures for planning and delivery of programs across the community, including government, non-government, community and private sector organisations.
Re-orienting the health system —	increase the capacity for primary preventive activity across the system.

Work is in progress to establish such partnerships and infrastructure at the Commonwealth, State and Territory and regional levels. Mechanisms include the National Public Health Partnership (NPHP) Group's Strategies Coordination Working Party and the currently evolving framework for a Primary Prevention Strategy (discussed further in Section 3.4).

3.3   Scope for further gains from prevention

Although the risk factor approach is only one of the ways to view health, it still offers an important guide to past and potential prevention. The scope for prevention can partly be gauged by considering the current levels of risk factors in Australia, and the falls in those risk factors that ought to be achieved if known strategies are fully applied.

This section considers coronary heart disease and stroke separately. However, since heart, stroke and other vascular diseases have basically the same risk factors, strategies to reduce one disease should help to reduce another.

There is too little information to assess potential gains for less common cardio-vascular conditions such as peripheral vascular disease and heart failure. However, it is important to note that these are significant diseases among older people, and that people with these diseases are likely to have other vascular conditions as well.

Coronary heart disease

Chapter 5 (see Table 5.1 on page 102) presents falls in the prevalence of major risk factors and the resulting reduction in risk of a 'major coronary event' such as a heart attack or sudden death, based on evidence from population studies and clinical trials.

As well as the individual effects of risk factors, some studies have looked at their combined effect in community-wide studies, especially in the United States, but also in Wales and in Finland (Tudor-Smith et al 1998; Puska 1995). These studies typically demonstrate significant changes in both intervention and control communities, especially for cholesterol, blood pressure and smoking (Luepker et al 1996; Winkelby et al 1997). The North Karelia project in Finland has shown that community-based programs can reduce risk factor levels and coronary heart disease risk in the general population and among higher-risk groups (Jousilahti et al 1995).

Until recently, there have been no estimates of the effects of combined risk factor reduction on coronary heart disease among Australians. Such estimates are now being made by the University of Newcastle, along with estimates of the effects of secondary prevention, and of treatment during an acute event. A summary of these estimates is given in Chapter 5.

According to this research, there is considerable potential to lower coronary risk further by lowering high cholesterol and high blood pressure through lifestyle modifications and/or drug treatment, reducing smoking and increasing physical activity. However, as discussed below under 'Effective interventions', the estimated degree of change may not be possible unless more becomes known about how to increase levels of physical activity or decrease overweight on a population basis.

Stroke

Table 3.1 shows the percentage of ischaemic strokes (which comprise 85 per cent of all strokes) attributable to risk factors.

Table 3.1: Percentage of ischaemic strokes attributable to risk factors or conditions

Risk factor/condition	Percentage	95% confidence interval
High blood pressure	26	12–41
Transient ischaemic attacks of the brain	14	11–17
Tobacco smoking	12	8–16
Coronary heart disease	12	7–17
Atrial fibrillation	8	4–12
Diabetes	5	2–9

Source: Whisnant (1997).

There is also evidence that up to 15 per cent of stroke events may be attributed to physical inactivity (Shinton 1997).

Chapter 5 summarises the evidence for estimated reductions in risk of a stroke associated with a reduction in each major risk factor, showing that the risk of stroke can be lowered by reducing the mean level of risk factors in people with no history of stroke, with or without risk factors present (see Table 5.2, page 104).

In the primary prevention of stroke, the population approach has the potential to be most effective as well as cost-effective. A strategy aimed at high-risk groups, such as identification and treatment of all people in the population with hyper-tension, may reduce stroke incidence by up to 15 per cent (Law et al 1991) but would require considerable resources, particularly in primary practice, and many individuals may not benefit (Rose 1992). However, identification and treatment with either warfarin or aspirin of those with atrial fibrillation is likely to be of benefit, as atrial fibrillation is often not recognised as a risk factor for stroke, and about 10 per cent of those over 75 may have atrial fibrillation. NHMRC clinical practice guidelines on stroke describe an appropriate approach to routine screening for stroke that can be used in general practice (NHMRC 1997a).

Effective interventions

There is considerable potential for further reductions in heart, stroke and vascular disease with the best use of existing information. This section outlines current evidence for the effectiveness of interventions to reduce the prevalence of these risk factors. Primary prevention of behavioural risk factors should include environ-mentally based strategies that address major societal influences on smoking, overconsumption of certain foods and calories, and inadequate physical activity.

Tobacco smoking

As smoking is an important risk factor for morbidity and mortality from a number of causes, reducing the proportion of smokers would bring widespread benefits.

Primary prevention

There is good evidence that interventions with individual smokers (advice from doctors, nicotine replacement therapy) and via regulatory mechanisms (taxes on tobacco products, adoption of smoke-free policies) result in significant reductions in smoking (Jamrozik et al 1984; Warner 1984; Borland et al 1991). Nicotine patches have been shown to aid 'quitting', although the cost to patients is substantial (Gourlay & McNeil 1990).

Other measures include structural changes such as price increases, ending all promotion of tobacco products including that at the point of sale, and legislation for smoke-free areas, reducing nicotine levels in cigarettes, and rigorous enforcement of laws covering the sale of cigarettes to minors. Educational initiatives include public education campaigns, universal health education in schools and greater involvement of general practitioners. Specific interventions targeting high-risk groups should be developed — these may include campaigns targeting Indigenous populations, males from some cultural and linguistic backgrounds, women who smoke during pregnancy and other high prevalence groups. Adolescents should be a specific target as they receive pro-smoking messages from a range of sources including the internet.

Physical inactivity

The potential for heart, stroke and vascular mortality and morbidity reduction through increased levels of physical activity at all levels of risk is significant, partly because of its effects on other risk factors such as overweight, high blood pressure and cholesterol.

There has been comparatively little research on the effectiveness of interventions designed to increase levels of physical activity, although several studies have shown that public education campaigns can result in short-term increases in participation in physical activity (Booth et al 1992). More recent studies have shown that general practitioners advising patients to be more physically active can help achieve substantial increases in weekly minutes of physical activity (Bull & Jamrozik 1998; Dunn et al 1997; Calfas et al 1996).

However, long-term behaviour is unlikely to change unless there are structural, policy and environmental changes that facilitate physical activity becoming an integral part of people's lives.

Diet

Diet is an important factor in heart, stroke and vascular disease. However, the issue of diet and nutrition is complex, as it is influenced by a range of social, cultural, economic and physiological factors, including the available food supply and its cost (Nutbeam et al 1993). Like physical activity, diet can affect the prevalence of other biological risk factors.

The role of fat intake in heart, stroke and vascular disease is now fairly clearly established. The direct protective effect of specific diets or dietary changes is less clear but there are general health benefits in promoting healthy eating.

Overweight and obesity are established risk factors for heart, stroke and vascular disease. National and international data suggest that environmental and behavioural factors are the most important contributors, within individuals and between populations, to weight gained during adulthood (WHO 1998b). There is little in the way of intervention studies to show how these factors can be best manipulated to prevent overweight and obesity in populations (NHMRC 1997c).

Strategies to reduce the prevalence of overweight include interventions affecting behaviour, physical activity, diet, and combinations of all three approaches (ABS 1997c). Educational campaigns and financial incentives have been shown to reduce average weight gain, compared to control groups, in two United States population interventions (Forster et al 1988; Taylor et al 1991). However, the effectiveness of others has been questioned (Winkleby et al 1997). The combination of diet and physical activity appears to be more effective for weight loss than diet alone (Wing et al 1998; WHO 1998b), indicating the need for multifaceted approaches.

There is good evidence that interventions at a population level encouraging weight control and dietary salt reduction lower mean levels of blood pressure (Fagard & Tipton 1994). Diets high in fibre have been shown to lower systolic and diastolic blood pressure in people with hypertension (Anderson et al 1990). An adequate intake of fresh fruit and vegetables is also an important component of primary prevention (Zatonski et al 1998; NHMRC 1992).

Effective strategies should address the major societal contributors to the over-consumption of certain foods and calories, and inadequate physical activity. These could include food marketing practices, transportation patterns and opportunities for safe physical activity (James 1995; Jeffrey 1995; NHMRC 1997c).

3.4 Current approaches to primary prevention in Australia

As described in the preceding sections, there is a growing focus on intersectoral collaboration in Australian heath care at all levels, and a shift in emphasis towards primary prevention. This section examines general policies and approaches to primary prevention of heart, stroke and vascular disease by governments, general practice, and non-government organisations, and also describes a range of activities in specific areas.

Government policies and approaches

The Commonwealth, in collaboration with the State and Territory Governments, is aiming to increase public awareness of risk factors through a range of national initiatives. The NPHP is a working arrangement to plan and coordinate national public health activities, provide a more systematic and strategic approach for addressing public health priorities and provide a vehicle to assess and implement new directions and major national initiatives. The work of the NPHP principally deals with the components of the health system outside the framework of the Health Care Agreements and with services conceived and delivered with whole populations and their health status in mind.

Also being developed is a framework for a National Primary Prevention Strategy, to integrate programs on physical activity, diet, tobacco and alcohol and target the major chronic non-communicable diseases.

The Commonwealth has developed, or is in the process of developing, national plans to address tobacco smoking, physical inactivity, nutrition, alcohol consumption and diabetes. At the State level, there are numerous programs that aim to improve the health of Australians through modification of both behavioural and

biological risk factors. Commonwealth and State and Territory programs in progress are discussed in the section below on 'Current activities in primary prevention in Australia'.

While there are few evidence-based guidelines on prevention, an NHMRC report, *Guidelines for Preventive Interventions in Primary Health Care: Cardiovascular Disease and Cancer* (NHMRC 1997d), addresses the issues of screening for coronary heart disease, stroke and peripheral vascular disease, high blood cholesterol, high blood pressure, overuse of alcohol, cessation of smoking and use of aspirin to prevent coronary heart disease.

Following is a brief outline of State and Territory policy relevant to the primary prevention of heart, stroke and vascular disease:

- The New South Wales policy on health is encapsulated in its *Caring for Health* series. The first in the series commits the New South Wales health system to developing strategies to tackle the NHPAs, including cardiovascular health. State-based strategies have been developed for risk factors associated with cardiovascular health and the other NHPAs.

- Victoria is working to enhance the knowledge and skills of allied health and community health workers and to develop new information and referral systems, a baseline participation survey, community grants programs, and a review of policy and practice relating to physical activity in organised care settings.

- Queensland has developed a Social Development Strategy outlining intersectoral measures to improve health. Queensland Health has developed Health Outcomes Plans that support and maintain evidence-based practice across the spectrum of health care, seeking to link the processes and quality of health service delivery more closely with individual and population health outcomes. The Plans include a systematic approach to health promotion and disease prevention across NHPAs. Outcome Area Teams have been established for 25 areas and common approaches will be taken to issues including tobacco, nutrition, alcohol and physical activity.

- The Department of Human Services in South Australia has, or is developing, policies and strategies in areas such as food and health, tobacco control, physical activity and diabetes. Environmental change is encouraged in a number of programs including the linking of sponsorship of arts and sporting organisations with health-promoting policies and practices.

- In Western Australia, the Framework for Health Gain is a system-wide approach designed to improve health in the State. Providers are required to link development of health service strategies with local population needs and key areas for action. This ensures that health service business plans address the key areas and strategic directions of the health system. More than 30 health promotion research projects have been undertaken in Western Australia, mostly in the areas of smoking, nutrition, alcohol consumption and illicit drugs. State-wide surveys of attitudes and behaviours relating to the use of tobacco, alcohol and illicit drugs were also undertaken.

- In Tasmania, State-based strategies have been developed for risk factors associated with heart, stroke and vascular disease.

- In the Northern Territory, an integrated strategy is being developed by Territory Health Services to address prevention and treatment for the extremely high proportion of Indigenous adults who suffer an inter-related group of chronic illnesses including obesity, high blood pressure, coronary heart disease, diabetes and renal disease.

- The Australian Capital Territory Department of Health and Community Care developed health goals and targets for heart, stroke and vascular disease in 1994 after consultation with key stakeholders. Early identification of risk factors and lifestyle interventions are addressed through both preventive and improved primary care initiatives (Gilbert & White 1997).

The role of general practice

General practitioners have a unique role in primary prevention, as the community perceives doctors as the most authoritative source of information on factors and behaviours associated with reducing the risk of disease (RACGP 1996). Since 1993, the Royal Australian College of General Practitioners (RACGP) has produced and updated guidelines for preventive services in general practice (RACGP 1998a), and practice systems to implement the guidelines (RACGP 1998b).

Risk assessment and helping patients to reduce their risk factors are essential parts of general practice. Detection and documentation of behavioural risk factors are less than those of biologically based risk factors (Nelson & Piterman 1997). There are a number of trials in progress involving prescription of physical activity by general practitioners which show promising results (Calfas et al 1996; Swinburn et al 1997). Barriers to the implementation of preventive strategies by general practitioners are well recognised (Cockburn et al 1987; Bauman et al 1989; Mann & Putnam 1989) and principally relate to the health care system, the general practitioners themselves, the consultation process and the patient.

To make general practice more effective and accountable, organisational development into Divisions of General Practice was undertaken in 1993. There are four Support and Evaluation Resource Units (SERUs) to facilitate the programs and activities of the Divisions throughout Australia. The Public Health and Health Promotion SERU is working with the Victorian Division of the National Heart Foundation (NHF) on a guide to currently accepted practice in primary prevention of heart, stroke and vascular disease for Divisions of General Practice. The guide aims to provide a framework for implementing the cardiovascular primary prevention strategy within the context of local needs, service provision and available resources. The SERU is also developing draft sets of outcomes and indicators for Division programs in primary prevention and early detection of heart, stroke and vascular disease.

The change in project funding for Divisions of General Practice to outcomes-based block funding will encourage Divisions to implement preventive strategies that are acceptable to general practitioners, and will involve SERUs, University Departments of General Practice, the NHF and other organisations.

Community and non-government organisations

Among community and non-government organisations there is also a shift towards collaborative programs in primary prevention. The following groups have been particularly active in addressing risk factors and the general cardiovascular health of Australians. Individual projects initiated by these organisations are discussed in the section on 'Current activities in primary prevention'.

The *National Heart Foundation* has promoted a number of innovative projects addressing aspects of cardiovascular health in Australia, including development of clinical guidelines to enhance the performance of general practitioners in relation to cardiovascular risk and disease management, education in nutrition of primary school students and promotion of increased physical activity. A telephone service, Heartline, has recently been introduced to answer queries from the community.

The *National Stroke Foundation* has worked with the Commonwealth Department of Health and Aged Care and the NHMRC to draft a National Stroke Strategy and is working with the States and Territories in their development of State-based stroke strategies. To date, Victoria (Victorian Stroke Strategy Task Force 1998) and New South Wales (NSW Stroke Working Group 1998a) have completed strategies.

The *Brain Foundation* has worked on primary prevention initiatives focusing on stroke prevention since the early 1980s. Initiatives include development and regular updating of stroke education material for the general public, carers, patients and health service providers.

Current activities in primary prevention in Australia

The following section highlights activities that are considered by the initiating organisations to be 'best practice' and possible models for wider implementation. This is neither a review nor a comprehensive record of initiatives in primary prevention, but a summary that gives an indication of just some of the key initiatives being undertaken across the nation.

Collaborative activity — coronary heart disease

- The Health Department of Western Australia, the Heart Foundation of West Australia and Divisions of General Practice are collaborating to implement programs to increase awareness of early warning signs and risk factors among men.

- The Burnie Take Heart project in Tasmania is a collaborative project which includes Commonwealth, State and local governments, local business interests, the NHF and the community. Interventions focus on the promotion of physical activity and healthy eating, initially targeting upper primary school children.

Collaborative activity — stroke

- The Brain Attack program, established by the National Stroke Foundation, is an umbrella for a series of inter-related initiatives to enhance understanding and prevention of stroke. A package of booklets and brochures on stroke has been developed and published. It includes material on primary and secondary prevention, symptoms, treatment and commonly asked questions. The next stage will be in professional education for general practitioners, neurologists, pharmacists and allied health professionals about primary and secondary prevention of stroke. This will include elements on screening and behaviour change interventions, early diagnosis of stroke and the appropriate actions that should follow, and interventions for secondary prevention.

- Stroke Week, established in 1984, has provided a vehicle for promoting a coordinated health message about stroke prevention across Australia. In 1998, the Brain Foundation collaborated with the National Stroke Foundation and key players such as hospitals and community health centres to promote the Stroke Week message. In each State, risk factor screening, public seminars and other events are held, following a nationally agreed message.

- The Brain Foundation Victoria Ltd has collaborated with MEDI-World Ltd to produce a CD ROM on stroke for general practitioners. The CD includes stroke case studies with video footage and interactive learning methods, and has been allocated 12 continuing medical education points by RACGP.

- A Workplace Stroke Prevention Kit has recently been produced by the Brain Foundation in Victoria and is also in use in New South Wales and Tasmania. In Western Australia, HealthWay has provided funding to the Brain Foundation for conducting a primary prevention program on stroke, risk factors and lifestyle change.

Tobacco smoking

- The National Tobacco Campaign is a collaborative initiative between the Commonwealth Government, State and Territory Governments and major non-government organisations which aims to reduce the proportion of regular smokers in the population and reinforce current non-smokers in their decision not to smoke. The Campaign involves advertising, nationally coordinated Quitline telephone services, campaign materials produced in nine languages, a web site (www.quitnow.info.au), and national media promotions.

- The New South Wales Tobacco and Health Strategy 1995–1999 aims to lower smoking rates through elimination of tobacco marketing and collaboration between sectors involved in tobacco control. This has involved a review of services to smokers and resources and interventions available for smokers seeking assistance in giving up smoking. The *NSW Health Promotion Survey 1994* (NSW Health Department 1994) outlines strategies that have been found to be effective in reducing the prevalence of smoking, particularly at the area health service level.

Primary prevention

- South Australia has committed significant funds to the implementation of a comprehensive Tobacco Control Strategy, with the objective of reducing smoking prevalence, particularly amongst young people. This collaborative government–non-government approach includes public education, restrictions on sales to minors, quit information and support, smoke-free public places including dining areas, restrictions on advertising and school-based programs.

- In the Northern Territory, the Tobacco Action project has initiated a specific Aboriginal Smoking Strategy to raise the awareness of Indigenous people of the harmful effects of smoking and to initiate community action to reduce smoking in Indigenous communities.

- Smoking in enclosed public places is prohibited in the Australian Capital Territory under the *Smoke-free Areas (Enclosed Public Places) Act 1994*, which aims to reduce people's exposure to environmental tobacco smoke. By late 1998, all enclosed public places were 'smoke free', including licensed premises. Only premises with an exemption may have limited smoking areas, and these areas must have mechanical ventilation equipment capable of maintaining air quality in accordance with Australian Standards.

Physical activity

- The Commonwealth has developed a national public education campaign (described below), funded economic analysis of the cost of inactivity, funded demonstration projects in several States trialing physical activity interventions aimed at both broad and specific population groups, and funded 44 projects under the Healthy Seniors Initiative to promote the health and well being of older Australians.

- Active Australia is a national initiative promoting population-wide strategies and public policies to increase regular involvement in physical activity. The Active Australia partnership involves the Australian Sports Commission, the Commonwealth Department of Health and Aged Care, the National Office of Local Government and Sport and Recreation departments in all States and Territories. Health, in consultation with State and Territory health departments, has produced a health sector response to the initiative (DHFS 1998). The report, entitled *Developing an Active Australia: a Framework for Action for Physical Activity and Health*, identifies intersectoral collaboration as essential for the efficient development of supportive infrastructure, environments and attitudes to encourage people to become and remain physically active at levels sufficient to achieve benefit to health.

- *Towards Best Practice for the Promotion of Physical Activity in the Areas of NSW* (Bauman et al 1996) provides data on the prevalence of physical activity in New South Wales at both the State and local levels; identifies priority populations for intervention; and identifies best-practice approaches to the promotion of physical activity that can be implemented at the local level. New South Wales physical activity demonstration project grants are directed towards supplementing and enhancing the knowledge needed to specify best practice for the promotion of physical activity at the State and area health service level, with a focus on priority areas such as disadvantaged groups, systems and settings, and environments.

- The NSW Health Centre for Disease Prevention and Health Promotion is involved in developing and implementing an interdepartmental Physical Activity Strategy to maximise awareness by key agencies and the public of the health benefits of regular physical activity of moderate intensity.

- The Victorian physical activity strategy (developed by the Departments of Human Services and of Sport and Recreation) is engaging a wide range of sectors to develop an integrated program of activities to increase participation in regular moderate physical activity, building on previous work done by the Active for Life program in Victoria.

- In South Australia, activities include a State-wide survey to assess levels of physical activity, the development of a State Active Australia Strategic Plan, school-based physical activity projects, local government plans, a project on prescribing of physical activity by general practitioners and several projects aimed at developing supportive environments to encourage people to be more active.

- In Tasmania, physical activity for older people is being promoted through provision of structured education sessions for Senior Citizens clubs and support for the development of safe, suitable physical activity programs. Just Walk It walking groups for people who have had cardiac events are organised all over Tasmania and coordinated by the NHF. Walk/Talk is a forum for coordinators of community recreation walking groups to meet regularly and share resources and knowledge.

- Supportive Environments for Physical Activity is a NHF program which aims to increase environmental support and opportunities for people to be physically active as part of their daily life. The program has been funded by a grant from the Commonwealth Department of Health and Aged Care and aims to work with local governments to influence urban planning. One such project, the Illawarra Physical Activity Project has developed a range of community-wide and inter-sectoral initiatives, using local media and working with local Councils, worksites and schools. Impact evaluation has been undertaken throughout the project.

Nutrition

- A National Public Health Nutrition Strategy has been commissioned by the Commonwealth to assist in achieving equitable and sustainable improvements in nutrition as outlined in the National Food and Nutrition Policy. In the first stage, a Strategic Intergovernmental Nutrition Alliance (SIGNAL) has been established under the NPHP. SIGNAL has membership from the Common-wealth, States and Territories and external expertise and reflects commitment to a coordinated and integrated partnership approach. Continuing monitoring and surveillance of the food system will be important. The second stage will look at the role of the non-government sector in effecting food and nutrition outcomes. Work has commenced on establishing a monitoring and surveillance system for food and nutrition, which will take into account other relevant data collections such as those for heart, stroke and vascular disease and the 1995 National Nutrition Survey (ABS & HEALTH 1998).

- The *Australian Guide to Healthy Eating*, a national food selection guide, has been developed for the Commonwealth, on the basis of recent research in nutrition.

Primary prevention

- Action in response to *Australia's Weight: a Strategic Plan for the Prevention of Overweight and Obesity* (NHMRC 1997c) is principally oriented towards primary prevention of overweight and obesity. A national strategy to implement the recommendations of the report is being developed.

- The New South Wales Nutrition Strategy is based on interventions in institutional settings (eg schools, hospitals, nursing homes). Specific projects include: the Better Health Innovation Award for new food products; a State-wide approach to fruit and vegetable consumption and a monitoring tool for school canteens.

- Current initiatives under the Victorian Nutrition Strategy (Healthy Eating Healthy Victoria) include developing a public awareness campaign; producing a common State-wide nutrition promotion logo and brand; undertaking a review of policy and practice relating to nutrition in various organised care settings; and establishing a new program at Monash University to provide critical analysis support for public health nutrition activity.

- The Garden KaiKai project in the outer islands of the Torres Strait seeks to improve food supplies in remote Indigenous communities through the establishment of community gardens, combined with workshops by nutritionists and diabetes educators. The project was developed by community councils in the participating islands in response to difficulties in obtaining fresh fruit and vegetables. Facilitated by the Tropical Public Health Unit and employing a horticulturist, it was funded by a three-year grant from the Queensland Health Promotion Council.

- The OK Takeaway project, an initiative piloted by the Darling Downs Public Health Unit, aims to increase availability of and demand for nutritious take-away foods through the use of education and marketing strategies. The project is now being piloted throughout southern Queensland in partnership with local government and community health services.

- Lighten Up is a community-based weight management project supported by the public health services of Queensland Health and offered through the services of professional staff and community volunteers. An adaptation of the project aimed at the Indigenous population, Healthy Weight, is currently being evaluated State wide.

- The Pintubi Homelands Health Service in central Australia is an example of an approach to developing an interagency nutrition program in a remote community. Covering the issues of child nutrition, food policy and store policy, the project involves consumers, the community store and a multidisciplinary health team.

- In South Australia, the What's Eating Enfield healthy food choice project resulted from intersectoral partnership between community health centre nutrition workers (State government) and an Environmental Health Officer (local government). The project was designed to increase the range of, and access to, healthy food available from food outlets in the local area.

- The key objectives of the Eat Well SA Project are to increase the availability of healthy food in settings where children, young people and their families live, are cared for, educated and spend their leisure time. Linkages are made with child care centres, the health-promoting schools framework, training institutions, local government and primary producers.

Current approaches to primary prevention in Australia

- The 1995 Western Australian Health Survey provides a comprehensive profile of population subgroups most at risk from poor dietary practices. As well, a report on nutrition-related deaths in Western Australia in 1983–1994, produced in conjunction with the Epidemiology Branch in 1996–1997, showed that 18 per cent of all deaths in West Australia are due to poor nutrition, mainly related to heart disease, stroke, bowel cancer and diabetes.

- State-wide consultation with Indigenous organisations, communities and individuals in Western Australia was conducted this year to develop a nutrition policy and plan for Indigenous peoples.

- Food service guidelines and assessment tools for child-care centres in Western Australia were developed as part of the Cent$ible Food Service Project, a joint initiative with Curtin University, funded by Healthway.

- The Territory Food Project is addressing deficiencies in food supply in remote Indigenous communities where availability of fresh fruit and vegetables and other healthy foods is often severely limited through local monopoly food retailers.

- The Northern Territory Strong Women, Strong Babies, Strong Culture program is addressing the health status of Indigenous mothers and children by enlisting and training older, senior Indigenous women as Strong Women Workers. These women provide leadership and advice to younger women on a range of issues including nutrition. Initial evaluation of three pilot communities indicates that the program has had considerable success, and women in other communities throughout the Northern Territory and interstate are taking up the program.

- The Eat Well Tasmania campaign of the Tasmanian Nutrition Promotion Task-force is in its third year of operation. The Taskforce is an intersectoral coalition with representation from primary producers, manufacturers, retailers, health sector and consumers. The campaign aims to foster an intersectoral approach to nutrition promotion throughout the State. An example of the type of project being supported is the Healthy Options Takeaway project, involving work with local government to provide incentives for local food outlets to offer healthy take-away foods. Financial incentives (a reduction in licensing fees) and marketing and promotion support are offered to food outlets that meet certain nutrition and food hygiene standards.

- In the Australian Capital Territory, the Good Food Good Fun initiative aims to improve nutritional health through promotion of good nutrition at all levels of the food and nutrition system. The initiative promotes the enjoyment of healthy food, supports activities that make healthy food choices easier and encourages links between a broad range of groups working in the areas of food and nutrition. The initiative is occurring over four phases: creating community awareness of the message; introducing the message and approach in the Healthpact Nutrition Grants and Sponsorships program; developing links with generic food retailers; and developing links with the broader food industry and community food services.

- The Australian Capital Territory Lifestyle Changes and Nutrition Program is conducted by the Nutrition Department of The Canberra Hospital. Referral sources are hospital inpatients and outpatients and general practitioner referral following risk factor assessment.

- Eat Smart for Heart is a NHF primary school nutrition program that addresses education, policy and practice in relation to food and nutrition. It has been implemented in over 250 schools in South Australia over the past five years. Impact evaluation showed positive changes in food provision and promotion in canteens, nutrition teaching in the classroom and children's food choices. Importantly, the program was seen as very enjoyable and positive. In 1998 the program is being revised and updated for national use.

Alcohol

- A National Expert Advisory Committee on Alcohol has been established to provide independent, high-level advice on alcohol issues to the Commonwealth Minister for Health and Aged Care, the newly formed Australian National Council on Drugs, the Ministerial Council on Drug Strategy and the Inter-governmental Committee on Drugs. Activities of this group include the development of a National Alcohol Strategic Plan and the development of a nationally targeted education campaign.

- Four Western Australian communities have signed an accord designed to reduce the harm associated with alcohol consumption. These accords aim to establish a link between the way alcohol is retailed and its effect on a community.

Diabetes

- The *National Diabetes Strategy and Implementation Plan* report (Colagiuri et al 1998) was presented to Health Ministers in March 1998 and is currently being considered by the Commonwealth Government and State and Territory Governments. This report, together with the NHPA report on diabetes to be released in mid-1999, will be the source material for a National Diabetes Strategy to be presented to Health Ministers in July 1999. Specific State and Territory and Commonwealth activity is outlined in the NHPA report.

Key points — Primary prevention of heart, stroke and vascular disease

- There is considerable potential for further reductions in heart, stroke and vascular disease, with the best use of knowledge already available. Primary prevention of behavioural risk factors should include environmentally based strategies that address major societal influences on smoking, over-consumption of certain foods and calories, and inadequate physical activity.

- There is great scope for coordination of health promotion among the main agencies that can improve health. While the health sector should take the lead in preventive actions, it will ensure more lasting effects and better serve the community if it forms long-term partnerships and alliances with other sectors.

4 Management and treatment

This chapter discusses the diagnosis, management and secondary prevention of the major forms of heart, stroke and vascular disease — coronary heart disease, stroke, heart failure, peripheral vascular disease, abdominal aortic aneurysm and hypertension. Rehabilitation after a cardiovascular event is also discussed. The management of rheumatic heart disease is considered in Section 6.1 on Indigenous Australians.

4.1 Management of heart, stroke and vascular disease

Coronary heart disease

The management of patients with coronary heart disease aims to reduce mortality and morbidity and improve quality of life. To reduce mortality, strategies should identify and treat patients at high risk of heart attack[5] or sudden death, and give emergency treatment to those suffering a heart attack (and subsequent myocardial infarction) or unstable angina. For those with more stable symptoms, there is a wide range of tests to confirm the diagnosis, guide management and assess prognosis. Options for treatment include medical therapy (mostly pharmacological), coronary bypass surgery and coronary angioplasty. The form of treatment is guided by the severity of symptoms, the extent of any damage to the heart muscle and the availability of expertise and facilities.

In 1993–94, coronary heart disease accounted for the greatest component of the total national cardiovascular health care bill and costs were greatest for the over 65 age group. Hospital costs comprised 62 per cent of the total (AIHW 1998b).

The standard of treatment for coronary heart disease in Australia is already high, and continues to improve. Estimates of potential further gains from the most effective use of available treatments are referred to later in this chapter and discussed more fully in Chapter 5.

Testing and diagnosis

Coronary angiography is currently the 'gold standard' for diagnosis of coronary heart disease, and is required before either coronary bypass surgery or coronary angioplasty is performed. Combined with assessment of left ventricular function, coronary angiography helps to classify patients according to risk (NHF 1996a). It is not used for screening because of its expense, limitations in access and potential for complications (an approximate risk of death, stroke or heart attack of 3 in 1,000). Data from 1995–96 show that the average length of stay for patients undergoing coronary angiography in Australia was four days (AIHW 1997b), and is likely to shorten with a current strong trend towards day-case angiography.

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5   See footnote 3 on page 30.

Management and treatment

Indirect non-invasive tests include resting electrocardiogram (ECG), exercise stress ECG, rest and stress nuclear perfusion (SPECT thallium or sestamibi scans) and blood pool imaging, rest or stress echocardiography, and continuous ambulatory (Holter) electrocardiography. These carry less risk for the individual than invasive tests, but have neither high sensitivity nor specificity for the diagnosis or prognosis of coronary heart disease, making them inappropriate for screening in people without symptoms.

Data from the AIHW for 1994–95 show peak use of cardiac testing in the 65–75 year age group, with a slightly lower rate in the 60–65 group. Because of demographic changes over the next 10 to 20 years, there will be a significant increase in the number of people in older age groups undergoing testing. There is also variation in rates of testing across Australia. Patients in rural or remote areas have to travel long distances for consultations with specialist cardiologists for assessment. Access in the future might be facilitated by the use of telemedicine, with infrastructure and funding mechanisms to enable rural doctors to contact cardiologists and transfer their patients for appropriate investigation and treatment.

Emergency treatment

Over 70 per cent of coronary deaths in males and 55 per cent of coronary deaths in females occur before the victims reach hospital (Chambless et al 1997). Immediate treatment can avert death and minimise damage to the heart. A recent Australian report showed that 50 per cent of heart attack patients delay seeking treatment by more than six hours (Dracup et al 1997). Examination of an Australian public health campaign designed to reduce patient delay (Heart Week 1989) showed that it was ineffective (Bett et al 1993) and further research is required to develop effective methods for reducing this delay. In addition to patient delay, efforts are being directed at improving bystander cardiopulmonary resuscitation (CPR) and providing public access to defibrillation and quick response coronary care ambulances.

Mortality after heart attack remains significant despite major improvements in the use of coronary care units, drugs such as aspirin and thrombolytic therapy, and coronary angioplasty. It is estimated that for every hour delay before thrombolytic therapy is given for heart attack, 1.6 lives are lost for every 1,000 patients treated (Fibrinolytic Therapy Trialists' Collaborative Group 1994). A recent Australian study showed that the proportion of patients with heart attack seen by a doctor within 10 minutes of arrival at hospital was only 26 per cent, and only 40 per cent received thrombolytic therapy within one hour of arrival (Palmer et al 1998). Delays were much higher if a junior doctor evaluated the patient. This information has significant resource implications for the staffing of emergency rooms.

There is an increasing trend in Australia towards using stent implantation for the acute treatment of heart attack, based upon early studies showing improved outcomes (Suryapranata et al 1998). Currently, coronary angioplasty with stenting is usually considered for patients who cannot be given thrombolytic therapy or who are in early onset cardiogenic shock (Berger et al 1997; Antoniucci et al 1998).

Unstable angina has a lower rate of mortality than heart attack, but in the first year after diagnosis, the combined rate of death and non-fatal infarction approaches 10–15 per cent, with most events occurring in the first six weeks. Admissions to hospital for definite or suspected unstable angina considerably

outnumber those for heart attack, and lead to many referrals for coronary angiography (AIHW 1997b). Examination of treatment strategies therefore has major cost implications. The introduction of casemix funding in Victoria in 1993 was not associated with reductions in length of stay, time spent in the coronary care unit or adverse complications in patients with unstable angina, although there was a modest reduction in investigation costs (Kerr et al 1998).

Appropriate triage and risk stratification of patients facilitates appropriate use of coronary care and other hospital beds and can shorten hospital stay. Outcome data are necessary to document the clinical and cost-effectiveness of various treatment approaches, including the use of chest pain triage protocols, intermediate intensity cardiac nursed areas adjacent to coronary units, and guideline-based referral for angiography and revascularisation. Australian practice guidelines recommend early angiography in patients with high risk clinical features, but local data on implementation of 'best practice' or a mechanism for continued reappraisal of treatment strategies are not available (NHMRC 1996b).

Pharmacological treatment

There is good evidence for the use of drugs in the treatment of coronary heart disease. Information about a number of these drugs in the secondary prevention of coronary heart disease is given in Section 4.2.

The main *thrombolytic therapies* are streptokinase, tPA and reteplase. The efficacy and effectiveness of thrombolytic therapy in limiting the size of myocardial infarction and improving long-term survival and other outcomes have been shown conclusively (GUSTO-1 Investigators 1996; ISIS-2 Collaborative Group 1993). The main drawback is serious bleeding, particularly intracranial haemorrhage (Berkowitz et al 1997). Streptokinase is less costly than tPA but in the GUSTO study tPA was more effective than streptokinase (GUSTO Investigators 1997).

Aspirin, alone or in combination with thrombolytic therapy, has been shown to reduce mortality in patients with heart attack and to reduce both mortality and heart attack rates in unstable angina (Goldstein et al 1996). Aspirin should be prescribed to all patients with heart attack or unstable angina, unless contra-indications are present (see trend to increasing use in Table 4.1).

Beta blockers are used to treat patients with angina or hypertension and those with a previous history of heart attack. Trials have shown that the size of myocardial infarction can be limited and survival increased by treatment with beta blockers (Beta-Blocker Pooling Research Group 1988; Yusuf et al 1988a). Long-term treatment can reduce mortality and prevent further events. Beta blockers should be prescribed to all patients with heart attack, unless contraindications are present (see trend to increasing use in Table 4.1).

Calcium channel blockers are effective in reducing blood pressure and angina (Krickler 1987). There is no evidence that their routine use prevents death or heart attack, although some studies using the longer acting forms suggest a survival advantage (DAVIT Investigators 1990). There is also evidence that short-acting dihydropyridine derivatives can have deleterious effects (Furberg et al 1995). Diltiazem has an adverse prognostic effect on post-infarct patients with heart failure or a reduced ejection fraction (Goldstein et al 1991).

Management and treatment

Angiotensin converting enzyme (ACE) inhibitors are currently used widely in the treatment of hypertension and heart failure and have been shown to prevent the progressive enlargement of the heart following myocardial infarction (Pfeffer et al 1992). They also reduce mortality if given early during a heart attack (GISSI-3 Study Group 1996; ISIS-4 Collaborative Group 1995) and improve longer term survival (Latini et al 1995). ACE inhibitors should be prescribed to most patients with heart attack and all patients with heart failure, unless contraindications are present (see trend to increasing use in Table 4.1).

Nitrates effectively relieve and prevent symptoms but there is no evidence that long-term use reduces mortality. Use during heart attack has not been shown to reduce mortality (GISSI-3 Study Group 1996; ISIS-4 Collaborative Group 1995).

Hormone replacement therapy has been identified in observational studies to be associated with lower rates of coronary heart disease in post-menopausal women (Stampfer et al 1991). However, a recent large randomised trial in post-menopausal women with coronary disease showed no overall cardiovascular benefit over four years of follow-up (Hulley et al 1998).

