The shifting burden of cardiovascular disease in Australia

ACCESS ECONOMICS

Heart Foundation

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EXECUTIVE SUMMARY

- CVD continues to dominate the national health profile. It affects 1 in every 6 Australians (over 3.2 million people), increasing to 1 in 4 by mid-century. 67% of families are impacted at present.
  - An Australian dies every 10 minutes from CVD, 38% of all deaths, with CHD, stroke and heart failure ranking at the top of the list of major killers.
  - Of the 50,292 who died in 2004, 60% had not reached average life expectancy, which itself is largely driven by CVD mortality.
  - If we are to continue to increase life expectancy in this country, we cannot be complacent about CVD care, but must rise to the new challenges.
- Although mortality rates from acute events (heart attack and stroke) have been declining, the mortality burden of CVD remains enormous and is becoming more associated with periods of chronic disabling illness (notably heart failure).
  - Health system and quality of life impacts are thus shifting towards more effectively managing risks and disease burden.
  - Disability from many CVDs is severe, especially stroke and heart failure.
- Risk for CVD rises progressively with the number of risk factors, which together contribute to the high burden of CVD in Australia.
  - Half the Australian population over 25 have high blood cholesterol, unchanged since 1980.
  - 54% of Australian adults do not exercise enough and 60% of those over 25 are overweight, with a doubling in obesity since 1980.
  - 30% of Australians over 25 have high blood pressure and 24% of adults still smoke, although these trends are declining.
  - Diabetes prevalence has more than doubled to over 3% self-reporting by 2001 and 5% including undiagnosed cases – 1 million people (AusDiab).
  - Heart failure prevalence is burgeoning, although data are poor, as are diagnoses, awareness and treatment.
  - Since age is also a risk factor, demographic ageing will mean that 24.2% of Australians will have CVD by 2051 – 6.4 million people.
- Aboriginal and Torres Strait Islander people and rural Australians, and those who are at socioeconomic disadvantage, tend to have increased risk for CVD and its impacts.
- People with CVD take more health actions than the average Australian including primary and specialist care, pharmacotherapy, surgeries and rehabilitation.
- The direct health system costs of CVD are estimated at $7.6 billion in 2004 (11% of total health spending).
  - On current trends, they will reach $11.5 billion by 2011.
  - Hospital inpatient costs ($2.7bn) and pharmaceuticals ($1.7bn) dominate the profile followed by residential aged care ($639m).
  - CHD remains the most costly single condition ($1.8bn), with stroke second (now over $1bn) and heart failure likely to be of similar magnitude.
- Indirect financial costs incurred due to CVD are conservatively estimated as $6.6 billion in 2004.

- 55,871 Australians are not in workforce due to CVD.
- Production losses due to lower employment rates and premature mortality cost $3.6 billion; carer costs $2.5 billion and other costs $0.5 billion.
- Thus the total financial costs are $14.2 billion per annum – 1.7% of GDP.

- Dwarfing the financial costs are the costs of suffering and premature death from CVD – valued at $94 billion in 2004.
  - The burden of disease costs over 600,000 years of healthy Australian life annually, 22% of the total burden from all illness and injury in Australia.
  - It is substantially more than any other National Health Priority area, as well as being one of the most prevalent conditions and the largest health cost item, with a disproportionate share of hospital and pharmaceutical costs.
- The shifting burden of CVD calls for strategic investments that recognise the need to adopt absolute risk assessments and targeted as well as population approaches, and to optimise cost-effectiveness through established interventions as well as new models of care.
  - Identification of the most at-risk Australians and targeted interventions for them, should be a priority, with widespread use of risk calculators in primary care.
  - An Australian population study like the European SHAPE study is needed to provide a more precise local picture of heart failure prevalence, impacts and patient care.
- Cost effectiveness analyses are important to identify high, medium and lower priority interventions to prevent or reduce risks, or treat disease, ranking by $/QALY, cost-saving or dominant therapies relative to comparators.
  - Since CVD tends to utilise a disproportionate amount of acute care services, there is scope for greater cost effectiveness where hospitalisations (and residential aged care) can be avoided, and functionality improved.
  - There is scope for further cost-effective reduction in cholesterol and blood pressure, as well as better use of other pharmacotherapies; surgeries (CABG, angioplasty and stents, bypasses etc); diet/weight and physical activity strategies; and services such as counselling, education and rehabilitation.
  - International and Australian studies show the cost effectiveness of new models of coordinated multidisciplinary care, that provide individualised management by specialist nursing staff and promotion of self-care activities, as well as appropriate pharmacotherapy (ie at effective dosages).
  - Local CEAs such as the Victorian ACE-Heart Disease project (2001-2003), whose results are shortly to be released, are essential to prioritising strategies through evidenced based medicine, to inform policy making in relation to CVD so that the most efficient and effective use of scarce resources can be achieved to purchase healthy lifespan.
- Much of the burden of disease of CVD is avoidable, with WHO estimating that a further halving of CVD events in the next decade is possible and at least five more years of healthy life expectancy can be gained through cost-effective interventions. Strategic investment in cost-effective research, prevention and management of CVD is required over the medium term to arrest the growth in its cost burden, taking into account the shifting epidemiological landscape.

1. CARDIOVASCULAR DISEASE (CVD) IN AUSTRALIA

1.1 WHAT IS CARDIOVASCULAR DISEASE?

Cardiovascular disease (CVD) is also known as 'circulatory disease' or as 'heart, stroke and vascular disease' and refers to all diseases and conditions of the heart and blood vessels. The main types are outlined below. The definitions in the following sections have been extracted with limited adaptation from AIHW (2004a), with permission.

Coronary heart disease (CHD, or *ischaemic* heart disease) is the most common cause of sudden death in Australia. Its main manifestations consist of **acute myocardial infarction (AMI,** or heart attack) and **angina**. The common underlying problem is **atherosclerosis**, which is plaque build-up on the inside of arteries.

- A heart attack occurs when a coronary plaque suddenly breaks open, bringing on a blood clot that blocks blood flow to the heart muscle. The blockage can cause severe chest pain and death of some of the heart muscle unless the blood flow can be quickly restored through the use of drugs or catheter procedures.
  - Among Australians having a heart attack, about 25% die within an hour of their first-ever symptoms and over 40% will be dead within a year.
- With stable angina, the plaque has narrowed an artery so that blood flow under normal conditions is adequate, but may be insufficient if there is physical activity or strong emotion, causing temporary chest pain, but no immediate threat to life. Unstable angina is a condition which may be manifest as chest pain occurring at rest, new onset chest pain with exertion, or angina that is more frequent, longer in duration or lower in threshold than before and this condition can quickly lead to heart attack.

Stroke (or **cerebrovascular disease**) is Australia's second greatest killer after CHD and the leading cause of long term disability in adults. Stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot (ischaemic stroke) or, less frequently, bleeds (haemorrhagic stroke). This can cause death, or damage part of the brain, which in turn can impair a range of functions such as movement of body parts, vision and communication. About one-third of people sustaining stroke die within 12 months and half of the survivors are disabled in the longer term.

Heart failure is a major burden on society due to its high costs of care, lower quality of life and premature death (the third biggest CVD killer). It describes a pathologically complex condition where the heart functions less effectively to pump blood around the body. This results from a lifetime of 'insults' to the structural integrity and efficiency of the heart that impair or overload it, such as heart attack, high blood pressure or a damaged heart valve. Symptoms can include fatigue, breathlessness and fluid retention, and these symptoms are related to unmet metabolic demand, abnormal neurohormonal regulation and left ventricular dysfunction. Heart failure that causes build-up of fluid in the lungs, liver or legs is called **congestive heart failure**. **Chronic heart failure** refers to length of duration of heart failure, usually where the heart muscle has been irreversibly damaged, in contrast to **acute heart failure** that can sometimes be reversed.

Peripheral vascular disease (**PVD or peripheral *artery* disease**) refers to disease of the arteries outside the heart and brain, when plaque builds up in these arteries and reduce

blood circulation, mainly affecting the legs and feet. It ranges from asymptomatic disease, through to pain on walking, to pain at rest and limb-threatening reduced blood supply that can lead to amputation. A major form of PVD is **abdominal aortic aneurysm**, which is an abnormal widening of the main artery from the heart below the level of the diaphragm, which can be life-threatening if it ruptures. However, the major cause of death in people with peripheral vascular disease is CHD.

Rheumatic heart disease is the damage done to the heart muscle and heart valves by an attack of **acute rheumatic fever**, which is caused by Group A Streptococcus bacteria associated with infections of the throat and skin. It occurs mainly in children and young adults and may affect the heart valves, the heart muscle and its lining, the joints and the brain. Recurrences of rheumatic fever lead to cumulative heart damage but can be almost completely prevented by strict follow-up and monthly injections of penicillin. Poverty and overcrowding, poor sanitary conditions, lack of education and limited access to medical care for adequate diagnosis and treatment are recognised as contributing factors in Australia. Aboriginal and Torres Strait Islander people living in remote areas have among the highest rates of chronic rheumatic heart disease in the world.

Congenital heart diseases (those present at birth) are one of the biggest killers of infants less than one year old, with over 42% of deaths associated with these conditions occurring prior to five years of age. Congenital heart diseases include abnormalities of the heart, its valves or of blood vessels such as the aorta or pulmonary artery. Anecdotal evidence from clinicians report that more children are surviving congenital heart disease resulting from improvements in paediatric surgery in recent decades. Consequently a larger number are reaching adulthood with complex congenital heart disease associated with the need for hospital admissions, late complications and complications of pregnancy.

1.2 RISK FACTORS FOR CARDIOVASCULAR DISEASE

Risk factors are genetic, behavioural and biomedical conditions associated with a greater risk of CVD. Social, economic, psychological and cultural factors can also affect health. **Age, heredity and being male** are key **non-modifiable risk factors**. Risk for a cardiovascular disease rises progressively with the number of risk factors. **Absolute risk** for disease is the likelihood of development of manifestations of disease over a certain time period, based on the presence, intensity and interplay among multiple risk factors (Absolute Risk Implementation Working Group, 2003; see also Section 4.1.3).

Behavioural risk factors are outlined below.

- **Tobacco smoking:** Smoking packet or roll-your-own cigarettes, pipes and cigars on either a regular or occasional basis increases the risk of CHD, stroke and peripheral vascular disease, and is the greatest contributing factor to disease burden (Mathers et al, 1999).
- **Physical inactivity:** The *National Physical Activity Guidelines for Australians* recommend "at least 30 minutes of moderate intensity physical activity on most, preferably all, days of the week" to obtain a health benefit ie 150 minutes/week over at least 5 sessions. Insufficient physical activity doubles the risk of death from CHD and may be linked to stroke, as well as to other CVD risk factors such as overweight and obesity, diabetes, high blood pressure and high blood cholesterol.
- **Poor nutrition:** Dietary guidelines for Australians recommend consumption of essential nutrients from a broad range of biologically diverse food groups. High intakes of saturated fats are associated with elevated blood cholesterol levels and increased death from CVD. High salt intake may contribute to elevated blood

pressure. Poor nutrition (eg, inadequate consumption of fruits and vegetables) and excessive consumption can affect other risk factors (eg, overweight and diabetes).

- **Alcohol consumption:** High consumption of alcohol (especially binge drinking) is associated with higher blood pressure and death from stroke, although low to moderate consumption can be a protective factor. However, it is not recommended for a non-drinker to commence consumption to try to obtain health benefits. 'Low risk' for males equates to 28 standard drinks per week; 29-42 per week 'risky' and 43 or more 'high risk'; for females the respective amounts are up to 14; 15-28, and 29 or more.

Biomedical risk factors for CVD are:

- **High blood pressure (hypertension):** There is a continuous relationship between blood pressure levels and the risk of CHD, stroke, heart failure, PVD and kidney failure. World Health Organization (WHO) and the National Heart Foundation of Australia guidelines define 'high' blood pressure as systolic pressure (SBP) at or above 140mmHg or diastolic pressure (DBP) at or above 90mmHg, or receiving medication for high blood pressure. Major contributors to high blood pressure include poor diet (especially high salt intake), overweight, excessive alcohol consumption and insufficient physical activity.
- **High blood cholesterol:** There is also a continuous relationship between total blood cholesterol levels and the risk of CHD, ischaemic stroke and PVD, with levels over 5.5mmol/L indicating increased risk[1]. Most lipids (fats) in the body and in foods are triglycerides; some are cholesterol, required to make cell membranes, corticosteroids, certain hormones and bile acids, and to ensure proper functioning of the nervous system. High-density lipoprotein (HDL or 'good') cholesterol helps reduce CVD risk, while low-density lipoprotein (LDL or 'bad') cholesterol can increase risk. Cholesterol comes from two sources – the food we eat (of which only 50% of the cholesterol may be absorbed) as well as the amount synthesized and metabolised in the body, mainly the liver, which is by far the greater amount (Thomas, 1988, p129).
- **Overweight:** Overweight is a condition of excess body fat that results from a sustained energy imbalance. This occurs when dietary energy intake exceeds energy expenditure over a period of time. **Obesity** is a severe form of overweight. Both are associated with higher death and illness rates from CHD and other conditions. **Body mass index (BMI)** is the most common measure[2] – where BMI of 25 or more indicates overweight and BMI of 30 or more indicates obesity.
- **Diabetes:** Diabetes is a collection of closely related metabolic conditions characterised by high blood glucose levels resulting from defects in secretion or action of the hormone **insulin.** Chronic high blood glucose levels (**hyperglycaemia**) are associated with long term damage, dysfunction and failure of various organs, especially eyes, kidneys, nerves, heart and blood vessels. Diabetes is the sixth leading cause of death in Australia, and contributes to significant disability. Diabetes

[1] The value of 5.5mmol/L, while useful in population approaches to risk management, is somewhat arbitrary. CHD risk decreases continuously at least down to 4.5mmol/L where the curve clearly flattens.

[2] BMI is weight in kilograms divided by the square of height in metres. Waist circumference is another measure.

shares risk factors with, and is itself a risk factor for CHD, stroke and PVD. People with diabetes are more likely to have a clustering of risk factors such as high blood cholesterol, overweight and high blood pressure, associated with the **metabolic syndrome**.

> **Metabolic syndrome** is a group of risk factors closely associated with insulin resistance that markedly increase the risk for coronary heart disease and diabetes. Abdominal adiposity appears to be a major predictor of the syndrome and its increasing prevalence. Lifestyle intervention with the goals of weight loss and increased exercise is a critical component of management, together with aggressive management of lipid disorders (Tonkin, 2004).

- **Kidney (renal) failure:** If the kidney fails to adequately remove waste products from the blood, the risk of acquiring and dying from CVD increases. In acute form it is usually reversible; in chronic form it can develop into **end stage renal disease (ESRD)** where dialysis or a kidney transplant are required to survive. Chronic kidney failure is mainly caused by infections, diabetes and high blood pressure.

Predisposing risk factors for CVD are age, family history and male gender.

- **Age**: CVD predominantly affects middle-aged and older Australians. Although people aged 60 and over represent only 16% of the population, people of this age account for 70% of hospital admissions for heart attack, 73% of bypass (CABG – coronary artery bypass grafting) surgery, and 61% of percutaneous coronary intervention (PCI) procedures. Moreover, 92% of deaths from CHD occur in this age-group, with over 50% in those aged 80 years and over (Mathur, 2002, p3).
- **Family history**: People with a history of CVD in their families tend to be more likely to develop CVD. The risk of heart disease is increased if a first degree relative is diagnosed with heart or blood vessel disease before the age of 60.
- **Gender**: Men are more likely to have a coronary event than women (7.66 events per 1000 people aged 40-90 years compared with 4.53; Mathur, 2002, p11). However, women are less likely to survive a heart attack and more likely to have a second heart attack. Men tend to die from CHD at an earlier age than women with age-specific death rates for men about the same as that for women who are five years older. Prior to menopause women are thought to be somewhat protected from heart disease by the hormone oestrogen.

In addition, **psychosocial factors**, such as depression, social isolation and lack of quality social support can also affect the development of CHD. Risk factors themselves are strongly influenced by wider circumstances, such as people's economic resources, education, living and working conditions, stress, and access to health care and social services (AIHW, 2004a).

1.3 HEALTH INTERVENTIONS

People with CVD take more health actions than the average Australian. The 2001 NHS data in Table B-1 show that 1.5% of people with CVD were hospital inpatients compared with the average of 0.9%, 3.5% were outpatients (compared to 1.9%); 4.6% visited day clinics (cf. 2.3%); 40.9% visited the doctor (cf. 24.5%) – ie a 60% greater use of medical services; 16.4% visited other health practitioners (cf. 13.1%) and 57.3% took health actions compared to 42.6%. Table B-2 provides a summary for particular diseases, showing the ratio of actions for that condition relative to the national average. Not

surprisingly, CHD and stroke had the highest health action rates (1.7 times the national average), although all conditions were higher than average.

Prevention: Prevention of CVD involves reducing morbidity and mortality in people with and without previously diagnosed disease. In the context of CVD, prevention relates to promoting healthy eating and regular physical activity, reducing salt and saturated fat intakes, quitting smoking, maintaining a weight in the healthy range and reducing high blood pressure and cholesterol levels. Currently less than 1% of health expenditure relates to CVD prevention activities.

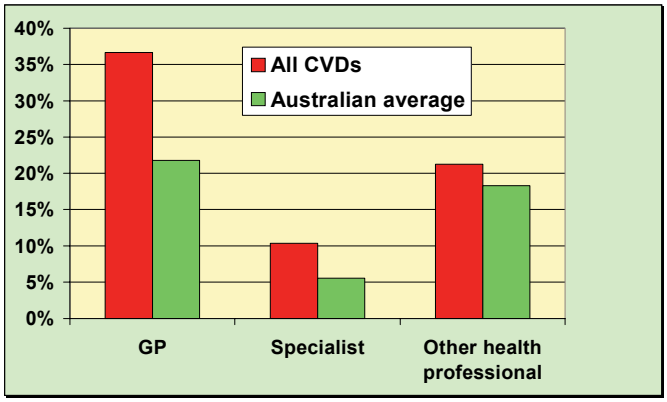
Research: Significant funding of CVD research is undertaken by the public and private sectors, including the pharmaceutical industry. In 2000-01, AIHW (2004) shows $153m of research funds for CVD, after cancer ($215m or 18%). R&D into CVD demonstrated the highest return to investment in Australia over the period 1960-1999 (Access Economics, 2003). The Heart Foundation is the largest non-government funding agency for cardiovascular research.

GP care is important in identifying and managing CVD and risk factors, with continuity of care including **secondary prevention** (for people with established CVD), counselling, prescription and referral. Senes and Britt (2001) found that of all problems managed by GPs in the BEACH study, CVD problems accounted for 11% of the total, diabetes almost 2% and other cardiovascular risk factors 8% of all problems managed. A summary by illness is provided in Table B-3.

Specialist, emergency and acute care: Emergency care is an important phase of care, including paramedic and ambulance services. Acute care is also extremely important: in 2000-01; CVD accounted for 6.9% of principal diagnoses for, and 9.8% of total, hospitalisations. There are around 120 coronary care and 31 cardiac surgery units in public hospitals, and a further 26 and 23 respectively in private hospitals. Specialist care for more severe CVD is provided by over 1,000 cardiologists, cardiothoracic surgeons and neurologists. There were 29,532 computerised tomography (CT) scans and 3,769 magnetic resonance imaging (MRI) scans for principle diagnosis of stroke and transient ischaemic attack and 81,800 coronary angiograms performed in hospitals in 2000-01. In 2001-02 there were 23,949 coronary angioplasty procedures performed and 16,252 coronary artery bypass grafting (CABG) procedures in Australia.