Table 4.1: A comparison of heart, stroke and vascular drug treatments in hospitals, 1985 and 1991–1993

Drug treatment during hospitalisation	1985 (%)		1991–1993 (%)		Estimated annual change (%)	
	Males	Females	Males	Females	Males	Females
Aspirin	35.10	29.70	85.70	76.50	6.77	6.18
ACE inhibitors	2.00	2.60	30.80	32.60	4.49	4.59
Thrombolytic therapy	6.00	1.60	44.80	39.10	5.18	4.96
Beta blockers	53.40	40.60	70.10	56.70	1.84	1.83
Calcium channel blockers	40.40	39.10	37.40	40.20	−1.49	−0.80
Nitrates	81.10	71.40	86.20	78.10	0.66	0.36

Source: Perth and Newcastle MONICA data.

As shown in Table 4.1, in Australia there has been a rapid increase in the use of aspirin, thrombolysis, beta blockers and ACE inhibitors from 1985 to 1991–1993.

A Commonwealth-initiated review of the cost-effectiveness of $400 million Pharmaceutical Benefits Scheme (PBS) expenditure/year demonstrated that expenditure on ACE inhibitors could be justified when considered across diseases such as hypertension, congestive heart failure and after a heart attack, but that expenditure on calcium antagonists across hypertension and angina was less well supported.

Invasive procedures and cardiac surgery

Coronary bypass surgery (also known as coronary artery bypass grafting or CABG) reduces mortality in patients with left main artery disease (Chaitman et al 1981) or multivessel disease and impaired ventricular function (Mock et al 1982). Newer methods of treatment such as less invasive procedures with patients not on cardiopulmonary bypass (Benetti et al 1991) or with limited thoracotomies (Calafiore et al 1996) may reduce discomfort and length of stay in hospital but cannot be used for all patients.

Valve replacement surgery,[6] most commonly aortic and mitral, is indicated for symptomatic valvular heart disease or progressive left ventricular dysfunction. Mitral valve repair is increasingly being used to treat selected patients with mitral regurgitation, and catheter-based, non-operative balloon mitral valvotomy is used for treatment of most patients with mitral stenosis.

Coronary angioplasty (also known as percutaneous transluminal coronary angioplasty or PTCA) leads to greater relief of anginal symptoms in patients with single and double vessel disease (Folland et al 1997; Parisi et al 1992), as well as sustained improvement in quality of life scores (Folland et al 1997), compared with medical therapy. Overall, with longer follow-up, costs tend to approximate those of patients treated with anti-anginal drugs (Parisi et al 1992). Use of the intravenous platelet receptor blocker abciximab (Reopro) has been shown to enhance the safety of coronary angioplasty in either low or high-risk patients (EPIC Investigators 1994; EPILOG Investigators 1997) and its widespread use will carry significant early cost implications.

Coronary angioplasty can also be used for the treatment of heart attack. Several studies have demonstrated benefits of coronary angioplasty over thrombolytic therapy (Grines et al 1993; Zijlstra et al 1993; Gibbons et al 1993; GUSTO Investigators 1997), and it has a particular role in patients who cannot have thrombolytic therapy or who have severe heart failure or cardiogenic shock.

Stent implantation reduces early coronary closure and early complications following coronary angioplasty, as well as reducing the rate of reblockage of coronary arteries in medium to long-term follow-up (Fischman et al 1994; Serruys et al 1994). Outcomes are also improved by the addition of newer and more effective antiplatelet therapies (EPISTENT Investigators 1998). Further trials using early stenting for heart attack (Suryapranata et al 1998) have suggested early benefits when compared with coronary angioplasty alone. If corroborated, these studies may make early stent implantation the treatment of choice for heart attack, with major potential implications for resources.

The treatment of multivessel coronary disease with stents is currently being investigated overseas and within Australia. Multivessel angioplasty was performed in only 8 per cent of procedures in Australia in 1994. If this technique is found to be safe and effective, it is likely that the rate of coronary angioplasty and stenting will increase significantly, removing some pressure from coronary bypass waiting lists. There is an urgent need to support registries to gather long-term data on outcomes and provide evidence of efficacy of coronary angioplasty and stent treatment strategies.

Rates of bypass surgery and coronary angioplasty. There is wide variation between the States in rates of bypass surgery and coronary angioplasty (NHF 1996a; 1996b). States with low rates of surgery and coronary angioplasty usually have more limited access to facilities, cardiac surgeons and interventional cardiologists in their public hospitals. The current NHF cardiac surgical registry data are limited to procedural numbers and perioperative mortality. Other complications such as stroke, and follow-up data on health outcomes, are not available. The data are not up to date and, in addition, are likely to contain inaccuracies which are inherent in the compilation of historical data. Newer methods of registry management are being assessed.

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6   Valve surgery pertains particularly to rheumatic heart disease and heart failure but is placed in
    this section for convenience.

Management and treatment

An increasing number of patients who have had previous bypass surgery are presenting with recurrent pain and occluded grafts. These will place an increasing burden on the hospital system and their management is often difficult or complicated, with re-operations carrying an operative mortality of 7.7 per cent (NHF 1996b). Coronary angioplasty or stenting and palliative medical therapy may be used in selective cases. Further research into risk profile reduction or other strategies for prolonging graft survival need to be evaluated.

NHF registry data (NHF 1996a) show that stents were used in 9.2 per cent of cases in 1994. Unpublished industry data suggest that the level of stent implantation in 1998 exceeded 70 per cent of all coronary angioplasty procedures. A national coronary angioplasty database committee is currently investigating electronic transmission of data so that rapid reporting of procedures and their outcomes can be obtained (see Section 7.2 on information management). There is an urgent need to support such registries to gather long-term data on outcomes and provide evidence of efficacy of coronary angioplasty and stent treatment strategies. It seems unlikely that acute coronary angioplasty can be performed cost-effectively outside major metropolitan hospitals but studies are required to demonstrate that outcomes are worse in the areas with the lowest bypass and coronary angioplasty rates.

The social and work-related outcomes for heart attack, coronary bypass surgery and coronary angioplasty patients are important and the percentage of eligible patients returning to the workforce within six months is an important indicator. Waiting times to receive cardiac services carry significant social and economic costs and are often critical in determining whether the patient returns to work at all.

The *implantable cardiac defibrillator (ICD)* has emerged as the most effective tool in preventing sudden cardiac death in people at high risk of life-threatening dysrhythmia (Garrat 1998). Its use is likely to expand significantly, becoming an important item on hospital budgets. The AVID trial (AVID Investigators 1997) demonstrated a clear survival benefit of the ICD over best drug treatment in patients with cardiac arrest or hypotensive ventricular tachycardia. The MADIT trial (Moss et al 1996) showed that the benefit extends to patients with impaired ventricular function (ejection fraction <0.35) or asymptomatic non-sustained ventricular tachycardia after heart attack.

In Australia in 1995–96, implantable cardiac defibrillators were used at an age-standardised rate of 2.4 in males and 0.8 in females per 100,000 population, with a total of 297 procedures performed (AIHW 1997b). International usage of the ICD ranges from 0.4 implants per 100,000 population in the United Kingdom to 8.9 implants per 100,000 population in the United States (Garrat 1998). A steep rise in ICD use in Australia is likely to occur as the indications of ICD implantation are extended to post-infarct patients as defined in the MADIT trial. A rate of implantation similar to the 1996 US rate (8.9/100,000) is likely and has major cost implications.

There is a rapid growth in development of *new technologies* in revascularisation, ensuring that recommendations are out of date within two years. Some new technologies with potential to reduce morbidity and mortality are coated stents; use of irradiation within stents; minimally invasive coronary bypass surgery; surgery without the use of cardiopulmonary bypass; biological modulation of vein grafts to increase graft longevity; biological modulation of restenosis after

angioplasty; and biological techniques to induce formation of new blood vessels to overcome occlusion. These new technologies must be evaluated in studies to show appropriate cost-effectiveness.

Potential gains from acute management of coronary heart disease

Along with estimates of the cumulative effects of risk factor reduction on coronary heart disease risk discussed in Chapter 3, the University of Newcastle is also assessing the potential effects of treatment on risk of death during an acute event. Estimates, summary data and the assumptions on which the estimates are based are given in Chapter 5. Results indicate that the use of aspirin, ACE inhibitors and thrombolytic therapy significantly reduces the risk of death during an acute event. Earlier use of thrombolytic therapy improves its benefits, and beta blockers can also improve outcomes in this context.

Key points — Management of coronary heart disease

- Although prompt aspirin and reperfusion therapy have been shown to be highly effective, too few eligible patients with heart attack receive them. In addition, too few patients with unstable angina receive aspirin and heparin.

- Half of all patients with heart attack take more than six hours to seek treatment.

- Early angiography and revascularisation are not available in all hospitals, which may affect the outcomes of their patients. Conversely, potential overuse of early angiography and revascularisation in hospitals with facilities may increase costs without improving outcomes. The collection of outcome data for acute coronary syndromes would help to resolve these points.

- There is regional variation in use of cardiac surgery and coronary angioplasty in Australia, with limited access to facilities and specialists causing long waiting times in some States.

- The demand for angioplasty is likely to increase as it may become the preferred emergency treatment for heart attack, and is currently indicated in early onset cardiogenic shock or when thrombolysis is contraindicated.

- The availability of Australian data on short and long-term outcomes following cardiac surgery and coronary angioplasty would help to clarify the roles of each intervention in various patient groups.

Stroke

The management of individual patients with stroke is influenced by the stroke's cause, type and severity. All patients with suspected acute stroke should be clinically assessed to confirm the diagnosis, the lesion location, the likely pathology and cause and the stroke's functional effects. In Australia, about 80 per cent of patients presenting with acute stroke are admitted to hospital. Acute inpatient care for patients with stroke should be organised and undertaken within dedicated units by a multidisciplinary stroke service (Stroke Unit Trialists' Collaboration 1997a; 1997b).

Testing and diagnosis

The clinical diagnosis of stroke requires considerable expertise, particularly in the first few hours when the history may be unclear because the patient is unconscious or confused. In about 15 per cent of patients initially diagnosed with stroke, an alternative (and often treatable) problem becomes apparent (eg epilepsy, brain tumour, subdural haematoma, hypoglycaemia, encephalitis) (Warlow et al 1996).

Computerised tomography (CT) scanning of the brain can be used to support clinical diagnosis of stroke. Its main role is to distinguish between the major stroke types — cerebral infarction, cerebral haemorrhage and subarachnoid haemorrhage. It is essential that all patients with acute stroke undergo CT brain scanning as soon as possible, preferably within 48 hours and no later than seven days after the stroke. Approximately 80 per cent of patients with suspected acute stroke had a CT scan in Perth during 1989–90 (Anderson et al 1993a) and 90 per cent in Melbourne during 1997 (Donnan et al 1997).

Emergency treatment

Stroke is now recognised as a medical emergency. Emergency treatment of stroke is critical to limit damage to the brain, and prevention of complications and recurrent stroke events is also important. In many States, ambulance services have stroke registered as a priority one service.

The emergency treatment of acute stroke encompasses early access to organised care in a stroke unit, which includes appropriate nursing and allied health care, general medical care, and specific medical and surgical therapy.

Stroke units

Stroke units have a coordinated approach to the management of stroke, with staffing by a multidisciplinary team of experts. Early access to rehabilitation is an important component of care.

A meta-analysis of all existing randomised trials of management within stroke units compared with general wards found that specialised units reduce the odds of death and dependency after stroke by about 29 per cent (Stroke Unit Trialists' Collaboration 1997a; 1997b). The effect appears to be most evident during the early post-stroke phase and is independent of severity of the stroke at entry. This care is associated with a reduction in complications such as pressure sores and contractures, urinary tract infection, aspiration pneumonia, venous thrombo-embolism and depression. Studies have also shown that stroke unit care improves aspects of long-term quality of life for stroke patients (Indredavik et al 1998).

There were approximately 20 stroke units or services in Australia in 1998. Each treated between 300 and 600 patients a year, representing only about 25 per cent of the total burden of acute stroke.

Pharmacological treatment

Aspirin is the only antiplatelet agent proven to be effective in the treatment of acute stroke. When given within 48 hours of the onset of an ischaemic stroke, it reduces early recurrent ischaemic stroke by about 28 per cent. Treating 1,000 patients with aspirin prevents about five recurrent strokes and nine non-fatal strokes or deaths in the first few weeks, and about 13 dead or dependent patients at several weeks or months follow-up. Early aspirin therapy also reduces the risk of

death and dependency at one to six months after stroke (CAST Collaborative Group 1997; International Stroke Trial Collaborative Group 1997).

Anticoagulants (ie heparin and heparinoids) have not been shown to be effective in the treatment of acute ischaemic stroke, even in patients with atrial fibrillation. Data from 16 randomised trials in more than 20,000 patients indicate that anti-coagulation for acute ischaemic stroke is not associated with an overall reduction in death or disability because any decrease in recurrent ischaemic stroke is offset by an increase in haemorrhagic stroke (Hankey 1998).

Thrombolysis is being used increasingly in the United States in line with the United States Food and Drug Administration recommendations, but in Australia and other countries it is still regarded as an experimental treatment.

A statistical overview of twelve randomised trials of thrombolysis using tPA, streptokinase or urokinase within three to six hours of onset of ischaemic stroke, indicates that thrombolysis is associated with an excess *early hazard* of early symptomatic intracranial haemorrhages and early deaths but an *overall net benefit* of fewer people being dead or dependent at one to six months after stroke (Wardlaw et al 1997). This result was confirmed by the second European Cooperative Acute Stroke Study (ECASS II) (Hacke et al 1998).

Neuroprotective therapies to prevent death of brain cells in the ischaemic stage of an acute stroke are also being assessed. In general, the results of trials have been disappointing, with no clear proof of benefit (Read et al, in press).

Surgery for stroke

Decompressive suboccipital craniectomy can be a life-saving treatment for cerebellar haemorrhage or infarction, when swelling compresses the brainstem (Warlow et al 1996). The relative risks and benefits of surgical evacuation of other haemorrhages remain uncertain and are the subject of two current randomised trials in the United Kingdom, Germany and the United States (Hankey & Hon 1997).

Key points — Management of stroke

- There is too little community understanding of the nature of stroke, its warning signs and what steps need to be taken for urgent stroke management.

- Low levels of knowledge about the management of acute stroke exist among general practitioners, general physicians and even neurologists.

- Emergency transport to hospital is poorly coordinated and triage of stroke patients once they arrive in hospital emergency areas is slow.

- An inadequate number of patients receive established effective therapeutic approaches of early use of aspirin and management in a stroke unit.

- There are currently insufficient stroke units to meet national needs.

- Although a number of promising acute-phase treatments are being investigated, the key issues in acute stroke care relate to general medical/nursing and early rehabilitation.

- The current poor access to nursing homes creates blockages within stroke units, preventing effective management of new cases.

Heart failure

Heart failure is mainly a disease of older people. The rate of hospital admissions for heart failure is increasing rapidly, and hospitalisation accounts for approximately two-thirds of the total cost for heart failure treatment. Despite pharmacological treatment, the prognosis of patients with heart failure is poor. A recent Australian report showed a mortality of 33 per cent at one year despite 68 per cent of patients being treated with ACE inhibitors at discharge (Lowe et al 1998).

Comprehensive specialist management programs for heart failure have been set up in only a few centres. They incorporate a systematic approach to drug therapy and patient education and provide regular contact with the medical advisor which improves patient compliance for both clinic attendance and therapy. A recent Australian report showed that a single home visit by a nurse and a pharmacist following a hospital admission for heart failure, significantly reduced the number of unplanned re-admissions (Stewart et al 1998).

Testing and diagnosis

As well as clinical examination of symptoms and signs, diagnosis of heart failure involves assessment of ventricular and valvular function, usually by echocardiography. Assessment by a cardiologist is usually appropriate for imaging and for diagnosis of coronary or valvular disease.

Pharmacological treatment

Extensive clinical research shows that *ACE inhibitors* relieve symptoms and improve prognosis (eg SOLVD Investigators 1990). Despite clear benefits, these agents are underused in clinical practice (Stafford et al 1997) and the doses given are persistently lower than those proven to be effective in clinical trials.

Angiotensin II receptor antagonists have shown comparable effects to ACE inhibitors in several short-term studies (Dickstein et al 1995; Pitt et al 1997) but long-term studies are not available. They may be particularly valuable in patients who are intolerant to ACE inhibitors.

Beta blockers, including bisoprolol (CIBIS-II Investigators 1999) and the vaso-dilating drug carvedilol (Packer et al 1996) have been shown to improve morbidity and mortality in patients with class II or III heart failure who have been stabilised on medical therapy, although the results of clinical trials have not been generally adopted.

Diuretics and *digoxin* are given to relieve symptoms but do not improve survival.

Invasive and surgical procedures

Cardiac transplantation programs, usually reserved for patients younger than 60–65 years, have had excellent results in Australia (Keogh & Kaan 1992). Application is severely limited by donor shortage and also by resource issues (to a lesser degree). However, this treatment is not applicable to most patients with heart failure. Other surgical procedures such as cardiomyoplasty and myocardial reduction surgery are under evaluation.

Key points — Management of heart failure

- Proven therapies such as ACE inhibitors and beta blockers are underused in clinical practice.

- Many heart failure clinics are based on referral for transplantation, which include only a small fraction of older patients with heart failure. Funding mechanisms should facilitate coordinated 'shared' care of heart failure patients.

Peripheral vascular disease

Peripheral vascular disease is caused by atherosclerosis affecting the lower limbs. The clinical spectrum includes asymptomatic disease, claudication (leg pain precipitated by walking) and limb-threatening ischaemia (rest pain, ischaemic ulceration and gangrene).

Testing and diagnosis

Ankle brachial index (ABI) is useful for initial assessment and in the monitoring of patients with peripheral vascular disease. It can be performed by general practitioners and is useful in remote and rural settings. The ABI is capable of identifying subjects with early atherosclerosis who are also at increased risk of coronary events (Fowkes et al 1998).

Duplex scanning is used to assess the extent of disease and confirm clinical findings. It has limited use once intervention is needed although it can be used to monitor outcome of intervention. Use of duplex ultrasonography has increased ten-fold in the last decade. This represents a substantial cost increase, only partly offset by reduced use of invasive diagnostic radiological procedures.

Contrast angiography is usually limited to cases requiring surgical or radiological intervention and is generally performed as a hospital day case by a specialist radiologist or vascular surgeon.

Emergency treatment

Emergency surgery or thrombolysis for peripheral vascular disease is indicated in cases of acute limb-threatening ischaemia due to arterial thrombosis or embolisation. The incidence of emergency surgery is falling due to a fall in embolic disease.

Pharmacological treatment

Innumerable drugs have been studied for the treatment of claudication, but no drug has been found effective enough to be recommended as standard practice. Anticoagulant drugs and, to a lesser extent, thrombolysis are used in selected cases. Cessation of smoking is very important.

Invasive procedures and surgery

In general, patients with ischaemic rest pain, ischaemic ulceration or gangrene need some form of invasive treatment, with many requiring more than one procedure. Treatment of claudication is less intense as it is often a chronic and stable condition.

Balloon angioplasty is widely used for treatment of claudication, but symptoms can recur due to re-stenosis (this occurs in about 50 per cent of cases over one to two years) (Gordon et al 1994). Stents are increasingly being used, especially in iliac artery disease, although few data are available on their effectiveness.

Bypass surgery (eg aorto-bifemoral bypass, femoro-politeal bypass) is generally indicated for more severe disease. These are major procedures performed by vascular surgeons and often require access to an intensive care unit.

Amputation remains an all too common endpoint in patients with peripheral vascular disease, especially those aged over 80 years. Nevertheless, in Western Australia the incidence of amputation has tended to fall for all ages apart from those aged 80 years or more (Mattes et al 1997). It is unclear whether this is due to improved overall management of peripheral vascular disease or to a fall in the incidence of severe peripheral vascular disease.

Key points — Management of peripheral vascular disease

- The role of duplex ultrasonography in patients thought to have peripheral vascular disease should be reviewed, in particular the possibility that more selective use of this technology, in conjunction with greater specialist consultation, could result in better, more cost-effective care.

- More data are needed on outcome following amputation as there may be scope for improving care through increased use of shared care, involving general practitioners and other community-based services.

Abdominal aortic aneurysm

The basic tenet of management in abdominal aortic aneurysm is diagnosis and elective surgery before rupture. Abdominal aortic artery aneurysms are five times more common in males than in females and prevalence increases steadily from about 60 years of age.

Testing and diagnosis

Abdominal ultrasound is of proven sensitivity, specificity and cost-effectiveness for assessing the majority of cases (Pleumeekers et al 1998) with many abdominal aortic aneurysms detected as incidental findings when ultrasound scans are performed for other reasons. The role of ultrasound in population screening is unclear at present but a randomised controlled trial is underway in Western Australia. CT (and magnetic resonance imaging [MRI]) scanning is used in selected cases, usually in pre-operative assessment rather than primary diagnosis. Small abdominal aortic aneurysms (3–5 cm in diameter) are at low risk of rupture and should be monitored by ultrasound scans at 6 to 12 monthly intervals with a view to surgery when the aneurysm diameter exceeds 5 cm.

Emergency treatment

Most abdominal aortic aneurysms are asymptomatic and may therefore present with rupture. About 40 per cent of these patients die before admission to hospital and less than 20 per cent survive more than 30 days after the event (Semmens et al 1998). There is often considerable morbidity within the group surviving emergency surgery.

Invasive procedures and surgery

Elective surgery for abdominal aortic aneurysm of a significant size is standard practice (Magee et al 1992). Case fatality for elective surgery varies but should be below 5 per cent (Semmens et al 1998). The incidence of elective procedures has risen steadily over the last two decades due primarily to increased diagnosis (Semmens et al 1998). The role of surgery in the management of abdominal aortic aneurysms with diameters between 4 cm and 5 cm is currently being assessed in two trials (UK Small Aneurysm Trial Participants 1995).

Endoluminal stenting, a minimally invasive method of treating abdominal aortic aneurysm, has been developed over the last five years and is currently under evaluation worldwide including by active groups in Sydney and Perth. It is not currently standard practice (Thompson et al 1997). While the method is expensive, this may be partly offset by shorter stays in hospital and reduced morbidity.

Key point — Management of abdominal aortic aneurysm

- The role of population screening and of stenting for abdominal aortic aneurysm is currently being assessed in Australia and overseas. No major changes in the overall management of abdominal aortic aneurysms should be considered until further information is available from these studies.

Hypertension

Hypertension has been described previously as a risk factor (see Section 1.1) however it is also treated as a cardiovascular condition.

The prevalence of hypertension rises with age. Isolated systolic hypertension in particular has a high prevalence in older people. Overall, approximately one in six Australian adults have hypertension. Even in those being treated with drugs, a significant proportion still have high blood pressure (DHSH 1994b). Untreated, hypertension can lead to stroke, cardiac disease, renal failure, dementia, prematurity and blindness. Even in the case of mild hypertension, treatment lowers the incidence of stroke by 38 per cent and that of coronary disease events by 16 per cent (MacMahon & Rodgers 1994).

Testing and diagnosis

Sphygmomanometry is usually performed in a doctor's clinic. Blood pressure levels can vary markedly throughout the day and a single reading may differ from the patient's average blood pressure level as assessed by ambulatory blood pressure monitoring. Clinic blood pressure levels are generally higher than those taken in the home environment. In some patients, blood pressure levels are only elevated when measured in the clinic ('white coat' hypertension).

While routine use of *ambulatory blood pressure monitoring* in clinical practice has not been advocated, it may provide additional information to assist diagnosis and management decisions in patients with labile blood pressure, isolated systolic hypertension or orthostatic hypertension (AHTAC 1997a).

Use of *echocardiography* to assess the degree of left ventricular hypertrophy is not routine but can be a guide to the severity of hypertension and importance of treatment, reflecting blood pressure level during the previous three months. It can be

repeated in order to monitor progress. This measurement correlates well with the risk of long-term complications such as stroke. However, use of echocardiography should not be considered as routine in all patients with hypertension.

Treatment

Lifestyle measures such as weight reduction in those who are overweight, physical activity programs or reduction in excessive alcohol intake may alone be enough to treat high blood pressure. However, in many cases, drug treatment is also necessary. The level of blood pressure at which treatment is commenced depends on the presence of associated disease eg diabetes, renal or other risk factors.

The principal drug classes used for treatment of hypertension are diuretics, beta blockers, ACE inhibitors and calcium antagonists. Centrally acting drugs and direct acting vasodilators are used less frequently. In practice, associated comorbidities often dictate rational therapy, as about half the hypertensive population has other conditions that can be treated by the same agents used to treat hypertension, or which should be avoided because of these other conditions. Examples are use of beta blockers in patients with co-existent angina, and ACE inhibitors or diuretics in patients with heart failure. In a small proportion of patients, investigations uncover a treatable cause of hypertension (DHSH 1994b).

Key points — Management of hypertension

- There is a need for more effective diagnosis and treatment to reduce blood pressure to acceptable levels.
- Patient compliance with lifestyle measures and drug therapy is a frequent problem because those with hypertension rarely have symptoms.

4.2 Secondary prevention and rehabilitation

The term secondary prevention is used to describe interventions in people who have experienced a cardiovascular event (eg heart attack or stroke) and who are therefore at risk of another event. Rehabilitation aims to help patients return to an active life. Long-term management involves modification of risk factors, which has an even greater potential for preventing cardiovascular events in those with heart, stroke and vascular disease than in those without, and continuing medical treatment to reduce risk factor levels and control symptoms. While aspects of rehabilitation begin during the hospital stay, most rehabilitation occurs after discharge.

Secondary prevention and outpatient rehabilitation should be available to all patients in Australia who have had heart attack, coronary bypass grafts, coronary angioplasty, stroke or other heart, stroke and vascular disease (NHF 1998a). This section discusses effective strategies in secondary prevention and rehabilitation for each condition.

Discharge planning

Evidence has shown that effective discharge planning is essential to ensure a smooth transition between management in hospital and return to usual activities. The following principles have been identified as important by consumers:

- timely delivery of post-hospital service;

- provision of clearly worded written information;

- discussion of the discharge process with the patient and patient consultation throughout the development of the discharge plan (Sullivan 1994);

- discussion of discharge with family and carers before it occurs; and

- referral to outpatient rehabilitation.

Secondary prevention

Coronary heart disease

The following secondary prevention strategies have been found to be effective.

Reduction of risk factors (ie cessation of smoking, increasing physical activity, lowering cholesterol, controlling blood pressure and modifying diet) is particularly important (Scandinavian Simvastatin Survival Study Group 1994; Sacks et al 1996; Smith et al 1997; Metz et al 1997; LIPID Study Group 1998).

Aspirin has a clear role in the continuing treatment of acute coronary syndromes. Long-term antiplatelet treatment has been shown to reduce the incidence of both heart attack and coronary death (Antiplatelet Trialists' Collaboration 1994). Significant benefit has also been shown with new antiplatelet drugs such as ticlopidine and clopidogrel in particular clinical situations.

Data from pooled studies suggest that early intervention and long-term treatment with *beta blockers* following a heart attack significantly reduce the risk of patients suffering death, cardiac arrest or another heart attack (Teo et al 1993; Yusuf et al 1988b).

ACE inhibitors should be considered for all patients with heart attack within 24 hours of the onset of symptoms and therapy continued for five to six weeks unless contraindicated (GISSI-3 Study 1996; ISIS-4 Collaborative Group 1995). In patients with signs of left ventricular dysfunction, therapy should be continued for at least three years. Large scale randomised trials are currently being conducted and should give some insight into whether all patients should be treated long term (Hennekens et al 1996; ISIS-4 Collaborative Group 1995).

Cholesterol-lowering agents, such as HMG-CoA reductase inhibitors (statins), are used in both primary and secondary prevention of coronary heart disease. In primary prevention, cholesterol lowering has been shown to reduce coronary heart disease events (Shepherd et al 1995). However, lipid-lowering agents have been shown to have a greater absolute effect in the secondary prevention of coronary heart disease (Scandinavian Simvastatin Survival Study Group 1994; Sacks et al 1996; LIPID Study Group 1998). The LIPID study of the HMG-CoA reductase inhibitor, pravastatin, was conducted among 9,014 patients in Australia and New Zealand. It showed a significant reduction in mortality, heart attack, stroke and

need for coronary bypass surgery/ coronary angioplasty in patients with previous heart attack or unstable angina and a representative 'average' range of cholesterol levels (4.0–7.0 mmol/L) at baseline (LIPID Study Group 1998).

Potential gains from secondary prevention of coronary heart disease

People with a history of symptomatic coronary heart disease account for only a small proportion of the community in the younger age groups, but this increases to over 20 per cent of males and 9 per cent of females aged 70–79 years, and to 35 per cent of males and 20 per cent of females aged 80 years or over. More importantly, nearly 60 per cent of deaths from coronary heart disease and 35 per cent of non-fatal heart attacks occur in patients with a previous admission for heart, stroke and vascular disease. These figures illustrate the potential of secondary prevention to reduce the impact of coronary heart disease in those who have had a coronary event.

Chapter 5 (see Table 5.1, page 102) summarises the evidence for the effectiveness of prevention and treatment strategies to reduce coronary risk in various groups of people. The estimates of cumulative risk factor reduction given in Chapter 5 indicate that lifestyle modification and optimal medical treatment for people with established coronary heart disease confer a significant benefit.

Key points — Secondary prevention of coronary heart disease

- A number of therapies have been shown to be beneficial in secondary prevention among patients with known coronary heart disease. However, there is probably underutilisation and inappropriate use of these therapies.

- Although some agents (eg HMG-CoA reductase inhibitors and ACE inhibitors) are relatively expensive compared to other cardiovascular agents, their benefits are conclusively established and appropriate analyses show that they can still be very cost-effective.

Stroke

Strategies shown to be effective in the secondary prevention of stroke and transient ischaemic attack (TIA) include reduction of blood pressure, antiplatelet therapy, anticoagulant therapy and carotid endarterectomy. Guidelines for the use of anti-coagulants, antiplatelet therapy and the application of carotid endarterectomy have been outlined in the NHMRC *Clinical Practice Guidelines: Prevention of Stroke* (NHMRC1997a). Other promising strategies include cessation of smoking and lowering of cholesterol by means of diet and HMG-CoA reductase inhibitors.

Blood pressure reduction. The prevalence of high blood pressure in people with symptomatic cerebrovascular disease (TIA and stroke) is about 50 per cent, which is about 2.5 times greater than in the general population (Jamrozik et al 1994). Reducing diastolic blood pressure by 5–6 mmHg and systolic blood pressure by 10–12 mmHg for several years leads to a 28 per cent reduction in stroke (INDANA Project Collaborators 1997). This relative risk reduction is likely to be the same for patients with TIA or stroke regardless of whether or not they have high blood pressure (MacMahon & Rodgers 1994). Most trials of blood pressure reduction and stroke incidence have used diuretics and beta blockers. There is a non-significant trend towards a lower incidence of stroke with diuretics than with beta blockers (MacMahon & Rodgers 1994).

Tobacco smoking. The prevalence of smoking among people with TIA or stroke is about 30 per cent (Jamrozik et al 1994). Smoking is associated with at least a 15-fold increased risk of all stroke and a two-fold risk of ischaemic stroke (Shinton & Beevers 1989; Donnan et al 1993).

Cholesterol reduction. The prevalence of cholesterol levels over 6.5 mmol/L in people with TIA or stroke is about 40 per cent (Hankey et al 1991). The relationship between total cholesterol and all-cause stroke risk remains to be clarified (Rodgers et al 1996; Qizilbash et al 1992). In the absence of large randomised trials of cholesterol-lowering therapy in patients with TIA or stroke, it is necessary to rely on data from trials in different populations (eg symptomatic coronary heart disease and high cholesterol) that suggest that lowering cholesterol over a few years with statin drugs reduces stroke risk by about 24 per cent (Bucher et al 1998; LIPID Study Group 1998).

Antiplatelet therapy is appropriate for about 75 per cent of people with TIA or stroke, and is associated with a 22 per cent reduction in non-fatal stroke, non-fatal heart attack or vascular death (Antiplatelet Trialists' Collaboration 1994), irrespective of the patient's age, gender and blood pressure.

The most widely studied antiplatelet regimen is 'medium-dose' aspirin. The only single antiplatelet agent which has been shown to be more effective is clopidogrel, which has recently been licensed in Australia. For patients with ischaemic stroke, the annual rate of subsequent ischaemic stroke, heart attack or vascular death was 7.7 per cent if treated with aspirin and 7.2 per cent if treated with clopidogrel (CAPRIE Steering Committee 1996). Ticlopidine may be marginally more effective than aspirin but its use is limited by the risk of neutropenia and thrombocytopenia, and by its cost (about $2000 per patient per year). When licensed, clopidogrel will almost certainly replace ticlopidine.

Combined dipyridamole and aspirin may also be more effective than aspirin alone. An analysis of the second European Stroke Prevention Study (ESPS-2) and four previous studies comparing aspirin plus dipyridamole with aspirin alone showed that the combination therapy was associated with a 15 per cent relative risk reduction in the composite outcome event of stroke, heart attack or vascular death compared with aspirin alone (van Gijn & Algra 1997; Diener et al 1996).

Anticoagulant therapy is the treatment of choice for about 20 per cent of patients with TIA or stroke who have high-risk sources of embolism from the heart to the brain (Hankey et al 1991; Petersen et al 1989).

People with atrial fibrillation have an increased risk of stroke of about 5 per cent per year. Those with a history of previous TIA or stroke have a risk of about 12 per cent per year (European Atrial Fibrillation Trial Study Group 1993). The risk is even higher if the fibrillating patient with stroke is elderly and has a history of high blood pressure or diabetes (Atrial Fibrillation Investigators 1994).

For people with TIA or ischaemic stroke and atrial fibrillation, warfarin reduces the risk of stroke by about 70 per cent, from 12 per cent to 4 per cent per year, with a 0.5–0.8 per cent risk of major haemorrhage. Aspirin reduces the risk of stroke by about 20 per cent, from 12 per cent to 6 per cent per year. Low-intensity, fixed-dose warfarin plus aspirin is ineffective compared with adjusted-dose warfarin (Atrial Fibrillation Investigators 1994). The cost-effectiveness of warfarin needs to be balanced against the additional costs of regular checks of the degree of anti-coagulation in the blood, extra visits to doctors, and the risk of major haemorrhage (Asplund et al 1993).

Management and treatment

Carotid endarterectomy is indicated in about 10 per cent of people with TIA or stroke, who have had a recent non-disabling carotid ischaemic event and have severe carotid stenosis, and are fit and willing for surgery (Hankey et al 1991). Carotid endarterectomy carries a small but important risk of stroke but this is highly variable depending on the surgeon and patient (Rothwell & Warlow 1996; 1997). Continuing independent prospective audit of the perioperative complication rate of carotid endartectomy should be standard practice.

Carotid endarterectomy does more harm than good in people with mild (0–29 per cent) or moderate (30–69 per cent) symptomatic carotid stenosis. However, for patients with severe (>70 per cent) symptomatic carotid stenosis it reduces the two-year risk of ipsilateral stroke from as high as 26 per cent to as low as 9 per cent (Hankey & Warlow 1994).

About 80,000 Australians aged 50–80 years have asymptomatic carotid stenosis. Carotid endarterectomy for >60 per cent carotid stenosis reduces the five-year risk of ipsilateral stroke from about 11 per cent to 5 per cent (Asymptomatic Carotid Atherosclerosis Study Group 1995).

Carotid angioplasty and stenting is presently a promising but experimental procedure (Bettmann et al 1998). The risks and benefits of carotid and vertebral artery angioplasty and stenting are being compared with carotid endarterectomy and with best medical therapy alone in ongoing trials.

Potential gains from secondary prevention of stroke

Among the 40,000 strokes that occur each year in Australia, about one-third occur in people who have had a previous TIA or stroke (Anderson et al 1993a; 1993b). These 14,000 strokes are potentially preventable through effective secondary prevention strategies (Hankey 1997).

Potential gains from improved stroke management are discussed in Chapter 5.

Key points — Secondary prevention of stroke

- Use of antiplatelet and anticoagulant therapy and lowering of blood pressure in patients with TIA or stroke are likely to have the greatest impact on secondary prevention of stroke.

- Aspirin, diuretics and warfarin (in patients with atrial fibrillation) are the most cost-effective pharmaceutical agents to prevent recurrent stroke in patients with TIA or stroke.

- If the effect of cholesterol-lowering statin drugs on the incidence of stroke among people with coronary heart disease can be replicated among people with TIA and stroke, then this strategy will also make an important, although costly, contribution to secondary prevention of stroke.

- Carotid endarterectomy for asymptomatic carotid stenosis is expensive and nowhere near as effective as the other strategies. Screening for asymptomatic carotid stenosis should be discouraged at this stage unless there is evidence of subgroups with asymptomatic carotid stenosis who are likely to benefit.

- The perioperative complication rate of carotid endartectomy should be audited prospectively by all surgeons performing the process.

Peripheral vascular disease and abdominal aortic aneurysm

As both occlusive peripheral vascular disease and abdominal aortic aneurysm share many of the same risk factors as coronary heart disease, the same primary and secondary preventions should be of benefit. As the major cause of death in patients with peripheral vascular disease is coronary heart disease, increased identification and treatment of high cholesterol and high blood pressure should improve overall long-term outcome. Continued smoking is a concern, as it causes progressive disease and contributes to failure of treatment.

The need for rehabilitation following amputation for peripheral vascular disease is an issue. Rates of referral for limb prostheses are probably increasing, especially in older people. Clinicians estimate that about 50 per cent of amputees are not suitable for prosthetic limb fitting and a large proportion of these patients lose their independence and become residents of nursing homes. This is increasingly a problem among those over 80 years of age.

As further aneurysmal disease after successful surgery for abdominal aortic aneurysm is rare, secondary prevention strategies are generally dictated by the extent of comorbid occlusive arterial disease. Formal rehabilitation is not standard practice. In general, quality of life appears to be very good after elective surgery for abdominal aortic aneurysm.