Figure 1-1 graphically illustrates the differences between people with CVD and average Australians the same age for visits to the GP (37% visited the GP compared to 22% in the two weeks prior to the Survey), specialist (10% compared to 6%) and other health practitioners (21% compared to 18%).

FIGURE 1-1 COMPARISON OF HEALTH ACTIONS, 2001, CVD AND AUSTRALIAN AVERAGE

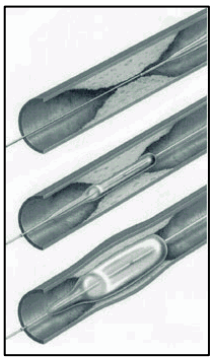


Source: Access Economics derived from ABS special data request. Not age-standardised.

Pharmacotherapy: The 2001 NHS data shows that 12.9% of all Australians and 69.4% of all those with CVD took pharmaceutical medication for a heart or a circulatory condition, in the two weeks prior to the Survey. Details for individual CVD conditions are shown in Table B-4. Descriptions of pharmacotherapies include:

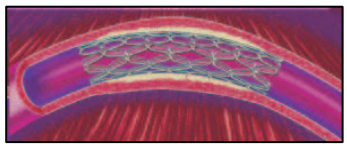
- **Medications to treat high blood pressure,** including angiotensin converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), beta-blockers, calcium channel blockers and low dose thiazide diuretics, and
- **Medications to lower cholesterol and triglycerides,** including statins, fibrates, resins and nicotinic acid.

There have been large increases in Australia over the past decade in prescribing lipid-lowering drugs (particularly statins), ACE inhibitors, ARBs and calcium channel blockers.



Surgery and other procedures: For people who have significant arterial blockages, there are surgical and other procedures to revascularise the heart by removing or bypassing the blockages thus restoring adequate blood flow. The most common surgical and other procedures are:

- **Angioplasty** or **percutaneous transluminal coronary angioplasty (PTCA)** involves insertion of a catheter containing a balloon into the narrowed section of artery, and expanding it with sterile fluid to compress the plaque against the wall of the vessel and make a wider opening in the artery.



- **Stents**: 91% of PTCA procedures involved stent implantation in 2000-01. A tiny expandable mesh tube made of medical grade stainless steel is delivered on the balloon catheter and, after the plaque is compressed, is fully expanded into position, acting as a miniature "scaffolding" for the artery.
- **Coronary artery bypass grafting (CABG)** involves blood vessel grafts using portions of another artery or vein from the patient's body (eg, chest wall or leg), that are connected in ways to bypass the blockage to re-establish blood flow. **Conventional CABG** involves a cardiopulmonary bypass (CPB or "heart-lung") machine that supports blood flow throughout the body, while **beating heart CABG** uses a stabilisation device to gently still a portion of the heart, mostly avoiding CPB and potentially reducing blood trauma, risk of adverse events (eg stroke) and recovery period.

- **Carotid endarterectomy** involves surgically removing atherosclerotic plaque from the carotid arteries in the neck, reducing the risk of stroke. There were 3,553 carotid endarterectomies in Australia in 2000-01.
- **Other surgeries** include heart transplants (72 in 2000-01), heart valve defect procedures (6,298), cardiac defibrillator implants (957).[3]

Cardiac rehabilitation programs: these are multidisciplinary services provided in acute care units, outpatient facilities, the community or the home, to improve functional capacity, retrain in lost skills and/or change psychosocial adaptation. Rehabilitation programs help CVD patients reduce their risk of recurring events and help them return to daily life by offering risk factor education, counselling, support and physical activity. Recent Cochrane reviews suggest that cardiac rehabilitation reduces the risk of subsequent events by between 25% and 30%. Australian and international data highlight low participation rates in this effective therapy.

1.4 EPIDEMIOLOGY OF CARDIOVASCULAR DISEASE

1.4.1 MORTALITY

CVD is the major cause of death in Australia, claiming 50,294 deaths in 2002 (37.6% of all deaths) – a death every 10 minutes. Table B-5 shows deaths in 2002 for the most fatal diseases, with combined heart diseases the largest killer, accounting for 25.6% of all deaths, and stroke second (9.4%). Within heart disease, CHD was responsible for 19.5% of deaths, including 10.7% directly from AMI. Heart failure was responsible for 2% of deaths[4]. PVD is not separately identified in the ABS data on causes of death.

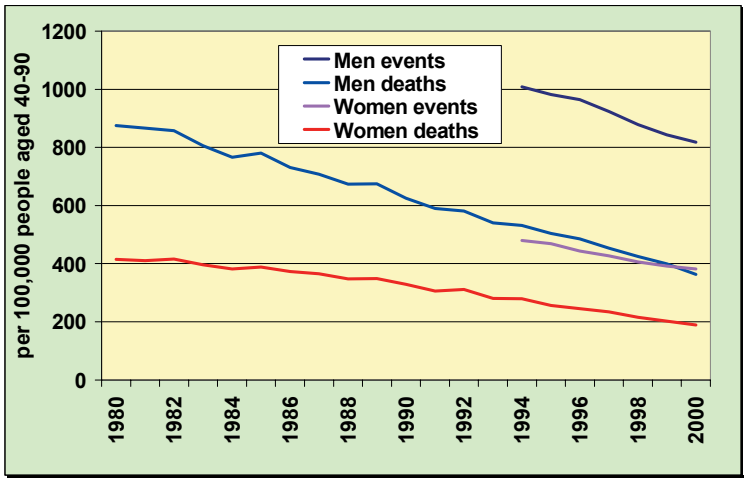
Mortality rates from CVD are declining, more than halving over the past two decades – a major factor underlying increased life expectancy in Australia over this period. Between 1950 and 1970, rates rose steadily, but today they are well below the 1950 levels for both males and females (AIHW, 2002b, Figure 2.1.2 p20). Moreover, there has been a 32% decline in mortality between 1993-94 and 1999-00 (see Figure 1-2), due to declining incidence (20%) of major coronary events together with better overall survival – 12-16% decline in case-fatality rates. Men die from CVD earlier than women, with death rates for men about the same as for women who are five years older (Mathur, 2002).

Australia's mortality rates from CVD currently lie in the healthier (lower) end of the spectrum of OECD nations, with mortality rates significantly less than in the US and UK but higher than those in Japan and France (Figure A-1). Prevalence of risk factors play an important role in determining the prevalence of CVDs and mortality rates internationally – eg, the relative importance of fish in the diet in Japan.

[3] Mathur (2002) notes that there were 28,002 hospital admissions for AMI in 1999-00 and one in eight AMI patients died in hospital. One in four of these patients had cardiac catheterisation, at least one in eight had PCI and 1 in 20 had CABG.

[4] While mortality as estimated by the ABS is 2%, the burden of heart failure may be greater. Chapter 2 provides more detail on the prevalence, impacts and costs of heart failure.

FIGURE 1-2 CORONARY EVENTS AND MORTALITY RATES BY GENDER, AUSTRALIA, 1980-2000



Source: Access Economics derived from AIHW data (Mathur, 2002, Tables A1 and A2).

1.4.2 MORBIDITY

Like mortality, morbidity from CVD is also declining. There was a 12% decline in heart attack admission rates between 1993-94 and 1999-00 (Mathur, 2002).

Disability: According to the 1998 Survey of Disability, Ageing and Carers, nearly 8,000 people, all aged 45 and over, reported that they had a disability due to a heart attack. This figure translates to a rate of 126 per 100,000 persons in that age group (AIHW, 2002b, p21). More importantly, 1.2% of survey respondents (equating to 230,300 Australians) reported one or more disabling conditions associated with their stroke. Of these, 76.6% needed assistance or had difficulties with self-care, mobility or communication and 19.4% had no difficulties but used aids or equipment (AIHW, 2004a, p35).

Table B-6 shows the disability weights for various CVDs compared to selected other national health priorities, as used by Mathers et al (1999). The range shows disability from CVDs, apart from stroke, similar to osteoarthritis or Type 2 diabetes. The range for stroke is more like the range for rheumatoid arthritis, cancer or dementia, where the disability burden can become the most severe of all conditions. The disability weights are generally higher for CVD than the other national health priority areas of asthma and accidents and injuries (with the exception of spinal cord injury – 0.725).

> Patients with heart failure have statistically significant impairment of all aspects of quality of life, and median survival of only 1.7 years in men and 3.2 years in women (Hobbs et al, 2002).

Impacts on employment: CVD has a negative impact on employment, due to both absenteeism and early retirement. In the two weeks prior to the NHS, 15.7% of people with CVD had days of reduced activity compared with 10.8% for the average Australian (Table B-7). The days of reduced activity for people with CVDs were 1.4 times the average, with 2.3 times the average for CHD (Table B-8).

1.4.3 INEQUALITIES

Australians who are at a socioeconomic disadvantage tend to have a poorer risk factor profile and are more likely to die from CVD than other Australians. Table B-9 shows the income of people with CVD by quintile, noting that people with CVD are over-represented in the lower income quintiles, and under-represented in the higher quintiles, more markedly so for females than males. This might also be due in part to the reverse causation – ie their condition reducing their income earning capacity. Studies that look at the relationship between socioeconomic deprivation and CVD (eg, McAlister et al, 2004) have found that:

- there is higher mortality and greater morbidity from CVD in socioeconomically deprived people, due largely to: riskier behaviours (eg, smoking, poorer diet, less exercise); reduced access to costly health care and procedures (eg, specialists, surgeries, transplantation); suboptimal application of therapies (eg, adherence to medication);
- there is evidence that mortality inequalities from CHD have widened over time (Turrell and Mathers, 2001); and
- there are lower rates of primary health care consultation for socioeconomically deprived people, due to different behaviours (eg, fatalism is more common, non-professionals sought more for advice); a tendency to seek care in hospital emergency rooms rather than primary care; and a possible failure by primary care providers to offer regular follow up care (although this latter possibility is speculative).

People with CVD are slightly over-represented in rural areas with 36% in inner and outer regional Australia compared to the Australian average of 33% (Table B-10). Aboriginal and Torres Strait Islander people have 2.6 times the mortality rate and 1.4 times the hospitalisation rate for CVD relative to other Australians (AIHW, 2004a).

1.5 ECONOMIC ISSUES

1.5.1 CONCEPTS OF DIRECT AND INDIRECT COSTS

There are three types of costs associated with CVD:

- Direct financial costs to the Australian health system include the costs of running hospitals and nursing homes (buildings, care, consumables), GP and specialist services reimbursed through Medicare and private funds, the cost of pharmaceuticals (PBS and private) and of over-the-counter medications, allied health services, research and "other" direct costs (such as health administration).
- Indirect financial costs (Chapter 3.1) include the value of informal care, productivity losses (income forfeited due to early retirement and absenteeism), premature mortality, equipment and aids that are required to help cope with illness, and transfer costs such as welfare and disability payments.
- Non-financial costs (Chapter 3.2) are also very important—the pain, suffering and premature death that result from CVD. Although more difficult to measure, these can be analysed in terms of the years of healthy life lost, both quantitatively and qualitatively, known as the "burden of disease".

1.5.2 DATASETS – DESCRIPTION AND LIMITATIONS

It is generally more desirable to use top-down national datasets in order to derive national cost estimates for large and well-studied diseases such as CVD rather than extrapolate bottom-up data from smaller partial datasets. However, this has been problematic in some areas (eg, heart failure). The following primary data sources have been utilised in this study:

- mortality data from the 2002 'Causes of death' publication (ABS, 2003) – this series reports mortality by underlying cause as per the International Classification of Disease (ICD);
- prevalence data from the 2001 National Health Survey (NHS) (ABS, 2002), which is rich in cross-tabulation information, eg, regarding employment, absenteeism, rurality, health actions) although it is self-reported (the authors are satisfied that the ABS survey techniques, triangulation and verification result in satisfactorily robust data) and its broad categories differ from the AIHW, though still linked to the ICD;
- data on direct health costs and the burden of disease from the AIHW, as well as general descriptive data regarding CVD and its risk factors (AIHW, 2004a, AIHW, 2004b, Mathers et al, 1999) – these are in turn based on other data sources, such as the Hospital Morbidity Database, ABS estimates for medical research, and BEACH data for GP costs, which are detailed in each relevant section;
- data on other indirect costs are drawn from a variety of sources, as described in Section 3 – for example, the productivity costing combines NHS data on lower employment for people with CVD with ABS data on average earnings;
- there is also a plethora of epidemiological work on cost-effectiveness of various interventions, although meta-analysis of these studies was beyond the scope of this report.

The main limitations of the data are in relation to timeliness, comparability and objectivity:

- National Health Surveys have been conducted in 1989-90, 1995 and 2001 (released September 2002), with not all series comparable and, being self-reported, without biomedical verification of risk factors;
- direct cost of disease data has been calculated by the AIHW for 1993-94 and 2000-01 (the latter released in May 2004), again with limited comparability – the latter series for example only includes 86% of the recurrent costs included in the former series; and
- burden of disease data dates to 1996, although a new attribution is underway.

Lack of comparability between the prevalence and cost data (different years, different categories) hinders analysis. More regular and timely release of prevalence, cost and burden of disease data could assist in better analysis and more informed health policy formulation for national health priority areas in particular.

For CVD, it may also be important in the future to expand the list of risk factors and comorbidities studied – eg, to include depression, social isolation and lack of social support for example – and develop a systematic approach to deriving 'attributable fractions' for these factors in relation to disease cost ie how much of the cost of CVD can be attributed to each risk factor, and to particular combinations in the case of multiple risk factors, using multiple regression analysis.

In addition, there is a need for an ongoing biomedical (rather than self-reported) survey of risk factors that includes physical/objective measurements, such as blood test results.

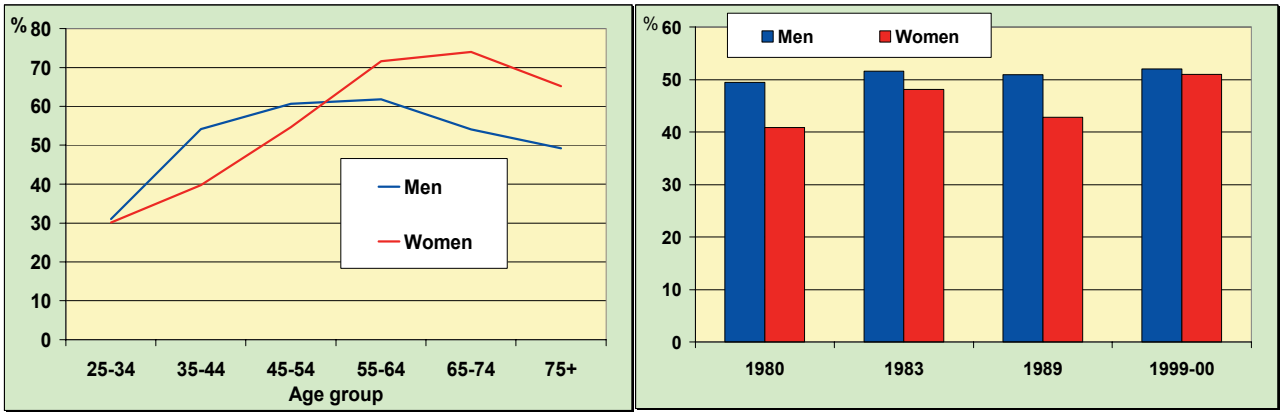
2. PREVALENCE AND DIRECT COSTS IN AUSTRALIA

2.1 PREVALENCE OF SELECTED CVD RISK FACTORS

High blood cholesterol: Over half the Australian population aged 25 and over – 6.4 million people – have levels over 5.5mmol/L, as measured in the AusDiab Study. However, it should be noted that this cut-off point is to some extent arbitrary, as risk rises continuously and in a curvilinear manner from blood cholesterol levels considerably lower than this. Figure 2-1 shows the age and gender distribution of high blood cholesterol, which rises with age and, after age 55, is more prevalent in women than in men. There has been little change in the prevalence of high cholesterol since 1980.

Over half Australians over 25 have high blood cholesterol

FIGURE 2-1 HIGH CHOLESTEROL, AUSTRALIA, BY GENDER & AGE, SELECTED YEARS

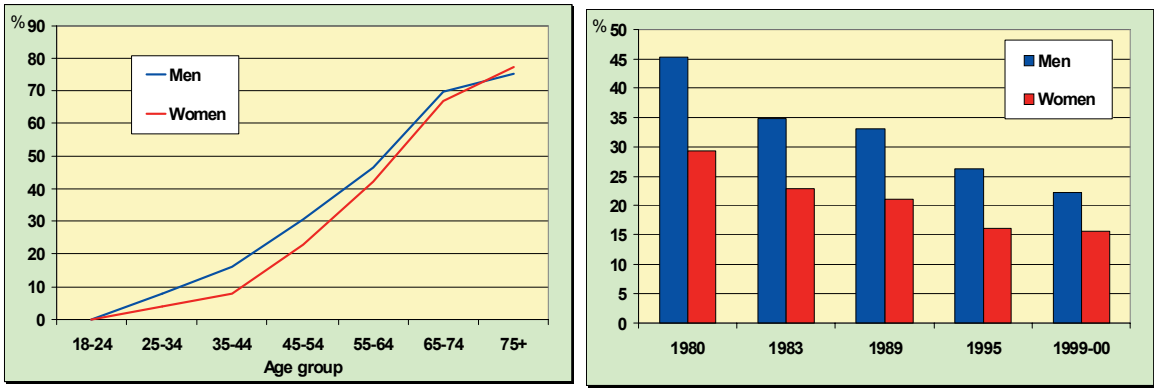


Source: Based on Mathur (2002), AIHW (2004a). NB: Left panel is for 1999-00. 'High' = 5.5mmol/L or more.

High blood pressure: 30% of Australians over 25 (3.7 million people) have high blood pressure (AIHW, 2004a). Prevalence increases steeply with age to three quarters of Australians over 75. However, the prevalence of high blood pressure is diminishing in the 25-64 age group, with 22.3% of men and 15.6% of women in 1999-00 in this age group with high blood pressure, compared to 45.3% and 29.4% respectively in 1980 (Figure 2-2). The prevalence of high blood pressure has approximately halved over the last two decades.