Rehabilitation

Cardiac rehabilitation

The WHO (WHO 1993) and the NHF (NHF 1998a) recommend that all patients with coronary heart disease be referred to cardiac rehabilitation services. The aims of cardiac rehabilitation are to maximise physical, psychological and social functioning to enable patients to live productively and with confidence and to assist and encourage behaviours that may minimise the risk of further coronary cardiac events and conditions (NHF 1998a). Cardiac rehabilitation services should involve the patient's cardiologist and other medical practitioners who retain overall responsibility for the patient's management (NHF 1998a).

In the short term, cardiac rehabilitation enhances recovery and reduces disability, allows earlier return to work and reduces inappropriate readmission to hospital (AHCPR & NHLBI 1995). Long-term programs reduce subsequent cardiac events (O'Connor et al 1989) and reduce the risk of sudden death and overall cardiac mortality after heart attack (Kallio et al 1979; Hedback et al 1993). The most substantial benefits of cardiac rehabilitation services include: improvement in exercise tolerance, symptoms and blood lipids; reduction in cigarette smoking; improvement in psychological well being and reduction of stress; and reduction in mortality (AHCPR & NHLBI 1995).

Limited evidence relating to cost-effectiveness suggests that multifactorial cardiac rehabilitation services for patients following heart attack: are similar in cost-effectiveness to coronary bypass surgery for left main disease (Oldridge et al 1993); result in lower rates of hospital re-admission (Levin et al 1991); reduce visits to emergency department and length of stay of re-admissions (Bondenstam & Breikss 1995); and reduce costs of hospital stay (Ades et al 1992).

Management and treatment

Throughout Australia, cardiac rehabilitation services are available at three levels — inpatient, outpatient and maintenance, as outlined in Table 4.2.

Table 4.2: Phases of cardiac rehabilitation

	Inpatient (phase I)	Outpatient (phase II)	Maintenance (phase III)
Duration	Length of hospital stay.	Up to 12 weeks.	Continuing.
Services provided	In hospitals following an acute cardiac event (eg heart attack, angina or heart failure) or following a procedure (cardiac surgery, coronary stenting, coronary angioplasty).	Following admission to a hospital or following specialist follow-up. May be hospital, home, community health centre or outreach based. Group setting preferable.	Preferably in a community setting by trained personnel, for people who have previously completed an outpatient program.
Aims	Alleviate immediate concerns, raise awareness of risk factors and lifestyle change, organise discharge planning and follow-up.	Provide information and skills for behaviour change, optimise adjustment to condition, modify risk factors, prevent further events.	Encourage maintenance of healthy behaviours, provide ongoing support, prevent further cardiac events.
Content	Physical activity program, counselling, education about management including medications and risk factors.	Interactive education, individually tailored physical activity, counselling, risk factor management.	Group physical activity, educational updates, group support, long-term risk factor management.

The recent NHF *Directory of Cardiac Rehabilitation Programs* (NHF 1998b) suggests substantial growth in availability of cardiac rehabilitation services in Australia. National and State standards and guidelines for cardiac rehabilitation are described in Section 4.3.

Key points — Cardiac rehabilitation

- Rates of participation in cardiac rehabilitation programs are less than desirable, with not all patients eligible for cardiac rehabilitation offered a place even when a program is available and accessible (Bunker et al, in press). Routine referral is not standard practice and a proportion of patients who are referred do not attend.

- Services are not available or accessible to all patients with heart disease, especially those in remote or rural Australia. Rural and remote services need to be coordinated and the shortage of allied health staff acknowledged. Programs need to be made more accessible and more attractive to some population groups (eg Indigenous people, women, people of culturally and linguistically diverse background and low income groups).

- Reduced length of hospital stay has implications for the delivery of inpatient cardiac rehabilitation and outpatient services are limited for people who return to work early.

- Linkages between formal programs and broader community facilities are less than optimal and do not address opportunities for supportive lifestyle health promotion.

- Development of rehabilitation modules suitable for shared-care strategies with general practitioners and other health professionals are required to increase availability of rehabilitation programs.

Key points — Cardiac rehabilitation (continued)

- A lack of formal accreditation of cardiac rehabilitation services allows programs to emerge that do not always comply with recommended national guidelines. National and State policy standards have significant resource implications that have not been addressed.

- The limited information regarding rates of attendance at cardiac rehabilitation programs would be improved if a standardised data collection tool were available.

Stroke rehabilitation

Rehabilitation after a stroke aims to maximise functional outcome and minimise handicap (Stroke Australia Task Force 1997). Approaches to rehabilitation include preventing complications; remediation or treatment to reduce neurological deficits; assistance in adapting to residual disabilities; and long-term maintenance of function. Rehabilitation should begin as soon as diagnosis of stroke is confirmed and should continue during management in the acute hospital, rehabilitation hospital and community rehabilitation services through to long-term community integration. There should be early and repeated assessment, referral to formal rehabilitation as early as possible, goal directed management and a coordinated and consistent approach as the patient moves between settings. Specific problems such as falls (46 per cent of people with stroke fall during their stay in hospital and 73 per cent fall at least once within six months of discharge from hospital) (Forster & Young 1995) and recovery of arm function (only 42 per cent of those with moderate initial motor loss and 16 per cent of those with severe motor loss in the arm regain full function at three months after stroke) (Parker et al 1986) should be taken into account.

Current services available for rehabilitation after a stroke vary, but include combinations of the following:

- *Inpatient rehabilitation in the acute setting*. Rehabilitation is initiated in the acute hospital setting by members of the interdisciplinary team. However, the amount and frequency of services available in the acute setting are often limited.

- *Inpatient rehabilitation in the post-acute setting*. In Australia, 43 per cent of stroke survivors have inpatient rehabilitation (Shah & Bain 1989). Intensive involvement by patients and their family or carers in the rehabilitation process, together with the interdisciplinary team, optimises functional recovery. An important goal is to prepare the patient for a successful return to community living.

- *Domiciliary rehabilitation services and community rehabilitation services (day hospitals).* These interdisciplinary services are often used to improve functional recovery and successful integration after a patient who has suffered a stroke returns home. They are usually less intensive, with one to two sessions per week. Of people attending Victorian Community Rehabilitation Centres, 16 per cent had stroke listed as their primary diagnostic category (Smith & Laffy 1998).

Recently, rehabilitation at home has been investigated in Australia and overseas as an alternative to inpatient rehabilitation. This involves intensive therapy provided by an interdisciplinary team in the home. Preliminary studies indicate that home

rehabilitation and inpatient rehabilitation achieve similar functional outcomes, with no significant differences in strain on the carer at 12 months after stroke (Rudd et al 1997). It is important to monitor strain on the carer in the short term following the patient's discharge from hospital.

Key points — Stroke rehabilitation

- Available services vary greatly between geographical areas, with clustering in some areas and few or no services available in others.

- While there is evidence that a range of factors is associated with successful outcomes of rehabilitation, there is no standardised approach to identifying people who will benefit from rehabilitation.

- To optimise continuity of care, sharing of information from assessments and about management between the different providers of stroke rehabilitation is necessary.

- Assessment procedures, management approaches and outcome measures vary between centres, limiting effective communication between centres and impeding attempts to work towards best practice.

- There are areas, such as falls and recovery of arm function, where the current process of rehabilitation has been shown to have limited effectiveness.

- Referral for further therapy after completion of the rehabilitation program usually only occurs in response to a clear deterioration in function. Processes should allow active identification of any need for further therapy, rather than only reacting to problems once they occur.

- Stroke can result in a sudden and catastrophic change in abilities, lifestyle and independence, to which the person with stroke may react with a range of psychological responses. Depression can occur as a reaction to the stroke, or may be directly due to the stroke. Depression and other psychological responses are also common in families or carers of people with stroke (Burvill et al 1995; 1997).

- Although the majority of strokes affect older people, 50 per cent affect people less than 75 years, and at least 5 per cent affect people under 45 years (Anderson et al 1993a). Stroke rehabilitation programs do not always meet the specific needs of younger patients such as vocational rehabilitation or retraining.

Palliative care

There are some patients with progressive heart, stroke and vascular disease for which cure becomes improbable or impossible. These patients should have access to palliative care of good quality. This has been defined by the Australian Association for Hospice and Palliative Care as care delivering coordinated medical, nursing and allied services in an environment of the person's choice where possible. Optimum symptom control is the basis of palliative care and may include drug and non-drug methods (Hodder & Turley 1990). Essentially, palliative care emphasises the care of the whole person and should address the psychological, emotional and spiritual needs of patients, their family and their carers. Where necessary, material or financial support should also be available (DHSH 1994a).

4.3   Current approaches to treatment and secondary prevention

As discussed in Chapter 3, there is a growing focus on intersectoral collaboration in Australian heath care. The integration of services is especially important in the management of heart, stroke and vascular disease to ensure continuity of care and the best possible outcomes. This section discusses provision of services by Commonwealth, State and Territory health departments, general practitioners and non-government and community organisations, and also describes a range of activities in specific areas.

Government policies and approaches

Medical Benefits Scheme/Pharmaceutical Benefits Scheme

In 1997–98, the Australian Health Technology Advisory Committee (AHTAC) undertook reviews of coronary stenting and ambulatory blood pressure monitoring (AHTAC 1997a, 1997b), and also developed guidelines on workforce and planning for acute cardiac interventions (AHTAC 1994). The Medicare Services Advisory Committee (MSAC) has now been established to strengthen evidence-based decision making for the inclusion of new items on the Medicare Benefits Schedule (MBS). Under this measure, new and emerging technologies and procedures will be assessed in terms of their safety, clinical effectiveness and cost-effectiveness.

The Commonwealth's initiatives in assessing new (and older) pharmaceutical technologies used in the management of heart, stroke and vascular disease are coordinated through the PBS listing process and focus on Pharmaceutical Benefits Advisory Council (PBAC) assessment of evidence and cost-effectiveness. In 1997–98 a government-initiated review investigated PBS expenditure on cardiovascular drugs. PBAC has also convened national consensus conferences on the management of high cholesterol and of high blood pressure.

Coordinated Care Trials

An example of the trend towards intersectoral collaboration is Commonwealth collaboration with States and Territories in the Coordinated Care Trials, which are designed to explore better ways of providing for chronically ill people who have a continuing need for a range of health and community services. This approach is particularly relevant to heart, stroke and vascular disease as it is chronic, often present in combination with other problems such as diabetes, and services can be poorly coordinated. The Commonwealth and States have pooled the funds they would otherwise spend on health and community services, for participants in each trial. A care coordinator is responsible for developing a care plan, together with the patient and their general practitioner (in some cases the care coordinator is the general practitioner), and then using the funds pool to buy the different services outlined in the care plan.

NHMRC guidelines for clinical practice

The NHMRC has produced clinical practice guidelines, and consumer and general practitioner guides, on coronary heart disease (NHMRC 1996a; 1996b) and on stroke (NHMRC 1997a; 1997e; 1997f). The NHMRC updated and adapted for use in Australia the unstable angina guidelines of the United States Agency for Health

Care Policy and Research (NHMRC 1997g; 1997h). The NHMRC is also developing partnerships with organisations such as the NHF and professional colleges to facilitate the uptake of evidence-based health advice and practices.

The Health Advisory Committee of the NHMRC has developed *A Guide to the Development, Implementation, and Evaluation of Clinical Practice Guidelines* (NHMRC 1998), to assist external organisations such as professional colleges and peak bodies to develop guidelines for NHMRC endorsement. International collaborations would also facilitate development and adaptation of guidelines, and enable appropriate ongoing surveillance of published research to ensure such guidelines remain current.

Little is known about the impact of guidelines on use rates, health outcomes or costs. Infrastructure for the dissemination and implementation of clinical practice guidelines is fundamental to their success. The Department of Health and Aged Care (HEALTH) is funding a development project that involves clinicians to investigate, develop and implement models for an evidence-based practice approach to clinical guideline development and application. Health is also seeking ways to use information technology to inform consumers about treatment options and the progress of their care.

General practice and secondary prevention

The role of general practitioners in secondary prevention is particularly important, given the difficulties people with established heart, stroke and vascular disease have in maintaining a healthy lifestyle (Campbell et al 1998; Pearson & Fuster 1996; Moher & Weston 1997). General practitioners play an important part in reinforcing lifestyle changes such as smoking cessation, regular physical activity and good nutrition as well as controlling high blood pressure and high cholesterol. General practitioners can also reinforce patient compliance with medications such as aspirin or beta blockers. This requires regular and structured follow-up by the general practitioner and is enhanced by reminder systems that prompt high-risk patients to return for review of their risk factors. Such systems are currently being evaluated in a number of trials.

The Cardiovascular Disease Alliance is a collaboration to improve general practice activity in treatment and rehabilitation. It comprises the Integration SERU of the Divisions of General Practice, the NHF (New South Wales Division) and the Pharmaceutical Partnership and is developing the following:

• a guide to currently accepted practice for Divisions addressing cardiac rehabilitation and treatment;

• draft sets of outcomes and indicators for Divisional programs in cardiac rehabilitation and treatment;

• case studies of how Divisions have tackled cardiac rehabilitation programs;

• production of a draft guide on developing Divisional shared-care programs in cardiac rehabilitation and the management of heart disease and stroke;

• a compilation of existing heart, stroke and vascular disease audits; and

• a Divisions database for patients with heart, stroke and vascular disease and diabetes which provides reminders to patients and general practitioners, audit data to health professionals on their quality of care against clinical management guidelines and data for evaluating the impact of programs on patient outcomes.

Community and non-government organisations

Heart Support-Australia (HSA) is a national, volunteer support organisation for heart patients and their families that works in collaboration with Divisions of General Practice, area health services, community health and hospitals, Cardiomyopathy Association, Heart Children and Diabetes Australia. HSA services complement formal rehabilitation programs. Through positive role modelling and peer support, HSA aims to encourage the maintenance of secondary prevention programs and compliance with medical advice, and enhance quality of life for patients and their families.

The *Australian Cardiac Rehabilitation Association* (ACRA) represents a network of health practitioners throughout Australia, delivering cardiac rehabilitation services to patients admitted to hospital with an acute coronary syndrome or undergoing revascularisation. In addition, ACRA prepares practical guidelines for health professionals for the delivery of cardiac rehabilitation services — a practitioners' guide to cardiac rehabilitation is scheduled for publication in 1999.

The *National Heart Foundation* provides guidelines and policy advice as well as Australia-wide support and resources for the planning, implementation and evaluation of cardiac rehabilitation programs.

The *Heart Research Centre*, based in Melbourne, conducts research locally into cardiac rehabilitation. It has developed *Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention* (Goble & Worcester 1999).

The *National Stroke Foundation* is currently undertaking a cost-benefit analysis of stroke morbidity and mortality to identify areas for investment that would simultaneously improve health outcomes and reduce national health costs over the long term. The project aims to develop a model to enable the likely impact of various policy initiatives to be assessed at a strategic level.

The *Brain Foundation* has initiated several programs aimed at improving support for people affected by stroke and their carers and providing education on stroke for general practitioners and for carers of people affected by stroke.

Patient support groups can play an important role in redressing access inequities and under-resourcing, particularly in rural areas. As well as HSA referred to above, there are a number of other groups including the Open Heart Association, the Cardiomyopathy Association, and Heart Beat (in Victoria, South Australia and Tasmania).

Current activities in treatment, secondary prevention and rehabilitation in Australia

The Commonwealth and States and Territories, sometimes in collaboration with health and community organisations, have undertaken many programs that aim to improve services. This section is representative of the scope of activity in this area and is not meant as a comprehensive list of all programs in this country.

Management and treatment

Emergency treatment

- The Commonwealth medical emergency team model offers a systems approach to emergencies in hospitals replacing existing cardiac arrest teams. It involves identifying seriously ill and at-risk hospital patients using hospital-wide criteria followed up by rapid and appropriate management of these patients.

- An emergency medical response pilot has been established in Victoria to determine whether the simultaneous dispatch of both Metropolitan Fire Brigades Board and Metropolitan Ambulance Service resources to cases of suspected cardiac arrest will lead to more rapid defibrillation.

- The Survival 2001 initiative in Victoria will develop community emergency response teams in isolated or difficult to access areas and/or in areas of steady population growth; develop a targeted community training program in CPR; and evaluate different community emergency response and CPR service delivery models and their overall program outcomes.

- The Queensland Rural Divisions Coordinating Unit has collaborated with the NHF and St Andrew's Hospital to produce a broadcast on cardiac emergencies. This project was supported by the Rural Health Education Foundation and has utilised satellite viewing sites in both public and private hospitals.

Management

- The Commonwealth's National Hospital Demonstration Program via Royal Hobart Hospital is establishing clear admission criteria and placing patients on the appropriate clinical pathway to standardise the care process. Chest pain, unstable angina and heart attack pathways have been developed.

- The Care Net Illawarra Coordinated Care Trial in New South Wales involves people with a cardiovascular condition referred by their general practitioner. The Trial has developed 'prompt sheets' to aid care coordinators in the development of care plans, with a focus on heart, stroke and vascular disease as the first of the top six categories of disease to target.

- The Congestive Heart Failure and Rehabilitation Management (CHARM) Study in New South Wales is a pilot study to develop and implement a best-practice program for the management of congestive heart failure, both within hospital and in the community after discharge, based on current best evidence.

- The NSW Health Department has developed implementation strategies for national guidelines for thrombolysis for heart attack and for unstable angina in collaboration with the NHF (New South Wales Division). As well, the implementation of a summary version of the NHMRC unstable angina guidelines (NHMRC 1997g) is being evaluated in collaboration with the Centre for Clinical Epidemiology and Biostatistics.

- Guidelines on prevention and management of stroke (NSW Stroke Working Group 1999a; 1999b) have been developed, primarily for general practitioners. As well, the New South Wales Stroke Expert Working Group was established to advise NSW Health on the development of policies and strategies for stroke prevention and management, and provide a broad framework for the development of local strategies.

Current approaches to treatment and secondary prevention

- An audit package for carotid endarterectomy has been developed and will be piloted (retrospectively) in all major centres, with the collaboration of over 36 hospitals and 48 clinicians within New South Wales. The first prospective State-wide audit of carotid endarterectomy will occur over the next 12 months. A stroke audit package, including a population-based service audit and a clinical audit is also under development in New South Wales.

- In 1996 a Victorian Stroke Strategy Taskforce was established jointly by the State Department of Human Services and the National Stroke Foundation. The Taskforce produced an overview of the impact of stroke and a review of key services in the State. At the same time, a major project aimed at evaluating the benefits and critical elements of hospital stroke units was funded. Community education on stroke prevention and carer support have been addressed through a number of projects, with particular focus on rural issues, ethnic communities and the role of general practitioners.

- The National Stroke Foundation has initiated a two-year study into cost-effective stroke care in Victoria. The study will prospectively collect comparative data from three Victorian hospitals with different methods of acute stroke management, with the aim of defining costs and benefits of different approaches to stroke care.

- The Brain Foundation Victoria is developing a Stroke Resource Guide for general practitioners to assist them in their management of the care of stroke patients.

- The West Moreton Cardiovascular Outcomes Project in Queensland, a collaboration between public and private hospitals, community health, public health and the Division of General Practice, aims to improve cardiovascular outcomes for its population (which has higher rates of heart, stroke and vascular disease than the State average). The project also aims to analyse the acute management of acute coronary heart disease and secondary prevention measures.

- A clinician-initiated study examining clinical outcomes and self-assessed health status for coronary bypass surgery patients is being conducted at the Prince Charles Hospital in Queensland.

- In South Australia, new models of care will be developed from knowledge and experience gained from the Coordinated Care Trials. Two projects, Heartplus and Aged Care, focus on people with heart, stroke and vascular disease, and involve Regional Demonstration Units, general practitioners, eligible patients, service coordinators, carers and other consumers, service providers and evaluation staff. HealthPlus has also developed practice guidelines for managing congestive heart failure.

- In Western Australia, the State Government supplied funds for new, world-class facilities at Fremantle Hospital which will provide patients with a continuity of care that was previously not possible for the people of Fremantle.

- Royal Perth's 12-bed stroke unit was the first purpose-built stroke treatment facility in Australia. In a recent randomised trial, patients treated in the stroke unit were found to have significantly better outcomes than those who were not.

Management and treatment

- In the Northern Territory, standard treatment protocols for chronic conditions have been developed as part of the Tiwi and Katherine West Coordinated Care Trials. These are being introduced in community health and specialist services and are of particular benefit in remote communities, where lack of onsite medical services and high staff turnover hinder continuity of care.

- Multi-disciplinary programs are in place at the three public hospitals in Tasmania to target patients who have undergone cardiac surgery.

Secondary prevention and rehabilitation

- Hunter on the Move is a demonstration project jointly coordinated by Cardiovascular Medicine, John Hunter Hospital and the Hunter Division of the NHF (with funding from NSW Health). The project aims to improve the availability of appropriate community-based physical activity programs for people with known heart disease and those at high risk of heart disease.

- The New South Wales State Department of Health has developed policy standards for cardiac rehabilitation to provide further support for consistent delivery of evidence-based services (Schacht et al 1997).

- The Hunter Outpatient Cardiac Care Study is a collaborative project using a prospective design to determine which patients are referred to outpatient rehabilitation following a cardiac-related hospital admission. The NSW Health Policy Standards for Cardiac Rehabilitation currently being developed will be used to determine eligibility for attendance.

- The Consumer Information Resources Project is a qualitative research project in New South Wales addressing the support and information needs of people following stroke and their carers.

- A coordinated set of activities aims to enhance Victoria's network of cardiac rehabilitation and secondary prevention programs. The initial target of every hospital providing cardiac treatment offering access to a phase II rehabilitation program was met in 1997. Further work is now being undertaken to develop best-practice guidelines, establish data systems to monitor participation levels and create program evaluation tools. A State-wide forum to develop a coherent strategy on cardiac rehabilitation was held in late 1997.

- Through the Victorian Carers Initiative, the Brain Foundation has been funded to provide specialist carer support and respite to people living in Eastern Melbourne affected by stroke, and is coordinating a State-wide carer education program for carers of people affected by stroke (and other neurological conditions).

- The Queensland Division of the NHF is developing a manual for rural and remote health workers in cardiac rehabilitation and secondary prevention.

- Health Promotion staff from the Flinders Medical Centre in South Australia trialed a new approach to long-term community-based cardiac rehabilitation. Patients with unstable angina were invited to develop their own rehabilitation. Social support was found to be a vital component. Gentle physical activity of appropriate intensity was established on a regular basis, even among older participants, resulting in considerable functional improvement. A self-managed support group now exists. Results from this study show reduced re-admission to hospitals.

Current approaches to treatment and secondary prevention

- The 1998 opening of the Cardiothoracic Surgical Unit in The Canberra Hospital increased the proportion of people able to access post-critical care and rehabilitation through the Heart Education And Rehabilitation Training (HEART) program. The program has a multidisciplinary focus and incorporates access, entry assessment and care planning, implementation of care, evaluation, separation and community management. The program involves three phases including education, a supervised physical activity program and peer support, and encourages the participation of families and friends of clients. Comprehensive data collection during the program allows evaluation of outcomes.

- In Tasmania, the Brain Foundation has established an extensive post-stroke support scheme for stroke sufferers and carers with organisational linkages with training programs in hospitals, rehabilitation centres, nursing homes and the University of Tasmania, as well as work skill disability courses with TAFE.

5 Potential gains from interventions to prevent and treat heart, stroke and vascular disease

Chapters 3 and 4 described the contribution that both prevention and management have made to the significant decline in heart, stroke and vascular disease over the last 30 years in Australia, and the extent of knowledge on which to base further endeavours. This chapter illustrates the potential for further reductions in morbidity and mortality if effective preventive and treatment strategies are used for the whole population and for high-risk groups, for both coronary heart disease and stroke.

The potential for reducing heart, stroke and vascular disease and the methods for achieving health gains vary for different groups of people. For example, for people with high blood pressure, the risk of having a heart attack or stroke can be reduced substantially by drug treatment to lower their blood pressure. Even for people without high blood pressure, the cardiovascular risk can be reduced by managing blood pressure through preventive strategies such as reducing overweight and obesity or lowering dietary salt intake. Similarly, there can be large benefits from reducing the average cholesterol level of the entire population, not just of those with high levels.

5.1 Coronary heart disease

This section looks at the main effects of prevention and treatment on coronary heart disease risk.[7] First, preventive approaches can reduce the incidence of coronary 'events' (heart attack or coronary death), many of which will prove to be fatal once they occur. This will reduce the number of deaths by reducing the number of cases. Second, fatalities can be reduced further by improved treatment of those who do have an event. Thus, overall coronary deaths can be lowered by both reducing the incidence and the case fatality.

Table 5.1 summarises the falls in the prevalence of major risk factors and the resulting reduction in risk of a coronary event, based on evidence from the latest literature on randomised trials and population studies. The estimates are given for people without any history of coronary heart disease, with or without elevated risk factors, and for people with established coronary heart disease. The term 'high-risk strategy' is used to describe medical interventions in people with elevated risk, for example, because they have high blood pressure. The term 'population strategy' is used to describe interventions that can benefit everyone, for example changes in diet. The table also examines the reduction in risk of death during an acute episode associated with various medical therapies.

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7 The estimates are taken from early work by the University of Newcastle, which will be published by the AIHW in 1999 after further refinement and peer review. Further details of the methodology, assumptions and limitation will be given in the published report.

Potential gains from interventions

Table 5.1: Estimated reduction in risk of suffering a major coronary event, or death during an acute episode, associated with reduction in risk factors or with medical therapy[*]

Risk factor reduction/ treatment	Study	Biological stage of coronary heart disease		
		Without established coronary heart disease	Acute phase	With established coronary heart disease
Smoking	English et al 1995	67% lower risk for never smokers aged < 65 years; 40% lower risk for never smokers aged ≥65 years	NA	67% lower risk for never smokers aged < 65 years; 40% lower risk for never smokers aged ≥65 years
Blood pressure	Collins et al 1990	*Population strategy* 14% reduction for a 5–6 mmHg reduction in diastolic BP *High-risk strategy* 14% reduction in risk	NA	*High-risk strategy* 14% reduction in risk
Cholesterol	Law et al 1994; Gotto 1996	*Population strategy* 17% reduction for a 0.6 mmol/L reduction in cholesterol *High-risk strategy* 31% reduction in risk	NA	*High-risk strategy* 34% reduction in risk
Physical inactivity	Manson et al 1992; O'Connor et al 1989	35–55% for active compared with physically inactive	NA	20% for active compared with physically inactive
Obesity	Manson et al 1992	35–55% for desirable weight compared with obesity	NA	
Aspirin	Antiplatelet Trialists Collaboration 1994	8% reduction in vascular events (includes stroke)	21% reduction	19% reduction in vascular events (includes stroke)
Beta blockers	Wikstrand et al 1991; ISIS-I Collaborative Group 1986; Yusuf et al 1985	24% reduction for beta blockade compared with diuretics	15% reduction	20% reduction
Calcium antagonists	Yusuf et al 1990	No significant difference	No significant difference	No significant difference
ACE inhibitors	Lonn et al 1994; Mant & Hicks 1995	NA	15% reduction	23% reduction
Streptokinase	Fibrinolytic Therapy Trialists' Collaborative Group 1994	NA	18% reduction	NA
Coronary angioplasty		NA		No difference from treatment with coronary bypass surgery
Coronary bypass surgery	Yusuf et al 1994	NA		Reduction in risk of death of 68% for LM disease, 42% for 3 vessel disease, 23% for 2 vessel disease

[*] Calculations assume that the benefit of increased medical therapy applies to all subjects who are likely to benefit from it.

Note: BP = blood pressure; LM = left main artery.

This evidence was used as the basis for estimating the potential reduction in coronary events by measures covering the entire Australian population. The estimation involves several steps:

- The adult population aged 35–79 years is divided into three groups based on their level of coronary risk and whether or not they have heart disease:

  — people with no known history of high blood pressure, high blood cholesterol or coronary disease (Group I);

  — those with a known history of hypertension or high blood cholesterol but without any evidence of coronary heart disease (Group II); and

  — those with a known history of coronary heart disease (Group III).

  The percentage of the population in each group was estimated from the 1995 National Health Survey of Australians (ABS 1997a).

- Calculations are then made of approximately how many coronary events occur in each of the three groups. These estimates are based on the findings of studies of risk factors, treatments and coronary events in Perth and Newcastle during the 1980s and 1990s as part of a multi-country project coordinated by the WHO.

- It is also assumed that more people with known high levels of blood pressure or blood cholesterol receive drug treatment and that risk factor reductions can be achieved in various subgroups. These changes are:

  — a fall in the prevalence of cigarette smoking by 50 per cent in all groups;

  — reducing the prevalence of physical inactivity to 25 per cent in all groups;

  — reducing by 50 per cent the proportion of people with known high blood pressure or high blood cholesterol who are not receiving treatment (for example, 82 per cent of people in Group II reported having high blood pressure, and 70 per cent were on treatment but 12 per cent were not; so if the proportion untreated were halved there would be a total of 76 per cent receiving drug treatment and the remaining 24 per cent [6 per cent with hypertension and 18 per cent without] would receive the benefit of the population strategies);

  — lowering the average level of cholesterol by 0.5 mmol/L in people who are not receiving drug treatment for high blood cholesterol; and

  — lowering the average level of diastolic blood pressure by 4 mmHg in people who are not receiving drug treatment for high blood pressure.

While these changes are somewhat arbitrary they are seen as achievable within five to ten years, based on past experience of risk factor reductions in Australia and elsewhere.

Finally, the gains from the prevention and treatment interventions, expressed as percentage falls in rates or numbers of coronary events, are estimated. The potential gains are estimated separately for each risk group by age and sex. The percentages of people in Groups I, II and III and the percentages of coronary events that occur in these groups are shown in Table 5.2.

Table 5.2: Percentage of population aged 35–79 years in various risk groups and percentage of coronary events in each group

Group	Level of coronary risk	Percentage of population	Percentage of coronary events
I	People with no history of hypertension, high blood cholesterol or coronary heart disease	72	21
II	People with a history of hypertension or high blood cholesterol but not coronary heart disease	23	48
III	People with a history of coronary heart disease	5	31
Total		**100**	**100**

Source: 1995 National Health Survey and the World Health Organization's MONICA Project collaborating centres in Perth, Western Australia and Newcastle, New South Wales.

Potential gains from interventions

The potential reductions in rates of coronary events that could be achieved through various prevention and treatment strategies for Groups I, II and III are shown in Figures 5.1, 5.2 and 5.3 respectively. The combined effects of risk factor reductions and treatment are also shown, as they are not simply the sum of the component parts (Sturmans et al 1977).

Group I

This is a large group (72 per cent of all persons in Australia aged 35–79 years). They have relatively low risk of coronary heart disease as individuals but, even so, 21 per cent of all coronary events occur in this group. Their risk could be reduced if the average levels of blood pressure and cholesterol in the population were lowered, by improvements in diet, exercise and weight, and if the prevalence of cigarette smoking and physical inactivity were reduced.

Figure 5.1: Reductions (per cent) in coronary events achievable in people with no history of hypertension, high blood pressure or coronary heart disease (Group I)*

* If the average level of cholesterol was reduced by 0.5 mmol/L, the average level of diastolic blood pressure by 4 mmHg, the prevalence of cigarette smoking halved and the prevalence of physical inactivity reduced to 25 per cent.
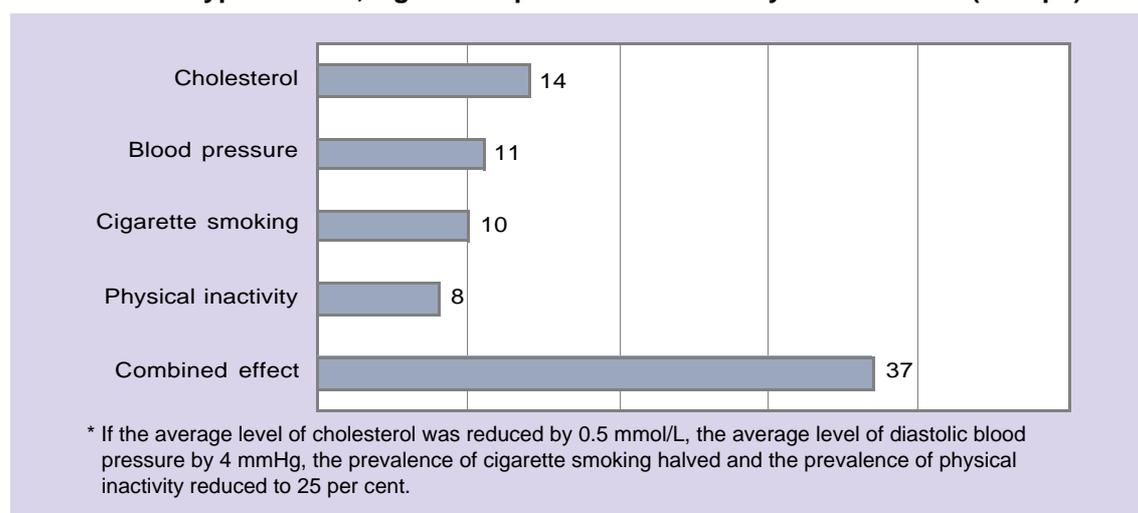
These estimates show that substantial gains could be achieved with reductions in risk factor levels. Overall, it is estimated that the rate of coronary events in this group could be reduced by 37 per cent.

Group II

This group comprises 23 per cent of the population but suffers 48 per cent of coronary events, and is therefore an important group for risk reduction. For those with high blood pressure or high blood cholesterol, increasing the proportion who receive medical treatment and other special measures is an important strategy for reducing risk. This should be complemented by reductions in the prevalence of cigarette smoking and physical inactivity and by population-based strategies to lower the average levels of cholesterol and blood pressure in those who do not receive medical treatment for hypertension or high cholesterol.

Figure 5.2: Reductions (per cent) in coronary events achievable in people with a history of high blood pressure or high blood cholesterol but no known coronary heart disease (Group II)*

* If levels of cholesterol and blood pressure were lowered by drug treatment (high-risk strategy) and other means (population strategy), the prevalence of cigarette smoking halved and the prevalence of physical inactivity reduced to 25 per cent.
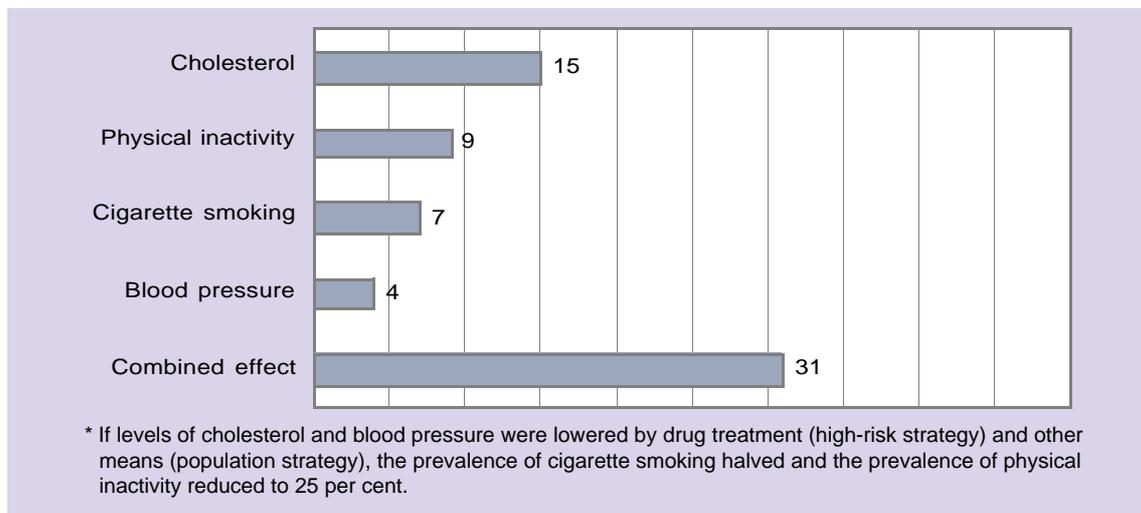
The gains in this group from various interventions are similar to those for Group I. Reductions in levels of cholesterol through drug treatment of those with high cholesterol levels and dietary change and other strategies for the others, and reductions in the prevalence of physical inactivity and cigarette smoking, are most important. Together with drug treatment for high blood pressure, the combined effect is estimated to be a 31 per cent reduction in coronary events in this group. The relatively smaller gains from blood pressure control, compared to the other interventions, is due to the fact that a high proportion of people in this group are already on treatment for high blood pressure so there is less room for further gains.

Group III

This is a small group (5 per cent of the population in this age group) but they are at high risk of recurrent events and death. This group accounts for 31 per cent of the coronary events. Their risk can be reduced by aggressive medical treatment including coronary bypass surgery, coronary angioplasty, and treatment with aspirin, beta blockers and ACE inhibitors, as well as other drugs aimed specifically at control of high blood pressure or high blood cholesterol. Reductions in the prevalence of smoking and physical inactivity can further reduce their risk. They would also benefit from population-based strategies to improve diet, exercise and other lifestyle factors.