30% of Australians over 25 have high blood pressure

FIGURE 2-2 HIGH BLOOD PRESSURE, AUSTRALIA, BY GENDER & AGE, SELECTED YEARS

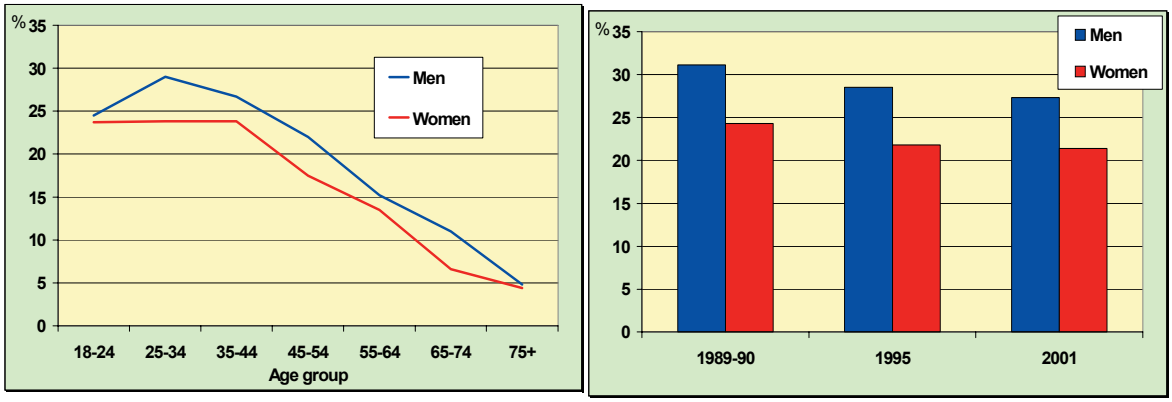


Source: Based on Mathur (2002). NB: Left panel is for 1999-00. Right panel is for Australians aged 25-64. 'High' = 140/90 or more, or taking blood pressure medication.

Smoking: Smoking tobacco has been declining since the 1950s when it was estimated 70% of men and 30% of women smoked (Mathur, 2002, p23). By 2001, 3.1 million Australians – 20% of those aged 14 years and over – smoked daily (AIHW, 2004a). Of adults over 18, 24.3% smoked in 2001, down from 27.7% in 1989-90 (ABS, 2002, Table 31). Younger Australians and men smoke more (see Figure 2-3). Less than 5% of people over 75 smoke.

One in four Australian adults still smoke

FIGURE 2-3 TOBACCO SMOKING, AUSTRALIA, BY GENDER & AGE, SELECTED YEARS

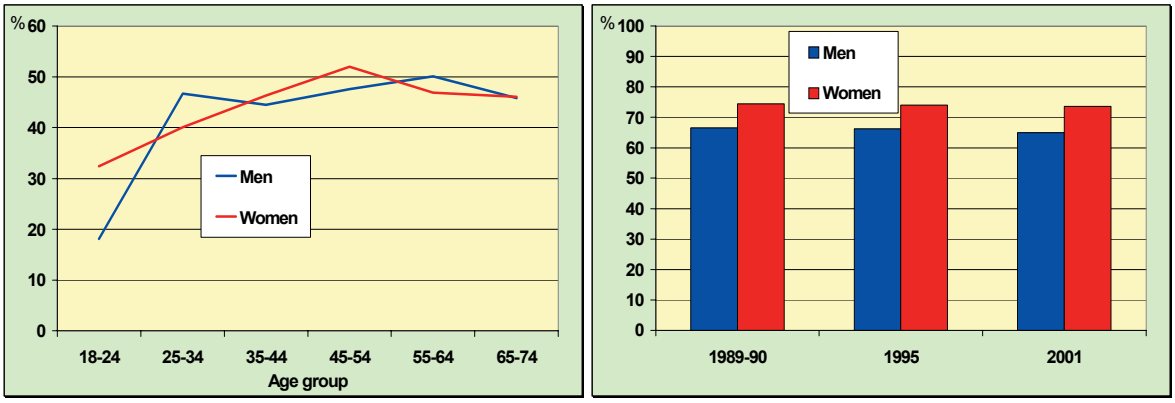


Source: Access Economics based on Mathur (2002), left, and ABS (2002), right.
NB: Left panel is daily smoking for 2001. Right panel is self-reported adults.

Physical inactivity: 54% of Australians aged 18-75 years (7.3 million people) have insufficient levels of physical activity to achieve health benefits, comprising 15% who did no physical activity and 39% who did some, but not enough (AIHW, 2004a). Younger adults tend to exercise more (Figure 2-4). Baumann et al (2001 and 2002) argue that, since 1997, inactivity levels have been on the rise. The National Health Survey, however, shows little change, with around two thirds of men and three quarters of women in the 'sedentary' and 'low exercise' categories (ABS, 2002, Table 33) over the 1990s. The ABS define categories based on scores from self-reported frequency, duration and intensity of physical activity.

54% of Australian adults do not exercise enough

FIGURE 2-4 INSUFFICIENT ACTIVITY, AUSTRALIA, BY GENDER & AGE, SELECTED YEARS



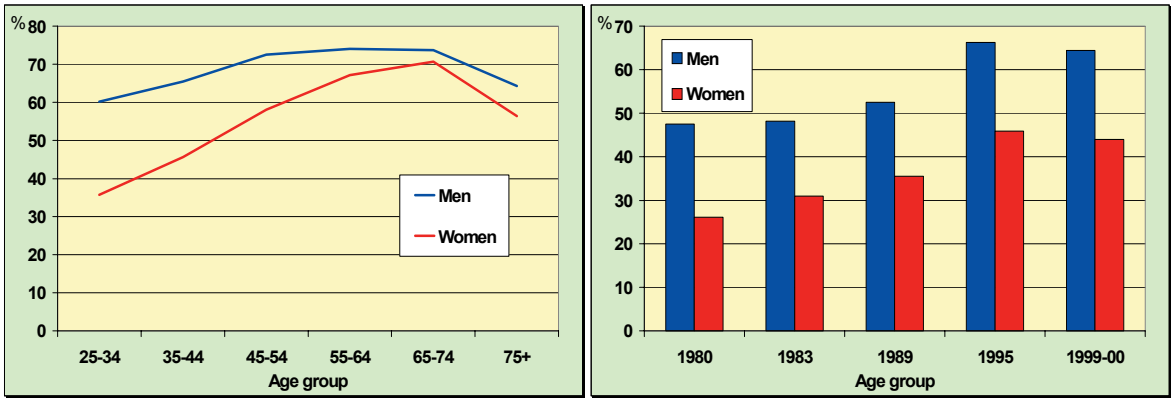
Source: Access Economics based on Mathur (2002), left, and ABS (2002), right.

NB: The left panel uses the AIHW definition (Section 1.2), and the right uses the ABS definition (above).

Overweight and obesity: Two thirds of men over 25 and half of women are overweight or obese, including 19% of men and 21% of women who are obese. In total, this represents 7.4 million Australians aged over 25 years. Figure 2-5 shows that being overweight tends to increase through middle age, dropping off amongst the elderly. Being overweight or obese has become much more common since 1980 (Mathur, 2002, Table 4.2). The prevalence of obesity has doubled over the last two decades and is a significant contributing factor in the increasing prevalence of Type 2 diabetes (AIHW / Heart Foundation, 2004).

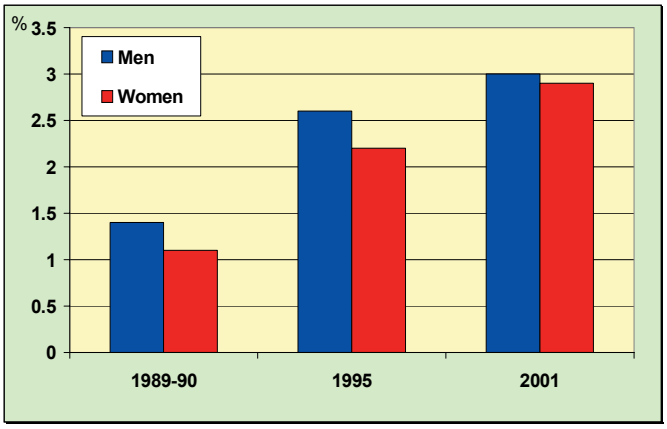
60% of Australians over 25 are overweight, with obesity doubling since 1980.

FIGURE 2-5 OVERWEIGHT AUSTRALIANS, BY GENDER & AGE, SELECTED YEARS



Source: Access Economics, based on Mathur (2002).

FIGURE 2-6 PREVALENCE OF DIABETES (SELF-REPORTED) BY GENDER, AUSTRALIA, 2001



Source: Access Economics derived from ABS (2002).

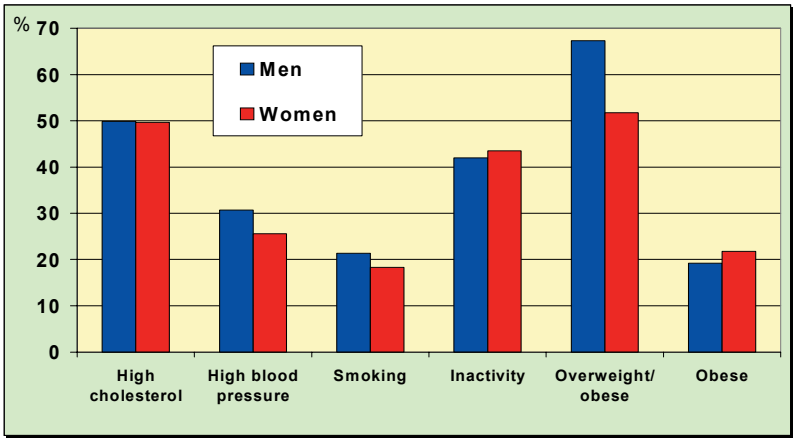
Diabetes: The National Health Survey (ABS, 2002) shows the prevalence of self-reported diabetes has more than doubled from 1.3% in 1989-90 to 2.9% in 2001 (Figure 2-6). However, more robust estimates such as those from the AusDiab study are higher; when undiagnosed cases are included, it is estimated that nearly 1 million Australians aged 25 and over (7.6% of the population) have diabetes. Diabetes involves high rates of health service utilisation, with morbidity and mortality increasing markedly with age. People with diabetes are two to four times more likely to develop cardiovascular disease (AIHW, 2002a).

Self-reported diabetes prevalence more than doubled from 1989-90 to 2001

2.1.1 SUMMARY OF CVD MORTALITY DUE TO RISK FACTORS

Figure 2-7 summarises the adult prevalence of modifiable risk factors for CVD in Australia.

FIGURE 2-7 ADULT PREVALENCE OF SELECTED RISK FACTORS, AUSTRALIA, 1999-01



Source: Access Economics, based on Mathur (2002).

NB: For Australians 25 and over, except for smoking (18 and over) and physical activity (18-75).

Table 2-1 shows the proportion of coronary heart disease (CHD) deaths due to each risk factor, attributing 80% of deaths to the main five risk factors. Nearly one quarter of deaths

from CVD can be attributed to high blood pressure, with physical inactivity second (21%) and high cholesterol a close third (20%).

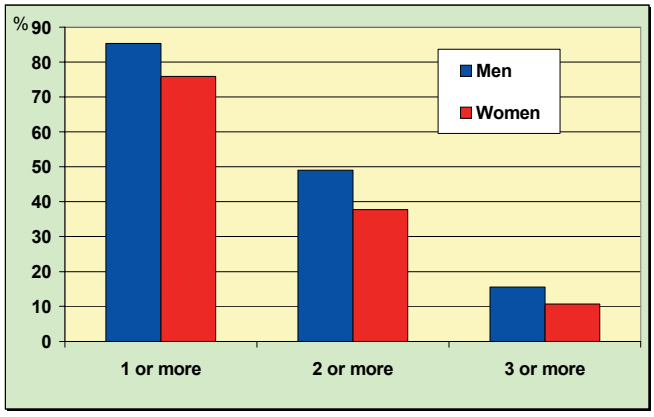
TABLE 2-1 CORONARY HEART DISEASE DEATHS DUE TO VARIOUS RISK FACTORS, 1996

Risk factor	% of total deaths
High blood pressure	24%
Physical inactivity	21%
High blood cholesterol	20%
Tobacco smoking	8%
Excess body weight	7%

Source: AIHW (2002b), p19.

The risk of CVD increases with the number of risk factors (and their intensity) present in any particular person. Excluding high cholesterol (ie including high blood pressure, smoking, physical inactivity and being overweight), about 4 in 5 Australians have at least one modifiable risk factor for CVD, over 4 in 10 have two or more, and 1 in 6 have three or more (Mathur, 2002, p24). Figure 2-8 shows the differences for men and women.

FIGURE 2-8 ADULT PREVALENCE OF MULTIPLE RISK FACTORS, AUSTRALIA, 1999-2001



Source: Access Economics, based on Mathur (2002).

2.2 PREVALENCE OF CVD IN 2001

The third National Health Survey released in October 2002 provides detailed information on the self-reported prevalence of a variety of CVDs in Australia with demographic breakdowns (ABS, 2002). As noted in Section 1.5.2, the ABS data is limited in its comparability due to different categorisation of CVD – apart from a few of the major CVDs (angina, stroke, heart attack) it asks questions about hypertension, tachycardia, oedema, diseases of arteries, arterioles & capillaries, haemorrhoids, varicose veins, cardiac murmurs and sounds, other CV signs & symptoms and other CVDs. Thus the prevalence of some major items of interest, such as heart failure or PVD, are not directly reported. Nonetheless, AIHW (2004a) also uses the Survey to quantify the prevalence of CVD in Australia. 2001 NHS data are presented in the Appendix (Table B-11 and Table B-12). Summary data are provided over the page, highlighting the major issues. Regarding heart failure prevalence, two other barriers to its estimation in Australia are the lack of a universally agreed definition and difficulties in diagnosis, particularly when the condition is mild. Data based on overseas studies on heart failure are presented in the box below.

Prevalence and impacts of heart failure: Information about the overall incidence, prevalence and public health significance of chronic heart failure (CHF) in Australia is largely derived by extrapolation of data from North America and Europe (McMurray and Stewart, 2003), where prevalence ranges from 1-2% in the middle-aged to 10-15% in octogenarians (Cowie et al, 1997). In a recent estimate of the overall burden of CHF in Australia it was estimated that 325,000 Australians have CHF secondary to both impaired and preserved left ventricular systolic function and a further 200,000 Australians have left ventricular systolic dysfunction without the typical clinical signs and symptoms that characterise CHF (Clarke et al, 2004). An estimated 30,000 new cases are diagnosed each year (AIHW, 2003b). CHF engenders a complexity of issues relating to its detection and optimal management and is a common reason for primary care contact. A survey of 341 Australian GPs estimated that for every 100 patients aged 60 years and over, 11 had known CHF and two could be newly diagnosed based on clinical features and known aetiological factors (Krum et al, 2001). Heart failure is often misdiagnosed or under-diagnosed in primary care – assessment of left ventricular function in suspected cases could lead to more effective diagnosis and treatment (Davies et al, 2001). There are more reliable data for Australia regarding hospitalisation – AIHW (2004a) reports that in 2000-01 there were 41,000 hospital separations with CHF as the primary diagnosis.

Table 2-2 shows that 16.4% of the Australian population had long term CVDs in 2001, a total of 3.2 million people.

TABLE 2-2 CVD PREVALENCE, AUSTRALIA, BY GENDER & CONDITION,'000 & %, 2001

Cardiovascular disorder (long term)	'000 males	% male pop'n	'000 females	% female pop'n	'000 people	% total pop'n
Hypertension	868.9	9.0%	1,040.3	10.6%	1,909.1	9.8%
Angina	137.6	1.4%	122.8	1.3%	260.3	1.3%
Other coronary heart disease	79.6	0.8%	46.1	0.5%	125.6	0.6%
Other heart disease	6.0	0.1%	6.4	0.1%	12.4	0.1%
Tachycardia	143.4	1.5%	195.0	2.0%	338.4	1.7%
Oedema	88.3	0.9%	208.3	2.1%	296.6	1.5%
Diseases of arteries, arterioles & capillaries	124.8	1.3%	74.4	0.8%	199.1	1.0%
Haemorrhoids	88.8	0.9%	119.8	1.2%	208.6	1.1%
Varicose veins	97.8	1.0%	341.9	3.5%	439.7	2.3%
Other CVDs	93.8	1.0%	111.3	1.1%	205.1	1.1%
Cardiac murmurs and sounds	159.3	1.7%	206.2	2.1%	365.4	1.9%
Other CV signs & symptoms	24.7	0.3%	41.6	0.4%	66.2	0.3%
Total	**1,387.4**	**14.4%**	**1,798.4**	**18.4%**	**3,185.9**	**16.4%**

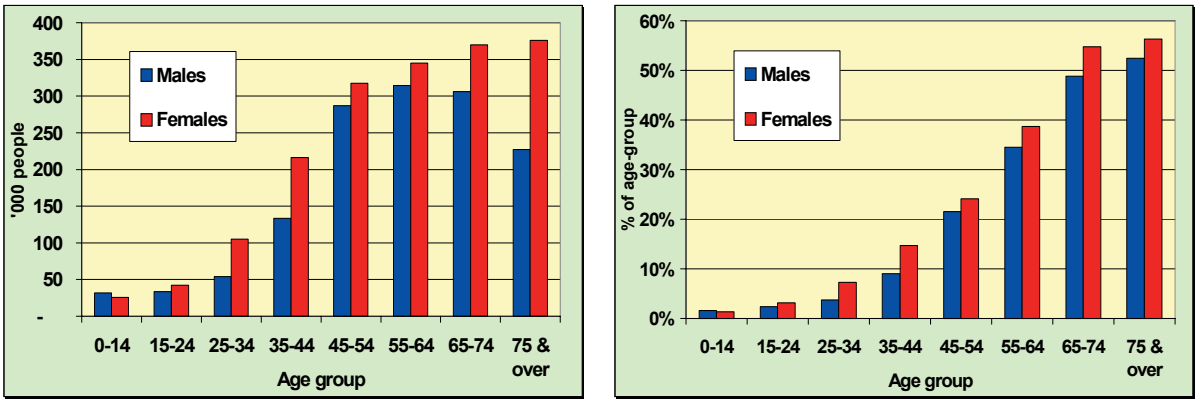
Source: Access Economics derived from ABS (2002), Table 5. Self-reported data.

Note: Numbers do not sum as a single individual may suffer multiple disorders.

Although coronary heart disease including angina has higher prevalence in men, Table 2-2 shows higher prevalence of total CVD in women (18.4%) than in men (14.4%) due to higher prevalence of potentially less life-threatening conditions such as haemorrhoids,

varicose veins and cardiac murmurs and sounds. Age as a risk factor for CVD is clearly illustrated in Figure 2-9.

FIGURE 2-9 CVD PREVALENCE, LONG TERM, AUSTRALIA, BY AGE & GENDER,'000 & %, 2001

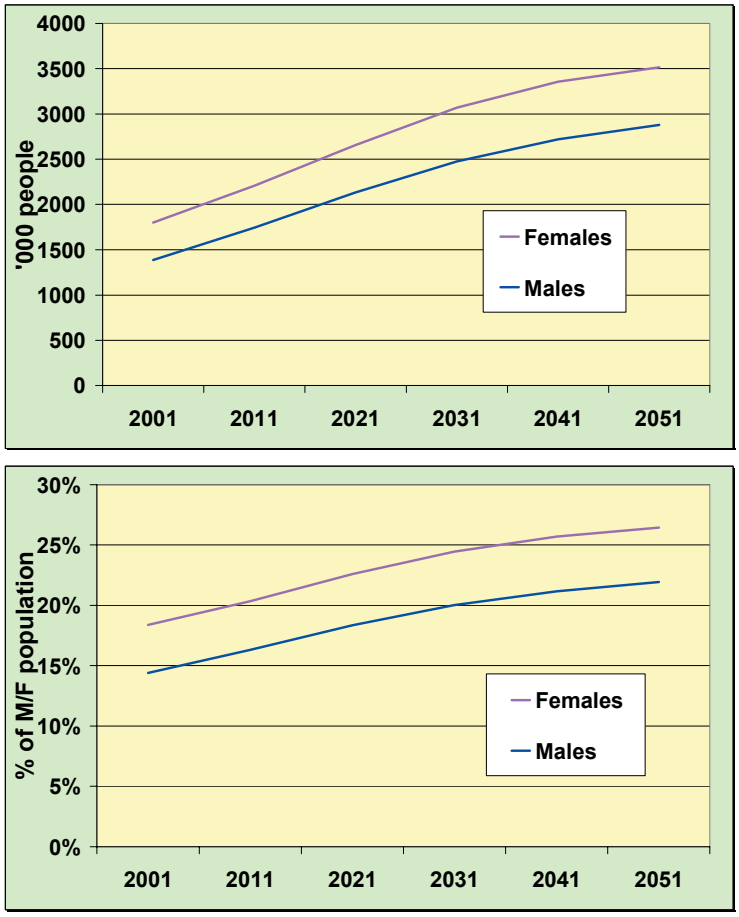


Source: Access Economics, based on ABS special data request (self-reported data).

2.3 PROJECTIONS OF PREVALENCE

Modelling in relation to future prevalence is difficult given the complex interplay between the ageing population, improvements in treatment and changes to the risk factor profile of Australians. On current demographic ageing trends, the prevalence of CVD in Australia will grow to 6.4 million people, 24.2% of the population, by 2051. Figure 2-10 shows the trends for CVD (fuller details are provided in Table B-13 and Table B-14).

FIGURE 2-10 PROJECTED PREVALENCE OF CVD BY GENDER, 2001-2051



Source: Access Economics based on ABS special data request, self-reported, and AusStats population data.

2.4 HEALTH COSTS IN 2004

Direct health system costs estimated in this paper are based on DCIS prevalence-based methodology developed by the Australian Institute of Health and Welfare for the year 2000-01 and provided in a special data request. The detailed 2000-01 official data is provided in Table B-15 to Table B-18 while overview data is published in AIHW (2004b).

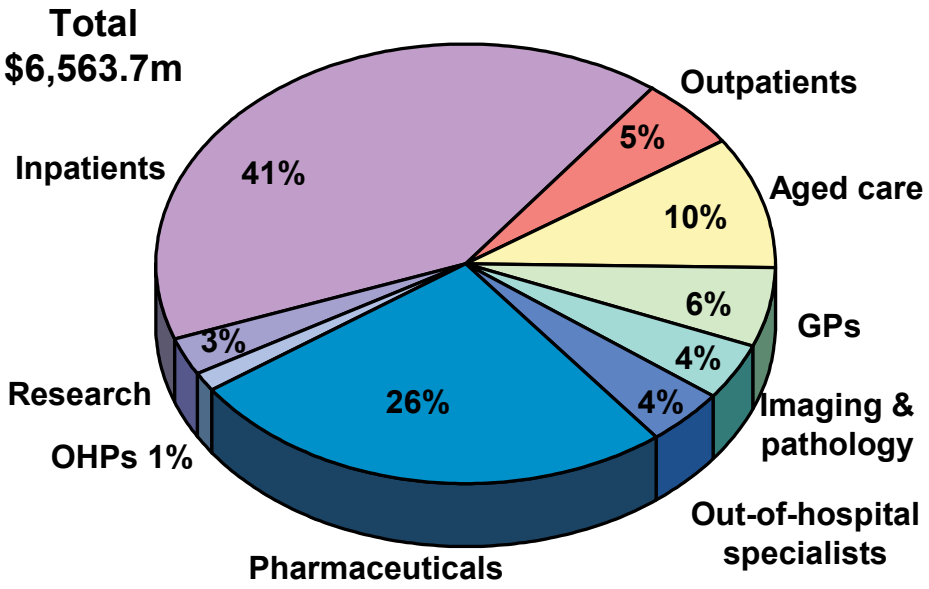
- In 2000-01 the official health cost of CVD was $5.5 billion, dominated by coronary heart disease ($1.5bn), with stroke $895m, PVD $200m and rheumatic heart disease ($34m).
- Hospital costs dominated the profile ($2.5bn), followed by pharmaceuticals ($1.4bn) and residential care costs ($782m).
- It is noteworthy that these costs only include 86% of total recurrent health expenditure – the excluded categories are capital expenditures, expenditure on community health, public health programs, health administration and health aids and appliances. This differs from similar data published by the AIHW for the year 1993-94, where estimates for these categories were included (AIHW, 2004b).

This report extends and projects the AIHW data to estimate the health costs allocated to CVD in CY2004. The 2000-01 data have been converted to 2004 prices using health cost

inflation data from AIHW (2003a) of 10.6% overall, based on the recorded health inflation between 2000-01 and 2001-02 of 3.2% (AIHW, 2003a) and 2.8% per annum thereafter (the average for the 5-year period to 2001-02). An allowance has also been made for increase in CVD prevalence based on increases for each age group in line with demographic changes. We have also excluded the recurrent health expenditure categories excluded by the AIHW from the 'allocated' health costs, but make allowance for the excluded (unallocated) elements in total cost estimates later. Detailed data for the 2004 estimates are provided in Table B-19 to Table B-22, with the key results outlined below.

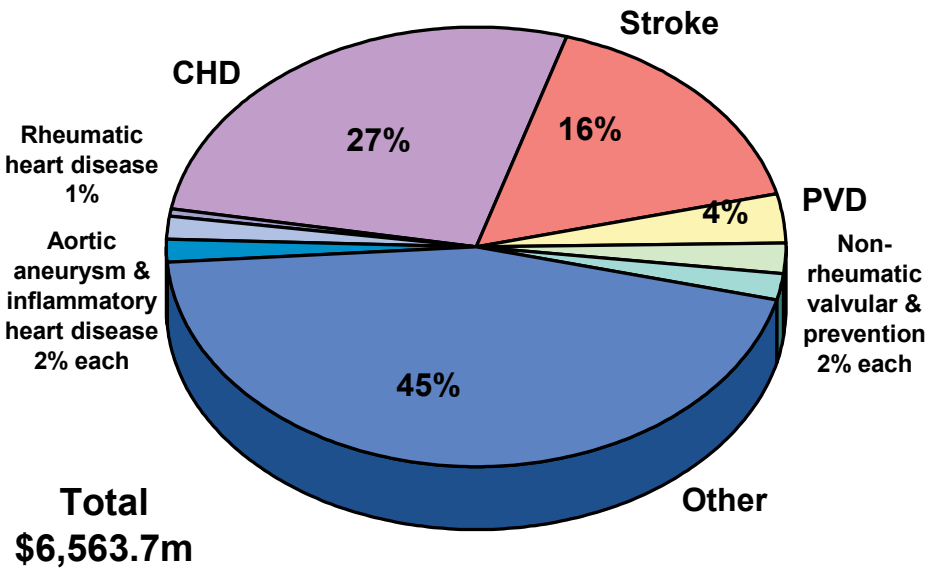
By 2004, the allocated health costs of CVD are estimated to be $6.56 billion. The composition of costs by cost type is illustrated in Figure 2-11 and by condition in Figure 2-12. The age distribution of health costs of CVD is shown in Figure 2-13.

FIGURE 2-11 HEALTH COSTS OF CVD, 2004, $M BY COST TYPE



- Inpatient costs are the largest item at $2.68bn (40.8% of the total).
- Second largest are pharmaceuticals at $1.69bn (25.7%).
- Residential aged care costs represent $639m (9.7%).
- Of the out-of-hospital medical costs, GP expenditure is $377.1m (5.7%), imaging and pathology $283.4m (4.3%) and specialists $271.5m (4.1%).
- $92.8m (1.4%) is spent on other health practitioners (OHPs).
- Research into CVD is estimated as $183.4m (2.8%) for 2004.

FIGURE 2-12 HEALTH COSTS OF CVD, 2004, $M BY CONDITION

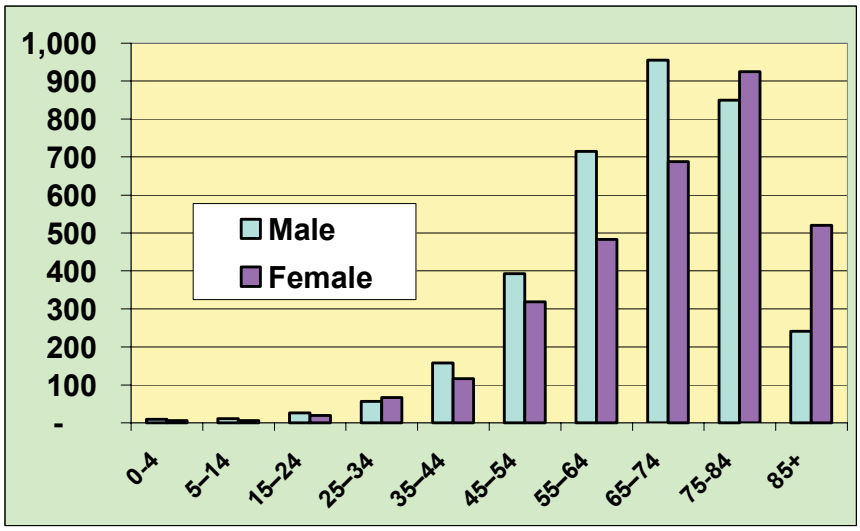


- The health cost of coronary heart disease (CHD) remains the largest single condition at $1.76bn (26.8% of the total).
- Second largest is stroke, the cost of which has now topped $1bn ($1.08bn, 16.5%).
- Peripheral vascular disease costs represent $240m (3.7%).
- A number of conditions are around 2% of the total – non-rheumatic valvular disease ($143.2m, 2.2%), inflammatory heart disease ($117.8m, 1.8%) and aortic aneurysm ($102.9m, 1.6%).
- Rheumatic heart disease is less than 1% of CVD health costs ($39.9m, 0.6%).
- $139.2m (2.1%) is estimated to be spent on cardiovascular prevention activities in 2004.
- Of 'other CVD', which is $2.94bn (44.8% of the total), the large items are likely to be heart failure as well as less dangerous conditions, such as haemorrhoids and varicose veins.

Cost of heart failure: AIHW data preclude the precise identification of heart failure costs. International studies of OECD countries including New Zealand, USA, Sweden and the UK suggest that chronic heart failure (CHF) costs the health care system between 1-2% of health care expenditure, rapidly rising (Stewart et al, 2002b). Hospital admissions account for around two thirds of expenditure, so most treatment programs that reduce costly inpatient stays are cost-effective. Recent data from the UK indicate the rising cost of caring for patients with CHF; between 1990 and 2000, CHF-related health care costs doubled from 1% to 2% of National Health Service expenditure. The latter figure was 4% when all CHF-related hospital admissions and nursing home care was included (Stewart et al, 2003). Extrapolated to Australian data, this suggests that CHF may cost the Australian health care system more than $1 billion per annum.

Heart failure has a high hospitalisation rate, which has increased by 80% in the last decade (Stewart et al, 2001a). Approximately 25% of patients are re-admitted within one year of their first hospitalisation (Feldman et al, 2001). Particularly in the elderly, hospitalisations are frequent, reoccur at a fast rate and are often of long duration. In patients over 65 years of age, heart failure is the principal discharge diagnosis. As hospitalisations account for approximately 70% of health care costs, heart failure is also an expensive disease, consuming on average 2-2.5% of national health care budgets (McMurray and Stewart, 2000). Finally, heart failure is a malignant disease. Mortality is higher than that of most cancers, ranging from 8-10% in mild to over 50% annually in severe heart failure. Forty percent of patients die within one year of their first hospitalisation (Blackledge et al, 2003). Thus, the burden of heart failure is enormous. (Remme et al, 2004, p154).

FIGURE 2-13 HEALTH COSTS OF CVD, 2004, $M BY AGE AND GENDER



- Over 80% of CVD health costs ($5.38bn, 81.9%) is spent on people aged 55 and over. Nearly two thirds of CVD health costs ($4.18bn, 63.7%) is spent on people aged 65 and over.
- Nearly $1bn ($955.4m, 14.6% of the total) is spent on CVD health costs for men aged 65-74.
- Overall, the costs for men ($3.41bn, 52%) are larger than for women ($3.15bn, 48%), despite the higher overall prevalence of CVD in women.

Total health costs are estimated to be $7.6 billion in 2004 (calculated by multiplying by $6,563.7*100/86), if the recurrent health costs of CVD excluded by the AIHW are included – capital expenditures, expenditure on community health, public health programs, health administration and health aids and appliances. **The cost of these 'unallocated' items is estimated as the difference between total and attributed costs – $1.1bn.**

2.5 HEALTH COST PROJECTIONS

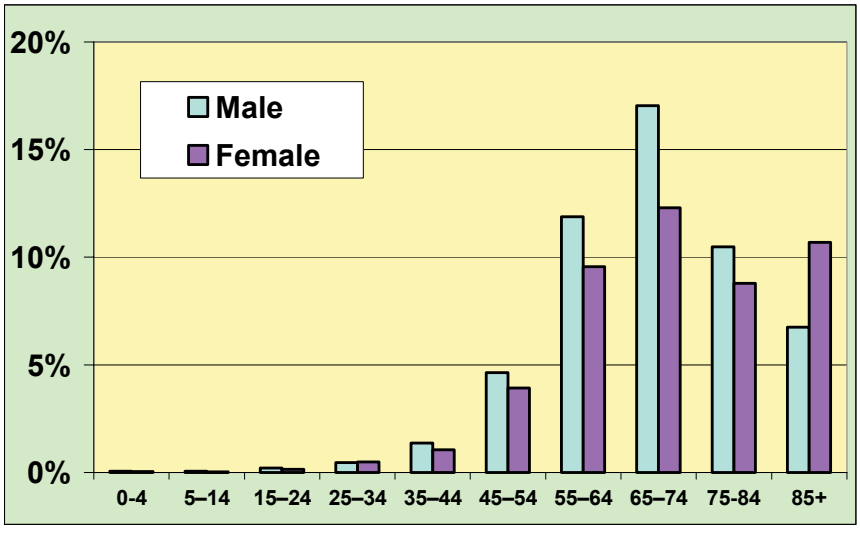
We are extremely cautious about projecting CVD health cost projections, because of the many factors influencing such projections. In particular, there are critical issues such as trends in risk factors and the impacts of new technologies (such as surgeries and key

pharmacotherapies) that may have large impacts on expenditures. Total pharmaceutical expenditure is influenced by the introduction of new therapies, the extent of usage and price drivers. So, for example, although the price of simvastatin may fall when its patent expires in mid-2005 and generic and other branded alternatives become available, over time expansion of use (there is a good deal more cholesterol to address) together with the introduction and use of new pharmacotherapies for CVD may offset this price impact. In addition, greater expenditure on pharmacotherapies can reduce hospital cost components.

We have made a retrospective comparison, projecting 1993-94 data to 2004 and comparing this with the 2004 estimates above. We find that the assumptions of average health cost inflation (making allowance for the temporary acceleration in pharmaceuticals expenditure in 2000 and 2001 due largely to expanded use of Cox-2 inhibitors) and no change in age-specific prevalence rates provide estimates within 0.07% of each other. Hence we cautiously adopt the same approach to project health costs forward for a similar period, to 2011, based on estimates of price growth for hospitals, residential care, medical, other professional services, pharmaceutical and 'other' derived from historical averages for 1991-92 to 2001-02 (AIHW, 2003a).

Using this methodology, projected allocated health costs for CVD would reach $9.9 billion by 2011, with total health costs $11.5 billion – the latter estimate including capital expenditures, expenditure on community health, public health programs, health administration and health aids and appliances. The contribution to the growth in costs by cost type is illustrated in Figure 2-14 and by age group in Figure 2-15.

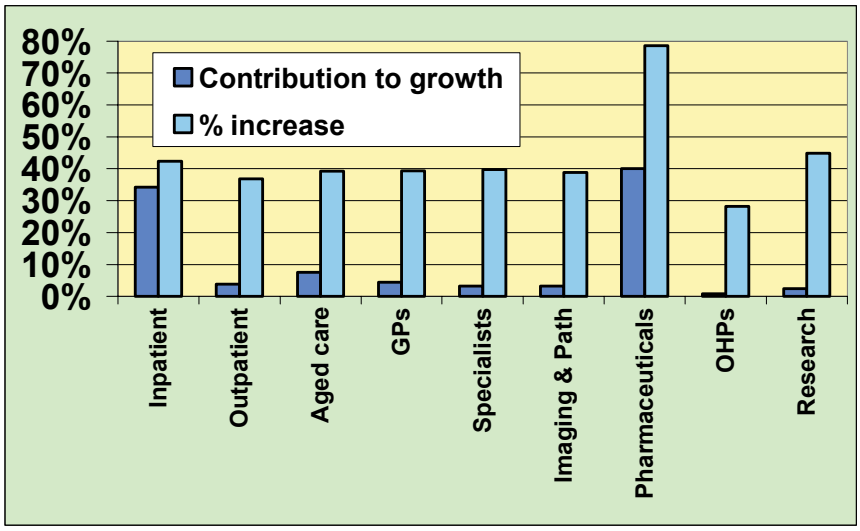
FIGURE 2-14 CONTRIBUTION TO GROWTH IN PROJECTED HEALTH COSTS, 2004-2011, % OF TOTAL $ INCREASE, BY AGE & GENDER



- Between 2004 and 2011, CVD costs are projected to grow by $3.3bn (50%), of which prevalence growth is estimated to account for just over a third ($1.3bn) with the remainder from increases in health costs.
- CVD among the baby-boomers (55-74 year olds) accounts for over half the growth ($1.7bn or 51% of the overall increase).
  - The largest single contribution to growth occurs in 65-74 year old males ($564m or 17%).

- The greatest growth in costs is expected among the very elderly (aged 85 and over) of 76% over the period, with the smallest increase for those aged 5-14 (18%).

FIGURE 2-15 CONTRIBUTION TO GROWTH IN PROJECTED HEALTH COSTS, 2004-2011, % OF TOTAL $ INCREASE, BY TYPE OF COST



- In terms of types of cost, growth is driven by a 79% projected rise in pharmaceutical spending, which comprises 40% of the overall projected increase.[5]
- Inpatient hospital costs contribute a further 34% of the increase (42% projected growth over the period).
- Residential aged care costs contribute 8% of the increase, projected to grow 39%.
- Outpatients, GPs, specialists and imaging/pathology each account for less than 5% of the increase, projected to grow 37-40%.

[5] Note that this does not take account of potential short term price impacts as certain pharmacotherapies come off patent (see p23).

Heart failure – future cost growth: Consistent with a contemporary study from Scotland that predicted a 'sustained epidemic of CHF' (Stewart et al, 2003), the burden associated with CHF is expected to increase within the Australian population (AIHW, 2003b) due to a number of factors, including:

- ageing of the population;
- the projected increase in the number of elderly people with CHD and hypertension;
- increasing prevalence of obesity and metabolic syndromes;
- improved survival rates for individuals with CHF;
- the decrease in case-fatality rates associated with acute coronary syndromes; and
- improved diagnosis of CHF because of greater utilisation of sensitive techniques, such as echocardiography and brain natriuretic peptides.

3. INDIRECT COSTS, COMPARISONS AND SUMMARY

3.1 INDIRECT FINANCIAL COSTS

Indirect financial costs for CVDs are primarily productivity losses from reduced workforce participation and carer costs.