Potential gains from interventions

Figure 5.3: Reductions (per cent) in coronary events achievable in people with a history of coronary heart disease (Group III) through medical and surgical treatment as well as lifestyle changes
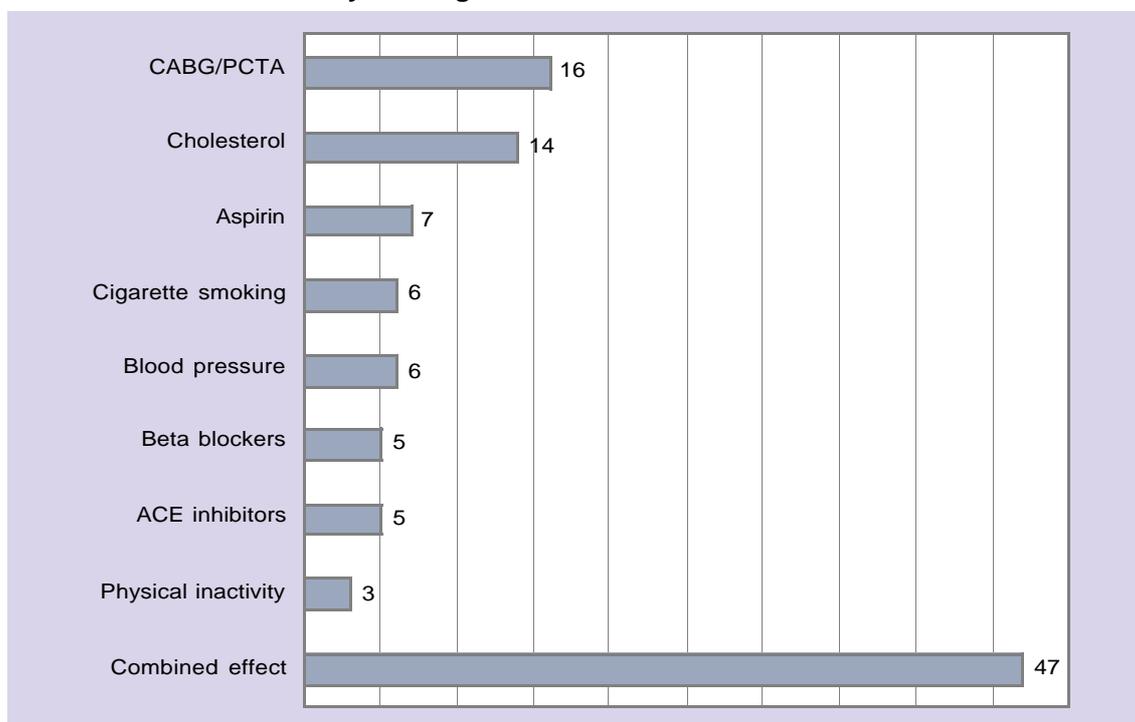
For Group III, a reduction in coronary events of about 16 per cent can be achieved through more extensive use of coronary bypass surgery and coronary angioplasty for revascularisation. Lowering cholesterol and blood pressure, by drug treatment in half of those with elevated levels but who are not already being treated, and by diet and other means in the rest, is also important. Higher use of aspirin and other drugs, such as beta blockers and ACE inhibitors, would lead to further gains. Reductions in prevalence of cigarette smoking and physical inactivity could also make important contributions. Overall, it is estimated that around 47 per cent of coronary events in this group could be prevented by these means.

Treatment of heart attack

It is also possible to estimate the additional lives that could be saved through optimal acute treatment of people who are having a heart attack (Figure 5.4). Early administration of thrombolytic therapy has an important role. If aspirin, ACE inhibitors and beta blockers were also used in all eligible patients it is estimated that the risk of death in those who reach hospital alive could be reduced by 12 per cent. The smaller potential gains from acute care are due to the relatively high levels of good quality treatment already used in Australia.

Cardiac rehabilitation has an impact in reinforcing preventive strategies including modification of lifestyle and compliance with pharmacological therapies.

Figure 5.4: Reductions (per cent) in case fatality achievable through acute treatment of people with a heart attack
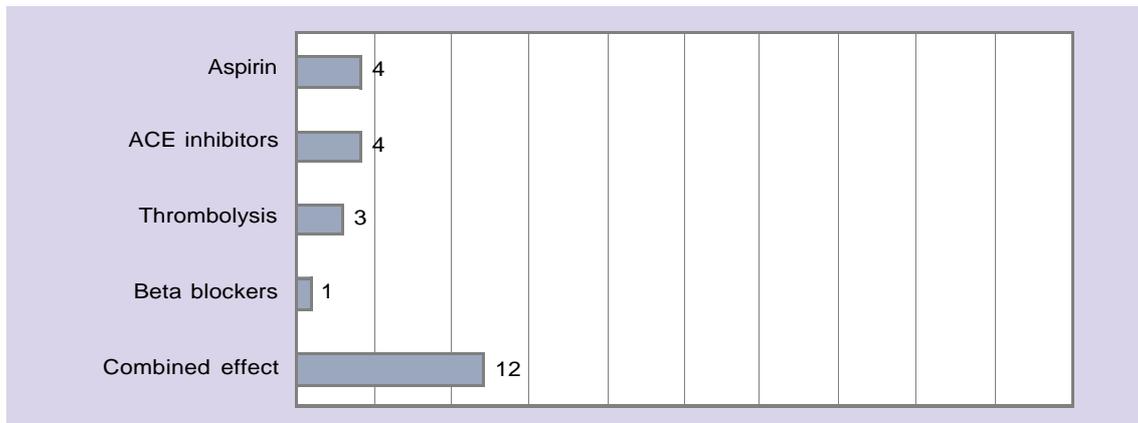
Integrated approaches to prevention and management

Table 5.3 shows the percentages of coronary events and deaths that could be avoided in the Australian population aged 35 to 79 years by improved intervention in each of the three risk groups and through improved acute management of patients with heart attacks. Overall, it is estimated that 38 per cent of events could be prevented. In Group II the benefits could be achieved through reductions in smoking and physical inactivity and drug treatment and lifestyle changes for people with high blood cholesterol or high blood pressure. Medical treatment for people with established coronary heart disease, Group III, could result in another 15 per cent of events prevented. While the greatest opportunities for gain are in Groups II and III, prevention in Group I is very important as it can stop people moving into the other groups where the risks of morbidity and mortality and the costs of treatment are much higher.

In total, it is estimated that 41 per cent of deaths could be prevented. The greatest gains, 17 per cent, are achievable in Group III, mainly through aggressive secondary prevention. Another 13 per cent could be saved from Group II by a combination of effective medical treatment of known conditions and by reductions in the average level of cholesterol and prevalence of smoking and physical inactivity.

Table 5.3: Percentage of coronary events potentially preventable through improved interventions

Outcome	Percentage of coronary events	Percentage of coronary deaths
Preventable through interventions in		
Group I	8	7
Group II	15	13
Group III	15	17
Acute treatment of heart attack		4
Subtotal	*38*	*41*
Non-preventable	62	59
Total	**100**	**100**

The percentage reductions in coronary events shown in these figures are estimates based on a number of assumptions. As already stated, risk factor prevalence and risk reduction estimates were obtained from the scientific literature and recent Australian data. The changes assumed for some risk factors, such as the 4 mmHg reduction in blood pressure, and improvement in the use of effective medical treatment are considered feasible within five to ten years. The feasibility of other changes, such as halving in the prevalence of cigarette smoking and reducing the prevalence of physical inactivity, to the national target of 25 per cent (from 30–40 per cent), is less well established.

Some risk factors have not been considered directly, for example, overweight and obesity, fat intake and other aspects of nutrition. Additional gains could be expected through improvements in diet, reductions in overweight and obesity and increased exercise levels in those who already undertake some physical activity. Appropriate drug dosage, cardiac rehabilitation, the most up-to-date interventions (such as use of angioplasty during a heart attack and the trend to use drug treatment to lower cholesterol levels in everyone with coronary heart disease) have not been taken into account. Nevertheless, the estimates given here relate to the major modifiable determinants of risk of coronary events and they can be used to calculate approximate gains achievable through well-targeted interventions.

5.2   Stroke

At this time, less detailed information is available for assessment of the potential impact of various interventions on stroke than for coronary heart disease. However, it is known that the impact of stroke can be reduced, mainly by primary prevention, and also by effective management of acute stroke and secondary prevention.

Prevention

The underlying causal and modifiable risk factors for stroke are the same as for coronary heart disease, so the overall prevention strategies are also the same. Therefore, the above discussion of potential benefits for coronary heart disease from reductions in risk factor levels will also apply to stroke, although the percentage reductions may differ.

The most effective strategy for reducing the incidence of stroke is likely to be a lowering of the average blood pressure of the population, through reducing salt intake, alcohol consumption and body weight of the population. In addition, the incidence of stroke, particularly in the young, could be substantially reduced by reducing the prevalence of cigarette smoking, alcohol abuse and physical inactivity, and improvement in nutrition to lower saturated fat intake.

Acute management

About 25 per cent of people who have a stroke die within one month and about 60 per cent are dead or dependent at 12 months after the stroke (Anderson et al 1994; Bamford et al 1988). The aim of acute stroke management is to minimise death or dependency after stroke. As discussed in Section 4.1, the most effective treatments for reducing death and dependency are organised care by a coordinated multidisciplinary team in a stroke unit, and treatment with aspirin. As can be seen from Table 5.4, both approaches are likely to be effective and at relatively low cost. The development of stroke units often requires only the re-organisation of existing services, and aspirin therapy is inexpensive, safe and effective. While thrombolytic therapy is effective in some patients, it carries risks, it is expensive and is only appropriate for a minority of patients. Further data are required before it becomes a routine form of management.

Table 5.4: Effectiveness of acute stroke management approaches in reducing death and dependency after stroke

	Target population (% acute stroke patients)	Odds reduction* (%)	Absolute risk reduction* (%)	Lives benefited* per 1,000 patients treated	Patients treated to save one life *
Stroke units	80#	29	6.0	60	15
Aspirin	80#	5	1.2	13	83
tPA**	5	25	6.5	65	15

This assumes that all of those admitted to hospital with acute stroke are given the treatment.

* Terms defined in Appendix 3, page 180.

** tPA is only likely to be applicable in about 5 per cent of all strokes so the total impact on stroke is likely to be minimal in comparison to that from management in stroke units.

Source: Hankey (in press).

Secondary prevention

The secondary prevention strategies with the greatest potential to reduce recurrent stroke are: anticoagulation for high-risk individuals in atrial fibrillation (8 per cent); blood pressure lowering drug therapy (7 per cent); smoking cessation (4 per cent); aspirin (4 per cent); cholesterol-lowering drug therapy with statins (at least 3 per cent); and least of all carotid endarterectomy in symptomatic individuals (1–2 per cent).

If all those with TIA or stroke were to lower their diastolic blood pressure by 5–6 mmHg through changes in lifestyle (and medication if necessary), these costs would be far less and about twice as many strokes would be prevented (Rose 1992).

Table 5.5 shows that the most cost-effective strategies of secondary prevention of stroke are appropriate use of anticoagulants, aspirin, diuretics and other anti-hypertensive agents, and smoking cessation.

Potential gains from interventions

Table 5.5: Summary of the cost-effectiveness of different strategies for the secondary prevention of stroke

Strategy/ intervention	Target population ('000s)	Stroke risk per year (%)	Relative risk reduction (%)	Absolute risk reduction (%)	No. of strokes avoided per year	Strokes avoided per year (%)	No. of TIA or stroke patients needed to treat	Cost per stroke avoided ($)
BP-lowering therapy	80	8.75	28	3.32	2,660	6.70	30	900 (diuretic)
Smoking cessation	48	8.75	33	2.89	1,400	2.90	34	0 (voluntary)
Cholesterol-lowering drug therapy	64	8.75	24	2.54	1,624	4.10	39	27,300
Antiplatelet therapy								
Aspirin	120	8.75	25	2.19	2,625	6.60	46	460
Clopidogrel	120	8.75	33	2.89	3,500	8.80	34	68,000
Aspirin + dipyridamole	120	8.75	37	3.24	3,885	9.70	30	18,000
Anticoagulant therapy	32	12.00	70	8.00	2,560	6.40	12	1,200
Carotid endarterectomy								
Symptomatic	10	13.00	65	8.50	1,360	3.40	11	77,000
Asymptomatic	80	2.00	55	1.00	880	2.20	91	637,000

Notes: Relative risk reduction was calculated by dividing the difference in risks between the control and treatment groups by the risk in the control group. For explanation of 'absolute risk reduction' see Appendix 3, page 180.

BP = blood pressure.

Source: Hankey (in press).

5.3 Other cardiovascular conditions

Much less is known about the potential for interventions to reduce vascular disease and heart failure, although vascular diseases share many of the same risk factors as coronary heart disease and stroke, and the same primary and secondary prevention strategies should be of benefit.

Vascular disease and heart failure occur predominantly among older people, and are likely to increase significantly as the population ages. In addition, most people with these diseases also have other cardiovascular conditions, and the major cause of mortality in these people is atherosclerosis. Data from the Framingham study indicate that within 18 months of diagnosis with intermittent claudication, 4 per cent of patients will have a cerebrovascular event, 4 per cent will have a peripheral vascular event, and 3.4 per cent will have a coronary event (Violi et al 1996). Within 10 years of onset of intermittent claudication, 43 per cent of patients develop coronary heart disease, 21 per cent have a stroke and 24 per cent develop heart failure (Kannel 1996).

5.4 Conclusions

This chapter demonstrates the likely benefits of various strategies through targeting specific interventions to appropriate groups in the population. This knowledge can be used to base further endeavours in the control of heart, stroke and vascular disease.

The analyses presented here illustrate the importance of both prevention and treatment targeted to particular risk groups. For example, for coronary heart disease it is estimated that there could be about 38 per cent fewer coronary events and 41 per cent fewer deaths in people aged 35–79 years in Australia if the interventions considered here were fully implemented. Reductions in the average levels of cholesterol and blood pressure and the prevalence of smoking and physical inactivity are important for the whole population and would save lives from heart, stroke and vascular disease, as well as other diseases such as some cancers and diabetes.

In addition, more widespread and appropriate use of effective drug therapy would produce significant reductions in morbidity and mortality from heart, stroke and vascular disease. The importance of medical interventions may, in fact, have been underestimated, as newer treatments may be more effective than the better established ones for which good risk reduction data are available.

Although the estimates of potential reductions in coronary events are impressive, the overall benefits would go beyond coronary heart disease. For example, treatment of high blood pressure reduces risk of both coronary heart disease and stroke. Quitting smoking also reduces the risk of peripheral vascular disease. If the risk of heart disease were lowered, there would be reductions in hospital admissions for unstable angina and less need for revascularisation procedures. Also, if there were fewer heart attacks there would be reductions in numbers of heart failure.

Potential gains from interventions

The same risk factors, such as high blood pressure, and the same treatments, such as aspirin, are shared by a range of conditions as well as stroke and peripheral vascular disease. Therefore, the range of preventive and treatment strategies considered here have the potential for health benefit across a spectrum of disease.

It is important to emphasise 'broad-spectrum' and integrated approaches to both prevention and treatment. The means by which these may be achieved are considered in Chapter 8, along with some opportunities for directing future effort towards enhancing lifestyle change and improving care.

6 Special populations

This chapter examines the higher mortality and disease burden from heart, stroke and vascular disease among Indigenous Australians, in remote areas of the country and among socio-economically disadvantaged groups, and outlines the kinds of measures that will be required to lessen inequalities in cardiovascular health. There is considerable overlap between these groups, and they share some of the factors that contribute to higher risk, such as higher rates of smoking. Reduced access to prevention programs, and use of treatment services that is not as high as it should be given the level of disease, are other determinants of health. It is particularly important to tackle the underlying causes of inequalities in health, through intersectoral action and changes in public policy.

6.1 Indigenous populations

Mortality

Heart, stroke and vascular disease is the biggest single cause of excess deaths in Indigenous Australians (Ring & Firman 1998). In Australia, mortality from heart, stroke and vascular disease is higher in Indigenous people than in non-Indigenous people (Table 6.1). Mortality from stroke in the Indigenous population is about double that in the non-Indigenous population, with males at greater risk than females. The most striking difference is in mortality from rheumatic heart disease.

Table 6.1: Death rates and rate ratios, by Indigenous status, selected heart, stroke and vascular disease, 1994–1996

	Males			Females		
Disease	Indigenous	Non-Indigenous	Rate ratio	Indigenous	Non-Indigenous	Rate ratio
Coronary heart disease	315.0	196.4	1.6	182.9	112.5	1.6
Stroke	157.2	65.2	2.4	135.4	62.9	2.2
Rheumatic heart disease	15.0	1.2	12.5	17.2	2.1	8.2
Circulatory system diseases	625.0	322.2	1.9	437.4	223.9	1.9

Notes: Rate ratio = Indigenous:non-Indigenous rate.

The rates, given as per 100,000 persons, are based on data from Western Australia, South Australia and the Northern Territory, age standardised to the 1991 population.

Source: Mathur & Gajanayake (1998).

Coronary heart disease is the major cardiovascular cause of death for Indigenous people, representing 55 per cent of deaths among males and 41 per cent among females in 1994–1996. Among Indigenous females, death rates for heart, stroke and vascular diseases have been declining, while among Indigenous males no change in death rates has been noted in the last five years (Mathur & Gajanayake 1998).

Comparison with other Indigenous populations

Current levels of coronary heart disease and stroke in the Indigenous population in Australia are substantially higher than those for the Indigenous populations of New Zealand and the United States. During 1990–1994 the mortality rate from coronary heart disease among the Australian Indigenous population was 33 per cent higher than the corresponding rate for Maoris. Mortality rates for stroke and hypertension were two to six times higher than those for the other Indigenous populations (Ring & Firman 1998).

In the early 1970s, rates of stroke in Maoris were comparable with those of Indigenous Australians, while their rates of coronary heart disease were higher. In Maoris, both rates fell rapidly over the next 20 years. While it is recognised that the factors having an impact on the health of Indigenous peoples vary between countries, these findings suggest that if suitable preventive and therapeutic measures were taken, mortality from heart, stroke and vascular disease among the Australian Indigenous population could fall rapidly over the next several decades (Ring & Firman 1998).

Prevalence of risk factors in the Indigenous population

Several behavioural risk factors for heart, stroke and vascular disease are known to be more prevalent among Indigenous Australians than among their non-Indigenous counterparts. The risk factors compared here include smoking, alcohol use, obesity, diabetes and physical inactivity among persons aged 18 years or above (Table 6.2). National data are not available for the Indigenous population for high blood pressure or high blood cholesterol.

Table 6.2: Prevalence of risk factors for the Indigenous and non-Indigenous populations, 18+ years

Risk factor	Indigenous (%)	Non-Indigenous (%)	Rate ratio
Current smokers	51	23	2.2
High-risk alcohol use*	21	8	2.6
Obesity**	28	18	1.6
Diabetes	5.1	2.2	2.3
No physical activity#	40	34	1.3

* Proportion among those who reported any recent alcohol use.

** Based on measured height and weight, age standardised to the 1991 Australian population. The comparison is for Indigenous and all Australians.

Rates for current smokers, high-risk alcohol use, diabetes and no physical activity have not been age standardised due to insufficient sample size.

Relates to leisure time physical activity.

Note: Rate ratio = Indigenous:non-Indigenous rate.

Sources: ABS (1999); Cunningham & Mackerras (1998); AIHW analysis of 1994 NATSIS (ABS 1996) and 1995 NHS (ABS 1997c).

Smoking

Among Indigenous Australians, the rate of smoking is twice that in the general population. The National Health Survey has found that among Indigenous people 18 years and over, 56 per cent of males and 46 per cent of females are smokers — this is about twice the proportion found in the non-Indigenous population (ABS 1996). There are consistent reports that, in the Northern Territory, the pattern of tobacco consumption among Indigenous Australians tends to be heavy. According to one study, 30–50 per cent of young males in some Aboriginal communities report smoking over 25 cigarettes per day (Burns et al 1995) compared with 11 per cent of all similarly aged Australian males.

In urban areas, Indigenous people underestimate the risks associated with smoking, and are less likely to give up or reduce their tobacco intake than are non-Indigenous people (DHFS 1996). In a rural community studied by Hogg (1994), Indigenous people were more likely to be current smokers than were the general population living in capital cities. In Western Australia and the Northern Territory, rates of hospital admissions and deaths from tobacco-related conditions have been found to be much higher among Indigenous people than non-Indigenous people (Unwin et al 1994; 1995; Plant et al 1995; Cunningham & Condon 1996).

Alcohol

The proportion of Indigenous Australians who consume alcohol is lower compared with non-Indigenous people. However, it has been found that Indigenous people who drink are more likely to consume harmful quantities of alcohol than the general population (ABS & AIHW 1997; Hunter et al 1991; Hogg 1994).

Obesity

There is little difference in the proportion of overweight or obese people among Indigenous Australians (61 per cent) and all Australians (56 per cent). However, obesity itself is more common among Indigenous Australians (28 per cent) than all Australians (18 per cent) (see Table 6.2). Thirty per cent of Indigenous women are obese compared with 18 per cent of Australian women. Comparable figures for men are 25 per cent and 18 per cent.

Diabetes

According to the 1995 National Health Survey, Indigenous Australians have over twice the prevalence of diabetes of non-Indigenous Australians (Table 6.2). Other studies show similar results. During 1992–1994, mortality from diabetes among Indigenous people was estimated to be 15 times higher than that among their non-Indigenous counterparts (Anderson et al 1996). Available data suggest that the overall prevalence of diabetes among Indigenous adults is between 10 per cent and 30 per cent, at least two to four times that of the non-Indigenous population (de Courten et al 1998). A recent study of Indigenous children and adolescents has documented a high prevalence of Type 2 diabetes (2.7 per cent), and of risk factors for Type 2 diabetes and heart, stroke and vascular disease (Braun et al 1996). Pooled data from south-eastern and central Australian Indigenous people aged 20–49 years showed a 12 per cent prevalence of Type 2 diabetes, compared with 1 per cent in a Victorian country town sample of non-Indigenous people in the same age range (Guest & O'Dea 1992).

Physical inactivity

Indigenous people are more likely than non-Indigenous to report no physical activity in their leisure time. In 1995, 40 per cent of Indigenous Australians reported no physical activity for sport, recreation or exercise, compared to 34 per cent of the non-Indigenous population. Indigenous women of all ages are more likely than their non-Indigenous counterparts to be physically inactive. For men, this is only true for 18–44 year olds.

High blood pressure

While there are no national data on the prevalence of high blood pressure in Indigenous populations, data from the Kimberley region suggest that high blood pressure is two to three times more prevalent among Indigenous Australians than among non-Indigenous Australians (Smith et al 1992a). In the same group of Indigenous people, drinking and obesity were associated with high blood pressure. There was also a positive association between high blood pressure and cholesterol level, independent of the relationship of cholesterol with age and body mass index (BMI) (Smith et al 1992b).

Admissions to hospital and rates of heart, stroke and vascular disease procedures

Table 6.3 presents hospital separation rates for heart, stroke and vascular disease by Indigenous status in 1996–97, showing that, overall, Indigenous Australians are admitted to hospital at a substantially higher rate than the non-Indigenous population, particularly in rural and remote areas.

Table 6.3: Hospital separation rates for diseases and disorders of the circulatory system, by Indigenous status, 1996–97

Population group	Urban	Rural	Remote	Total
Indigenous	2,000	3,100	2,700	2,600
Non-Indigenous	1,600	1,700	1,400	1,700
Rate ratio	1.2	1.8	2.0	1.5

Notes: Does not include stroke.

Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Excludes Tasmania.

Rate ratio = Indigenous:non-Indigenous rate.

Source: AIHW National Hospital Morbidity Database (unpublished data).

Data from the AIHW hospital morbidity database[8] suggest that the rates of surgical and investigative procedures may be lower among the Indigenous than among the non-Indigenous population

National targets

A range of targets and indicators has been approved by AHMAC to monitor the performance of governments in improving the health of Indigenous Australians. The National Health Information Management Group will oversee the collection

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8   Data from South Australia, Western Australia and the Northern Territory for procedures, separations and uptake of treatment where the principal diagnosis was cardiovascular disease.

and publication of a national report against the indicators. OATSIH, in consultation with the Aboriginal Health Units will produce an analysis of the report which will be used for development of national policy and setting of priorities on Indigenous health.

The following targets are relevant to cardiovascular health:

• reduce mortality from coronary heart disease by 50 per cent by 2008;

• reduce mortality from rheumatic heart disease by 50 per cent by 2008;

• reduce mortality from diabetes by 20 per cent by 2008;

• reduce prevalence of smoking by 25 per cent by 2008; and

• reduce prevalence of overweight and obesity in the 25–64 year age group by 15 per cent by 2008.

Indigenous people — issues for health services

Poverty, lower education levels and cultural and racial barriers are the major issues that affect Indigenous Australians. The standard of facilities in Indigenous communities continues to be unacceptably low.

These conditions make access to mainstream prevention and treatment services difficult for Indigenous people. In remote areas, these difficulties are exacerbated by problems caused by distance. In addition, current models of funding and delivery of services do not reflect the increased needs of Indigenous populations. The principles of self determination in health care, embodied in the WHO Alma Ata declaration of 1978, are critical to improvements in Indigenous health.

Some of the health service issues and strategies to address them are discussed below.

Primary prevention and primary health care

The following issues regarding essential services and primary prevention apply to urban, rural and remote Indigenous populations, and more generally to remote populations. The strategies necessary to achieve goals in Indigenous health comply with those used in the health promotion framework discussed in Section 3.1.

Community activities that aim to deal with the underlying causes of ill health should be developed. Consistent with principles of self determination, communities should determine their own priorities and have opportunities to provide input regarding health care needs and to contribute to the development of policy which affects their health care. Comprehensive primary prevention programs should include the following.

• Assessment of risk factors with appropriate follow-up integrated into primary health care.

• Information and recall systems, including reminder and recall systems for opportunistic screening and interventions, and the generation and maintenance of registers. There should be performance indicators for agreed health service activities, and standard protocols for treatment of sore throat, rheumatic heart disease, coronary heart disease (including emergency management), diabetes and high blood pressure.

Special populations

- Sufficient well trained staff — comprehensive staff education should incorporate protocols, including regular updating of skills in cardiopulmonary resuscitation and locally appropriate cultural orientation.
- Adequate infrastructure including housing for staff and clinic facilities.
- Functional transport to allow people access to appropriate health care when needed.

Other issues specific to Indigenous populations include problems of access (discussed below) and the need to ensure that staff have the necessary cross-cultural skills to work effectively with Indigenous people. Another concern is the proliferation of vertical health-related programs from a variety of organisations, with little implementation or integration. There is a need for coordinated primary health care activity, and partnerships with Aboriginal Community Controlled Health Services, the National Aboriginal Community Controlled Health Organisation, and relevant government health services.

Priorities for prevention of coronary heart disease in the Indigenous population include:

- nutrition programs that include improved access to good quality affordable fresh fruit and vegetables in remote communities (Zatonski et al 1998; Leonard et al 1995; Lee et al 1994);
- reducing the prevalence of tobacco smoking, through a strategic multisectoral approach which addresses issues such as heavy patterns of consumption and the social and ceremonial significance of tobacco in traditionally oriented Indigenous communities (DHFS 1996);
- increasing physical activity;
- reducing the prevalence of harmful and hazardous consumption of alcohol; and
- improving maternal and child health.

Access

Health services should be designed to minimise barriers to health care. The employment of Indigenous staff and having an environment that is 'culturally appropriate' and friendly, have been demonstrated to improve attendance (Inala Community Health Service 1997).

The Commonwealth Remote Communities Initiative introduced in 1997–98 aims to improve access to primary health care services in about 35 remote Indigenous communities that currently have little or no access to such services. Joint planning has been undertaken to identify those communities in greatest need.

There should be further research into barriers hindering access to health services by Indigenous people, and the development of orientation programs for staff that include relevant cultural and historical issues as well as health issues. Hospital services need to work closely with primary health care services to ensure that staff practices and systems accommodate and support the needs of Indigenous people and maximise continuity of care. This is particularly important in coordinating specialist visits and ensuring suitable reception, transport and accommodation is available to those in remote areas who need specialist care.

Secondary prevention

As discussed in Chapter 4, secondary prevention in people with established heart, stroke and vascular disease has been shown to significantly reduce the risk of further events. Effective secondary prevention includes treatment with drugs such as aspirin, beta blockers and ACE inhibitors, rehabilitation and continuing attention to reducing levels of risk factors. It is important that Indigenous communities and health services are involved in the development of secondary prevention and rehabilitation programs.

Information issues

The major information issues in Indigenous populations also generally apply to remote areas and include the following:

- community-based primary management of chronic disease (including heart, stroke and vascular disease, rheumatic heart disease, diabetes, renal disease, respiratory disease) is complex and may involve many care providers;

- in remote settings, the turnover of staff is high, and training of staff and levels of clinical competency are variable;

- standard evidence-based treatment protocols improve continuity of management in these settings;

- these protocols can be incorporated into information systems which could be used by all health workers for opportunistic screening, recall and review, including the generation of registers and reports; and

- such systems already exist in some health services, and should be introduced (with adequate training and support) into all primary health care clinics in remote communities.

Funding for health services

Currently, the total per capita health spending for Indigenous people is about 8 per cent higher than that for non-Indigenous people (Deeble et al 1998), with 55 per cent of spending occurring in the hospital sector. Despite the fact that primary prevention and appropriate public health care have the potential for the greatest gains in cardiovascular health in Indigenous people, current prevention and public health care programs are fragmented and under-resourced.

Current health spending would be adequate if the Indigenous population was only 8 per cent sicker than the total population. Most measures, however, show that the Indigenous population has a level of health two to three times worse than that of the total population (ABS & AIHW 1997). Existing funds cannot adequately address the current burden of illness, let alone provide the preventive and other services required to break the cycle.

The National Aboriginal Health Strategy set a target of achieving 'equal access to care appropriate to need'. Nevertheless, current funding mechanisms do not recognise the lack of access to MBS and PBS by a population with such high morbidity and mortality (Burns et al 1998). The situation in remote areas is complicated by the fact that the mechanisms do not take into account the extra expense involved in the delivery of services in a multidisciplinary, cross-cultural, remote situation and the relative lack of infrastructure in these areas (Burns et al 1998). It has been

suggested that to achieve equity according to need, per capita expenditure for Indigenous primary health care needs to be two to three times higher than the per capita expenditure in the mainstream (McDermott 1995; Burns et al 1998).

OATSIH is currently working with the Health Benefits Division to develop a broader approach to health financing structures for the Indigenous population. The Coordinated Care Model for delivery and funding of services is currently being evaluated through trials in New South Wales, Western Australia and the Northern Territory. These trials represent a unique partnership between Commonwealth Government and State and Territory Governments and local Aboriginal communities in relation to:

- funding issues (eg Medicare block funding in areas where there is little access);

- management of resources and control of the service by the community, including the development of effective health promotion programs (eg Tiwi for Life campaign);

- development of specific care plans drawing on a range of professional expertise; and

- evaluation of the program to include installation of a data collection system to assess the impact of the trial on the quality of the service delivered, on health outcomes and on acceptability.

While Medicare block funding will provide additional support for Indigenous health funding, it is unlikely to be sufficient unless the amounts reflect the health needs of Indigenous people, as discussed above. Nevertheless, the trials are likely to provide important information to improve aspects of continuity of care such as lack of coordination and integration of resources in the community, and the lack of integration of hospital and specialist services with community services. The Coordinated Care Model is a potential structure to address health service issues in a systematic manner. However, it should not be seen as the only effective model for funding or delivery of services, as many Aboriginal health services have been developing exemplary models over many years.

Rheumatic heart disease

Most rheumatic heart valve lesions result from repeated, prolonged episodes of acute rheumatic fever associated with Group A streptococcal infections in childhood and adolescence. Rheumatic heart disease is a disease of disadvantage associated with poverty and overcrowding, lack of education and limited access to medical care to obtain adequate diagnosis and receive secondary prophylaxis with monthly injections of Benzathine penicillin. Rheumatic heart disease represents a significant and entirely preventable cause of morbidity and mortality among Indigenous Australians (Carapetis et al 1996). In Australia, it almost exclusively affects Aboriginal and Torres Strait Islander peoples.

It has been difficult to document the size of the problem of acute rheumatic fever and rheumatic heart disease in the Indigenous population because most studies have been hospital-based or restricted to small communities in diverse remote locations. Aggregated data from Western Australia, South Australia and the Northern Territory for the years 1994–1996 reveal very large differences in mortality rates for rheumatic heart disease between the Indigenous and non-Indigenous populations (see Table 6.1 on page 95). The recent study by Carapetis (1998) in the

Northern Territory was the first regionally based study of the epidemiology, clinical characteristics and control of acute rheumatic fever and rheumatic heart disease in Australia that provides a model for investigating the problem in other regions, and in urban, rural and remote Indigenous populations.

Training in treatment and prevention of acute rheumatic fever and rheumatic heart disease for Indigenous health workers in remote and rural sectors has taken place under the Commonwealth Rural Health Education, Support and Training program.

Primary prevention of rheumatic heart disease

Primary prevention of rheumatic heart disease requires a concerted, ongoing intersectoral effort by all levels of government and researchers to prevent acute rheumatic fever. This should:

- address socio-economic issues including overcrowding, housing and hygiene;

- develop a better understanding of the epidemiology of Group A streptococci;

- develop, organise and evaluate programs of treatment for streptococcal sore throat and scabies and skin sores; and

- work towards the development of a vaccine for acute rheumatic fever.

The control of rheumatic fever is also dependent on sufficient access to treatment for scabies, and chemoprophylactic medication. Population control measures will need a re-evaluation of PBS access schemes as the current system does not recognise public health control needs. The Australian Pharmaceutical Advisory Committee has endorsed a proposal for a Public Health Drugs list.

Secondary prevention of rheumatic heart disease

The WHO recommends best practice that involves implementation of a coordinated, register-based control program including:

- a program coordinator, dedicated budget and expert advisory committee;

- an ultimate goal of national coverage through step-wise coverage of smaller regions (eg using the Northern Territory program to control acute rheumatic fever and rheumatic heart disease as a template); and

- establishment of primary health care service-oriented programs that include: a centralised register of all patients; case finding of those with acute rheumatic fever and rheumatic heart disease and coordination of secondary prophylaxis and clinical follow-up (including surgery); surveillance for new cases of acute rheumatic fever, rheumatic heart disease and group A streptococcal epidemiology; integration of these services into the existing primary care network; and adequate laboratory support.

A Commonwealth funded program, developed by Territory Health Services, researchers and the NHF, has a database with information on those with rheumatic heart disease and acute rheumatic fever, and focuses on secondary prevention, particularly compliance with long-term prophylactic medication, as well as access to the program.

Key points — Indigenous Australians

- Heart, stroke and vascular disease is the biggest single cause of excess deaths in Indigenous Australians.

- Death rates for coronary heart disease for the Indigenous population are almost twice as high as the non-Indigenous rate and substantially higher than the corresponding rates for the Indigenous populations of New Zealand and the United States.

- The rapid reduction in heart, stroke and vascular disease mortality in New Zealand Maoris in the early 1970s, from rates comparable with those of the Australian Indigenous population, suggest that similar declines ought to be possible in Australia.

- Levels of the major risk factors such as smoking, high-risk alcohol use and diabetes are over twice as high among Indigenous Australians as among their non-Indigenous counterparts.

- Despite the higher levels of mortality and morbidity in the Indigenous population:

  — programs for prevention are fragmented and there are no clearly identified sources of funding for such programs at an appropriate scale; and

  — in total, efforts currently under way are insufficient to allow a real prospect of achieving the nationally agreed 10-year target of a 50 per cent reduction in mortality from coronary heart disease or of achieving the related targets for risk factors.

- While there will be gains from improved access to treatment, there is even greater potential for gain from improved primary and secondary prevention. These services should not be seen as competitive and all need to be adequately funded under a balanced and comprehensive approach.

- Rheumatic heart disease represents a significant and entirely preventable cause of morbidity and mortality among Indigenous Australians. Organised primary health care is essential for the control of rheumatic fever.

- There is a need for a national training program to ensure adequate levels of skilled Indigenous health staff.

6.2   Remote populations

In terms of cardiovascular health, the major issues for remote populations are about access to services rather than health differentials. Mortality from heart, stroke and vascular disease, other than rheumatic heart disease, is marginally higher in remote than in urban areas (Table 6.4). However, in remote areas, mortality from rheumatic heart disease is almost three times that in urban areas. In remote areas where the Indigenous population makes up a higher proportion of the population than in urban or rural areas, high Indigenous mortality contributes significantly to the higher mortality (Figure 6.1).

Table 6.4: Death rates and rate ratios, by type of area, selected heart, stroke and vascular diseases, 1994–1996

Disease	Males			Females		
	Urban	Remote area	Rate ratio	Urban	Remote area	Rate ratio
Coronary heart disease	198.2	215.2	1.1	109.1	118.2	1.1
Stroke	67.6	70.2	1.0	59.8	62.4	1.0
Rheumatic heart disease	1.4	3.8	2.8	2.0	4.9	2.4
Circulatory system diseases	330.7	359.5	1.1	216.8	236.7	1.1

Note: Rate ratio = remote:urban rate.

              Rates, given as per 100,000 population, are age standardised to the 1991 Australian population.

Source: Mathur & Gajanayake (1998).

The situation in Queensland is somewhat different from the Australian average. For heart, stroke and vascular disease in total, and for coronary heart disease, stroke and hypertension separately, mortality rates in remote areas are generally substantially above both capital city and rural rates. These differences in Queensland persist, although at a substantially reduced level, even after allowing for the effects of a high Indigenous population (Muller et al 1998).

Figure 6.1: Death rates for coronary heart disease, by area of residence, Western Australia, South Australia and the Northern Territory, 1991–1995

Note: Age standardised to the 1991 Australian population

Source: AIHW National Mortality Database.
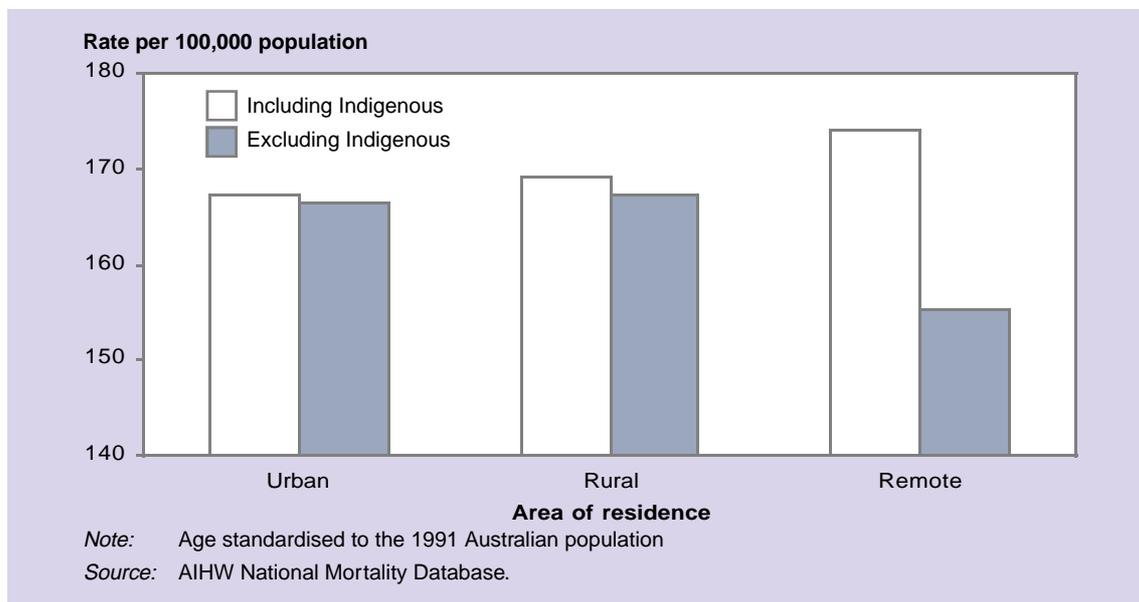
Prevalence of risk factors in remote populations

There is little difference in the prevalence of risk factors between remote and urban areas, when differences in age profiles are taken into account (Table 6.5).