3.1.1 PRODUCTIVITY LOSSES

Lower employment rates: People with CVD have lower rates of employment than healthy people of the same age, as noted in Section 1.4.2, which also highlighted the reduced activity and elevated absenteeism of people with CVD relative to Australian averages. Importantly, the age and gender standardised difference in employment between people with CVDs and those in the general population is 2.8% in 2004. If people with CVD aged between 15 and 65 achieved the same employment rate as the general population, there would be an extra 55,871 people in the workforce in 2004, with average weekly earnings $747.70 per week (full and part time, seasonally adjusted), all other things being unchanged. This would have generated an estimated $2.18bn in extra production and income in the Australian economy over the course of 2004.

This figure may be a conservative estimate of the true loss as many people may reduce their workload rather than stop work completely, as a result of the health impacts of CVD. Income losses of family carers of people with CVD who reduce or give up work in order to care for the person with the illness are identified in the next section.

Absenteeism: There are an estimated 763,990 people employed aged 15-65 with CVD in 2004, earning an estimated $29.8bn. The difference in absenteeism rates and length of absence (Section 1.4.2) shows that people with CVD lose 0.32% more time off work than the average Australian. The cost of absenteeism would thus be a further $95.2m.

In total then, the loss of earnings from loss of employment and absenteeism is estimated for 2004 as $2.3bn.

Potential tax revenue foregone: There are two sources of lost tax revenue that result from the lower earnings above—the potential income tax foregone and the potential indirect (sales) tax foregone. The latter is lost because, as income falls, so does consumption of goods and services, estimated up to the level of the disability pension. Without CVD, it is conservatively assumed that consumption would comprise 90% of income (the savings rate may well be lower than this). The indirect tax foregone is a product of the foregone consumption and the average indirect tax rate). Average tax rates for 2004 are derived from the AE macroeconomic model, incorporating changes from 1 July to the upper marginal tax rates. Tax revenue sacrificed is included as a transfer payment (not a real economic cost).

Table 3-1 summarises the tax losses of $656m in 2004, comprising $478m of personal income tax and $178m of indirect tax.

TABLE 3-1 POTENTIAL EARNINGS AND TAX REVENUE LOST DUE TO CVD, 2004

Potential Earnings Lost	$2,271.7 million
Average personal income tax rate#	21.05%
Potential personal income tax lost	$478.1 million
Average indirect tax rate#	15.48%
Potential indirect tax lost	$177.7 million
Total potential tax revenue lost	$655.8 million

Source: AEM Model FY2004 estimates, Access Economics.

3.1.2 MORTALITY BURDEN

In addition to the income foregone due to those with CVD in the community who are unable to work due to illness, there is also the income foregone of those who have died prematurely due to adverse CVD events. Deaths from CVD in 2002 (ABS, 2003) are shown in Table 3-2, from which a cost estimate of the mortality burden can be derived. We scale up the deaths between 2002 and 2004 by population growth only (2.4%), to balance the impacts of demographic ageing and expected declining mortality rates at each age-group. Assuming that if those who died from CVD prior to retirement age in 2004 (an estimated 5,420 people under 65) instead lived and were well and employed at the same rate as the age-standardised general population (62.2%), then an estimated 3,373 people under 65 would be employed rather than dying from CVD in 2004. The average age of death for those people under 65 is estimated from the ABS mortality data as 54.3 years (ie with 10.7 years to nominal retirement) and the income stream is discounted at 1.55% per annum (see Appendix C).

TABLE 3-2 DEATHS FROM CVD, AUSTRALIA, BY AGE AND GENDER, 2002

Age group (yrs)	Males	Females	Persons
1-14	17	13	30
15-24[1]	64	28	92
25-34	100	54	154
35-44	409	156	565
45-54	1,107	339	1,446
55-64	2,212	794	3,006
65-74	4,662	2,449	7,111
75-84	8,643	8,446	17,089
85+	6,773	14,026	20,799
Total deaths	**23,987**	**26,305**	**50,292**

Source: ABS (2003)

1 The 15-24 year age group also contains a few deaths from the under 1 year category, due to limitations of the published data from ABS (2003).

Life expectancy of 65 year olds in Australia is now 17 years for males (ie 82) and 21 years for females (ie 86) (ABS, 2004). Thus, of these 50,292 deaths, assuming these life expectancies, the proportion of strictly 'premature' deaths is 60% (over 30,000 deaths per annum). We note that CVD mortality is a key driver of life expectancy at these ages, so these estimates are conservative.

TABLE 3-3 AVERAGE AGE AT DEATH AND AGE-STANDARDISED EMPLOYMENT RATES

Age group[1]	Midpoint[2]	Age-weight	Mortality weights[3]			Employment rates[4]		
1-14	8.0	0.05	m	f	p	m	f	p
15-24	21.0	0.37	1.6%	2.0%	1.7%	62.9%	62.4%	62.7%
25-34	31.0	0.90	2.6%	3.9%	2.9%	86.7%	66.5%	76.5%
35-44	41.0	4.38	10.5%	11.4%	10.7%	87.7%	68.1%	77.8%
45-54	51.0	13.93	28.4%	24.7%	27.5%	84.4%	70.3%	77.3%
55-64	61.0	34.64	56.8%	57.9%	57.1%	62.1%	40.3%	51.3%
15-64		**54.3**	100.0%	100.0%	100.0%	**77.6%**	**62.8%**	**70.2%**
Age-standardised employment rate for mortality burden)[5]						**71.8%**	**52.4%**	**62.2%**

1 The 15-24 year age group also contains a few deaths from the under 1 year category, due to limitations of the published data from ABS (2003).
2 Midpoints are slightly above the strict middle of the ranges reflecting the distribution of deaths. If midpoints were at the middle of the ranges, the average age at death would be 53.3 years; if highest (ie 23, 33, 43 etc) the average age at death would be 56.3 years.
3 Mortality weights are the proportion of deaths at each age relative to total deaths for those aged 15-64.
4 Employment rates are derived from AusStats data as at April 2004.
5 Age-standardised rates multiply the mortality weights by the published employment rates to derive expected employment rates for the population who died under the aged of 65 from CVD.

This yields the net present value (NPV) of the mortality burden as $1.3bn. The NPV of taxation revenue sacrificed for the mortality burden is $392 million.

3.1.3 CARER COSTS

Carers Australia estimates there are at least 2.3 million Australians (one in every five households) providing care for family members or friends with a disability, chronic condition or who are frail aged. Nearly 20% (450,900) of these are 'primary' carers for people at home with severe or profound disability. 70% are female and 90% are aged 60-69. Conservative estimates show that the 'invisible workforce' saves the economy $16 billion annually and is the major provider of community care services, delivering 74% of all services to people needing care and support (compared to the HACC Program, worth over $1.1 billion in State and Federal funding, which meets only 9% of this need).

Most primary carers (78%) are of workforce age (aged 18 to 64 years) yet paid work is usually not possible - 59% are not attached to the workforce. Over one-half of all full time carers reported incomes of less than $200 per week, while also experiencing the increased expenses of looking after another person. 40% of primary carers have been providing care for a decade or more, and 68% for more than five years. 43% care for a partner, and 21% for a parent, and most primary carers (54%) said that they provided care either because alternative care was unavailable or too costly, or because they consider they have no choice. Carers suffer from generally worse physical health, tiredness, stress, back/muscle problems, depression, anxiety and lack of respite.[6]

Most people with CVD receive care at home at least initially, although some may be transferred to residential care depending on the disability caused by the illness, other comorbidities and the availability of carers. Post-operative care at home is especially important. Society, and our public sector health and welfare budget, relies increasingly on

[6] Sources: AIHW, *Australia's Welfare: 1999 Services and Assistance*; Carers Australia, *Caring Costs*, 1998, Australian Bureau of Statistics, *Disability, Ageing and Carers: Summary of Findings*, 1998. Cited on Carers Australia website.

the support that families and carers provide. However, there is a paucity of reliable data in Australia providing good quantitative estimates of the average care hours required by people with various CVDs or relating the care to disability levels. This might be an area of future investigation. As a consequence, carer estimates here are based on UK data, utilising the ratio of care to productivity costs (Petersen et al, 2003). This ratio was nearly 1.1:1 (productivity losses from morbidity of people with CVD were £2,207.5m while informal carer costs were £2,416.5m). Applying this to the Australian estimate of employment losses (morbidity burden) of $2.3bn from Section 3.1.1 implies **the value of care for people with CVD was $2.5bn in 2004.**

In so far as this represents the opportunity cost of work that could take place in the marketplace rather than in unpaid work, **the tax foregone** on this $2.5bn is **$718m**.

While Australian governments contribute to community care through various programs, as noted above the lion's share of community care is borne by informal carers themselves. Partial compensation for the burden is offered through federal Carer Payment ($470.70 for singles and $393.00 each for couples, means tested) and Carer Allowance ($90.10 per fortnight), so the imputed tax foregone above is offset to some extent by such welfare payments.

The value in 2004 of informal care of people with CVD was $2.5 billion

3.1.4 OTHER FINANCIAL COSTS

Aids and home modifications

People with CVD and their families and carers may require a variety of additional equipment, aids and home modifications in order to continue living at home safely. These include communication; bathing, toileting and continence; leisure and recreation; mobility, seating, lifting/transfers, transport (eg, ramps, hoists); nursing (eg, pressure-relief mattresses); and safety (eg, grab rails, lighting).

There are a number of public programs for older people, people with a disability and their families and carers to assist them to make home modifications and provide aids and equipment that will help them to remain living in their own home. The *Home Maintenance and Modification Program* is funded by the Commonwealth and State Governments under the HACC program, with two levels of assistance. The *Program of Appliances for Disabled People* (PADP) provides equipment and appliances to disabled people and some others, who are financially disadvantaged. The *Independent Living Centre* is a non-profit organisation that provides information about equipment, building design and other resources, as well as a display centre for people to view and sample a wide range of products.

Whether paid for privately or publicly, all these items incur financial costs. These are included in the total estimated of 'unallocated health costs' of $1.1bn in 2004 (see Section 2.4). Frisch (2001, Table 1, p18) undertook detailed survey work of the costs of aids, equipment and modifications in Australia, for a sample of people disabled due to musculoskeletal disease. The average cost imputed in the Frisch estimate for 'aids and appliances' was $174.20 per person, while including home modifications and consumables increased this average to $738.40 per person. If we assume that 20% of the 3.4m people with CVD in 2004 have levels of disability consistent with Frisch (2001), the total cost in that year of aids and modifications would be estimated as $503m. (Sensitivity analysis suggests that each 10% equates to around a quarter billion dollars.) However, since there

are no data to provide robust evidence for this parameter, we do not separate it from the total estimate for unallocated health costs.

Welfare transfers

Transfer payments are not real economic costs but, rather, represent government reallocations from some income units (taxpayers) to others (in this case, welfare recipients). Some people living with CVD receive welfare benefits. In most cases, this is the means-tested age pension, paid to eligible men over 65 and eligible women aged over 60-65, depending on their birth date (by 2014 the age will be 65 for everyone). Since the age pension would be paid to eligible elderly regardless of CVD, it is not included in modelling here.

People under retirement age with CVD, especially those suffering the effects of stroke, may be eligible for the **Disability Support Pension** (DSP) and in some cases, Sickness Allowance. The DSP is the main means of income support in Australia for people aged 16 years and over whose physical, intellectual or psychiatric impairment prevents them from working, or for people who are permanently blind. **Sickness Allowance** provides assistance for people who are employed and who are temporarily unable to work (or study) due to a medical condition. **Mobility Allowance** provides assistance to people with disabilities who are in paid employment, voluntary work, vocational training, undertaking independent living/life skills training or a combination of paid work and training and who are unable to use public transport without substantial assistance.

There are also entitlements to concession cards – Pensioner Concession Card & Health Care Card, which may result in concessional transfers such as prescription medicines, transport fares, rates, power bills and car registration – and to Rent Assistance, for people who get a payment such as the Carer Payment and pay rent for private accommodation.

Although insufficient data preclude a firm estimate of many of these transfer payments, we provide for interest a rough calculation of the welfare payments for some of the main items, based on various assumptions, in Table 3-4 below, totalling $520m. We reiterate that these transfer payments are not included in total real costs.

TABLE 3-4 COST OF WELFARE PAYMENTS

	weekly payment	receiving benefit	calculation	total cost $m
DSP	$215.93	12,091	0.61% of people with CVD aged 16-65	136.0
Carer payment	$215.93	17,025	0.5% of people with CVD	191.5
Carer allowance	$45.05	68,100	2% of people with CVD	159.8
Pharmaceutical allowance	$2.90	12,091	0.61% of people with CVD aged 16-65	1.8
Rent assistance	$51.41	3,627	0.18% of people with CVD aged 16-65	9.7
Mobility allowance	$34.00	12,091	0.61% of people with CVD aged 16-65	21.4
Total				**520.3**

Source: Access Economics estimates utilising Centrelink rates of 4-Nov-2004.

Deadweight losses associated with transfer payments

There are, however, real costs associated with taxation and welfare transfers. Administration of the taxation system costs around 1.25% (derived from total amounts spent and revenue raised in 2000-01, relative to the Commonwealth department running costs). However, larger deadweight losses (DWLs) from taxation also arise from the

distortionary impacts that taxes have on workers' work and consumption choices. It is estimated that this amounts to 27.5% of each extra tax dollar that is required to be collected (Lattimore, 1997 and used in Productivity Commission, 2003, p6.15-6.16, with rationale).

- Conservatively, the assumption is *not* made that welfare payments must be funded by further taxation that imposes additional 28.75% DWLs, since deficit funding or other alternatives might also possibly be exercised (and since this argument might be used in relation to the direct health funding also).
- Total real deadweight losses from taxation revenue raising is estimated as **$508m** in 2004.

CVD costs over 600,000 years of healthy Australian life in 2004

3.2 THE BURDEN OF DISEASE

3.2.1 DISABILITY ADJUSTED LIFE YEARS (DALYS)

The following analysis draws on the relatively new global and Australian methodologies developed for calculating the indirect burden of disease using DALYs (Disability Adjusted Life Years)[7]. DALYs have two components:

- Years of Life Lost due to premature death (YLL) – the 'mortality' burden;
- Years of healthy Life lost due to Disability (YLD) – the 'morbidity' burden.

Table 3-5 shows the total disease burden from CVDs in 2004, by disease. There are two offsetting factors in projecting to 2004 from the 1996 Australian data. While prevalence is increasing due to population growth and demographic ageing, there may be falls in mortality rates and morbidity due to better treatments. Thus we assume only an increase in line with population growth (effective falls in age-specific burden).

On this basis, CVD is estimated to be responsible for 602,558 years of healthy Australian life lost in 2004. 81% (490,711) of these years were lost due to the premature death (YLL) of people with CVD. The YLL share ranges from 97% for aortic aneurysm to 27% for peripheral arterial disease. The remaining 19% of healthy life years (DALYs) are lost due to disability (YLD). CHD is the cause of 57% of the disease burden, with stroke a further 25%. Burden of disease data will be strengthened with the future collection of heart failure data. 54% of the disease burden is borne by males, ranging from 65% for inflammatory heart disease to 36% for rheumatic heart disease. Table 3-5 and Table 3-6 provide further details.

[7] Murray and Lopez eds (1996) and Mathers et al (1999).

TABLE 3-5 BURDEN OF DISEASE OF CVDS, AUSTRALIA, 2004

DALYs	Total	Males	Females
Ischaemic heart disease	341,961	198,402	143,558
Stroke	150,015	70,659	79,356
Inflammatory heart disease	24,603	15,975	8,628
Peripheral arterial disease	20,137	11,151	8,986
Aortic aneurysm	14,375	9,195	5,180
Hypertension	14,324	5,492	8,833
Non-rheumatic valvular disease	9,539	4,783	4,756
Rheumatic heart disease	4,456	1,623	2,833
Other CVD	23,146	10,771	12,377
Total	**602,558**	**328,052**	**274,507**
YLL			
Ischaemic heart disease	302,911	173,960	128,949
Stroke	108,216	45,982	62,235
Inflammatory heart disease	16,598	10,639	5,959
Peripheral arterial disease	5,466	2,479	2,987
Aortic aneurysm	13,973	8,911	5,061
Hypertensive disease	12,423	5,082	7,342
Non-rheumatic valvular disease	8,411	4,140	4,272
Rheumatic heart disease	4,275	1,563	2,712
Other CVD	18,436	8,487	9,950
Total	**490,711**	**261,245**	**229,466**
YLD			
Ischaemic heart disease	39,050	24,441	14,609
Stroke	41,799	24,677	17,122
Inflammatory heart disease	8,005	5,336	2,669
Peripheral arterial disease	14,671	8,672	5,999
Aortic aneurysm	402	283	119
Hypertensive disease	1,901	410	1,492
Non-rheumatic valvular disease	1,128	644	484
Rheumatic heart disease	181	60	121
Other CVD	4,710	2,284	2,426
Total	**111,848**	**66,807**	**45,040**

Source: Access Economics based on Mathers et al (1999).

TABLE 3-6 MORTALITY AND GENDER BURDEN SHARES, AUSTRALIA, 2004

	YLL as % total DALYs			Males as% DALYs	Disease as % of total CVD
	Total	Males	Females		
Ischaemic heart disease	89	88	90	58	56.8
Stroke	72	65	78	47	24.9
Inflammatory heart disease	67	67	69	65	4.1
Peripheral arterial disease	27	22	33	55	3.3
Aortic aneurysm	97	97	98	64	2.4
Hypertensive disease	87	93	83	38	2.4
Non-rheumatic valvular disease	88	87	90	50	1.6
Rheumatic heart disease	96	96	96	36	0.7
Other CVD	80	79	80	47	3.8
Total	**81**	**80**	**84**	**54**	**100.0**

Source: Access Economics based on Mathers et al (1999).

3.2.2 COST OF SUFFERING AND PREMATURE DEATH FROM CVD

Ascribing a value to a statistical life (VSL) allows the expression of the burden of disease in dollar terms. Access Economics assumes a VSL of $3.7 million and applies a discount rate of 3.3% over a timeframe of 40 years to derive the discounted value of a life year (VLY) of $162,561. For discussion of the rationale underpinning this approach see Appendix C.

Applying the VLY to the DALYs associated with CVD, Access Economics estimates **the gross cost of suffering and premature death associated with CVD is $98 billion in 2004.**

TABLE 3-7 GROSS COST OF SUFFERING AND PREMATURE DEATH FROM CVD, 2004, $BN

	Male	Female	Total
Gross YLL cost	42.5	37.3	79.8
Gross YLD cost	10.9	7.3	18.2
Gross DALY Cost	**53.3**	**44.6**	**98.0**

The wage-risk studies that underlie the calculation of the VSL take into account all known personal impacts – suffering and premature death, lost wages/income, out-of-pocket personal health costs and so on – implying that the value calculated is a 'gross' figure. The net cost of pain and suffering, after lost earnings and the out-of-pocket personal health costs of individuals are removed, is $93.9 billion, as shown in Table 3-8. Out-of-pocket personal health costs are assumed to be 20% of total health costs, based on the most recently available data (AIHW, 2003a).

The net cost of suffering and premature death from CVD is $94bn

TABLE 3-8 NET COST OF SUFFERING FROM CVD, $M, 2004

Gross cost of suffering	**$97,952.5**
less lost earnings after tax	$2,530.2
less health costs borne personally	$1,526.4
Net cost of suffering	**$93,895.8**

3.3 COMPARISONS

Of the total health budget, 11.0% is spent on CVD, the largest single component. Musculoskeletal disease is second largest at 9.6%. Table 3-9 compares the health expenditure with other national health priorities (NHPs) for the year 2000-01.