Table 6.5: Prevalence of risk factors by area of residence,* Australia, 1995

Risk factor	Prevalence rate (%)			Rate ratios	
	Urban	Rural	Remote	Rural:urban	Remote:urban
Smoker	24	26	24	1.1	1.0
Never smoked	50	46	47	0.9	0.9
Overweight or obese	43	44	48	1.0	1.1
No physical activity	34	32	36	0.9	1.1
Diabetes	2	2	2	1.0	1.0
Medium-risk alcohol intake	5	6	5	1.2	1.0
High-risk alcohol intake	3	4	4	1.3	1.3

* The Australian Capital Territory and Brisbane are treated as urban; the Northern Territory is treated as rural; other Queensland metropolitan/rural centres are treated as rural. Based on self reports except for diabetes, which is a derived measure.

Note: Age standardised to the 1991 Australian population.

Source: 1995 National Health Survey (ABS 1997c).

Admissions to hospital and rates for heart, stroke and vascular disease procedures

Hospital separation rates for coronary heart disease and stroke are higher in remote than in urban areas except for coronary heart disease in males (Table 6.6).

Table 6.6: Hospital separation rates and rate ratios, by type of area, coronary heart disease and stroke, 1996–97

Disease	Males			Females		
	Urban	Remote area	Rate ratio	Urban	Remote area	Rate ratio
Coronary heart disease	1,110	1,100	1.0	490	670	1.4
Stroke	300	420	1.4	200	320	1.6

Notes: Rates, age standardised to the 1991 Australian population, are given as per 100,000 population.

Rate ratio = remote:urban rate.

Source: AIHW National Hospital Morbidity Database (unpublished data).

Remote populations — issues for health services

The issues relating to essential services outlined for Indigenous populations are also relevant for remote populations.

Central to the concept of effective health services in remote areas is support for and building of the components of sustainable communities, health service structures and health service providers.

This process must involve close collaboration between providers of health services and providers of other services in remote communities.

Workforce and management

There must be adequate funding and support for:

- sustainable structures for health services such as locally based services and a decentralised model of management;

- providers of health services, including support for relocation and retention of staff and access to ongoing education and locum relief; and

- sustainable access by remote communities to health services, including support for bringing services to communities and allowing community members to travel to services.

Collaborative projects to improve knowledge and skills in emergency treatment and transfer of patients suffering from a cardiovascular event could lead to increases in the survival rates of cardiovascular patients in rural and remote areas. The Flying Doctor remains an integral part of the health care infrastructure available to remote communities.

The Commonwealth Rural Australian Stroke Pilot Study will examine a rural population to determine the incidence, outcome, direct and indirect costs of stroke. The results will be compared with a similar study in a metropolitan population in order to develop both a model for the establishment of sustainable medical research capability in rural areas, and to establish comprehensive regional stroke services for the rural, remote and Indigenous populations of New South Wales.

Primary prevention

Priorities for primary prevention of heart, stroke and vascular disease in remote areas are nutrition, tobacco smoking and physical activity. To address these priority areas:

- it should be recognised that access to affordable fresh fruit and vegetables is central to primary prevention of heart, stroke and vascular disease (Zatonski et al 1998);

- programs on smoking should target both cessation and prevention of uptake, particularly among the young;

- ongoing support for physical activity should be considered a high priority, with support for a coordinated strategy for involvement of the community in sport; and

- primary health care teams in remote areas should be able to devote sufficient resources to both their clinical and public health components.

Management and secondary prevention

All members of communities should have access to appropriate training in recognition of symptoms and management of emergencies, including first aid and community and emergency life support for health workers.

Optimum practice for diagnosis and management of heart, stroke and vascular disease in remote areas involves an emphasis on coordination of treatment of co-existing conditions by primary health care teams.

Special populations

The management of chronic heart, stroke and vascular disease requires the appropriate use of health and medical services including pharmaceutical agents. It also requires access either locally by outreach services or by travel to appropriate specialist services.

Rehabilitation services should, as far as possible, be provided locally. This would have the additional benefit of rehabilitation programs becoming a local focus in education for primary prevention. A cardiovascular rehabilitation manual has been developed for rural health workers in Queensland to assist people who cannot access mainstream rehabilitation services.

Funding issues

Many of the issues regarding funding discussed for Indigenous programs also apply generally to remote areas. Costs of delivery of prevention and primary health care programs in remote areas are two to three times those for urban areas (Burns et al 1998; McDermott 1995).

It is important to develop methods of organisation and funding that strengthen the capacity of clinical services to contribute to early identification and intervention in a wide range of health issues. New funding mechanisms should foster collaboration between public health and clinical services and, where appropriate, facilitate the transfer of resources between clinical services or between public health and clinical services in ways that do not disrupt service delivery.

Key points — Populations in remote areas

- Mortality from heart, stroke and vascular disease is marginally higher in remote areas than in urban areas, particularly in Queensland.

- The prevalence of risk factors is not significantly different in remote areas than in urban areas. However, the cost, quality and accessibility of food supply in remote areas is a major issue.

- Access to health services is a problem for all people living in remote areas. Distance is a major factor, with poor roads and unreliable communication systems contributing to the isolation.

- The difficulties of recruitment and retention of health professionals in remote areas are generally appreciated. The problems of professional and geographical isolation, continuing education and overwork, accommodation and transport are all issues that have an impact on staff and ultimately on delivery of services.

- There should be a strategic and coordinated approach to the development and implementation of prevention programs and primary health care in remote areas, with sufficient funds allocated for this purpose. All programs must be appropriate to local needs and conditions.

6.3   Socio-economically disadvantaged people

In Australia, as in other developed countries, socio-economically disadvantaged people are at greater risk of heart, stroke and vascular disease. The relationship has been documented for mortality from coronary heart disease and stroke, and for related illness and risk factors (Dobson et al 1985; National Health Strategy 1992; Mathers 1994; Bennett 1995; 1996). Within developed countries, the pattern of higher rates of illness and death among socio-economically disadvantaged people holds for most diseases, not only heart, stroke and vascular disease (Marmot et al 1987; Feinstein 1993; Kapland & Keil 1993). As discussed in Chapter 3, the evidence suggests the contribution of structural factors such as people's economic resources, education, living and working conditions, social support and access to health care in addition to behavioural risk factors (National Health Strategy 1992).

Socio-economic disadvantage and mortality from heart, stroke and vascular disease

In Australia, socio-economic inequalities existed at the time mortality from heart, stroke and vascular disease peaked during the late 1960s. There is evidence for males that socio-economic inequalities widened during the 1970s (Gibberd et al 1984; Dobson et al 1985; Hardes et al 1985), continued to widen during the early 1980s, stabilised thereafter and persisted into the 1990s (Bennett 1996).

Mortality rates for coronary heart disease and stroke are especially high among people of working age living in the most socio-economically disadvantaged areas (lowest quintile). Their cardiovascular death rates are around double those among people living in the least socio-economically disadvantaged areas (highest quintile) (Table 6.7). There is a clear and consistent gradient of increasing standardised death rates with increasing socio-economic disadvantage.

Table 6.7: Death rates for heart, stroke and vascular diseases, by socio-economic status of area of residence, ages 25–64, 1991

Disease	Males			Females		
	Low SES	High SES	Rate ratio	Low SES	High SES	Rate ratio
Coronary heart disease	107.5	60.9	1.8	31.3	14.0	2.2
Stroke	22.0	8.5	2.6	13.8	7.3	1.9
Heart, stroke and vascular disease	155.7	84.9	1.8	56.7	27.7	2.1

Notes: Estimates, given as per 100,000 population, are age standardised to the 1991 Australian population and are defined by quintiles of socio-economic disadvantage according to the Index of Relative Socio-economic Disadvantage for the area of their usual residence.

Rate ratio = Low SES:high SES rate.

Source: AIHW National Mortality Database.

Socio-economic disadvantage and risk factors

Risk factors which are known to increase the risk of developing heart, stroke and vascular disease are far more prevalent in people of low socio-economic status than those of high socio-economic status (Mathers 1994; Bennett 1995; 1996).

Smoking is strongly influenced by the social circumstances in which people live, and is more common among people in unskilled occupations, unemployed people, Indigenous people, young adults with children and lone parents. Smoking is almost twice as common among people in disadvantaged circumstances (Table 6.8). Excessive drinking, physical inactivity, obesity and high blood pressure are also more prevalent in low than in high socio-economic groups (Table 6.8).

Table 6.8: Prevalence of risk factors for heart, stroke and vascular disease, by socio-economic status (SES), 1995

Risk factor	Males			Females		
	Low SES (%)	High SES (%)	Rate ratio	Low SES (%)	High SES (%)	Rate ratio
Hypertension	19.0	14.4	1.3	14.5	7.2	2.0
High cholesterol	20.4	19.2	1.1	18.9	13.9	1.4
Overweight (BMI > 25)	49.8	50.3	1.0	40.2	31.4	1.3
Obese (BMI > 30)	14.2	9.5	1.5	15.5	8.5	1.8
Smoking	35.9	18.5	1.9	27.5	15.1	1.8
At-risk alcohol intake	6.3	3.7	1.7	1.5	1.3	1.2
Physical inactivity	37.0	27.0	1.4	39.3	29.1	1.4

Notes: Estimates for high blood pressure and high cholesterol relate to people aged 25–64, living in State capital cities, 1989, with SES based on highest level of education completed. Estimates for other risk factors are national estimates based on self-reported data from people aged 18 or more, 1995, with SES based on socio-economic disadvantage of area of residence.

Rate ratio = Low SES:high SES rate.

BMI = body mass index.

Sources: National Health Survey 1995 and NHF Risk factor Prevalence Survey 1989, derived data.

Socio-economic inequalities in risk factors vary by age group as well as by sex, and also vary over time. During the 1980s, people who were socio-economically disadvantaged improved their cardiovascular risk factor profile overall but their relatively worse position compared with people of higher socio-economic status persists (Bennett 1996).

Tackling socio-economic inequalities in health

Socio-economic inequalities in the health of Australians have been demonstrated repeatedly over recent decades for most diseases. The international evidence for socio-economic inequalities in health status and health outcomes is also substantial.

Although the causes of inequalities in health are complex and not fully understood, it is clear that a combination of factors is at work (National Health Strategy 1992). Differences in risk behaviours make an important contribution to socio-economic inequalities in health, but they are not believed to be a complete explanation (Blaxter 1990). For future interventions to be fully effective in improving the nation's health, it will be important to recognise that risk factors themselves are strongly influenced by the circumstances in which people live and work (Link & Phelan 1995).

Factors that are increasingly recognised to be of importance include:

- the physical environment, such as the adequacy of housing, working conditions and pollution;

- social and economic influences such as income and wealth, levels of unemployment, and the quality of social relationships and social support;

- barriers to adopting a healthier personal lifestyle; and

- access to appropriate, effective health and social services (Benzeval et al 1995).

Clearly, tackling the underlying socio-economic causes of inequalities in health involves changes through public policy and intersectoral action, as discussed in the health promotion framework in Section 3.1. Health inequality considerations need to be integrated into all policy decisions, regardless of sector.

The last major review of health inequalities in Australia concluded that 'reducing inequalities is a daunting task', and saw that the way forward was to 'develop and implement policies to reform the health system and the broader social and economic environment in which we live' (National Health Strategy 1992).

The Commonwealth is funding a National Collaboration on Health and Socio-economic Status which will address many of these issues.

Key points — Socio-economically disadvantaged people

- There is a strong relationship between socio-economic disadvantage and death, sickness and disability from coronary heart disease, stroke and many other diseases.

- The poor in society shoulder a greater burden of illness, disability, distress and death from heart, stroke and vascular disease, and many other diseases, than those who are more affluent.

- The magnitude of health inequalities varies over time and between countries, suggesting that they are not inevitable or unchangeable.

- Health inequalities are caused by the interplay of risk factors and social and economic circumstances.

- Policy initiatives to address health inequalities will require coordination across sectors of government, and the health sector has an important advocacy role.

- Policy initiatives are needed that:
  — improve living and working conditions;
  — reduce poverty and unemployment;
  — change peoples attitudes and behaviours, through sensitive interventions that combine education and support with action at other policy levels; and
  — facilitate access to health and social services according to need.

- A key aim of public policy in the next millennium should be to design cross-sectoral interventions that improve the health of the socio-economically disadvantaged and reduce the socio-economic gap in health status.

- Government policy initiatives at all levels need to be examined for their likely impact on the health of the socio-economically disadvantaged.

7 Monitoring, information management and research

Monitoring disease trends and differentials, applying technology to improving information management and fostering research all underpin the developments in prevention and management described in previous chapters. This chapter examines current monitoring of heart, stroke and vascular disease through the national monitoring system, explores the wider role of information management in improving patient care, and describes the current status of research into heart, stroke and vascular disease in Australia.

7.1 National Cardiovascular Monitoring System

A major recommendation of the *Better Health Outcomes* report (DHSH 1994a) was to establish a national monitoring system for heart, stroke and vascular disease, its risk factors and management. In 1995, the National Health Information Development Plan also categorised the continuing surveillance of risk factors and improved information on heart, stroke and vascular disease as high priority areas. In the same year, the AIHW published its *Outline of a National Monitoring System for Cardiovascular Disease* (AIHW 1995), following extensive consultation with representatives of government and non-government agencies, public health researchers and epidemiologists. The Commonwealth Department of Health and Family Services subsequently provided funding support to the AIHW to establish and develop the monitoring system.

The monitoring system comprises the National Centre for Monitoring Cardiovascular Disease, an advisory committee and externally funded projects. The National Centre is located within the AIHW and monitors trends and differentials in risk factors, disease incidence, emergency care, medical and surgical hospital care, rehabilitation, follow-up care, disease prevalence, functional status and death. It also develops and monitors national indicators for cardiovascular health, promotes national data standards and develops national data systems.

The Advisory Committee advises on the development of the monitoring system, guides and reviews its work program and helps determine priorities. The committee includes representatives from Commonwealth, State and Territory health departments, the NHF, the RACGP and academics with expertise in the fields of heart, stroke and vascular disease, data collection and analysis. The capacity to fund projects outside the Centre enables the expertise in key agencies and centres of excellence around Australia to be integrated into the system.

A list of the principal data sources that feed into the monitoring system is given in Table A3.1 in Appendix 3 (pages 181–83). These data sources are used to monitor each aspect of cardiovascular health and to provide data for monitoring national indicators.

Activities

The National Centre for Monitoring Cardiovascular Disease is active in data collection, analysis, development and dissemination, and all its projects have the approval of the AIHW Health Ethics Committee. The Centre works closely with the National Centre for Aboriginal and Torres Strait Islander Statistics on matters of mutual interest, and other government and non-government organisations.

Prevention

The Centre monitors trends and inequalities in risk factors using national sample survey databases. With the support of the NPHP, the Centre is developing a proposal for a national survey of biomedical risk factors, especially blood indices.

National data standards have been developed for the definition, measurement and analysis of body fatness and smoking for inclusion in the *National Health Data Dictionary*. The process is almost complete for physical inactivity, and will commence shortly for high blood pressure and high total cholesterol (and other lipid risk markers).

A project has been commissioned to develop methods for determining the incidence of heart attack, stroke, unstable angina and heart failure.

Treatment and management

The Centre is supporting the Australian Resuscitation Council to develop a national ambulance database that will provide data on pre-hospital and emergency care in Australia. It will enable monitoring of national indicators that are not able to be monitored at present (eg the average delay between the onset of chest pain and presentation for emergency care).

A baseline report *Medical Care of Cardiovascular Disease in Australia* (AIHW 1998a) examines the most recent data available on cardiovascular problems and their care. The report covers general practice; hospital separations; the use of cardiovascular diagnostic procedures, surgery and other treatments; benefits paid for cardiovascular medical services; acute coronary care; use of drugs to manage cardiovascular conditions; and costs of acute care.

In collaboration with the NHF, the Centre maintains registers on the national use of cardiac surgery and coronary angioplasty procedures, including indications and acute complications. The Centre produces regular reports based on aggregated data submitted by all relevant hospital units. The scope of these registers may be expanded to include individual patient characteristics and outcomes.

The Centre is involved in discussions with surgeons, cardiologists, the National Heart Foundation and various government organisations about the feasibility of setting up a national patient-based database for cardiovascular procedures. Such a database would make available nationally consistent, risk-adjusted data for monitoring national indicators of quality and outcomes for treatment of heart, stroke and vascular disease, such as cardiac surgery and angioplasty.

The number of new cases and prevalence of acute rheumatic fever and rheumatic heart disease among the Indigenous population in the Top End of the Northern Territory, is being monitored using the register system based in Darwin (see Section 6.1). The register helps medical staff in the delivery of treatment, as well as supplying data on rates of compliance with appropriate treatment and health outcome data on the impact of intervention.

Mortality

Trends and differentials in death rates for all major heart, stroke and vascular diseases are monitored routinely. The report *Surveillance of Cardiovascular Mortality in Australia 1985–1996* (Mathur & Gajanayake 1998) provides a detailed examination of mortality trends and differentials at the national level and for States and Territories, as well as for the Indigenous population, and urban, rural and remote categories.

Disease costs

The Centre has worked with the AIHW's Disease Costs and Impact Study to produce estimates of the direct economic costs of coronary heart disease, stroke and other cardiovascular diseases, including the cost of care provided by hospitals, nursing homes and medical, pharmaceutical and allied professionals.

Information

The Centre is involved in the development and monitoring of national indicators for cardiovascular health, and has responsibility for identifying and addressing gaps and deficiencies in data required for monitoring.

The demand for up-to-date information on heart, stroke and vascular disease will be met in part by producing, in hard copy and on the Internet, a bulletin which provides the latest data for each component of heart, stroke and vascular disease, from risk factors through to acute care, follow-up care and mortality.

A user-friendly source of time-series data on cardiovascular health is under development, which can be accessed through the Internet by the public, media and health professionals. The database will include national data for national indicators for heart, stroke and vascular disease, and may be extended to include international data, State and Territory data, and other important subpopulation comparisons.

7.2   Information management

A vast amount of data is collected on the clinical care of patients. However, long-term outcome information is not collected and few data sources are linked. Improvements in collating and providing access to health-related information are likely to result in better patient care. This section examines current approaches to improving information management in Australia, and how these relate to the management of heart, stroke and vascular disease.

The current areas of developments in information management are:

• standardised databases for data collection and management, supported by developments in record linkage and unique patient identifiers;

• exploration of the use of a portable health care card;

• the use of telemedicine for long distance health care and education, and of multimedia for education and training in remote areas; and

• the use of the Internet for medical and lay education about new developments in the treatment and prevention of disease.

Much of this applies to information management in the health system as a whole. However, these issues are important for chronic conditions such as heart, stroke and vascular disease, where patients require long-term attention. Care delivery can occur within a number of settings, by more than one clinician, highlighting the need for standardised databases in general practice and in hospitals, and the systematic linking of records across different parts of the health system.

Data collection, management and standards

There exists a range of activities that aim to improve and standardise collection and management of data within the health system. On a national level, the Acute Care Reform Program is working to establish the necessary standards and other requirements to support the development of compatible clinical information systems and the electronic exchange of health information.

The activities of the Cardiovascular Disease Monitoring Centre were discussed in Section 7.1.

Coding systems and data standards

Systems of classification used in monitoring various aspects of heart, stroke and vascular disease are the International Classification of Diseases (WHO 1977), the SF-36, the New York Heart Association Classification of heart failure and the ABS classifications of demographic characteristics. Some of these classification systems form part of the *National Health Data Dictionary* (AIHW 1997c) and underpin the National Health Information Model, both of which are tools used to maintain the principles outlined above. Where classifications are not already in place for a particular aspect of monitoring, it is important that National Health Information Management Group principles be adopted so that new systems can be incorporated into the *Data Dictionary* and the Model.

Standardised databases

A number of standardised databases for heart, stroke and vascular disease already exist overseas. The United States Society of Thoracic Surgeons maintains a database that has set the standard using a nationally accepted dataset and regular reporting. Models to predict mortality risks (and morbidity) are produced annually (www.sts.org/databases/). More recently, the European Cardiac Surgery Registry has been established. The North American Cardiological Societies have also agreed on a dataset and have put into place a system for data collection for invasive cardiological investigations and interventional cardiology (coronary angioplasty).

As discussed in Section 7.1, national databases for cardiovascular procedures (patient based), rheumatic heart disease among the Indigenous population, and pre-hospital emergency care are being investigated or developed.

Record linkage

Health records in different databases can be linked through one or more identifiers. A system of record linkage between health databases would have a number of advantages to the health system, including:

- improving delivery of health care through appropriate allocation of resources, with planning based on levels of activity in various areas; and

- assisting patients, especially those with chronic conditions who are treated in a variety of settings, by enabling clinical data to be either linked, or recorded centrally and used from remote sites when necessary.

Clinical record linkage, where management of patients is involved, requires exact matching of data capable of identifying individuals, but in general the statistical analysis of results does not. Access to identifying information is necessary only for the few people doing the actual linkage and not for those doing analysis and research on the linked data.

Unique patient identifiers would greatly facilitate the development of record linkages and a national system for management of data. However, issues of privacy and security must be explored first and satisfactory safeguards found. Issues of unique patient identifiers and record linkage are being considered both nationally and within States and Territories.

- On a national level, the AIHW is conducting a National Health Record Linkage Project, to undertake developmental work for providing access to a range of health databases including the MBS and PBS, establish the technical feasibility of record linkage between these databases and define and implement demonstration linkage projects to show the value of this work.

- In New South Wales, there is a State-wide data linkage system in progress, which will allow sharing of information between inpatient, outpatient, emergency and community services. This will involve development of a unique patient identifier, requiring legislative support as well as overseeing by ethical committees, and discussions with consumer groups.

- In Victoria, a Client Index database integrates two or more systems, using a probabilistic linkage tool. It is mainly used for monitoring outcomes for future purchasing, but there is interest from hospitals for applying linkage across health care networks, especially for patients with chronic diseases who are high users of medical resources.

- In Queensland, there is a corporate data system for patient demographics. Several health districts are exploring ways to link records using existing systems. There is a State working group to oversee this area, with the aim of developing a unique patient identifier.

- In South Australia, the Open Architecture Clinical Information System is in use as a pilot system in the renal departments of four major teaching hospitals. The system collects patient data for all patients at these hospitals from the hospital computer systems. An automated patient record linkage process occurs as patient data is received, using patient demographics. Patient records from each hospital are automatically matched against all other patient records and when a match is found the records are linked.

- The Health Department of Western Australia and the Department of Public Health at the University of Western Australia are collaborating on a data linkage project that involves establishing linkages between most health databases in the State, including morbidity and birth and death records. The episode identifiers developed by the project are now being incorporated into a number of the databases. Acceptance of the system is increasing steadily as the linkage studies are extremely valuable for planning and resource allocation. The dataset will be expanded to include greater detail of coronary angioplasty, including the number of stents implanted and patient outcome.[9]

- In the Northern Territory, a system of record linkage covering acute inpatient care and community health is being developed.

- The Australian Capital Territory is in the process of developing a unique patient identifier.

It will be crucial to the success of standardised data systems that the Commonwealth, States and Territories work together in the development of consistent systems of record linkage and data standards. The formation and acceptance of a small group to act as 'honest brokers' in dealing with information capable of identifying individuals is vital to the success of any attempt to link together health data from a variety of sources. On a national level, in the first instance, such a group could be positioned within an institution such as the AIHW.

Electronic medical records

The health sector is lagging behind many other sectors in the use of electronic medical records. Although accounting information is computerised, patient records generally are not, either in hospitals or private practices. The current impediments to the uptake of the use of electronic medical records include the slow uptake of computers in general practice, the lack of technical infrastructure to provide a secure virtual network for communication and a lack of national standards. Electronic medical records would improve care of patients as they are more easily read, allow ready exchange of patient information (eg to improve continuity of care), facilitate more complete record keeping and prompt clinicians to provide treatment in accordance with evidence-based guidelines by providing condition-specific checklists of options for diagnosis and treatment.

These issues are particularly important for management of heart, stroke and vascular disease because of its prevalence in the population (so that suboptimal medical care can affect many people). Continuity of care and exchange of information between providers are important. There are also acute emergencies when rapid access to accurate information about the patient is vital.

Adoption of electronic patient records throughout the health care system requires unique patient identifiers to ensure that records relate to the correct person and that information from different sources is correctly linked, user-friendly software that is consistent with optimal patient care, and dedication of resources to the transition from paper to computerised records. This in turn would require development work on unique patient identifiers (dealing with the issues of confidentiality and security), development and testing of software and implementation of electronic record systems where possible.

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9   More information about the Western Australian experience can be found on the Internet, at http://www.publichealth.uwa.edu.au/hsr/index.htm.

Information management in general practice

There is not yet available a widely accepted electronic record system to manage information within general practice. Only about 10 per cent of practices in Australia currently use computers for record keeping, research or providing access to information (compared with 30 per cent in New Zealand and 90 per cent in the United Kingdom). Since 1991, the United Kingdom Government has contributed hardware, software and 70 per cent of the salary for a Practice Manager to ensure that records are successfully entered into a database and maintained. An initial step towards full computerisation in Australia could be taken through the Practice Improvement Section. Such a system might provide closer links with the MBS and PBS, and enable monitoring of side effects and even compliance.

Health care cards

Once a system of linkage of fundamental data is established, the concept of unique patient identifiers and electronic medical records could be extended into health care cards, which would be patient-held electronic medical records. The report into health information management and telemedicine by the House of Representatives Standing Committee on Family and Community Affairs (1997) found that such cards would provide a more effective means of exchanging information and would address unreliability and fragmentation of health information and management of data. An Information Technology and Telecommunications Committee is being established to further the recommendations of this report. However, as with unique patient identifiers and record linkage, there are important issues of privacy and security to be addressed before any such system could be considered.

Heart, stroke and vascular disease in Australia would be an appropriate field in which to test such a system due to the magnitude of the problem and the variety of settings of care involved, as well as the wide geographic spread of the population.

In Victoria, 'smartcards' are being trialed as part of the Coordinated Care Trial of the Southern Health Care Network. This trial is piloting a model for delivery of services and funding for people with complex and chronic health needs, and is testing the appropriateness of patient-held cards in gathering data on events and sharing information across health care settings and services.

Telemedicine/telehealth

Telemedicine or telehealth uses the Telecom Integrated Services Digital Network (ISDN) to transfer audio, video or graphic data. Over the last decade, the technology of videoconferencing has been used for rural and remote areas with limited or no access to specialised health services. Such projects also aim to address the problem of professional isolation felt by clinicians working in these areas. Professional education is another use of the technology, with telemedicine being used in a number of areas to teach and supervise registrars and medical students in rural placements.

Telemedicine is still in the developmental stage in Australia, with a total of 250 sites providing videoconferencing facilities. In the cardiovascular area, a telemedicine system set up by Concord Repatriation Hospital in Sydney provides high quality ECG transmissions via cellular telephone.

The National Rural Health Alliance has strongly supported proposals that Telstra's community obligations be upgraded to include data transfer services such as facsimile, email and Internet to rural and remote populations, thereby improving

access to health information in these areas. A pilot study in progress in the Australian Capital Territory will connect 250 homes to a network that will include general telephone services as well as pay TV and high speed Internet and through which video services can be utilised. The network has the band width necessary to support improved telecommunications services including telemedicine initiatives.

Multimedia

An important use of multimedia is in distance education, especially in rural and remote areas. In particular, there is a need for:

- support for the development of medical multimedia laboratories with advice from appropriate areas to produce suitable training material; and

- training materials specific for use with Indigenous Australians which are localised to individual groups within the Indigenous population.

Other developments in distance education

Most distance education is still print based but there are developments in a number of areas that are likely to have a significant impact in the future. The Internet is a cost-effective mode of sharing information which is being used increasingly by health professionals and the public. Internet sites are widely used for delivering information about the treatment and prevention of disease. In a number of areas, the Internet is now being used more systematically in medical and non-medical distance education.

The use of high-band-width satellite communication for interactive medical education is well established in Australia. This has been funded in part by industry, with some Commonwealth support. Other countries such as Israel with its GILAT system, have extended the capabilities with lectures being beamed into subscribers' homes.

7.3　Research

Specific strategies for improving cardiovascular health should be underpinned by evidence based on appropriate research. Australia has international standing for its biomedical research, the area of heart, stroke and vascular disease being at the forefront of these achievements. It has also been recognised that significant research has been undertaken linking social environment issues to health status. This research contributes to the evidence base on heart, stroke and vascular disease. This section examines the current approach to research funding in Australia and considers how research could be better used to improve cardio-vascular health.

Overall research funding

The ABS Research and Experimental Development Survey recorded $45 million expenditure on research into heart, stroke and vascular disease in Australia in 1994–95. The Commonwealth Government and State and Territory Governments provided 46 per cent of this funding (see Figure 7.1). Research into heart, stroke and vascular disease represented 11 per cent of total clinical research. Expenditure for research into heart, stroke and vascular disease was also recorded in other ABS categories, such as preventive medicine research, nutrition research, general public health research and pharmaceutical research.

Figure 7.1: Sources of funding for clinical research into heart, stroke and vascular disease in Australia, 1994–95

Other (donations, overseas funding) 21%

Commonwealth Government 23%

Private (not-for-profit) organisations 8%

Business 10%

State Governments (including hospitals) 23%

Universities 15%

Source: ABS (unpublished data).
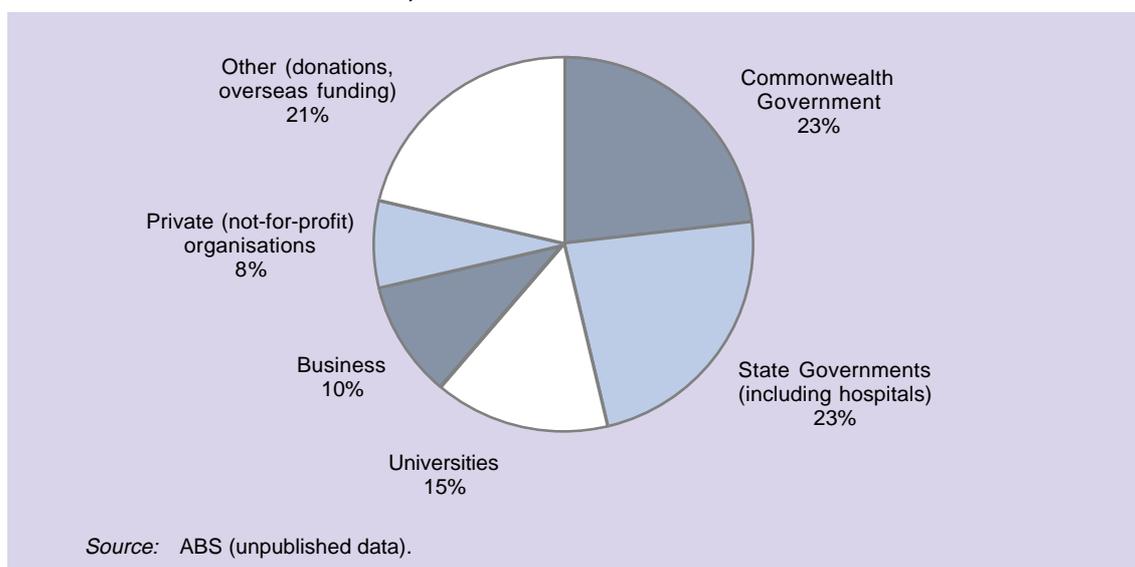
National Health and Medical Research Council

The NHMRC consolidates the often independent functions of research funding and developing advice within a single organisation. Applications for research funding are accepted from all research areas and all disciplines, from biomedical research to clinical, health services and public health research.

Currently, approximately 19 per cent ($30.1 million) of government funding allocated through the NHMRC goes directly to research into heart, stroke and vascular disease (see Table 7.1). This includes 314 grants for specific projects and block grants for cardiovascular research at the Baker Medical Research Institute and the Howard Florey Institute for Experimental Physiology and Medicine.

Table 7.1: NHMRC funding for research in NHPAs — actual expenditure and percentage of total expenditure

	Injury		Mental health		Cardiovascular		Cancer		Diabetes		Total
Year	$m	%	$m	%	$m	%	$m	%	$m	%	$m
1995	2.00	1.5	17.89	13.6	24.86	19.0	13.74	10.5	3.06	2.3	131.15
1996	2.37	1.5	10.69	14.3	26.73	18.4	16.13	11.1	3.07	2.1	145.20
1997	2.35	1.6	22.95	15.2	29.70	19.7	17.57	11.7	3.61	2.4	150.75
1998	4.08	2.6	25.40	16.4	30.10	19.4	21.60	13.9	4.20	2.7	154.70

Note: These figures are based on NHMRC and RADGAC funding and also include pro-rata expenditure estimates of relevant research done in NHMRC-funded research institutes where appropriate.

Source: Office of NHMRC.

Research for stroke continues to be relatively poorly funded (Stroke Australia Taskforce 1997). Although stroke only attracted about 1 per cent of NHMRC funding as a category, the percentage of successful applicants was as high as for other groups. This suggests that more investigators need to be attracted into this area if progress is to be made (Stroke Australia Taskforce 1997).

Non-government research

A number of non-government organisations provide significant support for cardio-vascular research in Australia, primarily using public funds. Relatively 'specific' cardiovascular research institutes include the Baker Medical Research Institute, Victor Chang Research Institute, Howard Florey Institute (largely endocrinology) and the Heart Research Institute, Sydney. These institutions have international reputations for their work.

The *National Heart Foundation* primarily supports investigator-driven basic bio-medical research, largely on a project grant-in-aid basis. Research that supports and complements the NHF's strategic directions includes clinical research, public health, epidemiological and behavioural research, with particular emphasis on working with socio-economically disadvantaged and Indigenous populations in developing effective interventions to improve health in their communities. The NHF also fosters the development of young cardiovascular health professionals through research fellowships, scholarships and travel grants for undergraduates, graduates and recent postgraduates. The total amount of project funding from the NHF in 1998 was approximately $5.8 million.

An example of the quality of local clinical research was the Long Term Intervention with Pravastatin in Ischaemic Disease (LIPID) trial, a large-scale study conducted under the auspices of the NHF with industry funding (described in Chapter 4). The study is considered the most substantial body of data concerning the benefits of cholesterol lowering in patients with established coronary heart disease, and should influence and improve medical practice throughout the world.

The LIPID trial was conducted by a management committee and investigators independent of the sponsor (Bristol Myers Squibb) and coordinated by the NHMRC's Clinical Trials Centre located at the University of Sydney. It was

Australia's largest clinical trial, with a budget now in excess of $30 million, and highlights the opportunity of attracting substantial industry funding from multi-national companies to support clinical research endeavours.

The *Stroke Society of Australasia* is a professional organisation with medical, nursing and allied health professional members. The Society provides a forum for issues relating to the practical management and research into stroke through its annual scientific meeting and its subcommittee, the Acute Stroke Trials Network. The Society collaborates with the National Stroke Foundation and its research arm, the National Stroke Research Institute (NSRI), to foster stroke research in basic and clinical areas.

The majority of research grants from the *National Stroke Foundation* are allocated to the following categories — epidemiological studies, neuro-imaging studies and clinical trials of therapy and a small proportion to behavioural and social research.

The *National Stroke Research Institute* is located at the Austin and Repatriation Medical Centre in Melbourne. The research program ranges from basic sciences, neuro-imaging, clinical trials through to epidemiology. The NSRI is in the process of establishing a network of collaborating centres in Australia, the first of which is at the Royal Melbourne Hospital.

The *Cardiac Society of Australia and New Zealand* provides one-year research scholarships to full-time students who are members of the Society. The aim is to support members who wish to pursue a career in cardiovascular research.

The *High Blood Pressure Research Council of Australia* provides a forum for discussion and dissemination of information on research into blood pressure and related diseases. The Council, through the Foundation for High Blood Pressure Research, has provided Fellowships for Australian and international researchers and is actively involved in Australia-wide trials involving blood pressure. For example, the Australian National Blood Pressure Trial-2 (ANBP-2), described below, is coordinated through the Executive of the Council.

The *Brain Foundation* provides funding grants for research into stroke on a State-by-State basis. Allocation of grants follows guidelines established by the Foundation's governing body in each State and is overseen by a scientific advisory board.

Private industry partnerships

As illustrated in Figure 7.1, 10 per cent of clinical research into heart, stroke and vascular disease in 1994–95 was funded through business. The LIPID trial, described above, was conducted under the auspices of the NHF with funding from Bristol Myers Squibb.

The ANBP-2 study is another important example of a new funding partnership. It is jointly funded by the pharmaceutical industry (Merck, Sharp and Dohme Aust Pty Ltd) and the Commonwealth through provision of drug treatment via the PBS system, subsidies for patient visits to general practitioners under the MBS and NHMRC support for data monitoring. ANBP-2 is a major clinical trial investigating the effectiveness of an ACE inhibitor compared with diuretic-based treatment in the prevention of cardiovascular morbidity and mortality in older hypertensive subjects. ANBP-2 constitutes a paradigm for future funding of important large-scale trials of pharmacological therapies which might be demonstrated to be cost-effective.