- The other NHPs are musculoskeletal disease (including arthritis), injuries, mental disorders (including depression), cancer, diabetes and asthma. Consideration is being given to dementia as a NHP (currently within mental disorders).
- The share of CVD in the total is higher for pharmaceutical costs (17.1%), somewhat higher for medical research spending (12.9%), and much lower for medical and other health practitioner costs (5.7%).

- CHD accounts for 3.0% of Australian health system costs and stroke for 1.9%.

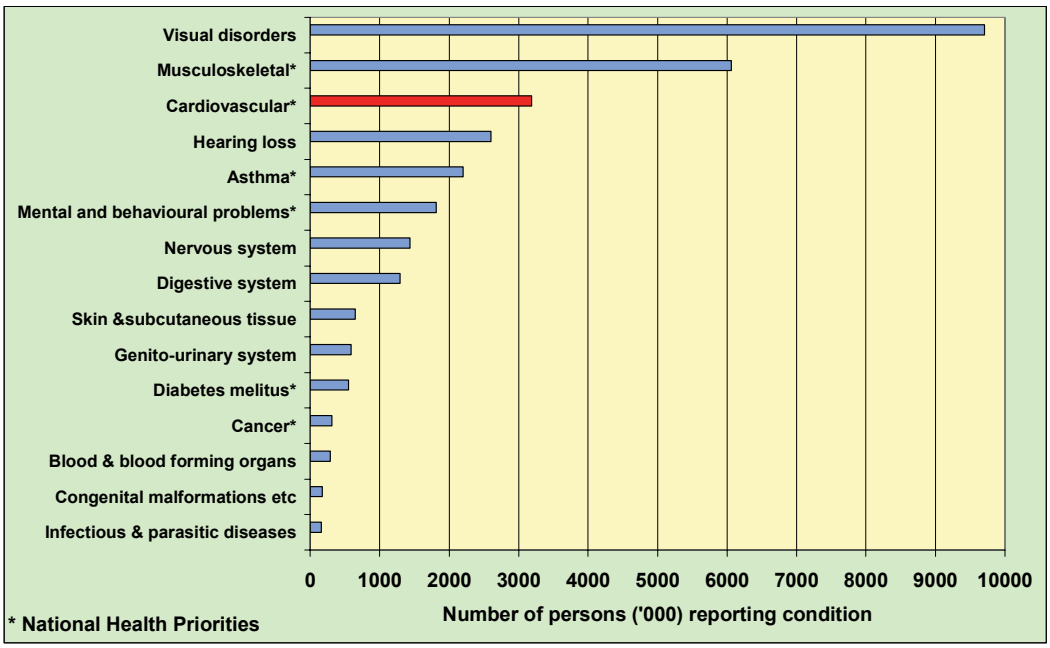
TABLE 3-9 COMPARISON OF ALLOCATED HEALTH COSTS, $M, 2000-01

Disease category	Total Costs	Hospital and aged care homes	Medical and OHPs	Pharma-ceuticals	Research	% total health spending
Cardiovascular disease*	**5,393**	**3,059**	**794**	**1,386**	**153**	**11.0%**
Coronary heart disease	**1,488**	**1,145**	**116**	**183**	**44**	**3.0%**
Stroke	**922**	**834**	**38**	**30**	**20**	**1.9%**
Musculoskeletal*	4,725	2,310	1,669	691	55	9.6%
Arthritis	1,461	999	248	197	17	3.0%
Injuries*	4,061	2,935	931	190	6	8.3%
Mental disorders*	3,018	1,561	733	615	109	6.1%
Depression	1,042	349	353	302	38	2.1%
Cancer*	2,764	2,025	297	226	215	5.6%
Dementia	2,251	2,077	29	33	112	4.6%
Diabetes*	836	327	223	251	35	1.7%
Asthma*	615	196	123	290	6	1.3%
Neonatal	359	334	13	1	11	0.7%
Congenital anomalies	224	164	22	2	37	0.5%
Other**	24,928	10,941	9,144	4,400	443	50.7%
Total	**49,174**	**25,929**	**13,978**	**8,085**	**1,182**	100.0%
CVD as % of total	**11.0%**	**11.8%**	**5.7%**	**17.1%**	**12.9%**	

* National Health Priorities. ** Contains respiratory, genitourinary, digestive, endocrine, nutritional and metabolic, infectious and parasitic diseases; maternal conditions; and signs, symptoms and ill-defined conditions associated with other contacts with the health system. Source: AIHW (2004c).

In terms of prevalence, CVD also ranks highly, behind musculoskeletal disease (which affects over 6 million Australians) and visual disorders (which affect early half of Australians). Musculoskeletal disease includes arthritis, which has a similar prevalence to CVD. Visual disorders include a large component of corrected and correctable refractive error (mainly myopia, hyperopia, presbyopia and astigmatism) as well as other conditions such as cataract, glaucoma, macular degeneration and diabetic retinopathy (Access Economics, 2004).

FIGURE 3-1 COMPARISON OF PREVALENCE, 2001

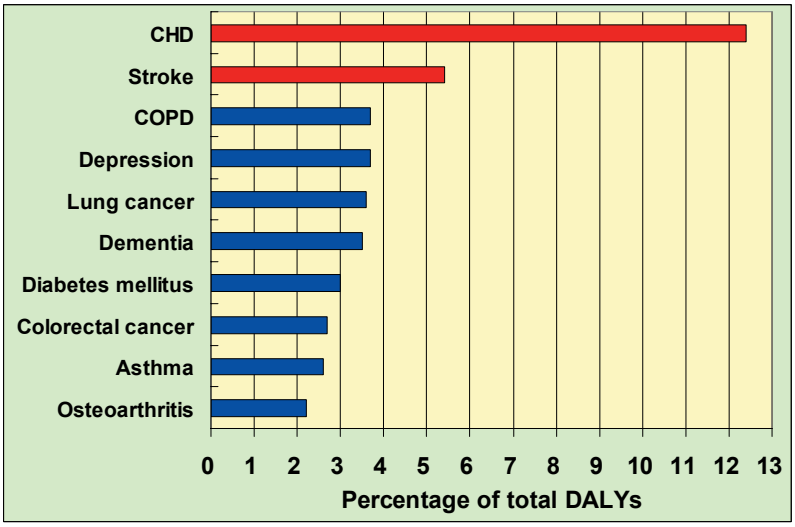


Source: ABS (2002). Note: Visual disorders include refractive error that can be corrected with spectacles/lenses.

In terms of overall disease burden, CVD is the giant. Figure 3-2 shows the ten leading causes of disease burden in Australia in 1996, with CHD and stroke the two largest sources. Altogether, CVD represented 22% of the disease burden in Australia. Other NHPs were substantially smaller in impact.

CVD causes 22% of the burden of disease in Australia

FIGURE 3-2 TEN LEADING CAUSES OF YEARS OF DISEASE BURDEN (DALYS), 1996



Source: Mathers et al (1999), Table 5.2, p65.

For older Australians (over 65), nearly 22% of the disease burden was due to CHD alone (rather than all the CVDs), with stroke a further 9% for men and 11% for women. Table 3-10 illustrates the ten largest sources of disease burden for older Australians.

TABLE 3-10 CONTRIBUTION TO TOTAL BURDEN OF DISEASE FOR OLDER AUSTRALIANS, 1996

	Males	% of DALYs		Females	% of DALYs
1	*Ischaemic heart disease*	*21.7*	*1*	*Ischaemic heart disease*	*20.3*
2	*Stroke*	*8.6*	*2*	*Stroke*	*10.7*
3	Lung cancer	6.9	3	Dementia	8.9
4	COPD	5.8	4	COPD	4.0
5	Dementia	5.3	5	Breast cancer	3.6
6	Prostate cancer	5.1	6	Colorectal cancer	3.4
7	Colorectal cancer	3.8	7	Lung cancer	3.1
8	Diabetes mellitus	3.0	8	Age-related vision disorders	2.8
9	Adult-onset hearing loss	2.9	9	Diabetes mellitus	2.8
10	Benign prostatic hypertrophy	1.9	10	Osteoarthritis	2.2

Source: Mathers et al (1999), Table 5.9 p73.

Moreover, CVD not only dominates the burden from mortality profile, but in 1996 was the fourth largest in terms of burden from disability (and may now have risen to third).

- The years of life lost to disability from CVD (8.8% of the Australian total), while less than the enormous disability associated with mental health problems (27.0%) and nervous system disorders (16.1%), are on par with chronic respiratory disease (8.9%) and greater than cancer (6.8%) (Mathers et al, 1999).

These burden of disease estimates are in the process of being updated and new comparative data are expected to be released during 2005. While we may expect other conditions to be increasing relatively in terms of disease burden (eg, dementia for older women), we would still expect CVD to be at the top of the list with a share around the 20% mark.

3.4 SUMMARY OF COSTS

CVD costs 1.7% of national income - $14.2bn per annum

The direct costs of CVD in 2004 total $7.6bn or 0.9% of GDP. The indirect financial costs are a further $6.6bn or 0.8% GDP. The economy-wide bill is $14.2bn (1.7% GDP), $4,172 per person with CVD per annum or $706 for each Australian man, woman and child.

These are the real economic costs. In addition there are $2.3bn of transfer payments – loss of tax revenue and welfare payments. Finally, CVD is the most costly condition in Australia in terms of its overall impact on quantity and quality of life, the burden of which is valued in the order of $94bn.

Table 3-11 summarises the costs derived above, distinguishing between real and transfer costs and also highlighting share in gross domestic product, and per capita and per family expenditures. For the latter category, definitions of 'families' are as per ABS (2004), with an estimated 5.1m families in Australia in 2004, derived from 2001 Census data

extrapolated on the basis of recent growth rates. If CVD is equally distributed across families, this suggests that **67% of Australian families are affected by CVD**.

TABLE 3-11 SUMMARY OF COSTS OF CVD, AUSTRALIA, 2004

Cost element	Real cost ($m)	Transfer payment ($m)	%GDP
Direct health costs	**$7,632.2**		**0.92%**
Allocated	$6,563.7		0.79%
Unallocated	$1,068.5		0.13%
Indirect financial costs			
Lost earnings	$2,271.7		0.27%
Mortality burden	$1,306.2		0.16%
Tax foregone		$1,047.7	0.13%
Value of informal carers	$2,486.8		0.30%
Tax foregone (carers)		$717.9	0.09%
Welfare payments		$520.3	0.06%
Deadweight losses	$507.6		0.06%
Subtotal indirect financial	**$6,572.3**		**0.79%**
Total transfers		$2,285.9	0.28%
Total financial costs	**$14,204.5**		**1.71%**
per person with CVD ($)	$4,172	$671	
per Australian family	$2,781	$448	
per Australian	$706	$114	
Burden of disease	$93,895.8	602,558 DALYs, *Rank 1*	

Source: Access Economics

4. INVESTING IN CVD PREVENTION AND TREATMENT

Preceding chapters have highlighted that CVD is a large source of disease burden and of other direct and indirect costs in Australia. While there have been significant advances in recent decades in reducing mortality from CVD events, in particular heart attack and stroke, in absolute numbers the prevalence and economic impacts of CVD will continue to be large and ongoing. Certain aspects – obesity, physical inactivity, diabetes and heart failure – may potentially continue to worsen unless a change in direction is actively pursued.

We cannot be complacent about the gains that have been made in reducing premature mortality from CVD.

- First, there are still considerable gains to be made – over 50,000 deaths per year in Australia.
- Second, reducing mortality rates has meant that we are now witnessing a growing number of Australians living with chronic cardiovascular diseases, notably heart failure, and thus a shifting emphasis towards managing the associated disability, with a view to enhancing the quality as well as longevity of life.
- Moreover, the challenge remains to prevent disease onset as far as optimal and possible.

There are economy-wide benefits of keeping people well, so even though health expenditure may grow, such spending buys greater 'healthspan' – years of healthy life – as well as greater productivity through enabling people to remain employed and reducing carer burden. Health spending can thus be seen as an investment in healthy ageing with the returns to investment determined by the cost-effectiveness of interventions. With 'smart' investment, significant gains can be made.

The keys to smarter investment include the identification and use of *cost-effective* therapies and preventive strategies. Consideration needs to be given to *targeted* relative to *population* interventions, and the use of *absolute risk approaches*. The demographic transition of industrialised nations is accompanied by a risk transition, so scientific effort and health resources should focus on *risk prevention* as much as the current focus on *treatment*. This chapter looks at these issues and makes recommendations for future priorities in Australia to optimally manage the CVD burden.

4.1 RELATIVE AND ABSOLUTE RISK

4.1.1 RISK PERCEPTION AND RESPONSES

Risk perception consists of two judgements: the perceived *likelihood* of a coronary event and the perceived *severity* of such an event. Risks are perceived as verbal categories (eg, 'likely', 'possible'), as **absolute probabilities** (eg, 'I have a 10% chance of developing CHD') and/or **relative risk** in comparison to other people. Since verbal categories tend to mean different things to different people, their use is usually avoided. People tend to downplay their risk and there is a strong tendency for them to make overly optimistic judgement of risk compared to others of the same age and gender (Van der Pligt, 1998).

- **Risk-reducing behaviours and risk communication**: Perceptions of risk show moderate associations with the adoption of risk reducing behaviour – that is, patients

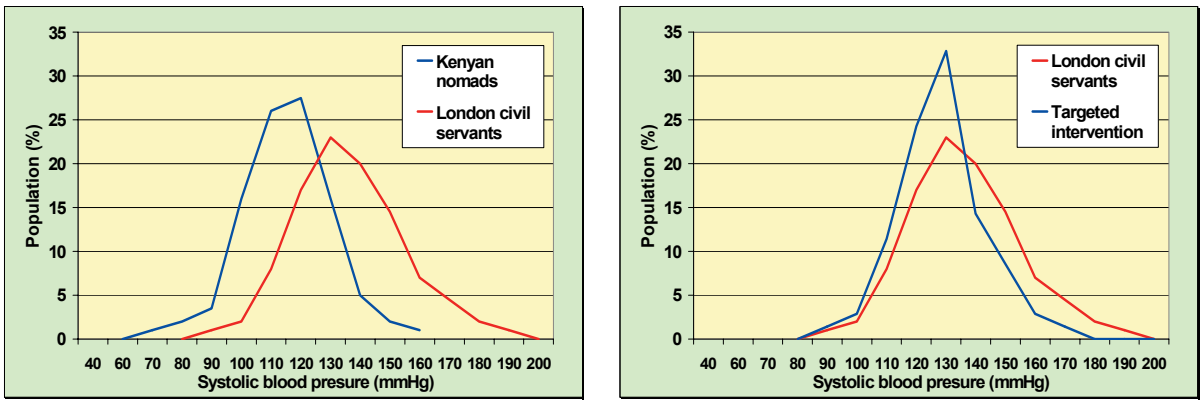
who perceive themselves to have a high risk of CVD are likely to adopt behaviours that reduce risk such as stopping smoking, improving diet, doing more physical activity and taking their medication as prescribed. The association is also determined by **response efficacy** (confidence that the risk-reducing behaviour will be effective in preventing CVD) and **self-efficacy** (confidence that they can in fact achieve the risk-reducing behaviour). Some interventions will be more acceptable and successful than others, based in part on how well absolute and relative risk is communicated by health professionals (Edwards et al, 2002). People respond best (more change of behaviour) if the communication of risk is personalised, eg through a *personal risk profile* including computer-based programs that permit patients to view in graphic form the effects of changing individual components of their CVD risk (McClure, 2002; Robson et al, 2000; Hingorani and Vallance, 1999).

4.1.2 POPULATION HEALTH AND INDIVIDUALLY TARGETED STRATEGIES

There are two broad approaches to reducing risk, not necessarily mutually exclusive:

- **population based strategies**: these seek to reduce risks by intervening across the entire population (eg, so that London civil servants' blood pressure was more like that of Kenyan nomads in Chart 15 below); and
- **individually targeted strategies**: these focus on the people likely to benefit most from an intervention (eg, so that the London civil servants' blood pressure looked more like the distribution after the targeted intervention – higher mean than Kenyan nomads and more concentrated distribution).

FIGURE 4-1 DISTRIBUTIONS OF BLOOD PRESSURE, POPULATION BASED AND TARGETED APPROACHES



Source: Access Economics, right panel, based on Rose (1985), left panel.

Population-based approaches are clearly a worthwhile investment. Reduction in tobacco consumption at a cost of $176 million, saved at least $0.5 billion and created benefits worth $8.4 billion (Australian Chronic Disease Prevention Alliance, 2004). Comprehensive cost-effective analyses in the areas of nutrition and physical activity are currently underway.

The individually targeted approach can generate savings as the intervention is provided to fewer people, but the savings need to be offset against the cost of screening/identification. General principles for adopting an individually targeted approach should be based on:

- relatively low costs of identification and screening; and

- relatively high costs of the intervention.

Clearly, most pharmacotherapies fit into this category, while awareness programs (such as reducing salt intake) would be more suited to population-based approaches.

Remme et al (2004) describe the rationale and design of the SHAPE population study in Europe, which aims to:

- document the awareness and perception level of heart failure in the general public (for the first time) and in health care providers (documentation phase);
- increase awareness, perception and education regarding heart failure for patients, the general population, health care authorities and health care providers (education); and
- improve heart failure care and prevention through improved national management strategies (assessment).

They argue that the need for this study derives from the differences in populations which mean that "extrapolating medical practice results from one part of the globe to another is not possible" (Remme et al, 2004, p154). They conclude that "there is a great potential for health care authorities to impact in a positive way on current heart failure management, and save large sums of money in the process" (p158).

4.1.3 THE ABSOLUTE RISK APPROACH

A further refinement is to identify individuals who have not one but multiple CVD risk factors. As noted in earlier sections, this is important because the consequences for health of being hypertensive or hypercholesterolemic, for example, are strongly dependent on the presence and level of other risk factors. Designing interventions for people with a combination of risk factors is generally even more cost-effective and has become popular worldwide. This is known as the 'absolute risk' approach.

Absolute risk measures the likelihood of developing CVD or having a cardiovascular event(s) over a given time period, recognising the multifactorial causation of CVD.

Interventions based on elevated levels of a single risk factor may allocate treatment to individuals with little chance of gain because of low absolute risk (see the Box example below). Moreover, individuals with levels that fall in the highest decile for systolic blood pressure, cholesterol and body mass index account for only 20%–30% of the total number of cases of stroke, ischaemic heart disease and diabetes (Law and Wald, 2002). Epidemiological studies have shown a continuum of risk for increasing levels of risk factors, such as blood pressure, total cholesterol and HDL cholesterol levels, which is recognised in absolute risk equations, together with the sex difference in risk and the steep increase in risk with ageing.

> *Any discussion of cardiovascular risk must distinguish between relative and absolute risk. An intervention that may produce a 50 percent reduction in the risk of heart disease sounds impressive, but it is probably of little importance to a healthy 50-year-old woman. Because her risk of death from coronary disease by the age of 65 years is only 1.4 percent (one in 70), even a 50 percent relative reduction yields a reduction in absolute risk of only 0.7 percent (one in 140). Thus, 140 women would need to be treated for 15 years to prevent a single death from coronary artery disease. In this scenario, even a small risk of complications from the intervention would probably be unacceptable.*
>
> Newnham and Silberberg (1999)

In order to apply this approach, the absolute risk of each individual must be assessed and primary care workers (especially GPs) need to be trained and skilled in such assessment. In the US, the Framingham equation is used to calculate absolute risk (Anderson et al, 1991), adapted in France for lower overall coronary risk (Laurier et al, 1994) as well as in other countries. A number of countries are now implementing the absolute risk approach in practical clinical settings.

In Australia, the Epidemiological Modelling Unit at Monash University undertook a cardiovascular modelling project (McNeil et al, 1994) from which were developed methods to allow lifetime projections of cardiac risk amongst individuals or sub-populations of different percentiles of CVD risk. This has resulted in two programs - **Take Heart** and the **CHD Prevention Model**.

- **Take Heart** is an interactive program which presents an Australian individual's relative and absolute risk of developing and dying from CHD based on the major risk factors - age, sex, blood pressure, cholesterol and smoking. The purpose of developing this information system was to allow patients a greater understanding of the impact of high levels of smoking, blood pressure and cholesterol on their future health as well as the benefits to be gained from intervention. This program has been adapted and simplified for use in general practice.
- **The CHD Prevention Model** involves modelling the incidence of fatal and non-fatal CHD within various CHD risk percentiles of an adult population. It was found that approximately 25% of CHD deaths are predicted to occur amongst those in the top 10 percentiles of integrated CHD risk, regardless of age group or gender. In addition, all causes survival curves indicated no large differences in survival between the different deciles of CHD risk until around the age of 50 years for males and 60 years for females. In contrast, differences in CHD-event-free survival were apparent around 5-10 years earlier.

The model is now being used to assess the cost effectiveness of various preventive measures in CHD. The project will initially focus on primary interventions but expand subsequently to examine secondary and tertiary programs, enabling cost effectiveness analyses at all levels of cardiovascular health service.

The New Zealand Cardiovascular Risk Tables are also a popular tool for calculating absolute risk based on gender, age, smoking, diabetes, blood pressure and cholesterol. The grid structure of the one-page calculator utilises colours to represent a patient's five-year risk (ranging from very mild – <2.5% – to extremely high – over 30%) of a CVD event including angina, MCI, CHD death, stroke and transient ischaemic attack. The Table is presented in Appendix D.

In Australia, the Practical Implementation Taskforce for the Prevention of Cardiovascular Disease (2004) has outlined guidelines which distinguish between high and lower risk patients on the basis of evident disease and absolute risk, as summarised in the following box. High risk includes risk of a future vascular event greater than or equal to 2%–3% per year, based on an aggregate of unfavourable risk characteristics determined using a calculation of the 5-year risk of any cardiovascular event and death, from a validated absolute-risk calculator such as the Framingham Heart Study Prediction Score Sheets.

Categories of patients based on future risk of a cardiovascular event

High-risk patients are those with:

- Clinically evident coronary heart disease (prior acute myocardial infarction, angina, or history of a revascularisation procedure)
- Clinically evident vascular disease (cerebrovascular or peripheral vascular disease)
- Diabetes
- Renal disease
- A risk of a future vascular event ≥ 2%–3% per year, based on an aggregate of unfavourable risk characteristics*

Low-risk patients are those with:

- A risk of a future vascular event < 2%–3% per year*

* Determined using a calculation of the 5-year risk of any cardiovascular event and death, from a validated absolute-risk calculator such as the Framingham Heart Study Prediction Score Sheets.

Source: Practical Implementation Taskforce for the Prevention of Cardiovascular Disease (2004)

4.2 COST EFFECTIVENESS ANALYSES (CEA)

There is a variety of opinion on where bounds for cost-effective interventions lie. The World Health Organization (2002) defines cost-effective and very cost-effective as:

- **Cost-effective:** one to three times GDP per capita to avert one lost DALY (or buy one QALY); for Australia in 2004, A$41,000 (US$30,000) to A$124,000 (US$90,000).
- **Very cost-effective**: less that GDP per capita to avert one lost DALY (or buy one QALY); for Australia in 2004, less than A$41,000 (US$30,000).
- **Cost saving** interventions in fact reduce overall financial costs – for example, they may enhance activities of daily living to such an extent that entry to nursing home care is delayed or averted. Thus relative to a specified 'default' alternative, total costs are lower.
- **Dominant therapy:** a therapy that improves clinical outcomes at a net equivalent or diminished cost, relative to its comparator (better outcomes at lower cost).

Brown et al (2004) suggest that interventions costing less than US$50,000/QALY gained are cost-effective whereas those costing more that US$100,000/QALY gained are not cost effective.

The cheapest treatments are not necessarily the most cost-effective. However, it is also important to consider the annual cost of initiatives as well as their cost-effectiveness, in order to determine affordability and thus, equity of access.

The World Health Organization (WHO), in one of its largest ever research projects – into ways of reducing risks and promoting healthy life in the coming decades – concluded in 2002 (WHO, 2002, p7) that at least five more years of healthy life per person can be gained by industrialised nations such as Australia through cost-effective interventions. WHO estimates that in the year 2000, tobacco was the leading risk factor in developed countries, responsible for 12.2% of the burden of disease. High blood pressure caused 10.9% and high cholesterol 7.6%. For CVD in over-30s specifically, half was attributed to high blood pressure, 31% to high cholesterol and 14% to tobacco, although the joint effects of these risk factors (due to inter-relationships) amounted to 65% of CVD (WHO, 2002, p85).

WHO goes on to estimate the avoidable burden of disease – by reducing risk factors 25% towards theoretical minima from their current trends. For example, reducing systolic blood pressure on average by 5-10mmHg , or reducing cholesterol on average by 0.3-0.6mmol/L would save 42% of the current DALYs lost from these risk factors. The modelling also showed that most of the benefits were achieved in the first five years and the effects were approximately additive. Cost-effective strategies to achieve the results were also modelled.

> "More than three-quarters of cardiovascular disease – the world's leading cause of death – results from tobacco use, high blood pressure or cholesterol, or their combination. Overall, cholesterol causes more than 4 million premature deaths a year, tobacco causes almost 5 million, and blood pressure causes 7 million… Cost-effectiveness analyses should be used to identify high, medium and low priority interventions to prevent or reduce risks, with highest priority given to those interventions that are cost-effective and affordable…. Population-based strategies aim to make healthy behaviour a social norm, thus lowering risk in the entire population. Small shifts in some risks in the population can translate into major public health benefits… Very substantial health gains can be made for relatively modest expenditures on interventions."
>
> World Health Organization (2002, p8,11-13)

WHO (2002, p117-18) reports the results of modelling an absolute risk approach to CVD where all people with an estimated combined risk of a cardiovascular event over the next decade that exceeds a given threshold are treated for multiple risk factors as well as being provided with health education. Four different thresholds are evaluated – 5%, 15%, 25% and 35%. Individual risks of a CVD event are based on age, sex, BMI, cholesterol, blood pressure levels and smoking status. People above the threshold level of risk are provided daily with 30mg lovastatin, 100mg acetylsalicylic acid (aspirin), 25 mg thiazides and 50mg atenolol, with four visits to a provider for evaluation, 1.5 outpatient visits for health education and lab tests for renal function, lipid profiles, hepatic function and blood sugar. Consequences of bleeding from use of aspirin are modelled.

The results for a threshold of 35% are very cost effective and always more cost-effective than the alternative treatment based on observed levels of blood pressure and cholesterol alone. As the threshold is lowered, each marginal unit of health benefit becomes incrementally more costly. It is always cost-effective, but not always very cost effective, to set the threshold to 25%. In most sub-regions, moving to a 5% threshold would be cost-

effective even taking into account the increase in side-effects. Policy-makers would choose the exact point at which to set the threshold based on budgetary and other considerations. WHO conclude:

> *"Overall, the potential to reduce the risk of cardiovascular events through this intervention is very impressive. Population-level effects exceeding a 50% reduction in events is possible."*

Similar findings have arisen from the INTERHEART study – a mega-analysis of AMI in 52 countries. The nine risk factors in the standardised case-control study (15152 cases and 14820 controls enrolled) collectively accounted for 90% of the population attributable risks (PAR) in men and 94% of the PAR in women (Yusuf et al, 2004). The authors conclude:

> *Abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, consumption of fruits/vegetables and alcohol, and regular physical activity account for most of the risk of myocardial infarction worldwide in both sexes and at all ages in all regions. This finding suggests that* ***approaches to prevention can be based on similar principles worldwide and have the potential to prevent most premature cases of myocardial infarction.***

4.3 CEA RESULTS FOR VARIOUS INTERVENTIONS

This section reviews recent international literature in relation to cost-effective interventions for CVD, noting where such interventions may still be under-recognised and/or under-utilised in Australia. A recurring theme in many of these cases is the avoidance of costly acute care services.

In this section, the results of a number of studies into the cost-effectiveness of possible interventions for CVD have been drawn from Harvard University's Cost-Effectiveness Analysis Registry (cardiovascular section only).[8] This registry reports on the cost-effectiveness of different interventions using a standardised ratio – the cost per Quality Adjusted Life Year (QALY) gained. The objective of the CEA Registry project is to create a single electronic database source, updated and appended regularly, to compare the cost-effectiveness of a broad range of interventions using cost-utility ratios published in the medical literature, and to investigate variations in the methods used in their estimation and promote consistency for research and policy purposes.

4.3.1 LOWERING CHOLESTEROL

For many years now, large randomised control trials have shown that statins reduce cardiovascular events, strokes, morbidity and mortality among selected patients (Sheppard et al, 1995; Scandinavian Simvastatin Survival Group, 1994). Average life expectancy gains are around four months for each patient treated with a statin (Ganz et al, 2000).

- In a Swedish hazard model study, Johannesson et al (1997) found that the direct cost of each year of life gained through simvastatin treatment ranged from US$3,800 for 70-year old men to US$27,400 for 35-year old women. Including indirect costs, the findings ranged from a savings (in the youngest patients) to a cost of US$13,300 per year of life gained (in 70-year old women).

[8] www.hsph.harvard.edu/cearegistry/

- More recently, Ganz et al (2000) estimated that average patients would gain 4.41 QALYs if they received usual care and 4.66 QALYs if they received statin therapy. The incremental cost-effectiveness of statin therapy compared with usual care was US$18,800 per QALY. On the basis of probabilistic sensitivity analysis, there was a 75% chance that statin therapy costs less than US$39,800 per QALY compared with usual care. When the cost of statin therapy and efficacy of statin therapy at reducing MCI were set to their most favourable values (55% reduction in reinfarction), statin therapy cost US$5,400 per QALY; when set to their least favourable values (5% reinfarction), the cost was US$97,800 per QALY.

The results here are also in line with WHO (2002, p116), where an individual-based treatment and education program was evaluated with two variations - treatment for people with cholesterol (1) over 6.2 mmol/L and (2) over 5.7mmol/L. 'Treatment' comprised 30mg of lovastatin daily[9], four visits p.a. to a health provider, 1.5 visits p.a. to outpatient education sessions and one annual test for cholesterol level and hepatic function. The results were in the 'very cost-effective' range for the 6.2mmol/L threshold in all world regions, although for the 5.7mmol/L threshold some developing regions dropped to the 'cost-effective' range. For Australia, the WHO results imply cost-effectiveness of less than A$41,000 per DALY.

Table 4-1 presents the results of a search of the Harvard CEA registry for 'statin' – generating a number of cost-effective interventions ranging from US$9,300/QALY to US$48,000/QALY. In all cases the statin therapy was preferred, except relative to bypass surgery.

TABLE 4-1 CEAS IN HARVARD REGISTRY, CHOLESTEROL

Year of study	Description of intervention	US$/QALY
2001	Secondary prevention with pravastatin vs. No pravastatin in post-myocardial infarction patients with average cholesterol levels, aged between 21 and 75 years	9,300
1998	Medical management + Aspirin + Simvastatin Over 10 years vs. Medical Management + Aspirin in Ischemic Heart Disease Patients	13,000
2000	Statin therapy vs. Usual care in patients aged 75-84 with a history myocardial infarction	21,000
1998	Medical management+ Aspirin + Simvastatin Over 5 years vs. Medical Management + Aspirin in Ischemic Heart Disease Patients	26,000
1998	Bypass surgery vs. Medical management + Aspirin + Simvastatin Over 5 years in Ischemic Heart Disease Patients	48,000

[9] Note that lovastatin is not available in Australia.

4.3.2 REDUCING BLOOD PRESSURE

The main modifiable causes of high blood pressure are diet – especially salt intake – levels of physical activity and obesity. WHO (2002, p115) modelled a population-wide salt reduction program involving cooperation between government and the food industry to include appropriate labelling about salt content on products to ensure a stepwise reduction of salt in commonly consumed processed foods (for example, as per Utting, 2002). The estimated effect was a 15% reduction in sodium intake with corresponding reductions in mean systolic blood pressure levels. An alternative scenario was based on mandated legislative action to ensure reduction in salt content of processed food, including quality control and enforcement measures. Costs were higher but double the reduction in sodium intake (30%) was assumed able to be achieved (Lawes et al, 2002).

In Australia, **The 'Tick' program,** which involved placing a red tick on the packaging of food items that represent healthier eating choices, achieved high levels of awareness (93%) in Australia and the Tick logo was found to be more powerful than the brand name or on pack nutrition claims in influencing buyers' choices at the point of purchase. Of the manufacturers interviewed, about 50% complied with the Heart Foundation guidelines prior to applying for the Tick and the other half specifically and intentionally formulated or reformulated a product to get the Tick (Elliot and Shannahan Research, 1998).

Table 4-2 presents the results of a search of the Harvard CEA registry for 'hypertension' – generating a number of mostly cost-effective interventions ranging from dominant therapies to US$210,000/QALY. Screening and pharmacotherapy were preferred.

TABLE 4-2 CEAS IN HARVARD REGISTRY, HYPERTENSION

Year of study	Description of intervention	US$/QALY
1991	Treatment with antihypertensive medication vs No antihypertensive treatment in 30 yo men with mild-to-moderate hypertension (pretreatment DBP = 90 mm Hg) in New Zealand	Dominated
1991	Treatment with antihypertensive medication vs No antihypertensive treatment in 30 yo women with mild-to-moderate hypertension (pretreatment DBP = 90 or 100 mm Hg) in New Zealand	Dominated
1991	Treatment with antihypertensive medication vs No antihypertensive treatment in 40 yo women with mild-to-moderate hypertension (pretreatment DBP = 90 mm Hg) in New Zealand	Dominated
2001	Drug treatment vs No treatment in stage I hypertensive patients: men, age 80	4,800
2001	Drug treatment vs No treatment in stage I hypertensive patients: women, age 80	4,900
2001	Drug treatment vs No treatment in stage I hypertensive patients: men, age 70	7,100
2001	Drug treatment vs No treatment in stage I hypertensive patients: women, age 70	8,300
1977	Antihypertensive medication treatment vs No antihypertensive treatment in 20-yo male patients with essential hypertension (pretreatment diastolic blood pressure of 110 mm Hg)	10,000
2001	Drug treatment vs No treatment in stage I hypertensive patients: men, age 60	12,000
1990	Hypertension screening and therapy vs No screening in asymptomatic 60-yo men in the U.S.	13,000
2001	Drug treatment vs No treatment in stage I hypertensive patients: women, age 60	14,000
1997	Hypertension treatment vs No treatment in 45-69 yo men in Sweden	15,000
1986	Hypertension identification and follow-up program vs No hypertension program in inhabitants of North Karelia, Finland	15,000
1977	Antihypertensive medication treatment vs No antihypertensive treatment in 60-yo female patients with essential hypertension (pretreatment diastolic blood pressure of 110 mm Hg)	16,000
2001	Drug treatment vs No treatment in stage I hypertensive patients: men, age 50	18,000
1997	Hypertension treatment vs No treatment in 45-69 yo women in Sweden	19,000
1990	Hypertension screening & therapy vs No screening in asymptomatic 60-yo women in the U.S.	19,000
1997	Hypertension treatment vs No treatment in 45-69 yo men in Sweden	21,000
2001	Drug treatment vs No treatment in stage I hypertensive patients: women, age 50	23,000
1990	Hypertension screening and therapy vs No screening in asymptomatic 40-yo men in the U.S.	25,000
1997	Hypertension treatment vs No treatment in 45-69 yo men in Sweden	26,000
2001	Drug treatment vs No treatment in stage I hypertensive patients: men, age 40	27,000
1977	Antihypertensive medication treatment vs No antihypertensive treatment in 20-yo female patients with essential hypertension (pretreatment diastolic blood pressure of 110 mm Hg)	27,000

(continued)

Year of study	Description of intervention (continued)	US$/QALY
1997	Hypertension treatment vs No treatment in 45-69 yo women in Sweden	28,000
1997	Hypertension treatment vs No treatment in >70 yo women in Sweden	30-33,000
1997	Hypertension treatment vs No treatment in >70 yo men in Sweden	31-35,000
2001	Drug treatment vs No treatment in stage I hypertensive patients: women, age 40	34,000
1990	Hypertension screening & therapy vs No screening in asymptomatic 40-yo women in the U.S.	35,000
1991	Treatment with antihypertensive medication vs No antihypertensive treatment in 60 yo men with mild-to-moderate hypertension (pretreatment DBP = 110 mm Hg) in New Zealand	36,000
1997	Hypertension treatment vs No treatment in 45-69 yo women in Sweden	38,000
2001	Drug treatment vs No treatment in stage I hypertensive patients: men, age 30	41,000
1990	Hypertension screening and therapy vs No screening in asymptomatic 20-yo men in the U.S.	45,000
2001	Drug treatment vs No treatment in stage I hypertensive patients: women, age 30	50,000
1977	Antihypertensive medication treatment vs No antihypertensive treatment in 60-yo male patients with essential hypertension (pretreatment diastolic blood pressure of 110 mm Hg)	52,000
1977	Antihypertensive medication treatment vs No antihypertensive treatment in 60-yo male patients with essential hypertension (pretreatment diastolic blood pressure of 110 mm Hg)	52,000
1990	Propranolol vs No initial antihypertensive therapy in persons in the U.S. population 35-64 yo without the diagnosis of coronary heart disease with essential hypertension (> 95 mm Hg)	53,000
1991	Treatment with antihypertensive medication vs No antihypertensive treatment in 60 yo women with mild-to-moderate hypertension (pretreatment DBP = 110 mm Hg) in New Zealand	62,000
1994	Individual utility assessment of trial of drug therapy vs No individualized utility assessment in mild hypertensive patients	64,000
1990	Hypertension screening & therapy vs No screening in asymptomatic 20-yo women in the U.S.	68,000
1997	Hypertension treatment vs No treatment in <45 yo women in Sweden	150,000
1990	Captopril vs Propranolol in persons in the U.S. population 35-64 yo without the diagnosis of coronary heart disease with essential hypertension (> 95 mm Hg)	170,000
1997	Hypertension treatment vs No treatment in <45 yo women in Sweden	210,000

4.3.3 CARE MODELS

Multidisciplinary approaches shift the emphasis from managing acute events and clinical symptoms to providing a wholistic and continuous modulation of CVD risk to prevent imbalance, optimise therapy and improve quality of life and prognostic outcome. The cost effectiveness of multidisciplinary approaches to managing CVD are becoming more widely recognised, with studies showing that about half of hospital readmissions for chronic heart failure can be prevented by a multidisciplinary approach, reducing health resource utilisation and improving clinical outcomes (Shah et al, 1998; Fonarow et al, 1997; West et al, 1997; Hanumanthu et al, 1997; Rich et al, 1995).