PROGRESS is a multicentre international study jointly funded by industry (Servier Laboratories), the NHMRC and the Health Research Council of New Zealand. The study is investigating the effect of lowering of blood pressure in preventing secondary stroke in normotensive and hypertensive patients who have had a stroke (Bousser et al 1996).

The LIPID trial, ANBP-2 and PROGRESS provide models for indirect support of large-scale trials that address important clinical questions.

Issues for research into heart, stroke and vascular disease

Funding dedicated to ongoing or new research programs by non-government organisations is unpredictable, because it is reliant on community donations to relevant organisations or, in the case of the Cardiac Society of Australia and New Zealand, surplus funds from attendance at their Annual Scientific meeting.

In practical terms, the limited extent of funding is reflected in the fact that the major organisations that assess grants for cardiovascular research (NHMRC and NHF) can now provide funding for only approximately 25 per cent of applications despite the ranking of most as worthy of funding.

Most research is supported on a project grant-in-aid basis. A major deficiency of this process is that often project grants are incompletely funded and there may be insufficient support for infrastructure costs. In many cases, salaries for biomedical research workers are also substantially below their counterparts in other research fields including clinicians with similar background training. Investment in research can achieve substantial long-term gains and infrastructure support and salary levels must be addressed to support appropriate levels of research endeavour.

Possible directions for research into heart, stroke and vascular disease

Basic and applied research, in areas such as those highlighted below, is critical to the prevention and treatment of heart, stroke and vascular disease.

- *Basic research.* Research is required into genotypic abnormalities predisposing to disease; molecular and cellular mechanisms leading to disease; and factors that transform stable disease into acute processes (ie heart attack and stroke).

- *Other risk factors for heart, stroke and vascular disease.* Research is required to explain the significant proportion of heart, stroke and vascular disease that cannot be explained by known risk factors.

- *Clinical research to improve outcomes in patients with established heart, stroke or vascular disease, or to retard or prevent its development in 'at-risk' individuals.* Well structured clinical trials, evaluating effectiveness of innovative approaches to reducing mortality and morbidity in patients with established disease, should result in improved management programs and lower long-term morbidity.

- *Behavioural research.* Inadequate attention has been paid to behavioural aspects (and their possible modification) relating to lifestyle factors including compliance.

- *Social sciences.* New research is required to develop greater understanding of cultural, social and economic determinants of health and illness (the issue of socio-economic determinants is discussed in Chapter 6).

- *Cost/benefit research.* Research is needed to fully evaluate the effectiveness and efficiency of interventions aimed at improving cardiovascular health to investigate whether any increased health outcomes attributable to a specific intervention justify any increased costs of its use over existing technologies.

- *Indigenous research.* Applied research is needed to address the significantly higher rates of heart, stroke and vascular disease in the Indigenous population, compared to the non-Indigenous population. Social and behavioural research is needed on both prevention programs and primary health care in Indigenous populations, as evidence-based best practice is required for future policy development.

8 Opportunities and future directions

As discussed earlier in this report, heart, stroke and vascular disease constitutes a major public health burden in Australia. Coronary heart disease is one of the major causes of death in those aged less than 70 years and stroke is one of the principal causes of serious long-term disability. Since these diseases particularly affect older people, their public health impact will increase with the progressive ageing of the population. In addition, as discussed in Chapter 6, certain groups in the population have significantly higher mortality from heart, stroke and vascular disease than others, especially Indigenous Australians.

The estimates described in Chapter 5 indicate that there could be about 38 per cent fewer coronary events and 41 per cent fewer coronary deaths in people aged 35–79 years in Australia, if the prevention and treatment interventions considered in this report were fully implemented. Reductions in the average levels of cholesterol and blood pressure and the prevalence of smoking and physical inactivity are important for the whole population. In addition, more widespread and appropriate use of effective drug therapy would produce significant reductions in morbidity and mortality.

The size of the burden and the extent of knowledge suggest that further efforts have great potential to make progress. Since conditions such as diabetes and some cancers share lifestyle-related risk factors with heart, stroke and vascular disease, it is to be expected that prevention in the cardiovascular area will also have an impact on other major public health problems.

Achieving the potential improvement in cardiovascular health will require new approaches and sometimes new systems to support them. This action will involve governments at all levels, the private sector, and non-government and community organisations. Governments should focus in particular on the settings, environment and public policies that affect the broad determinants of health. These include education, employment, occupation, income and housing, all of which affect people's knowledge, attitudes and opportunities to change health behaviours.

Governments have a number of broad levers at their disposal to foster better programs and practice and to discourage inappropriate practice — expenditure on programs, initiatives and incentives; regulation; the provision and use of information; leadership; and coordination.

In particular, the Australian Health Care Agreements for 1998–2003 confirm the cooperative relationship between the Commonwealth and the States in funding and the continuing reform of public hospital and related health service delivery. While the Agreements do not specifically address the cardiovascular NHPA, they have some potential to advance the objectives of the NHPA initiative. For example, the Commonwealth/State Working Party on Quality Enhancement and the National Health Development Fund under the Australian Health Care Agreements could consider whether the work in the NHPAs should be specifically addressed in State strategic plans.

Opportunities and future directions

This chapter makes suggestions for how a number of levers could be employed within the following priority areas for cardiovascular health:

- establishing a secure long-term national focus on cardiovascular health from which policies and activities can emanate;

- coordinating primary prevention across NHPAs;

- establishing a national mechanism for development, review and implementation of better-practice guidelines that is linked to local planning and quality improvement practices;

- ensuring that any national focus on heart, stroke and vascular disease includes a specific focus on stroke to address additional stroke-related issues;

- tackling the underlying causes of inequalities in health among populations with worse cardiovascular health than the general population; and

- continuing and expanding the activities of the National Centre for Monitoring Cardiovascular Disease.

National focus on cardiovascular health

There is a wide range of activity at all levels, and an immense capacity to improve the health of Australians through further improvements in cardiovascular health. Although cardiovascular health is an NHPA, it lacks a secure long-term national focus from which policies and activities can emanate. National approaches exist for other NHPAs, and major achievements have occurred with other national programs such as HIV control and screening for cervical cancer.

A similar multidisciplinary approach should be established to help coordinate the prevention and guide the management of heart, stroke and vascular disease. It should involve government, non-government organisations, colleges of health professionals and consumer groups. There could also be provision for regular review of progress and future opportunities.

To ensure a strategic long-term approach to heart, stroke and vascular disease, a national program area within the Commonwealth Department of Health and Aged Care should be established. The Commonwealth could also provide secretariat support to a national expert advisory group on heart, stroke and vascular disease prevention and management issues. This group would provide advice to Health Ministers through existing mechanisms such as the NHPC and the NPHP.

Areas that need to be considered include:

- developing a national cardiovascular strategy as part of a longer term planning process;

- encouraging integration of primary prevention activities across national strategies for other diseases;

- identifying priority areas for cardiovascular research and commenting on funding mechanisms;

- exploring the role and feasibility of information technology to facilitate approaches to prevention and treatment;

- recommending infrastructure and projects for support and funding;

- investigating ways to reduce socio-economic differences in cardiovascular health, with an emphasis on the special needs of Indigenous populations; and

- encouraging mechanisms to forge partnerships between public health and clinical service providers.

Coordination of primary prevention across National Health Priority Areas

There are highly developed, largely evidence-based programs already defined or under development to address risk factors for heart, stroke and vascular disease, through strategies developed by governments and non-government organisations such as the National Stroke Foundation and the NHF.

National action will be most effective in any of these areas if there is coordination across different program areas, consistent health messages and adequate funding.

The primary prevention messages relating to health and lifestyle across the major health issues are virtually the same. This means that the one, consistent set of messages can be applied across the different programs relating to cardiovascular health, cancer and diabetes. To do this requires strong coordination and secure, long-term funding. There is already preliminary work on a National Primary Prevention Strategy aimed at the major non-communicable diseases. The strategy is being developed by the Commonwealth Department of Health and Aged Care. It integrates physical activity, diet, tobacco and alcohol issues and provides a base on which to build future prevention activities.

Important points in developing a national integrated primary prevention strategy are:

- primary prevention takes many years to have full effect and should be maintained long term;

- actions aimed at primary prevention of chronic disease will not achieve this full effect until due attention is paid to social and economic causes that lead to social inequalities in health; and

- these actions will need partnerships between the health sector and other sectors and agencies.

The work of the National Strategies Working Group of the NPHP should contribute much to this area. The NPHP is a working arrangement involving the Common-wealth Government and State and Territory Governments, to plan and coordinate national public health activities. It seeks to encourage better coordination across the country, to provide a more systematic and strategic approach to public health priorities and to help develop new directions and major national initiatives.

Currently there is no funding infrastructure in place to address these coordination issues. There are, however, several innovative proposals that could be further explored and which could draw together processes and principles established under existing arrangements. These would include principles for pooling funds developed under the Coordinated Care Trials, and cost and benefit-sharing principles.

National mechanism for development, regular review and implementation of better-practice guidelines

There is a substantial gap between accepted best practice and usual practice in the management of patients with heart, stroke and vascular disease. The gains that could accrue from better practice have been described earlier in this report, in the areas of management and secondary prevention. The focus of guideline development has so far been on clinical practice. However, there is also a need for evidence-based guidelines to advise public health practice.

Identifying areas of inappropriate practice is also important, where population screening or treatments are unnecessary or even harmful. For many years the PBS has had a requirement that new medicines added to the Schedule must be demonstrated to be cost-effective for the condition for which they are listed. In addition, MSAC's work in assessing new medical technologies and procedures may play an important role in identifying areas of inappropriate or costly practice.

The Health Advisory Committee of the NHMRC has continued with the development of clinical practice guidelines, a process previously undertaken by the Quality of Care and Health Outcomes Committee. Clinicians are being involved in guideline development and implementation. The role of information technology in informing consumers about treatment options and the progress of their care is also being considered. The Health Advisory Committee has prepared *A Guide to the Development, Implementation and Evaluation of Clinical Practice Guidelines* (NHMRC 1998) to assist organisations to develop guidelines for NHMRC endorsement.

The guideline development process should involve the following stages:

- review of relevant best-practice guidelines that have been implemented or are in the process of being implemented in Australia;

- consideration of links with international bodies (for example, whether a similar guideline developed overseas could be adapted for use in Australia);

- development of the guideline document by a multidisciplinary group including consumers, and consultation with all stakeholders (non-government organisations such as the NHF, Stroke Foundation, Royal Colleges and Divisions of General Practice could play a key role, as will the Expert Advisory Group on Quality and Safety in Australian Health Care);

- incorporation of the best available evidence, assessed for level, quality, relevance and strength;

- endorsement by the NHMRC and other clinical bodies, such as specialist societies;

- widespread and effective dissemination;

- development of an infrastructure for implementation; and

- regular review and updating.

It should be recognised that many of the issues central to implementing change in practice are service design issues and require the involvement of State and local planners, and non-government groups such as Divisions of General Practice, to

ensure uptake. A nationally coordinated process to ensure regularly updated systematic reviews and guidelines are available should be linked to local planning and quality improvement processes for implementation.

Focus on stroke

Stroke is a major public health problem in Australia, but the area has received less emphasis and funding than coronary heart disease. Many issues in stroke will be addressed by improvements in the coordination of preventive activities and the development, implementation and review of best-practice guidelines, suggested above. However, any national program for coordinating the prevention and management of heart, stroke and vascular disease should include a specific focus on stroke, to address the following additional issues.

- Improve community understanding of the nature and management of stroke through public awareness campaigns (for example Brain Attack coordinated by the National Stroke Foundation). Emergency aspects should be highlighted within these programs.

- Increase levels of knowledge about the management of stroke among general practitioners, general physicians, neurologists, geriatricians and rehabilitation specialists by coordinating educational sessions through organisations such as the National Stroke Foundation and the Stroke Society of Australia.

- Increase levels of knowledge about the continuing management of stroke among nursing and paramedical staff and members of Aged Care Assessment Teams.

- Improve emergency transport to hospitals. Strokes should be a priority for ambulance services Australia wide. Standards for coordination of triage within emergency rooms should be improved through collaboration between the National Stroke Foundation, the Stroke Society of Australia and emergency physician societies.

- Increase the number of stroke units nationwide. Stroke units should be present in every major hospital with an accreditation system established, as suggested in National Stroke Guidelines and Victorian Stroke Guidelines.

- Maximise functional level and independence following stroke. Ensure an appropriate level of continuing care through improved patient evaluation and education and better coordination across the range of services. Better coordination between State and Territory and Commonwealth bodies is required to ensure improved access to the level of care appropriate for recovery stage, level of disability and age.

Special populations

Populations in which cardiovascular mortality or disease burdens are higher or more problematic have many common issues. For these populations, it is particularly important to tackle the underlying causes of inequalities in health, such as the interplay of risk factors and social and economic circumstances. Policy initiatives to address health inequalities will require coordination across sectors of government.

Opportunities and future directions

Indigenous Australians

As described earlier, the cardiovascular health of Indigenous Australians is much worse than that of non-Indigenous Australians.

Current efforts may be insufficient to allow a real prospect of achieving the nationally agreed 10-year target of a 50 per cent reduction in mortality from coronary heart disease in Indigenous populations or of achieving the related targets for risk factors.

There should be a strategic and coordinated approach to the development and implementation of prevention programs and primary health care in Indigenous populations. This should be a priority for funding and attention.

A set of minimum essential services for heart, stroke and vascular disease, as part of a wider set of services for chronic diseases, needs to be developed to support the activities of health service providers.

Funding

Governments developing funding for programs for the control of heart, stroke and vascular disease in Indigenous populations should consider all health financing arrangements to ensure a secure long-term approach. The Commonwealth should continue exploring possible mechanisms through:

- current OATSIH work with the National Aboriginal Community Controlled Health Organisation, and State and Territory health departments on an inventory of current programs, expenditure on these programs and future financial requirements. This should include primary health care and primary prevention;

- the findings of the joint Health Financing Working Group in its evaluation of options for improving access to Commonwealth health program funding for Indigenous people and its consideration of ways to overcome the barriers faced by this group in accessing the MBS and PBS; and

- investigation of cost-shared Commonwealth/State funding under Medicare for national Indigenous cardiovascular control initiatives becoming part of a wider set of programs for addressing health and social issues for Indigenous people.

Workforce

Formal programs should be further developed to strengthen the capacity of Indigenous providers and rural health workers, particularly in the field of public health. Incentive programs currently available for general practitioners should be extended to all health professionals working in remote Indigenous communities.

Service delivery

Barriers and access to services (cultural and geographical) need to be further identified and addressed. Mainstream health services should offer culturally appropriate health services.

Decentralised management and service delivery models should be supported and introduced. The fundamental principle of community control in health service delivery should be supported.

Rheumatic heart disease

With funding from the Commonwealth, a coordinated rheumatic heart disease control program should be expanded into all affected regions within two years, based on an evaluation of the Northern Territory program as a possible template and further knowledge of the epidemiology of acute rheumatic fever and rheumatic heart disease in Indigenous Australians.

Remote populations

Many of the specific strategies for Indigenous populations (above) will also improve infrastructure and programs for remote populations. It should be noted however, that the Commonwealth and States and Territories are currently developing a framework document, titled *Healthy Horizons*, which will replace both the National Rural Health Strategy 1994 and the update document to the 1996 Strategy.

The current draft of *Healthy Horizons* identifies as one of its priority goals the improvement of 'highest health priorities first'. By using *Healthy Horizons* as a broad framework, it is recommended that State and Territory Governments and communities consider specific strategies related to improving cardiovascular health in rural and remote areas such as:

- ensuring that a consistent supply of affordable fresh fruit and vegetables is available. This may involve means of reducing transport costs, subsidies, grants for upgrade of storage facilities and support for production of locally grown produce;

- increasing the emphasis on anti-smoking programs, especially the prevention of uptake among youth;

- developing strategies for nursing, allied health and Aboriginal health workers that are equivalent to the General Practice Incentives Program, which aim towards a competent and continuous remote health workforce through financial support in relocation, accommodation, and retention strategies such as continuing education programs (or financial support) and locum services;

- developing and implementing basic standards of essential primary health care services including clinical and public health components;

- upgrading the community service obligations of telecommunications service providers to include data transfer facilities such as facsimile, email and Internet to remote populations; and

- ensuring that new information systems are based on those that already exist, and include standard treatment protocols for opportunistic screening, recall and review.

The Commonwealth Government, through OATSIH and the Rural Health program area, should ensure that there is collaboration and cohesion between the various Aboriginal Health and Primary Health Care services being developed.

Socio-economically disadvantaged populations

A key aim of public policy in the next millennium must be to design cross-sectoral interventions that improve the health of the socio-economically disadvantaged and reduce the social inequalities in health status.

The Commonwealth-funded National Collaboration on Health and Socio-economic Status is looking at the evidence and implications for policy and practice of the relationship between health and personal and social control, and the importance of social networks in health creation.

Policy initiatives are needed that:

- improve living and working conditions; and

- influence people's health-related attitudes and behaviours, through sensitive interventions that combine education and support with action at other policy levels, and facilitate access to health and social services according to need.

A strategic approach should include:

- research to investigate variations in cardiovascular health across populations that are not explained fully by known risk factors or advances in treatment;

- establishing new partnerships to encourage community development in public health interventions eg with communities, voluntary organisations and employers; and

- development of new indicators for monitoring risk conditions.

Monitoring and information management

The National Centre for Monitoring Cardiovascular Disease is developing an integrated information system that will cover major aspects of prevention, treatment, management and mortality for individual heart, stroke and vascular conditions, as well as monitoring differences between population groups. It has already established a comprehensive mortality surveillance system and produced a baseline report on the medical care of heart, stroke and vascular disease in Australia. Major gaps and deficiencies in data for monitoring heart, stroke and vascular disease are being addressed and the Centre has initiated the development of national data standards for risk factors. The Centre plans to meet demand for up-to-date information on heart, stroke and vascular disease through a regular bulletin and Internet access to data.

There is an urgent need for a national risk factor prevalence survey which includes taking blood samples from participants, and which collects information relevant to all NHPAs. There has been no such 'blood survey' since the last conducted by the National Heart Foundation in 1989. Thus, there is no way of knowing trends in such important determinants of heart, stroke and vascular disease as blood cholesterol. It is important that sufficient funds be allocated to complete this essential component of the national monitoring system as soon as possible.

It is also recommended that the national cardiovascular monitoring system gives special attention to monitoring cardiovascular conditions other than coronary heart disease, such as stroke, heart failure, peripheral vascular disease, angina and related coronary syndromes.

Other methods of information management should include linkage of patient-related medical data, and the use of technology to promote the uptake of accurate and current clinical guidelines.

- The establishment of a unique patient identifier to facilitate record linkage will need Commonwealth oversight to coordinate State and Territory activities. The process would be aided by a Commonwealth-coordinated conference to set up the terms of reference and timelines, with AIHW being the appropriate body to supervise and coordinate further development.

- There should be further evaluation of portable medical records (health care cards).

- The introduction of computerised clinical records into general practice needs to be encouraged and supported. The Practice Incentives Program payment formula will be amended in mid-1999 to encourage greater use of clinical computing, in the first instance through an incentive to adopt electronic prescribing.

- The further development of telemedicine should be focused on areas of clinical need.

- Information technology should facilitate education of and encourage communication with health professionals working in remote regions.

Recommendations

- A national focus on cardiovascular health should be established, through a national program area within the Department of Health and Aged Care. This would support a Cardiovascular Health Advisory Committee, which would advise Commonwealth Government and State/Territory Governments through existing mechanisms such as the National Health Priority Committee and the National Public Health Partnership.

- Approaches to primary prevention should be integrated nationally through the National Public Health Partnerships and the framework for the National Primary Prevention Strategy, and resourced at the level required for effective action.

- A nationally coordinated mechanism to ensure regularly updated systematic reviews and guidelines are available should be linked to local planning and quality improvement processes for implementation.

- A national approach to cardiovascular health should include a focus on stroke, which involves all relevant stakeholders and addresses specific stroke-related issues across the continuum of care.

- There should be a strategic and coordinated approach to the development and implementation of prevention programs and primary health care in special population groups, especially Indigenous populations, with sufficient funds and infrastructure for this purpose. All programs must be appropriate to local needs and conditions.

- There should be continued funding of the national system for monitoring cardiovascular disease, through the Australian Institute of Health and Welfare, and funds allocated for the conduct of a national risk factor prevalence survey which includes taking a blood sample from participants.

Appendix 1

NHPA indicators for general health

This appendix presents detailed information on cardiovascular and general health indicators for which data are available. The relevance, interpretation, trends where possible, and the most recent data are shown for each indicator. Where available, a comparison of data for States and Territories is provided. Data issues such as definitions, coverage and availability are also discussed.

The indicators highlight the major modifiable behavioural and physiological risk factors for heart, stroke and vascular disease (ie tobacco smoking, physical inactivity, overweight, hypertension, high blood cholesterol and a high dietary intake of saturated fat). These risk factors are relevant to chronic conditions other than heart, stroke and vascular disease. For example, physical inactivity is considered a risk factor relevant to all five of the NHPAs (heart, stroke and vascular disease, cancer, diabetes, injury and mental health). Overweight, high cholesterol levels and hypertension are associated with risk of Type 2 diabetes, and smoking and saturated fat intake are associated with an increased risk for some cancers.

NHPA indicators for general health

Indicator 1.1: Proportion of adults who smoke regularly, ages 18 or more
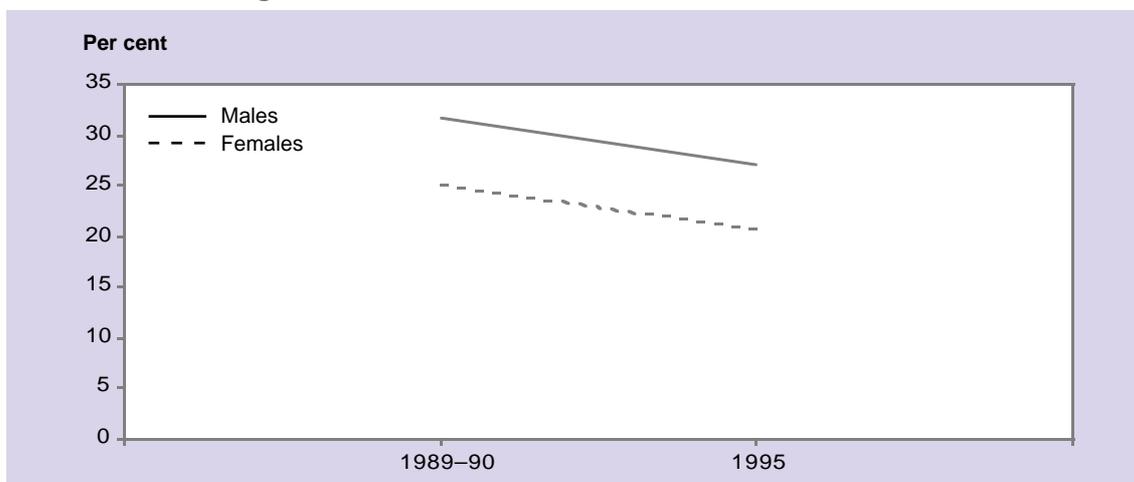
Per cent

Sex	1989–90	1995
Males	31.6	27.1
Females	25.1	20.8

Note: Rates, age standardised to the 1991 Australian population, are given as percentages.

Source: AIHW analysis of data from ABS National Health Surveys.

- Tobacco smoking is associated with an increase in risk for coronary heart disease, stroke and peripheral heart disease, some cancers and other diseases and conditions.

- One in four males and one in five females are at an increased risk of heart, stroke and vascular disease due to tobacco smoking, corresponding to some 3.2 million people.

- The prevalence of smoking has been declining since the early 1980s and this trend has continued into the 1990s. Time series data from the Anti-Cancer Council of Victoria show that the rate of decline in current smoking has slowed in more recent years (Hill et al 1998).

- The decline in proportion of adults smoking between 1989–90 and 1995 was greater for females (17.1 per cent) than for males (14.2 per cent).

- The prevalence of smoking is almost twice as high among both sexes in lower socio-economic groups and among Indigenous Australians.

- Tobacco smoking varies with age, with the highest rates among 25–29 year olds for both males (34.7 per cent) and females (35.0 per cent), after which the prevalence of smoking decreases with age for both sexes (AIHW 1998a).

State and Territory comparisons

- There are no major differences between the States and Territories in the prevalence of tobacco smoking, except for the Northern Territory where the proportion of males and females who smoke is higher.

- The proportion of males and females smoking tobacco declined between 1989–90 and 1995 for each State and Territory.

- Largest declines in smoking were noted among males in the Northern Territory and the Australian Capital Territory, and among females in Western Australia and New South Wales.

Regional variations in smoking prevalence, ages 18 or more

State/ Territory	Males			Females		
	1989–90	1995	% change	1989–90	1995	% change
NSW	32.0	27.0	−15.6	25.8	20.4	−20.9
Vic	30.8	26.5	−14.0	24.5	20.5	−16.3
Qld	31.7	28.7	−9.5	24.8	22.1	−10.9
WA	30.3	26.5	−12.5	25.0	19.3	−22.8
SA	32.6	26.5	−18.7	23.6	20.6	−12.7
Tas	31.2	26.9	−13.8	26.9	25.1	−6.7
ACT	34.8	23.6	−32.2	21.9	19.9	−9.1
NT	43.3	33.6	−22.4	29.9	29.0	−3.0
Australia	**31.6**	**27.1**	**−14.2**	**25.1**	**20.8**	**−17.1**

Note: Rates, age standardised to the 1991 Australian population, are given as percentages.

Source: AIHW analysis of data from ABS National Health Surveys.

Data issues

Data definition

- Current smoker defined as having smoked one or more cigarettes per day on average for ages 18 and above.

Data availability

- ABS National Health Surveys; ABS Population Survey Monitor; NHF Risk Factor Prevalence Surveys; Anti-Cancer Council of Victoria Patterns of Tobacco Smoking; National Campaign Against Drug Abuse National Household Surveys.

Data coverage

- Frequency is variable; national, States and Territories.

Data reliability

- Self-reported data may produce underestimates of smoking prevalence.

Data deficiencies

- Standard methodologies for monitoring smoking prevalence rates are currently being developed by the AIHW.

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Indicator 1.2: Proportion of secondary school students who smoke, age 15

Per cent

[Line chart showing proportion of 15-year-old secondary school students who smoke, Males and Females, from 1984 to 1996. The y-axis shows Per cent from 0 to 35, and the x-axis shows years 1984, 1987, 1990, 1993, 1996.]
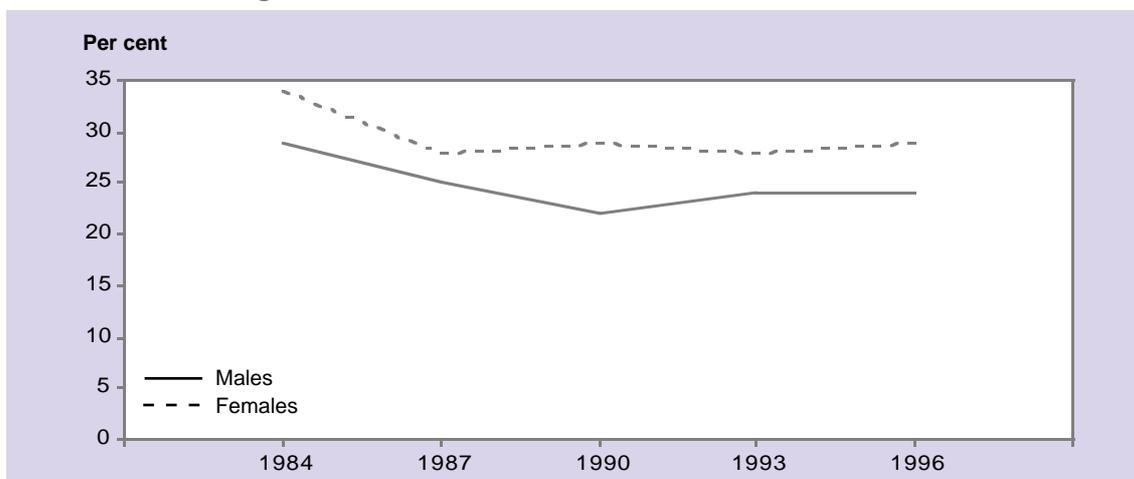
Sex	1984	1987	1990	1993	1996
Males	29	25	22	24	24
Females	34	28	29	28	29

Notes: Rates are given as percentages.

1984 Australian Capital Territory not sampled; 1987 South Australia not sampled.

Sources: Hill et al (1987; 1990; 1993; unpublished); Hill & White (1995).

- Tobacco smoking is related to an increase in risk for coronary heart disease, stroke and peripheral disease, some cancers and other diseases and conditions.
- About 70,000 Australian teenagers start smoking each year. Surveys conducted by the Australian Cancer Society show that more than one-quarter of 15-year-old secondary school students smoked in those years. Girls were more likely to have smoked at least one cigarette in the week before interview (Hill et al 1987; 1990; 1993; Hill & White 1995; Hill et al, unpublished data).
- Between 1987 and 1996, the proportion of 15-year-old students who smoked in the week before the interview stayed relatively stable. This trend indicates that the propensity of 15-year-old students to start smoking has not decreased during the past 10 years.

- In 1993, the proportion of current smokers among male students varied by State. For females, wide variation was noted in the rate of change between 1990 and 1993 across the States and Territories (AIHW & DHFS 1997).
- Significantly fewer secondary school children of Asian ethnic origin were current smokers compared to secondary school children of other ethnic origins (Gliksman et al 1989).

Data issues

Data definition

- This indicator is defined as age-specific smoking rate among 15-year-old secondary school students.

- 'Current smoking' was defined as having smoked at least one cigarette in the week prior to the survey.

Data availability

- Anti-Cancer Council of Victoria; National Campaign Against Drug Abuse National Household Surveys.

Data coverage

- Frequency is variable; national, States and Territories (excepting 1984 — ACT not sampled; 1987 — SA not sampled).

Data reliability

- Self-reported data may produce underestimates of smoking prevalence.

Data deficiencies

- There is a need to develop standard methods and definitions for monitoring smoking prevalence among young people for use in population surveys.

Indicator 1.3: Proportion of adults not engaged in regular physical activity, ages 18 or more
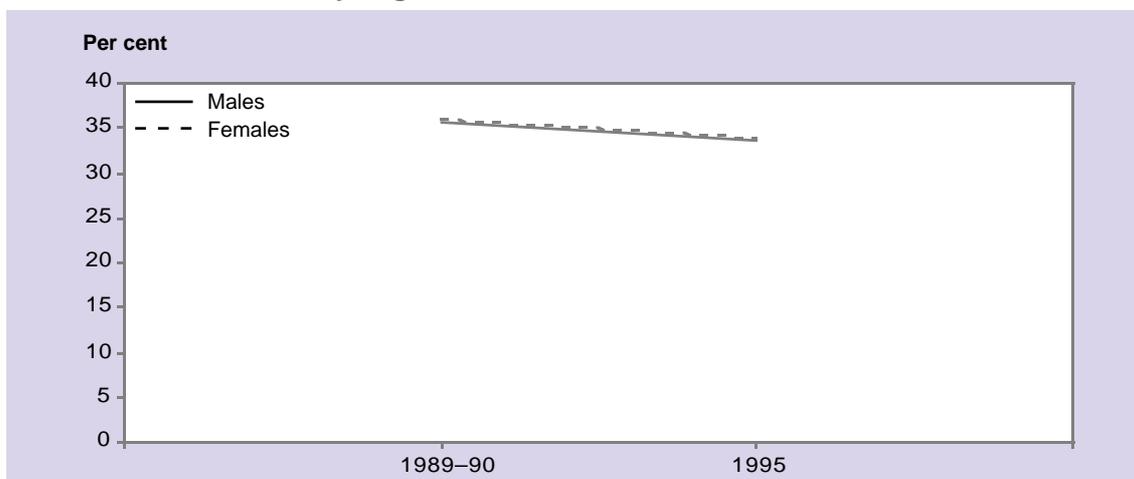
Per cent

Sex	1989–90	1995
Males	35.6	33.5
Females	36.0	33.8

Note: Rates, age standardised to the 1991 Australian population, are given as percentages.

Source: AIHW analysis of data from ABS National Health Surveys.

- Physical inactivity is a risk factor for coronary heart disease, some cancers, diabetes, injury, osteoporosis, and mental health. Physical inactivity is recognised as at least as important as high blood pressure or high blood cholesterol in contributing to cardiovascular conditions.

- Over one-third of adult Australians are at an increased risk of several health-related conditions due to a sedentary lifestyle. Between 1989–90 and 1995 there was only a slight increase in the prevalence of adults participating in physical activity for sport, recreation or fitness.

- Physical inactivity is more prevalent among males and females in lower socio-economic groups and among those living in remote regions (Chapter 6).

- Walking for recreation or exercise continued to increase in popularity during the 1990s with 45 per cent of males and 53 per cent of females reporting walking (a moderate-intensity activity) in 1995 compared with 41 per cent and 49 per cent respectively in 1989–90. Despite this increase, the overall proportions of people undertaking physical activity at moderate intensities remained fairly similar between 1989–90 and 1995, suggesting that walking may have replaced other forms of moderate physical activity (Armstrong 1998).

- Rates of physical inactivity generally increased with increasing age, however high rates of physical inactivity were seen among males aged 45–59 years.

State and Territory comparisons

- The prevalence of physical inactivity for males was highest in the Northern Territory and lowest in the Australian Capital Territory. There was less variation for females, although the Australian Capital Territory and Western Australia had lower rates than the other States and the Northern Territory.

- For males and females in the Northern Territory, and for females in Tasmania, the prevalence of physical inactivity increased between 1989–90 and 1995.

Regional variation in proportion not engaged in physical activity, ages 18 or more

State/ Territory	Males			Females		
	1989–90	1995	% change	1989–90	1995	% change
NSW	34.7	34.3	−1.2	37.5	36.7	−2.1
Vic	35.7	34.2	−4.2	35.5	31.9	−10.1
Qld	37.1	33.7	−9.2	36.7	34.2	−6.8
WA	33.2	29.5	−11.1	32.4	28.0	−13.6
SA	38.9	34.0	−12.6	36.4	34.1	−6.3
Tas	36.4	33.6	−7.7	33.5	35.5	6.0
ACT	29.8	22.7	−23.8	30.2	27.4	−9.3
NT	36.8	42.7	16.0	25.8	35.1	36.0
Australia	**35.6**	**33.5**	**−5.9**	**36.0**	**33.8**	**−6.1**

Note: Rates, age standardised to the 1991 Australian population, are given as percentages.

Source: AIHW analysis of data from ABS National Health Surveys.

Data issues

Data definition

- Proportion of adults not engaged in physical activity was defined as those not participating in any vigorous exercise, moderate exercise or walking for sport, recreation or fitness in the two weeks prior to interview. This definition does not reflect current recognition that a level of regular, moderate intensity physical activity is required to obtain health benefits.

Data availability

- ABS National Health Surveys; National Physical Activity Survey; ABS Population Survey Monitor; NHF Risk Factor Prevalence Surveys; Australian Health and Fitness Survey; Department of the Arts, Sport, the Environment, Tourism and Territories Physical Activity Survey.

Data coverage

- Frequency is variable; national, States and Territories for ages 18 and above.

Data reliability

- Self-reported data reflect the respondent's perception of the activity undertaken, its intensity, the respondent's level of fitness etc.

Data deficiencies

- Standard methodologies for monitoring physical activity prevalence rates and develop-ment of a measure of physical activity to obtain health benefit are currently being developed by the AIHW.

Indicator 1.4: Proportion of adults who are overweight, ages 18 or more
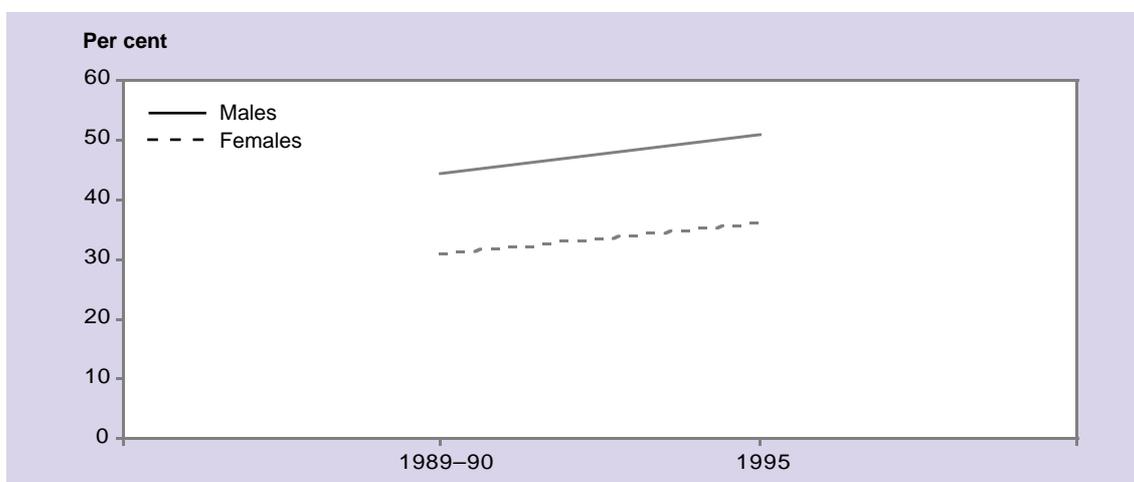
Per cent

Sex	1989–90	1995
Males	44.4	51.0
Females	30.9	36.1

Note: Rates, age standardised to the 1991 Australian population, are given as percentages.

Source: AIHW analysis of data from ABS National Health Surveys.

- Overweight is associated with an increased risk for cardiovascular conditions, diabetes and high blood pressure.

- The proportion of adults at increased risk of illness and health-related conditions through being overweight is increasing.

- The steady increase in the prevalence of overweight seen during the 1980s has continued with a greater rate of increase during the first half of the 1990s (AIHW 1998a).

- Between 1989–90 and 1995, the proportion of overweight adults rose 6.6 per cent among males and 5.2 per cent among females.

- Overweight is more prevalent among people living in remote areas, and among females in lower socio-economic groups (Chapter 6).

- The estimates are based on self-reported data and may therefore underestimate the true prevalence of overweight people. Analysis of the 1995 National Nutrition Survey (ABS & HEALTH 1998) based on measured height and weight shows that an estimated 63.1 per cent of men and 47.8 per cent of women aged over 18 years could be classified as overweight.

State and Territory comparisons

- In 1995, the proportions of overweight adults were greatest among males in the Northern Territory, and among females in Tasmania, the Northern Territory and South Australia.

- Between 1989–90 and 1995, an increase in the proportion of overweight males occurred in all States and Territories. However, the rate of change varied considerably, with large increases noted in the Northern Territory, the Australian Capital Territory, New South Wales, Queensland and Tasmania.

- Between 1989–90 and 1995, large increases in the proportion of overweight females occurred in all States and Territories.

Regional variation in proportion of persons overweight, ages 18 or more

State/ Territory	Males			Females		
	1989–90	1995	% change	1989–90	1995	% change
NSW	43.5	51.0	17.2	29.9	35.2	17.7
Vic	45.5	51.2	12.5	32.1	35.7	11.2
Qld	44.5	51.8	16.4	31.0	36.3	17.1
WA	43.0	48.9	13.7	30.4	36.4	19.7
SA	47.2	51.9	10.0	32.1	38.8	20.9
Tas	44.5	51.5	15.7	31.4	40.0	27.4
ACT	42.2	49.8	18.0	25.6	35.0	36.7
NT	44.8	53.6	19.6	28.8	39.7	37.8
Australia	**44.4**	**51.0**	**14.9**	**30.9**	**36.1**	**16.8**

Note: Rates, age standardised to the 1991 Australian population, are given as percentages.

Source: AIHW analysis of data from ABS National Health Surveys.

Data issues

Data definition

- Overweight refers to persons with a BMI of greater than 25.0 (BMI is a person's weight in kilograms divided by the square of the person's height in metres).

Data availability

- Self-reported height and weight: ABS National Health Surveys; ABS Population Survey Monitor; National Physical Activity Survey.

- Measured height and weight: National Nutrition Survey (ABS & HEALTH 1998); NHF Risk Factor Prevalence Surveys; Australian Health and Fitness Survey; Department of the Arts, Sport, the Environment, Tourism and Territories Physical Activity Survey.

Data coverage

- Frequency is variable; national, States and Territories for ages 18 and above.

Data reliability

- Self-reported estimates of height and weight underestimate the prevalence of overweight adults.

NHPA indicators for general health

Indicator 1.5: Proportion of adults with high blood pressure and/or on antihypertensive treatment, ages 20–69

Per cent

Sex	1989	1995
Males	19.5	17.1
Females	12.6	10.1

Notes: Rates, age standardised to the 1991 Australian population, are given as percentages.

All estimates are for State and Territory capital cities only.

Sources: AIHW analysis of data from the 1989 NHF Risk Factor Prevalence Study and the 1995 ABS National Nutrition Survey (ABS & HEALTH 1998).

- Hypertension is a risk factor for coronary heart disease, stroke and peripheral vascular disease. The risk of stroke or coronary heart disease is up to four times greater among people with high blood pressure than among non-affected people of the same age. People on treatment for high blood pressure are also at an increased risk.

- The proportion of people at risk of heart, stroke and vascular disease from hypertension declined during the first half of the 1990s. This trend continues the significant decline in the proportion of males and females with hypertension seen during the 1980s (AIHW 1998a).

- The proportion of males and females with hypertension increases with age. For example, in 1995, among people aged 65–69 years, 40 per cent of men and 35 per cent of women had high blood pressure and/or were on treatment for the condition.

- High blood pressure is known to be more prevalent in lower socio-economic groups (Bennett 1995; 1996).

Data issues

Data definition

• Hypertension is defined as systolic blood
pressure ≥ 160 mmHg and/or diastolic blood
pressure ≥ 95mmHg and/or receiving treat-
ment for high blood pressure.

Data availability

• 1995 National Nutrition Survey (ABS &
HEALTH 1998); NHF Risk Factor Prevalence
Surveys.

Data coverage

• Frequency is variable — for trend analyses,
States and Territory capital cities for ages
20–69; for 1995, national, State and Territories
for ages 16 and above.

Data reliability

• Blood pressure is liable to measurement error,
dependent as it is upon observer skill in
objective and accurate reading and recording.

Data deficiencies

• Standard methodologies for measuring blood
pressure in population surveys are to be
developed by the AIHW.

Indicator 1.6: Mean blood pressure levels, ages 20–69

Sex	1989		1995	
	Systolic BP	**Diastolic BP**	**Systolic BP**	**Diastolic BP**
Males	129	82	128	78
Females	122	76	122	74

Notes: Mean levels, age standardised to the 1991 Australian population, are given as mm Hg.

All estimates are for State and Territory capital cities only.

BP = blood pressure.

Sources: AIHW analysis of data from the 1989 NHF Risk Factor Prevalence Study and the 1995 ABS National Nutrition Survey (ABS & HEALTH 1998).

- High blood pressure is a risk factor for heart, stroke and vascular disease.

- The population risk of heart, stroke and vascular disease from high diastolic blood pressure decreased during the first half of the 1990s.

- This trend continues the significant declines in mean blood pressure levels seen during the 1980s that occurred equally among those not on antihypertensive medication as among those on treatment (Bennett & Magnus 1994).

- Both systolic and diastolic blood pressures are predictors of cardiovascular disease at all ages, although systolic blood pressure is a stronger predictor of death due to coronary heart disease.

- Mean systolic blood pressure is higher in Eastern European males than in Australian-born males but higher in Australian-born females than in those born in the Middle East, South-East Asia, England and Wales.

- Mean systolic blood pressure among migrants generally increases with length of residency in Australia (Bennett 1993).

Data issues

Data definition

• The mean blood pressure levels of the population, ages 20–69 (excluding pregnant women).

Data availability

• 1995 National Nutrition Survey (ABS & HEALTH 1998); NHF Risk Factor Prevalence Surveys.

Data coverage

• Frequency is variable — for trend analyses, States and Territory capital cities for ages 20–69; for 1995, national, State and Territories for ages 16 and above.

Data reliability

• Blood pressure is liable to measurement error, as it is dependent upon observer skill in objective and accurate reading and recording.

Data deficiencies

• Standard methodologies for measuring blood pressure in population surveys are to be developed by the AIHW.

Indicator 1.7: Proportion of adults with high blood cholesterol, ages 20–69

Per cent
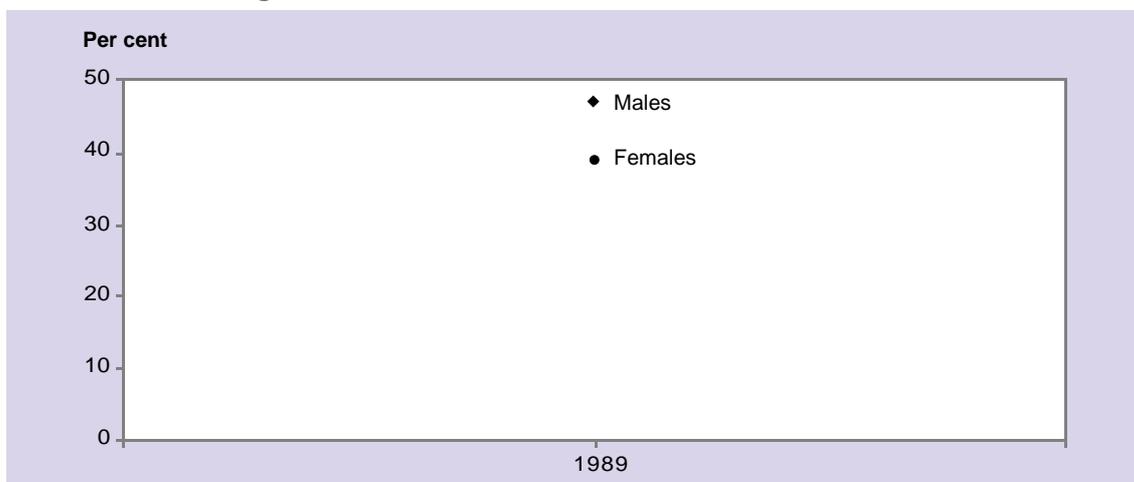
◆ Males

● Females

1989

Sex	1989
Males	46.6
Females	38.6

Notes: Estimates, age standardised to the 1991 Australian population, are given as percentages.

Estimates are for State and Territory capital cities only.

Source: AIHW analysis of data from the 1989 NHF Risk Factor Prevalence Study.

• High blood cholesterol levels are a major risk factor for coronary heart disease and stroke. Total blood cholesterol levels above 5.5 mmol/L are an indication of increased risk of developing coronary heart disease. Levels above 6.5 mmol/L are considered to indicate very high risk.

• There are no data to determine if the proportion of people at risk of coronary heart disease and stroke from high blood cholesterol levels is decreasing.

• There were no clear time trends in the blood cholesterol levels of Australian men and women during the 1980s (Bennett & Magnus 1994) and there are no later data on trends during the 1990s.

• The 1989 National Heart Foundation (NHF) Risk Factor Prevalence Survey found that 16.0 per cent of males and 15.4 per cent of females (aged 20–69) had blood cholesterol levels of 6.5 mmol/L or more (Risk Factor Prevalence Management Committee 1990).

• The prevalence of high blood cholesterol tends to increase with increasing age, and is more common in males than females in most age groups (Risk Factor Prevalence Management Committee 1990).

• Among males aged 25–64 years, those living alone or previously married had around 1.5 times higher rate for elevated blood cholesterol than did those with partners or dependents (Mathers 1994).

• High blood cholesterol is known to be more prevalent among females in lower socio-economic groups (Bennett 1995; 1996).

Data issues

Data definition

- High blood cholesterol is defined as a level equal to or greater than 5.5 mmol/L.

Data availability

- NHF Risk Factor Prevalence Surveys.

Data coverage

- Frequency is variable; State and Territory capital cities for ages 20–69 (25–64 only for 1980 and 1983).

Data reliability

- Good.

Data deficiencies

- There is no national collection strategy for regular population monitoring of blood cholesterol levels.

Indicator 1.8: Contribution of saturated fat as a proportion of total energy intake, ages 25–64
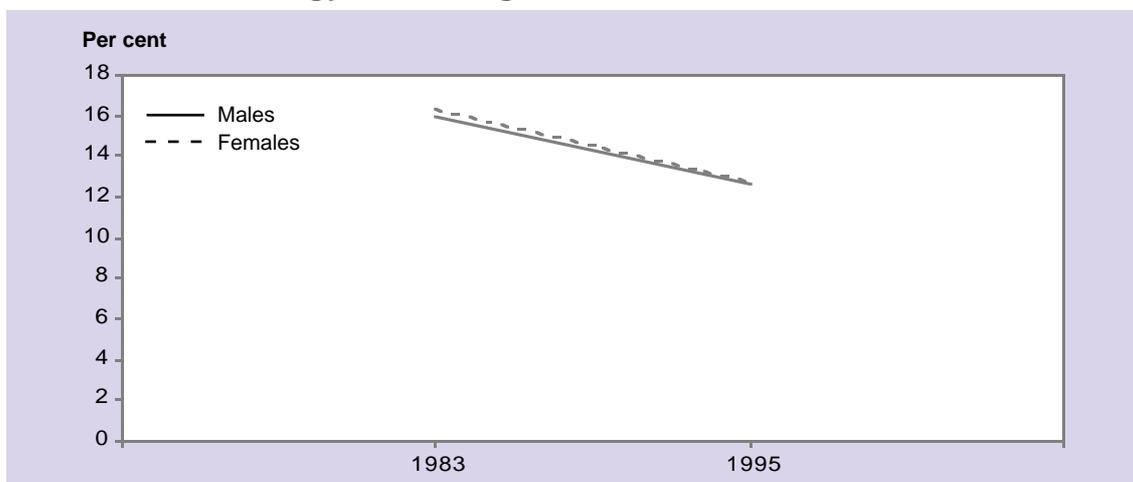
Per cent

Sex	1983	1995
Males	15.9	12.7
Females	16.3	12.8

Notes: Estimates, age standardised to the 1991 Australian population, are given as percentages.

1983 estimates are for State and Territory capital cities only.

Sources: 1983 National Dietary Survey of Adults (NHF 1986; 1987) and AIHW analysis of data from the 1995 ABS National Nutrition Survey (ABS & HEALTH 1998).

- Diets high in saturated fatty acids, particularly trans-fatty acids, and total intake of fat are considered to be among the dietary risk factors for heart, stroke and vascular disease. Although trans-fatty acids tend to raise blood cholesterol levels, heart, stroke and vascular disease results from a complex of individual dietary factors rather than any one dietary component.

- The risk of heart, stroke and vascular disease from a high contribution of saturated fat as a proportion of total energy intake has declined over the past decade.

- Diet can exert its effect not only through the types of food consumed and the resultant energy intake, but also through different processes for its metabolism at different ages. Disease risk may also vary with sex.

Data issues

Data definition

- Energy (in kJ) contributed by saturated fat taken as a percentage of total energy (kJ) intake:

    $$E_{sf}/E_t * 100$$

    where Esf = energy in saturated fat given as [saturated fat (g) * 37kJ], and E_t = total energy.

Data availability

- 1983 National Dietary Survey of Adults (NHF 1986; 1987); 1995 National Nutrition Survey (ABS & HEALTH 1998).

Data coverage

- Frequency is variable — State and Territory capital cities (1983), national (1995).

Data reliability

- Good. Comparisons between 1983 and 1995 are to be interpreted with caution as data were collected from State capital cities only in 1983.

Appendix 2

NHPA indicators for cardiovascular health

This appendix presents detailed information on cardiovascular health indicators for which data are currently available. The relevance, interpretation, trends where possible, and the most recent data are shown for each indicator. Where available, a comparison of data for States and Territories is provided. Data issues such as definitions, coverage and availability are also covered.

Several of the indicators are based on hospitalisation separations. These are proxy indicators of morbidity, since the rates are influenced by availability of beds, admission policies and social factors. Also, data are based on events rather than individuals and re-admissions are not distinguished from first admissions. As such, hospitalisation rates are best interpreted as an indicator of the use of hospital resources.

Indicator 2.1: Incidence rates for myocardial infarction, ages 30–79

Events per 100,000 population
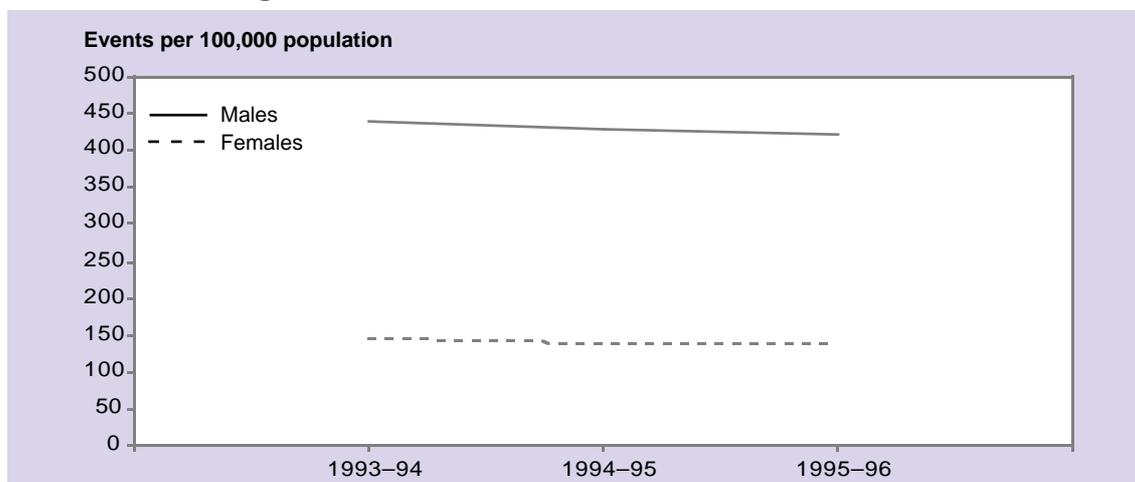
Sex	1993–94	1994–95	1995–96
Males	441	428	421
Females	144	139	137

Notes: Although the indicator definition refers to the age range 30–79 years, currently data are available for ages 30–69 only.

Rates, age standardised to the December 1993 Australian population, are given per 100,000 population.

Includes fatal and non-fatal myocardial infarction events.

Methodology developed by Universities of Newcastle and Western Australia and Queensland Department of Health.

Sources: AIHW National Hospital Morbidity Database and AIHW National Mortality Database.

- Myocardial infarction describes damage to the heart that results from a heart attack, an acute event that occurs when a vessel supplying blood to the heart muscle is suddenly blocked by a blood clot.

- The incidence rate for myocardial infarction (heart attack) is useful for monitoring the effectiveness of prevention of coronary heart disease.

- National estimates are available for three years only, so a clear national trend of the incidence of myocardial infarction cannot be determined with certainty. However, local studies in Newcastle and Perth show that, between 1984 and 1993, the rate of first heart attack fell, indicating a decline in incidence of heart attacks (Beaglehole et al 1997).

- Heart attacks are almost three times more common among males (421 per 100,000 population) than among females (137 per 100,000 population) for the ages 35–69.

- Non-fatal heart attacks represented about 60 per cent of the total number of events over the period 1993–1996.

Data issues

Data definition

- Age-standardised number of fatal and non-fatal myocardial infarction events (ICD-9 410) per 100,000 population, ages 30–79 years.
- Rates of heart attack were estimated from numbers of coronary deaths and hospital separations, and applying adjustment factors determined from regional studies in New South Wales, Queensland and Western Australia.

Data availability

- AIHW data based on information collected by State and Territory registrars of births, deaths and marriages; AIHW data based on information collected by State and Territory public and private hospitals; and adjustment factors from regional studies in New South Wales, Queensland and Western Australia. These factors are currently available for ages 35–69 only.

Data coverage

- Annual

Data reliability

- Good

Indicator 2.4: Hospital separation rates for principal diagnosis of unstable angina, ages 0–79

Hospital separations per 100,000 population
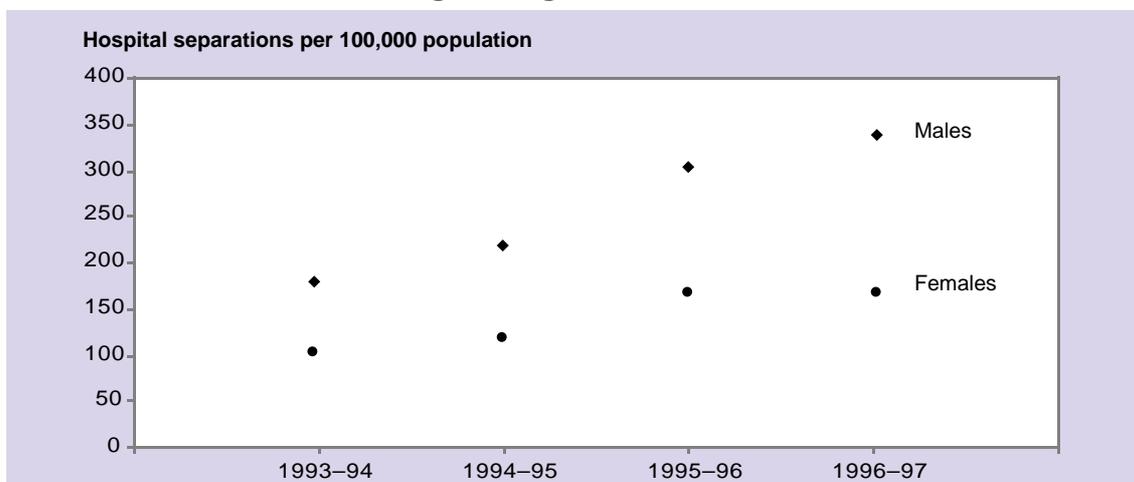
Sex	1993–94	1994–95	1995–96	1996–97
Males	178	216	302	337
Females	100	117	164	166

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Hospital Morbidity Database.

- Angina is temporary chest pain or discomfort caused by a reduced blood supply to the heart muscle. In unstable angina, the pain occurs at rest; or occurs more easily, more often or for longer.

- Unstable angina carries an important risk of death. Admissions to hospital for definite or suspected unstable angina outnumber those for myocardial infarction. The indicator reflects the use of hospital resources (caseload, throughput) for unstable angina.

- There was an apparent increase in the rate of hospitalisation for this diagnosis in the period 1993–1997. However, it should be noted that a new coding standard concerning angina was introduced in July 1995, so any comparisons between years should be made with caution.

- In 1996–97, the age-standardised hospital separation rate for unstable angina was 337 per 100,000 population among males aged 0–79 and 166 per 100,000 population in females of the same age.

- In 1996–97, there were 33,782 hospitalisations for unstable angina in males of all ages, 30,438 of these among those aged 0–79. Among females of all ages there were 21,137 separations, 16,349 among those aged 0–79.

- People aged 65 years and above account for over 50 per cent of hospital separations for this diagnosis among males and 70 per cent among females.

- Males were almost twice as likely as females to be hospitalised for unstable angina in 1996–97.

Data issues

Data definition

• Age-standardised number of separations with a principal diagnosis of unstable angina (ICD-9 411.1) per 100,000 population, ages 0–79.

Data availability

• AIHW data based on information collected by State and Territory public and private hospitals.

Data coverage

• Annual; States and Territories.

Data reliability

• A new coding standard for angina was introduced in July 1995, making comparisons between years difficult.

Indicator 2.5: Hospital separation rates for principal diagnosis of congestive heart failure, ages 0–79

Hospital separations per 100,000 population
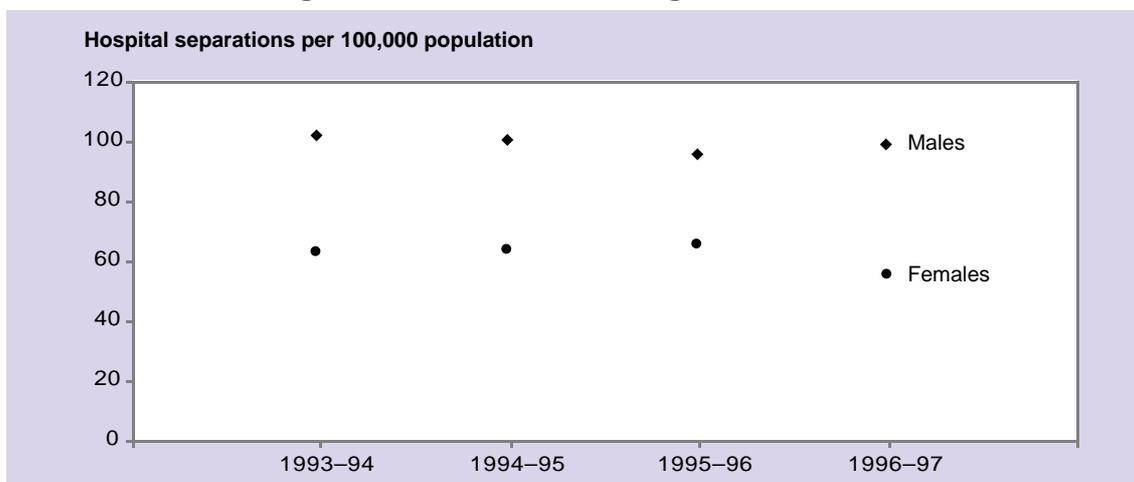
Sex	1993–94	1994–95	1995–96	1996–97
Males	102	100	96	98
Females	63	63	65	55

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Hospital Morbidity Database.

- Heart failure occurs when the heart is unable to pump blood adequately to the rest of the body. The term congestive heart failure is often used as an alternative term, with the congestion referring to an associated build up of fluid in the lungs, liver or legs.

- The indicator reflects the use of hospital resources (caseload, throughput) for congestive heart failure.

- The rate of hospitalisation for this diagnosis in the period 1993–1997 has remained fairly stable.

- The age-standardised hospital separation rate for congestive heart failure was 98 per 100,000 males aged 0–79 and 55 per 100,000 females of the same age in 1996–97.

- In 1996–97, there were 12,844 separations for congestive heart failure in males of all ages, 8,514 of which were in people aged 0–79. Among females of all ages there were 12,423 episodes, 5,593 of which occurred in those aged 0–79.

- Heart failure is a disease of older people. People aged 65 years and above account for over 80 per cent of hospital separations for this diagnosis.

- Males were 75 per cent more likely than females to be hospitalised for congestive heart failure in 1996–97.

- Heart failure and shock is the leading cardio-vascular AN-DRG in terms of public hospital admissions. It accounts for the largest number of patient days among cardiovascular conditions and ranks eighth highest for public hospital patient days overall.

Data issues

Data definition

- Age-standardised number of separations with a principal diagnosis of congestive heart failure (ICD-9 428.0) per 100,000 population, ages 0–79.

Data availability

- AIHW data based on information collected by State and Territory public and private hospitals.

Data coverage

- Annual; States and Territories.

Indicator 2.10: Death rates for coronary heart disease, ages 0–79

Deaths per 100,000 population
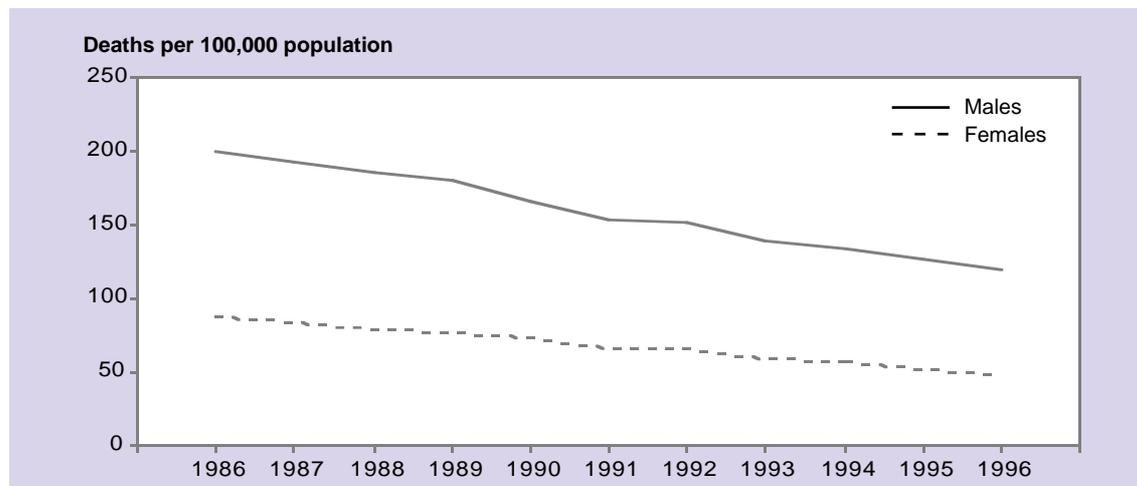
Sex	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Males	200.8	192.8	185.8	179.9	165.9	154.3	151.4	139.9	134.2	125.9	118.8
Females	87.9	84.2	78.5	77.2	73.0	66.7	65.3	59.6	56.8	52.1	48.5

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.
Source: AIHW National Mortality Database.

- Coronary heart disease includes diseases such as heart attack and angina, caused by blockages in the coronary arteries that supply blood to the heart muscle.
- The indicator represents the net effect of prevention and management of coronary heart disease.
- Coronary heart disease death rates have declined substantially over the past 30 years. Between 1985 and 1996 mortality from coronary heart disease fell annually at 5.2 per cent among males and 5.4 per cent among females in the 0–79 age range.
- Coronary heart disease is the leading cause of death in Australia. In 1996, it represented 23 per cent of all deaths and 55 per cent of all cardiovascular deaths.
- Total deaths in 1996 for coronary heart disease were 29,637, representing age-standardised death rates of 195.5 per 100,000 population for males and 105.5 per 100,000 population for females.

- Death rates from coronary heart disease among the Indigenous population in 1994–96 were 1.6 times higher than for other Australians. For the 25–64 age group, the difference was even more marked, with Indigenous males and females having five and seven times the death rates of their non-Indigenous counterparts (Mathur & Gajanayake 1998).
- Mortality from coronary heart disease is higher among people who are socio-economically disadvantaged. For example, males in manual occupations are at least 35 per cent more likely to die from coronary heart disease than males in professional occupations (Bennett 1996).

State and Territory comparisons

- In 1994–1996, in the age group 0–79, coronary heart disease death rates were greatest in Tasmania among males and in the Northern Territory among females.

- Between 1985 and 1996, there was a decrease in death rates from coronary heart disease in all States and Territories. However, the rate of change varied, with slower declines in the Northern Territory than other States and Territories, for both males and females.

Regional variations in coronary heart disease deaths per 100,000 population, ages 0–79

State/ Territory	Males		Females	
	Average 1994–1996	Annual % change 1985–1996	Average 1994–1996	Annual % change 1985–1996
NSW	127.8	–5.5	55.2	–5.6
Vic	119.1	–5.3	47.4	–5.6
Qld	132.2	–4.6	57.2	–4.8
WA	122.6	–4.7	47.2	–5.2
SA	130.6	–4.7	50.3	–5.8
Tas	137.2	–5.3	61.8	–4.6
ACT	108.4	–4.9	43.3	–5.5
NT	133.8	–2.3	64.2	–1.1
Australia	**126.3**	**–5.1**	**52.5**	**–5.4**

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Mortality Database.

Data issues

Data definition

- Age-standardised number of deaths from coronary heart disease (ICD-9 410–414) per 100,000 population, ages 0–79.

Data availability

- AIHW data based on information collected by State and Territory registrars of births, deaths and marriages.

Data coverage

- Annual; States and Territories.

Data reliability

- The identification of Indigenous people in death registrations is not accurately recorded in all States and Territories. Only data recorded in South Australia, Western Australia and the Northern Territory are reliable in terms of identifying Indigenous status in death certificates.

Indicator 2.11: Death rates for coronary heart disease among rural and remote area residents, ages 0–79

Deaths per 100,000 population
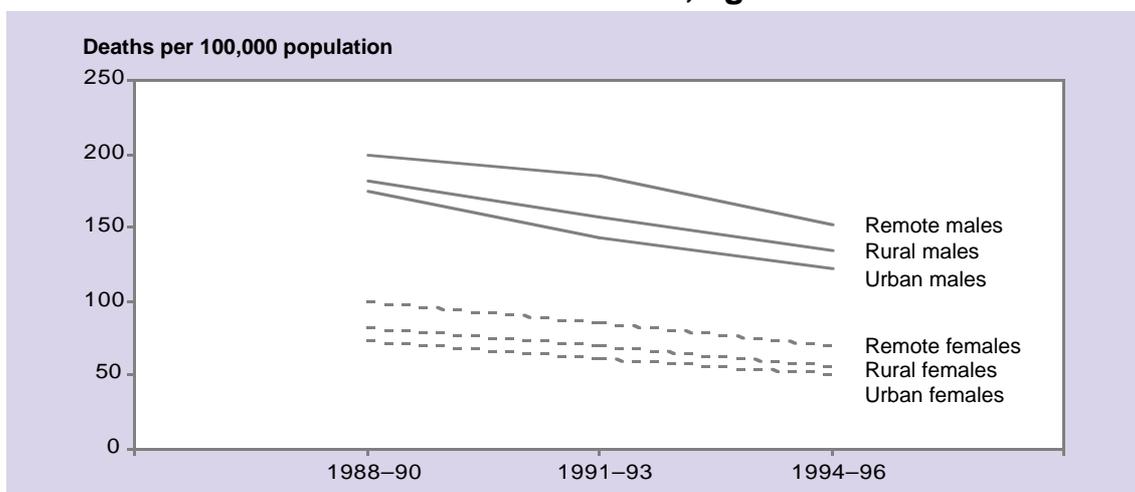
Sex	1988–90			1991–93			1994–96		
	Remote	**Rural**	**Urban**	**Remote**	**Rural**	**Urban**	**Remote**	**Rural**	**Urban**
Males	199.9	182.3	174.3	185.2	158.2	143.1	152.8	134.3	122.0
Females	100.3	81.5	73.6	86.0	69.9	61.0	70.0	56.6	50.5

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Hospital Morbidity Database.

- The indicator represents the net effect of prevention and management of coronary heart disease in rural and remote areas, for comparison with urban areas.

- Death rates from coronary heart disease are higher in rural and remote areas than in urban areas.

- The differences partly reflect the high mortality rates among Indigenous people who make up a higher proportion of the population in rural and remote areas. Access to health services may also be an influencing factor.

- The decline in coronary heart disease death rates over the past decades has been less marked in rural and remote areas than in urban areas. In rural areas, between 1986 and 1996, mortality from coronary heart disease has been falling annually at 4.7 per cent among males and 5.2 per cent among females in the 0–79 age range. In remote areas, the corresponding annual falls have been 3.7 per cent for males and 4.5 per cent for females.

- By comparison, in urban areas the annual falls have been 5.5 per cent for males and 5.9 per cent for females.

Data issues

Data definition

- Age-standardised number of deaths from coronary heart disease (ICD-9 410–414) per 100,000 rural or remote population, ages 0–79.
- The Rural, Remote and Metropolitan Areas classification, based on population numbers and an index of remoteness, was used to categorise deaths by area (see Appendix 3).

Data availability

- AIHW data based on information collected by State and Territory registrars of births, deaths and marriages.

Data coverage

- Annual; States and Territories.

Indicator 3.4: Proportion of people whose main/underlying disabling condition is stroke, ages 25 or more

Rate per 100,000 population
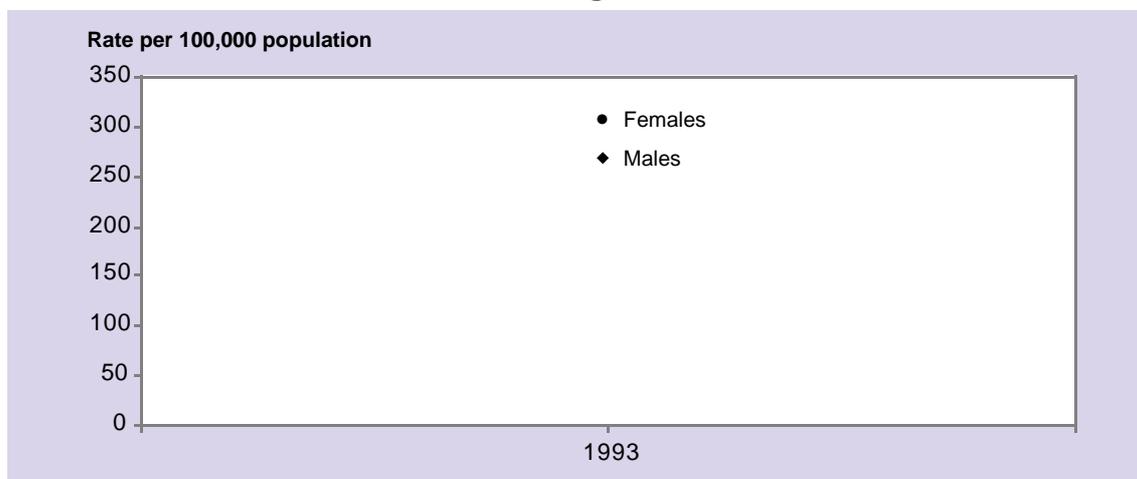
Sex	Number	Rate
Males	14,500	268
Females	17,100	304

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW analysis of data from ABS 1993 Survey of Disability, Ageing and Carers.

- The indicator reflects the burden of stroke in the adult population in terms of disability.
- In 1993, there were 31,600 males and females who identified stroke as the cause of their main disabling condition. Paralysis and physical activity restrictions are prevalent among one in three stroke sufferers, and almost two in three require assistance with mobility tasks.
- About one-third of stroke sufferers are permanently disabled. Stroke is the cause of almost 25 per cent of all chronic disability in Australia (Stroke Australia Taskforce 1997).
- The prevalence of stroke in the community is 20 per cent higher among females than among males.
- The prevalence of stroke increases markedly with age. The risk of stroke doubles with each decade of life. For example, in the 25–44 age group the proportion of stroke sufferers was 42 per 100,000 population compared to 1,236 among the 65 years and over population.
- The vast majority of stroke sufferers are therefore older people. In 1993, 80 per cent of stroke sufferers were aged 65 and over.
- Males and females born in Europe are more likely to have suffered a stroke than their Australian born counterparts.

Data issues

Data definition

- Number of people whose main underlying disabling condition is stroke per 100,000 population, aged 25 and above.

Data availability

- The 1993 Survey of Disability, Ageing and Carers conducted by the Australian Bureau of Statistics is the source for this data. A similar survey was conducted in 1998 and data will become available in 1999.

Data coverage

- The coverage of the Disability, Ageing and Carers Survey includes all Australian households as well as health, aged care and disability support establishments.

Data reliability

- Information on disabling conditions from the Survey is self reported and the underlying cause of the main disabling condition has been used to obtain the prevalence of disabling stroke in the community.

Indicator 3.7: Death rates for stroke, ages 0–79

Deaths per 100,000 population
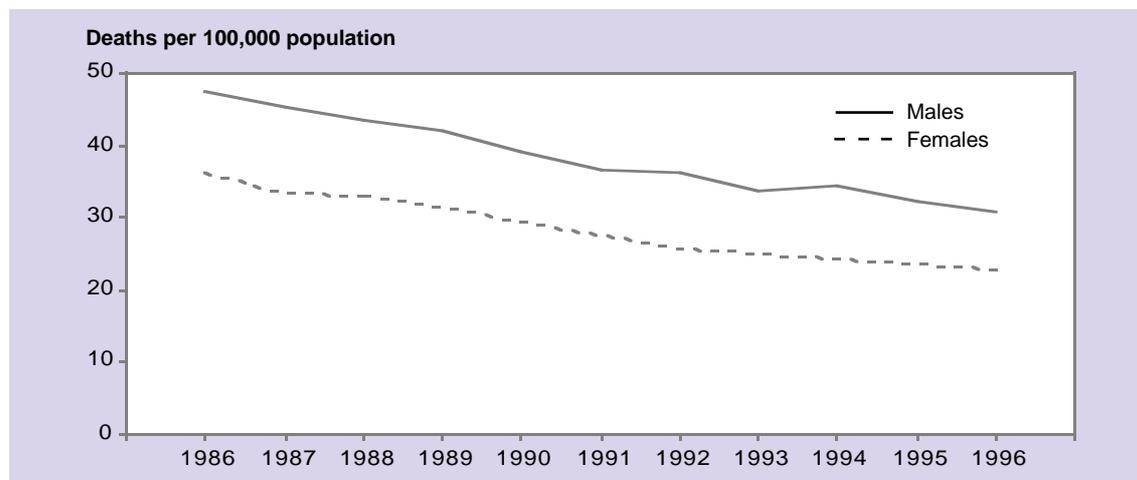
Sex	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Males	47.4	45.4	43.4	42.2	39.1	36.6	36.1	33.6	34.6	32.1	30.8
Females	36.4	33.4	32.9	31.4	29.3	27.5	25.7	24.9	24.1	23.6	22.9

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Mortality Database.

- A stroke occurs when an artery supplying blood to the brain suddenly becomes blocked or bleeds, often causing paralysis of parts of the body or speech problems.
- The indicator represents the net effect of prevention, treatment and management of stroke.
- Stroke is the third leading cause of death in Australia. In 1996, it represented 10 per cent of all deaths and 24 per cent of all cardio-vascular deaths.
- In 1996, there were 12,806 deaths due to stroke, with an age-standardised death rate of 65.5 per 100,000 population for males of all ages and 57.7 per 100,000 population for females of all ages.

- Stroke death rates have declined steadily over the past 30 years. Between 1985 and 1996 mortality from stroke fell annually at 4.4 per cent among males and 5.1 per cent among females aged 0–79.
- Among the Indigenous population there are relatively few deaths attributable to stroke. This may be a reflection of the younger age structure of this group compared to the total Australian population overall. However, the age-standardised death rates from stroke in the Indigenous population are about double those of the rest of Australians.
- Mortality from stroke is higher among people who are socio-economically disadvantaged. On average, males in manual occupations are at least 60 per cent more likely to die from stroke than males in professional occupations (Bennett 1996).

State and Territory comparisons

- In 1994–1996, stroke death rates were greatest among males and females in the Northern Territory.

- Between 1985 and 1996, there was a decrease in death rates from stroke in all States and Territories except the Northern Territory. The largest decreases were observed in the Australian Capital Territory for males and in Victoria for females.

Regional variation in death rate for stroke, ages 0–79

State/ Territory	Males		Females	
	Average 1994–96	Annual % change 1985–1996	Average 1994–96	Annual % change 1985–1996
NSW	34.3	−5.3	25.0	−5.5
Vic	30.8	−4.1	21.1	−5.8
Qld	31.6	−3.7	24.2	−4.7
WA	30.5	−3.7	21.6	−3.5
SA	33.2	−3.7	23.8	−3.9
Tas	34.9	−3.8	26.2	−4.9
ACT	24.3	−5.7	23.4	−1.2
NT	58.4	0.9	33.1	0.5
Australia	**32.5**	**−4.4**	**23.5**	**−5.1**

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Mortality Database.

Data issues

Data definition

- Age-standardised number of deaths from stroke (ICD-9 430–438) per 100,000 population, ages 0–79.

Data availability

- AIHW data based on information collected by State and Territory registrars of births, deaths and marriages.

Data coverage

- Annual; States and Territories.

Data reliability

- The identification of Indigenous people in death registrations is not accurately recorded in all States and Territories. Only data recorded in South Australia, Western Australia and the Northern Territory are reliable in terms of identifying Indigenous status in death certificates.

Indicator 3.8: Death rates for stroke among rural and remote area residents, ages 0–79

Deaths per 100,000 population
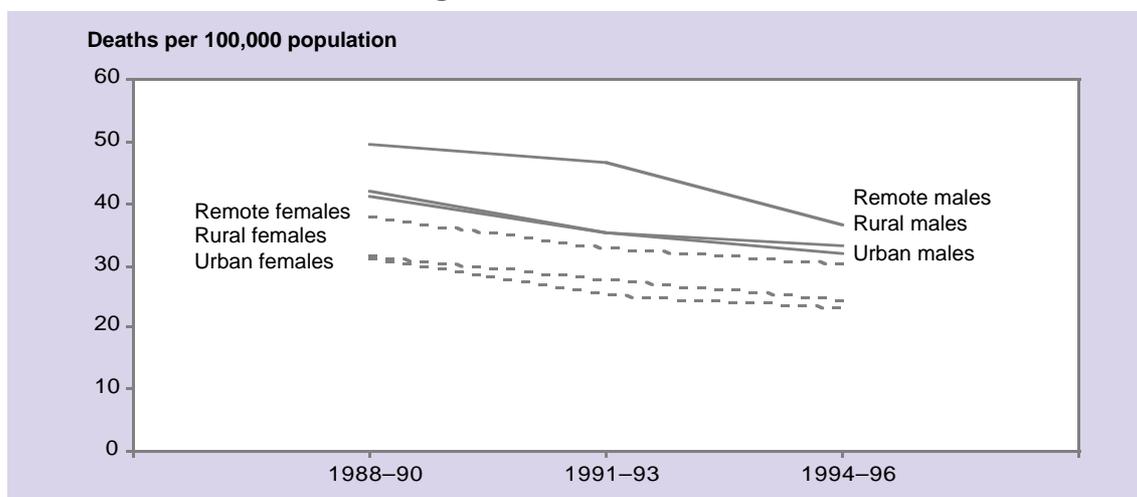
Sex	1988–90			1991–93			1994–96		
	Remote	**Rural**	**Urban**	**Remote**	**Rural**	**Urban**	**Remote**	**Rural**	**Urban**
Males	49.7	42.0	41.0	46.5	35.4	35.2	36.3	33.3	32.0
Females	37.7	31.6	30.9	32.9	27.8	25.2	30.2	24.5	23.0

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Mortality Database.

- The indicator reflects the net effect of prevention, treatment and management of stroke in rural and remote areas for comparison with urban areas.
- Stroke death rates have declined in all areas over past decades. In rural areas, between 1986 and 1996 mortality from stroke has been falling annually at 4.0 per cent among males

and 4.5 per cent among females aged 0–79. In remote areas, the corresponding annual falls have been 5.0 per cent for males and 2.3 per cent for females, whereas in urban areas the respective figures are 4.3 for males and 4.9 for females.

- Death rates from stroke are higher in remote areas than in rural or urban areas.

Data issues

Data definition

- Age-standardised number of deaths from stroke (ICD-9 430–438) per 100,000 population, ages 0–79.
- The Rural, Remote and Metropolitan Areas classification, based on population numbers and an index of remoteness, was used to categorise deaths by area (refer to Appendix 3 for details).

Data availability

- AIHW data based on information collected by State and Territory registrars of births, deaths and marriages.

Data coverage

- Annual; States and Territories.

Indicator 4.1: Hospital separation rates for major amputation for peripheral vascular disease, ages 0–79

Hospital separations per 100,000 population
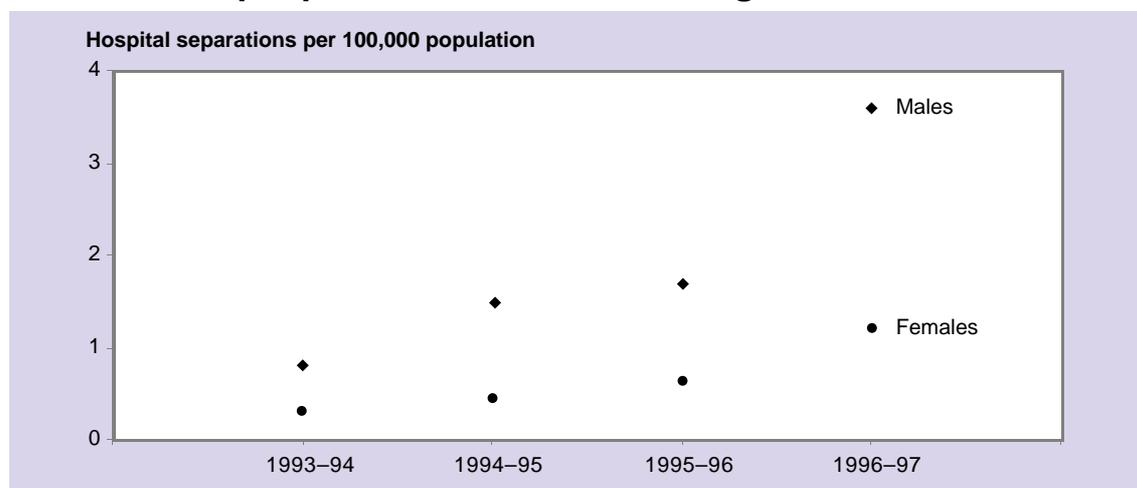
Sex	1993–94	1994–95	1995–96	1996–97
Males	0.8	1.5	1.7	3.6
Females	0.3	0.4	0.6	1.2

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Hospital Morbidity Database.

- Peripheral vascular disease involves a reduced blood supply to the legs, causing pain when walking.
- This is an indicator of the incidence of major amputation for peripheral vascular disease. It also gives a measure of the incidence of severe cases of peripheral vascular disease.
- The rate of hospitalisation for this procedure increased in the period 1993–1997.
- Males were three times as likely as females to be hospitalised for amputation for peripheral vascular disease in 1996–97.

- In 1996–97, there were 422 separations for amputation for peripheral vascular disease in males of all ages, 310 of which were in people aged 0–79. Among females of all ages, there were 260 hospital episodes, 118 of which occurred among those aged 0–79.
- People aged 65 years and above account for over 80 per cent of hospital separations for this procedure.
- Peripheral vascular disease manifests in severe cases as limb-threatening ischaemia. Significant morbidity and amputations are an increasing problem in older people, especially those aged over 80 (Mattes et al 1997).

Data issues

Data definition

- Age-standardised number of separations with principal diagnosis codes of peripheral vascular disease (ICD-9 440.0 or 440.2) and procedure codes (ICD-9 84.15 or 84.16 or 84.17), per 100,000 population, ages 0–79.

Data availability

- AIHW data based on information collected by State and Territory public and private hospitals.

Data coverage

- Annual; States and Territories.

Indicator 4.2: Hospital separation rates for emergency and elective surgery for abdominal aortic aneurysm, ages 0–79

Hospital separations per 100,000 population
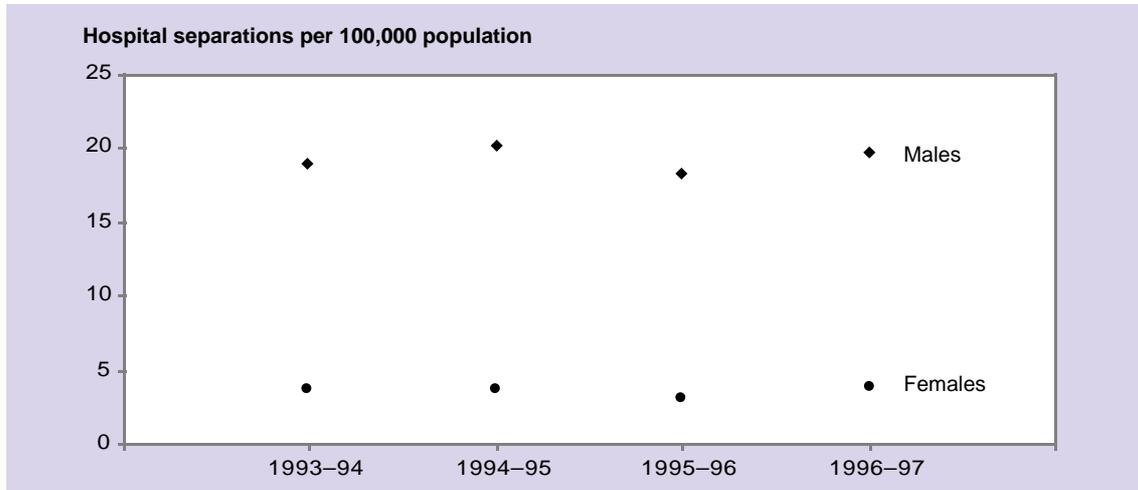
Sex	1993–94	1994–95	1995–96	1996–97
Males	19.0	20.1	18.3	19.5
Females	3.4	3.4	3.0	3.7

Note: Rates, age standardised to the 1991 Australian population, are given per 100,000 population.

Source: AIHW National Hospital Morbidity Database.

- Abdominal aortic aneurysm refers to a ballooning-out of the main artery in the abdomen, the abdominal aorta, through a weakening of its wall.

- This is an indicator of the incidence of major surgery for abdominal aortic aneurysm. It also gives a measure of the incidence of severe cases of abdominal aortic aneurysm.

- The rate of hospitalisation for this procedure has remained fairly constant in the period 1993–1997.

- Males were five times more likely than females to be hospitalised for abdominal aortic aneurysm in 1996–97.

- In 1996–97, there were 1,972 separations for abdominal aortic aneurysm in males of all ages, 1,684 of which were in people aged 0–79. Among females of all ages, there were 456 hospital episodes, 368 of which occurred in those aged 0–79.

- People aged 65 years and above account for over 80 per cent of hospital separations for this procedure.

- Large abdominal aortic aneurysms pose a significant life risk if they rupture and elective surgery before rupture is standard practice. As most aneurysms are asymptomatic, they may rupture, requiring emergency surgery. Abdominal aortic aneurysms are five times more common in males than in females and their prevalence increases steadily from around age 60.

Data issues

Data definition

- Age-standardised number of separations with principal diagnosis codes ICD-9 441.3 or 441.4 and procedure code 38.44 per 100,000 population, ages 0–79.

Data availability

- AIHW data based on information collected by State and Territory public and private hospitals.

Data coverage

- Annual; States and Territories.

Appendix 3

Data issues

Sources of national data

Data for the indicators of cardiovascular health used in this report were extracted primarily from national mortality and morbidity databases and from health surveys, by the National Centre for Monitoring Cardiovascular Disease. A list of the principal data sources used in the national cardiovascular monitoring system are shown in Table A3.1.

Data gaps and developments

A general discussion of gaps and deficiencies in Australian health statistics is given in *Australia's Health 1998* (AIHW 1998a). Data issues concerning individual indicators have been discussed in relevant sections of the report. This section discusses issues that are particularly relevant to monitoring heart, stroke and vascular disease. Some specific issues are being addressed by projects on the work program for the National Centre for Monitoring Cardiovascular Disease. Other generic issues are being addressed at a broader level.

Data requirements for indicators of cardiovascular health

The indicator set for cardiovascular health has been recently revised. New indicators for coronary heart disease have been included and indicators for stroke and vascular disease have been introduced. Indicators for which there are data have been reported against in Appendix 2. There are 15 indicators for which there are either no data or data are inadequate for estimating trends. These are:

1.7 Proportion of adults with high blood cholesterol, ages 20–69

2.1 Incidence rates for myocardial infarction, ages 30–79

2.2 Median delay between the onset of chest pain and presentation for emergency care at hospital, all ages

2.3 Time from presentation at emergency departments to clinical and ECG assessment and administration of appropriate reperfusion therapy (thrombolysis or angioplasty), all ages

2.6 Proportion of cardiac patients who enter and complete a rehabilitation program, all ages

2.7 Proportion of patients who die, suffer myocardial infarction or undergo further revascularisation procedure (angioplasty or bypass surgery) within 12 months of angioplasty treatment for coronary heart disease, all ages

2.8 Proportion of patients who die, suffer myocardial infarction or undergo revascularisation at 28 days and 1 year after having undergone surgical treatment for coronary heart disease, all ages

2.9 Proportion of people with mild/moderate/severe disability at six months following diagnosis of initial cardiac event, all ages

3.1 Incidence rates for stroke, all ages

3.2   Median delay between the onset of stroke symptoms and presentation for emergency care at hospital, all ages

3.3   Proportion of patients admitted to hospital with acute stroke who are managed in specialised stroke units (dedicated multidisciplinary teams), all ages

3.4   Proportion of people whose main/underlying disabling condition is stroke, ages 25 or more

3.5   Proportion of people with mild/moderate/severe disability at six months following diagnosis of initial stroke event, all ages

3.6   Case fatality rate for stroke within 28 days, all ages

4.3   Proportion of people with mild/moderate/severe disability at six months following diagnosis of initial vascular event, all ages

Several projects are underway to address the data needs for some of these indicators. For example, the National Centre for Monitoring Cardiovascular Disease has commissioned a project to develop methods for estimating the incidence of heart attacks and stroke based on morbidity and mortality statistics, and is supporting the development of a national ambulance database that will provide data on pre-hospital emergency care. The National Centre is also examining the feasibility of monitoring treatment outcomes for revascularisation procedures and case fatality rates for stroke by using record linkage techniques to follow-up long-term outcomes. The proposed national biomedical risk factor survey and the survey of disability recently conducted by the ABS will enable trends to be estimated for several indicators.

Proposal for a national biomedical risk factor survey

Ongoing monitoring of risk factors by national population surveys is necessary if preventive activities are to be appropriately directed and adequately evaluated. Risk factor indicators feature strongly in the NHPAs program and strategies are aimed at affecting favourable trends in these indicators. Many risk factors have relevance to more than one priority area and therefore have great public health significance. Some important biological risk factors can only be measured from a blood sample, and without regular data monitoring is not possible and targets cannot be set with any confidence.

Accordingly, a proposal for a national biomedical survey is being developed which will address areas of major public health significance for which there are established risk factors that can be assessed from a blood sample. These include heart, stroke and vascular disease, diabetes, nutrition and communicable diseases. The NPHP supports the development of a proposal for such a survey.

Development of data standards for risk factors

National data standards and definitions have been developed for monitoring the prevalence of overweight or obese people, and included in the *National Health Data Dictionary*. The process, conducted under the National Health Information Agreement, involved the development of standards by an expert committee and demonstration of national consensus. A similar process is nearing completion for smoking and physical activity. The process is commencing for high blood pressure and high total cholesterol for use in epidemiological and health care settings.

Quality of Indigenous death registrations

Australia's vital statistics system remains the most comprehensively collected national data of relevance to health. Mortality data is particularly important for monitoring cardiovascular health. However, the identification of the Indigenous population in the death registration process is not satisfactory in several States.

The need to improve the quality of Indigenous health information, including mortality data, has been identified as a national health information priority (AIHW & AHMAC 1995), and a plan was presented to the October 1997 AHMAC meeting (AIHW & AHMAC 1998). The Plan's major recommendations include:

- development of specific protocols for the sensitive handling of data concerning Indigenous peoples, with the active involvement of communities;

- establishment of permanent and long-term positions for Indigenous personnel, to facilitate substantial improvements in the quality of information;

- ensuring all major health and related collections in all jurisdictions have the capacity to differentiate between Indigenous and other Australians; and

- use of common identification classifications and collection protocols in all major collections.

Representatives from the National Health Information Management Group and relevant Indigenous health organisations are working together to help implement the plan. The ABS and AIHW have accepted lead roles in working with organisations to implement Indigenous identification in priority information systems. ABS has this role for vital statistics and AIHW for hospital separations, perinatal data and cancer registrations.

Use of hospital separations data

Hospital separation data measure the use of hospital resources but have limitations for measuring disease incidence. They do not identify multiple admissions for the same condition, and the number and pattern of hospitalisations can be affected by differing admission practices, differing levels and patterns of service provision, and differences in coding standards over time. Records are based on events rather than individuals and first admissions are not distinguished from re-admissions.

In addition, there are currently no national data on long-term outcomes of care for cardiovascular conditions, which makes it difficult to assess the effect of health services and interventions on changes in health status.

The feasibility of addressing these deficiencies by linking records from different data collections is being investigated.

Introduction of ICD-10

ICD-10 is the tenth revision of the *International Statistical Classification of Diseases and Related Health Problems*, produced by the WHO as the most recent in its series of ICD classifications (WHO 1998a). The subject matter of each chapter of the ICD-10 is generally the same as in the ICD-9 although there has been some relocation of diseases and conditions to make their placement within the classification consistent with current medical knowledge. The Australian Bureau of Statistics will implement the WHO version of ICD-10 from 1 January 1999 for coding causes of death.

Data issues

For morbidity coding in Australia, the National Centre for Classification in Health, has produced the tenth revision of the International Statistical Classification of Diseases and Related Health Problems æ Australian Modification (ICD-10-AM). This was done with the input of Australian clinicians and coding specialists, and in close collaboration with the WHO to ensure that international comparability is maintained (NCCH 1997). Hospitals in some States and Territories began using ICD-10-AM in July 1998, with the others to follow in July 1999.

The introduction of ICD-10 and ICD-10-AM will improve the completeness, accuracy and integrity of coded mortality and morbidity data.

Calculations of risk reduction

Calculations of potential risk reductions for stroke in Chapter 5 used the following methods. The odds ratio (or relative odds) of an event was calculated by dividing the odds in the treatment group (the number of individuals who experienced the event divided by the number who do not) by the odds in the control group, and was expressed as a number from zero (event will never happen) to infinity (event is certain to happen). The relative odds reduction (or increase) is the difference between the odds in the control group (unity) and the treatment group, multiplied by 100. Absolute risk reduction was calculated by subtracting the risk in the treatment group from the risk in the control group. 'Lives benefited' is the number of patients who have been saved from death and dependency by the treatment, for every 1,000 patients treated. The number of patients needed to treat to prevent one event is the reciprocal of the absolute risk difference.

Rural, remote and metropolitan areas classification

To compare trends in mortality for coronary heart disease and stroke among people living in rural, remote and metropolitan areas of Australia, deaths were cross-categorised using the Rural, Remote and Metropolitan Areas classification. The classification was developed by the Commonwealth Departments of Primary Industries and Energy and Human Services and Health, based primarily on population numbers and an index of remoteness. The Rural, Remote and Metropolitan Areas categories show a natural hierarchy, providing a model for incremental health disadvantage with rurality and remoteness as risk factors. Based on population density, the following three zones and seven area categories are recognised.

Zone	Category
Metropolitan	Capital cities Other metropolitan centres (urban centres population $\geq$ 100,000)
Rural (Index of remoteness < 10.5)	Large rural centres (urban centres population 25,000–99,999) Small rural centres (urban centres population 10,000–24,999) Other rural areas (urban centres < 10,000)
Remote (Index of remoteness > 10.5)	Remote centres (urban centres population $\geq$ 5,000) Other remote areas (urban centres population < 5,000)

Table A3.1: National Cardiovascular Monitoring System — principal data sources

Data source	Agency	Principal measures for monitoring	Scope of data	Frequency/ availability
Risk factors				
Smoking				
National Health Survey	ABS	Smoking levels, status and quantity	National 18+	5-yearly 1989–90, 95
Patterns of Tobacco Smoking	ACCV	Smoking prevalence	National 16+	3-yearly 1974–95
Alcohol and Smoking Survey of Secondary Students	ACCV	Smoking prevalence	National 12–17	3-yearly 1984–96
Population Survey Monitor	ABS	Smoking prevalence	National 18+	Quarterly, May 94–May 95
National Household Survey	NCADA/ DHFS	Smoking prevalence	National 14+	2–3 yearly 1985, 88, 91, 93, 95
National Household Survey: Indigenous supplement	NDS/ DHFS	Smoking prevalence	Urban Indigenous 14+	1994
National Aboriginal & Torres Strait Islander Survey	ABS	Smoking prevalence	Indigenous 13+	5-yearly 1994
Poor lipid profile				
Risk Factor Prevalence Survey	NHF	Raised cholesterol, lipid levels, lipid fractions	Capital cities 20–69	Irregular 1980, 83, 89
Australian Health and Fitness Survey	ACHPER	Raised cholesterol, lipid levels, lipid fractions	National 9,12,15	Irregular 1985
National Health Survey	ABS	High cholesterol (self reported)	National 18+	5-yearly 1989–90, 95
High blood pressure				
National Nutrition Survey	ABS/ DHFS	Hypertension, blood pressure levels	National 16+	Irregular 1995
Risk Factor Prevalence Survey	NHF	Hypertension, blood pressure levels	Capital cities 20–69	Irregular 1980, 83, 89
Australian Health & Fitness Survey	ACHPER	Hypertension, blood pressure levels	National 9,12,15	Irregular 1985
National Health Survey	ABS	Hypertension (self reported)	National 18+	5-yearly 1989–90, 95
National Aboriginal & Torres Strait Islander Survey	ABS	Hypertension (self reported)	Indigenous 13+	5-yearly 1994

Table A3.1: National Cardiovascular Monitoring System — principal data sources (continued)

Data source	Agency	Principal measures for monitoring	Scope of data	Frequency/ availability
Risk factors				
Inadequate physical activity				
National Health Survey	ABS	Self-reported activity	National 15+	5-yearly 1989–90, 95
Population Survey Monitor	ABS	Self-reported activity	National 18+	Quarterly May 94–May 95
Risk Factor Prevalence Survey	NHF	Self-reported activity	Capital cities 20–69	Irregular 1980, 83, 89
Australian Health and Fitness Survey	ACHPER	Self-reported activity Measured fitness	National 9,12,15	Irregular 1985
Active Australia Benchmark Physical Activity Survey	Active Aust NSW Health	Self-reported activity	National	Benchmark 1997
Overweight/ obesity				
National Nutrition Survey	ABS/ DHFS	Overweight/obesity (BMI)	National 2+	Irregular 1995
Risk Factor Prevalence Survey	NHF	Measured height and weight	Capital cities 20–69	Irregular 1980, 83, 89
National Health Survey	ABS	Self-reported height and weight	National 15+	5-yearly 1989–90, 95
Population Survey Monitor	ABS	Height and weight (self reported)	National 18+	Quarterly, May 94–May 95
Inappropriate nutrition				
National Nutrition Survey	ABS/ DHFS	Fat to total energy intake Salt use	National 2+	Irregular 1995
National Dietary Survey of Adults	DHFS	Fat to total energy intake	Capital cities 25–64	Irregular 1983
National Dietary Survey of Schoolchildren	DHFS	Fat to total energy intake	National 10–15	Irregular 1985
Apparent Consumption of Foodstuffs and Nutrients	ABS	Fat to total energy in the food supply	National	Annual 1936–37 to 1993–94
Risk Factor Prevalence Survey	NHF	Salt use	Capital cities 20–69	Irregular 1983, 89
Disease incidence				
National Hospital Morbidity Database	AIHW	Non-fatal heart attacks	National 25–69	New 1995–96
Mortality database	AIHW	Fatal heart attacks	National 35–69	New 1996
Rheumatic Heart Disease Register	Territory Health	Rheumatic heart disease incidence	Top End, NT	New 1998
Pre-hospital & emergency care				
National ambulance database	ARC/ Curtin University	Time between onset and presentation for emergency care	National State & Territory	New 1999

Table A3.1: National Cardiovascular Monitoring System — principal data sources (continued)

Data source	Agency	Principal measures for monitoring	Scope of data	Frequency/ availability
Medical & surgical care				
National Hospital Morbidity Database	AIHW	Use of surgical and medical procedures performed in hospital	National	Annual 1996–97
Cardiac Surgery Register	NHF	Operations	National	Annual 1976–1994
Coronary Angioplasty Register	NHF	Procedures	National	Annual 1980–1995
National Health Survey	ABS	Hospital visits, doctor consultations	National	5-yearly 1989–90, 95
Medical Benefits Data	Medicare & DVA	Medical services (diagnostic investigations & procedures)	National (excl public patients in public hospitals)	Annual 1997
Australian Survey of Morbidity & Treatment in General Practice	University of Sydney	General practice management of chronic cardiovascular conditions	National (excl salaried practitioners)	Irregular 1990–91
Secondary prevention				
Drug Utilisation Subcommittee Database	DHFS	Prescription medicines	National (excl public hospital use)	Annual 1990–1997
National Health Survey	ABS	Self-reported medication use	National	5-yearly 1989–90, 1995
Disease prevalence				
National Health Survey	ABS	Self-reported recent illness, long-term conditions	National	5-yearly 1989–90, 1995
Rheumatic Heart Disease Register	Territory Health	Rheumatic heart disease prevalence	Top End, NT	New 1998
National Aboriginal & Torres Strait Islander Survey	ABS	Self-reported recent illness, long-term conditions	Indigenous 13+	5-yearly 1994
Disability, Ageing & Carers Survey	ABS	Persons whose main disabling condition is CVD	National All ages	5-yearly 1981, 88, 93
Mortality				
Mortality Database	AIHW	Heart, stroke and vascular disease mortality	National State & Territory Indigenous All ages	Annual 1964–1996
Costs				
Disease Costs & Impact Study	AIHW	Health care costs heart, stroke and vascular disease	National	Irregular 1989–90, 93/94

Notes: ABS = Australian Bureau of Statistics; ACCV = Anti-Cancer Council of Victoria; NCADA = National Campaign Against Drug Abuse; NDS = National Drug Strategy; ACHPER = Australian Council for Health, Physical Education and Recreation; ARC = Australian Resuscitation Council; DVA = Department of Veterans' Affairs.

Acronyms and abbreviations

ABI	ankle brachial index
ABS	Australian Bureau of Statistics
ACE	angiotensin converting enzyme
ACRA	Australian Cardiac Rehabilitation Association
AHCPR	Agency for Health Care Policy and Research (US)
AHMAC	Australian Health Ministers' Advisory Council
AHTAC	Australian Health Technology Advisory Committee
AIHW	Australian Institute of Health and Welfare
ANBP-2	Australian National Blood Pressure Trial-2
BMI	body mass index
BP	blood pressure
CABG	coronary artery bypass grafting
CHD	coronary heart disease
CPR	cardiopulmonary resuscitation
CSANZ	Cardiac Society of Australia and New Zealand
CT	computed tomography
CVD	cardiovascular disease
DHFS	Commonwealth Department of Health and Family Services
DHSH	Commonwealth Department of Human Services and Health
DRG	diagnosis-related group
DVA	Department of Veterans' Affairs
ECG	electrocardiogram
HDL	high density lipoprotein
HEALTH	Commonwealth Department of Health and Aged Care
HIC	Health Information Centre
HSA	Heart Support - Australian
ICD	implantable cardiac defibrillator
ISDN	Integrated Services Digital Network
LDL	low density lipoprotein
LIPID	Long Term Intervention with Pravastatin in Ischaemic Disease
Lp	lipoprotein
MBS	Medicare Benefits Schedule
MI	myocardial infarction
MRI	magnetic resonance imaging
MSAC	Medicare Services Advisory Committee

Acronyms and abbreviations

NAHS	National Aboriginal Health Strategy
NATSIS	National Aboriginal and Torres Strait Islander Survey
NCCH	National Centre for Classification in Health
NHF	National Heart Foundation
NHIM	National Health Information Model
NHLBI	US National Heart, Lung and Blood Institute
NHMRC	National Health and Medical Research Council
NHPA	National Health Priority Area
NHPC	National Health Priority Committee
NPHP	National Public Health Partnership
NSRI	National Stroke Research Institute
OATSIH	Office for Aboriginal and Torres Strait Islander Health
OECD	Organisation for Economic Cooperation and Development
PBAC	Pharmaceutical Benefits Advisory Council
PBS	Pharmaceutical Benefits Scheme
PET	positron emission tomography
PTCA	percutaneous transluminal coronary angioplasty
RACGP	Royal Australian College of General Practitioners
SERU	Support and Evaluation Resource Units
TG	triglyceride
TIA	transient ischaemic attack
tPA	tissue-type plasminogen activator
UPI	unique patient identifier
WHO	World Health Organization

Glossary

Methodology terms

Additional diagnosis: diagnosis of conditions that affect a person's care in terms of requiring therapeutic treatment, clinical evaluation, diagnostic procedures, extended length of hospital stay or increased nursing care and/or monitoring. These include comorbid conditions (co-existing conditions) and complications.

Confidence interval: a range of values computed from a sample of data that has a given probability of containing the parameter being estimated. It indicates the precision with which the parameter has been estimated.

Goal: a general statement of intent and aspiration describing outcomes that might be reasonably achieved in the light of current knowledge and resources. Goals apply to the broad population with priority population identified when different strategies are required for certain groups of the population.

Health outcome: a change in the health of an individual, a group of people or a population, which is wholly or partially attributable to an intervention or series of interventions.

Indicator: provides a specific measurable way of assessing progress towards goals. In terms of health outcomes, an indicator is a statistic or other unit of information which reflects, directly or indirectly, the performance of a health and welfare intervention, facility, service or system in maintaining or increasing the well being of its target population.

Meta-analysis: method used for combining the results of a number of independent studies of the same outcome. It effectively increases sample size and decreases sampling errors.

Principal diagnosis: the diagnosis established after study to be that chiefly responsible for occasioning the patient's episode of care in hospital.

Randomised controlled trial: an experimental study in which subjects are randomly assigned to treatment and control groups.

Separation: the process by which a patient completes an episode of care that can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (eg from acute to rehabilitation).

Target: a specific and measurable amount of change in population health gain that could be expected in a given population within a given timeframe. Health gains include mortality, quality of life, disability, disease states and other significant health states such as risk factors.

Medical terms

Acute myocardial infarction: an acute process of myocardial ischaemia with sufficient severity and duration to result in permanent myocardial damage.

Angina: a clinical syndrome typically characterised by a deep, poorly localised chest or arm discomfort that is reproducibly associated with physical exertion or emotional stress and relieved promptly by rest or sublingual nitroglycerine.

Angioplasty: see percutaneous transluminal coronary angioplasty.

Glossary

Arrhythmia: irregularity or loss of rhythm of the heartbeat.

Atherosclerosis: nodular thickening or hardening of the layers in the wall of an artery; characterised by irregularly distributed lipid deposits in the intima of large and medium sized arteries.

Atrial fibrillation: a cardiac arrhythmia marked by rapid randomised contractions of the atrial myocardium, causing a totally irregular, often rapid, ventricular rate.

Beta blocker (beta adrenergic blocking agent): a drug that blocks the effect of catecholamines, producing a decrease in heart rate and oxygen demand in the myocardium.

Calcium antagonist: a drug that blocks entry of calcium into cells and inhibits the contractility of smooth muscle. The result is dilation of the blood vessels and a reduction in blood pressure.

Cardiac catheterisation: passage of a catheter into the heart through a blood vessel leading to the heart for the purpose of measuring intracardiac pressure abnormalities, obtaining cardiac blood samples and/or imaging cardiac structures by injection of radio-opaque dye.

Claudication: a complex of symptoms characterised by absence of pain in a limb at rest, commencement of pain, tension and weakness when walking, intensification of the condition until walking is impossible and the disappearance of symptoms after the limb has been at rest.

Comorbidity: a concomitant but unrelated pathologic or disease process, usually used to indicate co-existence of two or more disease processes.

Congestive heart failure: heart failure that causes swelling of the ankles and lung congestion.

Coronary artery bypass grafting: vein or artery grafted surgically to permit blood to travel from the aorta to a branch of the coronary artery at a point past an obstruction.

Coronary stenosis: narrowing or constriction of any orifices leading into or from the heart or between chambers of the heart.

Echocardiography: use of ultrasound in the investigation of the heart and great vessels and diagnosis of cardiovascular lesions.

Electrocardiography: the graphic recording from the body surface of the potential of electric currents generated by the heart, as a means of studying the heart muscle.

Haemorrhagic stroke: stroke caused by rupturing of a blood vessel, usually an artery, within the brain.

Hyperlipidaemia: excessive quantity of fat (cholesterol and triglycerides) in the blood.

Ischaemia: deficiency of blood in a part, due to functional constriction or actual obstruction of a blood vessel.

Ischaemic stroke: stroke resulting from cerebral thrombosis which causes ischaemia, oedema and congestion of the brain tissues surrounding the area.

Left ventricular function: function of the main pumping chamber of the heart that receives blood from the left atrium and pumps it out into the general circulation through the aortic valve.

Mitral regurgitation: abnormal systolic back flow of blood from the left ventricle into the left atrium, resulting from imperfect closure of the mitral valve.

Myocardial infarction: damage to the heart muscle caused by occlusion of one or more of the coronary arteries.

Myocardial ischaemia: a condition in which oxygen delivery to and waste removal from the myocardium falls below normal levels with oxygen demand exceeding supply. As a consequence, the metabolic machinery of myocardial cells is impaired leading to various degrees of systolic (contractile) and diastolic (relaxation) dysfunction. Ischaemia is usually diagnosed indirectly through techniques that demonstrate reduced myocardial blood flow or its consequences on contracting myocardium.

Nitrate: a drug whose metabolites produce a relaxation of vascular smooth muscle. This in turn produces a strong dilation of the veins, reducing preload and myocardial oxygen demand.

Percutaneous transluminal coronary angioplasty (PTCA): a method of treating localised coronary artery narrowing using a special catheter with a cylindrical balloon surrounding it that can be inflated to dilate the narrowed vessel.

Perfusion scan: a test to determine the status of blood flow to an organ.

Pulmonary oedema: a condition, usually acute but sometimes chronic, where fluid builds up in the lungs. This often occurs as a response to left ventricular failure in coronary heart disease, hypertension or aortic valve disease.

Restenosis: the recurrence of a stenosis in a coronary artery.

Revascularisation: restoration, to the extent possible, of normal blood flow to the myocardium by surgical or percutaneous means or with removal or reduction of an obstruction as occurs when coronary bypass surgery or coronary angioplasty is performed.

Stenosis: a narrowing or blockage of a coronary artery.

Stress testing: also referred to as an exercise tolerance test, a diagnostic test in which the patient exercises on a treadmill, bicycle or other equipment while heart activity is monitored by an ECG.

Thrombolysis: pharmacological treatment with a class of drugs that can break up fibrin blood clots.

Transient ischaemic attack: a sudden episode of temporary or passing symptoms typically due to diminished blood flow through the brain.

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