An Italian study (Capomolla et al, 2002) randomised patients from a heart failure unit to compare the outcomes of management programs delivered by a day-hospital (DH) – tailored interventions based on risk stratification, education, counselling and review – relative to usual care (discharge to primary care physician and cardiologist). Follow-up at 1-year showed that the usual care group had a significantly higher rate of hospital readmissions (86%), resulting in higher care management costs overall than the DH group. This was despite the much higher costs of the ongoing health management in the DH (including pharmaceutical usage). The DH group had fewer cardiac deaths (2.7% compared to 17.2%, RR=0.17; CI 0.06-0.66) as well as greater functional outcomes, and hence a higher average QALY. The cost-effectiveness of the DH was $19,462/QALY (CI$13,904-$34,048), and it was cost-saving relative to the control (usual care) by $1,068/QALY.

Table 4-3 compares Capomalla's results with those of Berry et al (2000) for other CVD interventions.

TABLE 4-3 COST-EFFECTIVENESS OF SELECTED CVD INTERVENTIONS

Intervention	Cost per annum $US	Cost/QALY $US	Source
ACE-inhibitor treatment in chronic HF		7,777	Berry et al (2000)
Two-vessel CABG surgery		17,500	Berry et al (2000)
Home haemodialysis		23,794	Berry et al (2000)
Pacemaker implantation	1,516		Berry et al (2000)
Multidisciplinary day-hospital management (relative to usual primary/specialist care in community)	1,483	19,462	Capomolla et al (2002)

Capomalla et al (2002) argued that the gains from their multidisciplinary approach were realised as a result of three key factors relative to community medical care.

- **Reducing inefficient/ineffective interventions** for the clinical case being managed eg, **inappropriate medication –** the mean dose of ACE-inhibitors in the day-hospital group was about 25% higher than in the usual care patients, with fewer of the latter also receiving beta-blockers (40% compared to 71%).
  - Inappropriate medication has been shown to be quite common and to increase the risk of hospitalisation significantly. In general practice 38-55% of patients receive an ACE inhibitor and 6-21% a beta-blocker and then often in insufficient dosages (Hobbs et al, 2000; Cleland et al, 2002). Stroupe et al (2004) found, in their Indianapolis study, that less than a third of patients were receiving appropriate medication (defined as between 90% and 110% of that needed, with compliance not tracked) with 3.1 times the rate of hospitalisation for those undersupplied and consequently, 25% higher costs overall.
- **Avoiding repetition of procedures** caused by occasional evaluations, and providing continuity of care.
  - In chronic illness such as heart failure, the patient is apt to fluctuations in clinical well-being as a result of misperceptions of the nature of the disease, the impact of changes in lifestyle/diet and the importance of compliance to therapy. Accordingly there is a great need for continuous supervision and experienced help, which is time-intensive and thus may be difficult for doctors to be able to provide. Nurse-led care has been shown to significantly impact on patients' wellbeing and hospitalisation frequency. "While the over-burdened doctor is relieved from inefficient time spent on checking up on chronic patients, the patient in turn will receive far more attention and is more likely prevented from worsening through intensive paramedical care. Efforts by the health care authorities to initiate such care on a large scale would be well spent." (Remme et al, 2004, p158).
- **Simulation analysis** of consequences of behaviour. Educational interventions can be useful in providing impetus for change contemplation and implementation.

Stewart et al (2002a) modelled the cost of establishing and applying a national service based on three models of **specialist nurse management – home management, clinic-based and a hybrid approach** – for patients discharged to home with a diagnosis of congestive heart failure. These models were estimated to be cost effective if they resulted in around 40% reduction in recurrent hospital bed utilisation. Most studies show reductions

of 30-60% less hospitalisation relative to usual care (p1370).[10] In total, the models could be implemented across the UK population for around £70 million per annum, assuming one nurse to 200-250 patients. Clearly there is a pivotal role in these models for the specialist heart failure nurse, with consequent workforce recruitment and training implications. Primary and specialist care support to the nurse and patient would also be part of the framework. Similar interventions have been modelled in the US, Netherlands, Sweden, New Zealand and Australia, with similar outcomes (McMurray and Stewart, 1998; Stewart et al, 2001b).

Galbreath et al (2004) found in their (real-world) Texan study of **disease management** (DM) in a community-based population with heart failure that the protective effects (reductions in hospitalisation and mortality) were strongest among the most severely ill patients, suggesting scope to stratify target populations to such models of care to further enhance cost-effectiveness.[11] In this case the (commercially available) DM model involved interventions including in-home technology (electronic blood pressure monitor, finger pulse oximeter, bathroom scales, activity monitors), educational material, options of special interventions (eg, smoking cessation programs), periodic monitoring and a call-line, coordinated by a specialist nurse "disease manager". There was no significant difference in hospitalisation or health costs between the interventions groups and the control (usual care)[12], and DM did not succeed in optimal titration of drugs or in increasing exercise performance. However, life expectancy was improved on average by 76 days (over the 18 months) and functionality also showed moderate improvement.

4.3.4 SUMMARY OF CEA RESULTS

Table 4-4 summarises CEAs for coronary artery bypass graft surgery (CABG), based on Harvard University's CEA Registry, again most of which are cost-effective. Appendix E presents CEA summaries for other interventions – angioplasty and stents, pacemakers, bypass operations, beta-blockers, diet supplements, rehabilitation (exercise and counselling) and other interventions that were found to be cost-saving or dominant.

The CEAs presented reveal that, for any given intervention, its cost-effectiveness may vary greatly depending on its comparator and also on the age, gender, disease severity and other treatments of the population to which it is applied. For policy purposes, this suggests that optimal resource allocation will only occur when interventions are strategically planned and managed to maximise health gains in QALYs per dollar spent.

To this end, the results of the Victorian ACE-Heart Disease project (2001-2003) are soon to be released. This project reviewed interventions in the Australian context including: community-wide CVD prevention programs; nutritional counselling by a GP or nutritionist; use of sitostanol, statins, four blood pressure lowering agents and aspirin; and smoking

[10] The reductions in hospitalisation tend to be taken around the one-year milestone, although some studies have shown benefits sustained for 18 months or more. Given that survival to 18 months is only around 33%, more dynamic modelling may be required to determine economic impacts over longer periods.

[11] In addition to stratification on the basis of disease severity, McAlister et al (2004) suggests that DM programs specially targeting more socioeconomically deprived individuals with heart failure may improve their prognosis.

[12] The cost-neutrality may reflect that this study was larger, randomised and had a longer follow-up period than other similar studies that have shown cost savings.

cessation with nicotine replacement (buproprion). A marginal analysis approach was used as well as pathway analysis (advocated by WHO-CHOICE) to determine the most cost-effective mix of preventive interventions given a certain budget level. All the personal interventions (drugs and counselling) were modelled by cut-offs for single risk factors as well as absolute risk cut offs (>5%, >10% and >15% five-year CVD risk).

With the shifting landscape of CVD burden and disease management, such local cost effectiveness analyses (CEAs) are vital to continue to inform policy making in relation to CVD so that the most efficient and effective use of resources can be achieved to purchase healthy lifespan.

TABLE 4-4 CEAS IN HARVARD REGISTRY, CORONARY ARTERY BYPASS GRAFT SURGERY

Year of study	Description of intervention	US$/QALY
1990	CABG vs PTCA in 55-yo men with angina from 1-vessel CAD & type A lesions	Dominated
1990	CABG vs PTCA in 55-yo men with 3-vessel CAD & type A lesions with angina & depressed ventricular function	Dominated
1985	CABG vs Medical management in patients with mild angina & one vessel disease	Dominated
1985	CABG for patients with severe angina & triple vessel disease vs Medical management in patients with severe angina & triple vessel disease	3,500
1985	CABG vs Medical management in patients with moderate angina & left main vessel disease	3,600
1985	CABG vs Medical management in patients with severe angina & double vessel disease	6,200
1985	CABG vs Medical management in patients with moderate angina & triple vessel disease	6,600
1985	CABG vs Medical management in patients with mild angina & left main vessel disease	6,900
1982	CABG for left main vessel disease & good ventricular function vs Medical management of angina in 55-yo males with CAD considered operable by angiographic & clinical characteristics, with moderately severe angina	7,500
1985	CABG for patients with moderate angina & double vessel disease vs Medical management in patients with moderate angina & double vessel disease	11,000
1998	CABG vs. Medical management in patients over 80 years old with CAD who are good candidates for CABG surgery	12,000
1982	CABG for three-vessel disease & good ventricular function vs Medical management of angina in 55-yo males with CAD considered operable by angiographic & clinical characteristics, with moderately severe angina	14,000
1985	CABG vs Medical management in patients with mild angina & triple vessel disease	17,000
1985	CABG vs Medical management in patients with severe angina & one vessel disease	31000
1985	CABG for patients with moderate angina & one vessel disease vs Medical management in patients with moderate angina & one vessel disease	33,000
1985	CABG for patients with mild angina & double vessel disease vs Medical management in patients with mild angina & double vessel disease	34,000
1982	CABG for two-vessel disease & good ventricular function vs Medical management of angina in 55-yo males with CAD considered operable by angiographic & clinical characteristics, with moderately severe angina	35,000
1982	CABG for one-vessel disease & good ventricular function vs Medical management of angina in 55-yo males with CAD considered operable by angiographic & clinical characteristics, with moderately severe angina	59,000
1990	CABG vs PTCA in 55-yo men with 3-vessel CAD & type A lesions with severe angina & normal ventricular function	99,000
1990	CABG PTCA in 55-yo men with 3-vessel CAD & type A lesions with mild angina & normal ventricular function	120,000
1990	CABG vs PTCA in 55-yo men with 2-vessel CAD & type A lesions with severe angina & normal ventricular function	530,000

PTCA = Percutaneous transluminal coronary angioplasty; CAD = coronary artery disease

5. CONCLUSIONS

Chapter 1

CVD continues to dominate the national health profile. Although mortality rates from acute events (heart attack and stroke) have been declining, the mortality burden of CVD remains enormous and is becoming more associated with periods of chronic disabling illness (notably heart failure). The health system and quality of life impacts are thus shifting towards more effectively managing risks and disease burden, as much as reducing mortality.

- There is a death every 10 minutes from CVD in Australia, 38% of all deaths (p7).
  - CHD remains the most common cause of sudden death in Australia (p1).
  - Stroke and heart failure rank second and third of the major killers (p1).
  - Australian mortality rates are significantly less than UK or USA, but higher than Japan and France (p7).
- Disability from most CVDs is similar to osteoarthritis or type II diabetes (p9). Disability from stroke and heart failure can be more severe, with poor survival prognoses.
- Risk for CVD rises progressively with the number of risk factors (p2) – behavioural, biomedical, demographic, genetic and psychosocial.
- People with CVD take more health actions than the average Australian (p4), including primary and specialist care, pharmacotherapy, surgeries and rehabilitation.
- GP care is important in identifying and managing CVD and its risk factors (p6).
- CVD rates are much higher among Aboriginal and Torres Strait Islander people and the socioeconomically disadvantaged, and also slightly in rural areas (p9).
- There are data limitations in analysing CVD prevalence and costs, particularly in the area of heart failure.

Chapter 2

CVD has not 'gone away'. It affects the quality of life of 1 in every 6 Australians (over 3.2 million people), increasing to 1 in 4 by mid-century. While trends in two risk factors are improving (smoking and high blood pressure), there is still great scope for improvement in these two areas and even more so in relation to cholesterol levels, physical inactivity, overweight and obesity, and diabetes, where levels are already alarming and trends are worsening.

- 16.4% of Australians have CVD. Since age is a risk factor, demographic ageing will mean that 24.2% of Australians will have CVD by 2051 – 6.4 million people.
- Half the Australian population over 25 have high blood cholesterol, unchanged since 1980.
- 54% of Australian adults do not exercise enough and 60% of those over 25 are overweight, with a doubling in obesity since 1980.
- 30% of Australians over 25 have high blood pressure and 24% of adults still smoke, although these trends are declining.
- Diabetes prevalence has more than doubled to over 3% self-reporting by 2001 and 5% including undiagnosed cases – 1 million people (AusDiab).

- Heart failure prevalence is burgeoning, although data are poor, as are diagnoses, awareness and treatment.

Direct health system costs of CVD are estimated at $7.6 billion in 2004 (11% of total health spending). On current trends, they will reach $11.5 billion by 2011.

- Hospital inpatient costs dominate the profile ($2.7bn) followed by pharmaceuticals ($1.7bn). Residential aged care costs are third, estimated as $639m.
- CHD remains the most costly single condition ($1.8bn), with stroke second (now over $1bn). Heart failure costs are not calculable from the data, but are estimated from international trends as around 1-2% of total health spending (potentially also around the $1bn mark).
- 64% of CVD health spending is on people over 64, and 80% on those over 54.
- $1.1 billion of recurrent health expenditure is estimated to be spent on 'unallocated' items – aids and appliances, capital spending, public and community health.
- Over the remainder of the decade, the greatest forecast growth in costs is amongst the very elderly (85+), focused mainly on pharmaceuticals and inpatient hospital costs; with the burden of heart failure expected to increase. We note that cost projections are cautiously based on future demographic change together with extrapolation of historical health expenditure growth patterns, and do not take account of technological, policy or other potential changes in key cost drivers.

Chapter 3

Indirect financial costs incurred due to CVD are conservatively estimated as $6.6 billion in 2004. Production losses due to lower employment rates and premature mortality cost $3.6 billion; carer costs $2.5 billion and other costs $0.5 billion. Thus the total financial costs are $14.2 billion per annum – 1.7% of GDP.

- CVD does not 'just affect really old people' – 50,292 people died – more women than men, of whom 60% had not reached average life expectancy, which itself (over 65) is largely driven by CVD mortality.
- 55,871 Australians are not in the workforce due to CVD.
  - The age and gender standardised difference in employment rates between people with and without CVD is 2.8%.
  - The lost production of people not in the workforce due to CVD in 2004 was worth $2.3bn.
  - In addition, the net present value of the lost production of Australians who died from CVD prior to age 65 and would otherwise have been employed, is $1.3bn.
- The value in 2004 of informal care of people with CVD is over $2.5bn (based on UK ratios due to lack of Australian data).
- Taxation losses and extra welfare payments are transfers, not real economic costs. However, the deadweight losses associated with tax and welfare system administration and economic distortions due to CVD is estimated as $508 million.

Dwarfing the financial costs are the costs of suffering and premature death from CVD – valued at $94 billion in 2004.

- The burden of disease costs over 600,000 years of healthy Australian life annually.
  - This is 22% of the total burden from all illness and injury in Australia.

- It is substantially more than any other National Health Priority area.

- The years of life lost to disability from CVD (8.8% of the Australian total), while less than the enormous disability associated with mental health problems (27.0%) and nervous system disorders (16.1%), are on par with chronic respiratory disease (8.9%) and greater than cancer (6.8%).
- Compared to other diseases, CVD is the largest health cost item, with a disproportionate share of hospital and pharmaceutical costs.
- In terms of prevalence, CVD ranks only behind visual disorders (much of which is correctable with glasses or lenses) and musculoskeletal disease.
- CVD is estimated to affect 67% of Australian families.

Chapter 4

We cannot be complacent about CVD. More effective medical treatment of coronary heart disease and, in particular, acute events such as heart attack and stroke, has resulted in improved longer term survival rates. However, this survival is linked with the rapid escalation of the prevalence of heart failure and other chronic disease, such that the health costs and burden of disease from CVD remain high, with most risk factors worsening into the future. The shifting burden of CVD calls for strategic investments that recognise the need to adopt absolute risk assessments and targeted as well as population approaches, and to optimise cost-effectiveness through established interventions as well as new models of care.

- Targeted approaches are more effective when there are:
  - relatively low costs of identification and screening; and
  - relatively high costs of the intervention.
- Absolute risk approaches are more effective in identifying target populations to optimise health gains. The use of risk calculators is especially useful in primary care.
  - Identification of the most at-risk Australians and targeted interventions for them, should be a priority.
- Population based approaches tend to be effective for awareness raising (eg, quit-smoking campaigns in 1990s). A better understanding of heart failure in Australia by health practitioners, policy makers and the population would undoubtedly have a positive effect on management and prevention.
  - An Australian population study like the European SHAPE study is needed to provide a more precise local picture of heart failure prevalence, impacts and patient care.
- Cost effectiveness analyses are important to identify high, medium and lower priority interventions to prevent or reduce risks, or to treat disease, by ranking interventions by $ per QALY, cost-saving or dominant therapies relative to comparators.
- Since CVD tends to utilise a disproportionate amount of acute care services, there is scope for greater cost effectiveness where hospitalisations (and residential aged care) can be avoided, and functionality improved.
- Many large randomised control trials have demonstrated the cost effectiveness of pharmacotherapies in lowering cholesterol and blood pressure – most of which are in WHO's "very cost effective" range of less than GDP per capita per QALY ie less than A$41,000/QALY (equivalent to US$30,000/QALY in 2004 prices).

- There is scope for further reductions in these areas.

- International and Australian studies show the cost effectiveness of new models of coordinated multidisciplinary care, that provide individualised management by specialist nursing staff and promotion of self-care activities, as well as appropriate pharmacotherapy (ie at effective dosages).
  - Clinic-based, home-based and day hospital models have been shown in the literature to be cost effective, with disease management models most useful when targeted to patients with worse functional class and, potentially, with greater socioeconomic deprivation.
- There is also a useful evidence basis in relation to surgeries (CABG, angioplasty and stents, bypasses etc); other pharmacotherapies; population programs to reduce salt intake, improve diet/weight and enhance physical activity; and provide services such as counselling, education and rehabilitation.
- Local CEAs such as the Victorian ACE-Heart Disease project (2001-2003), whose results are shortly to be released, are essential to prioritising strategies through evidenced based medicine, to inform policy making in relation to CVD so that the most efficient and effective use of scarce resources can be achieved to purchase healthy lifespan.
- **Cost-effective investment in research, prevention and management has been shown in Australia in the past decade to reduce CVD events and mortality rates and to arrest growth in health costs over the medium term. These health investments need to continue, taking into account the shifting epidemiological landscape.**
  - **Poor or inadequate treatment of CVD would contribute significantly to future national costs and burden of disease, in a world of increasing health resource scarcity.**
  - **Much of the burden of disease of CVD is avoidable, with WHO estimating that a further halving of CVD events in the next decade is possible and thus at least five more years of healthy life expectancy can be gained in Australia and elsewhere through cost-effective interventions.**

> *"Governments, in their stewardship role for better health, need to invest heavily in risk prevention, in order to contribute substantially to future avoidable mortality."*
>
> WHO (2002, p14)

REFERENCES

Absolute Risk Implementation Working Group (2003) *Risk Identification Tool for Cardiovascular Disease and Diabetes,* Progress Report, April.

Access Economics (2004) *Clear Insight: The Economic Impact and Cost of Vision Loss in Australia,* Report for Eye Research Australia, August.

Access Economics (2003) *Exceptional returns: the value of investing in health R&D in Australia,* Report for the Australian Society for Medical Research, September.

Anderson K, Odell P, Wilson P, Kannel W (1991) "Cardiovascular disease risk profiles" *Am Heart J*, 121:1 Pt 2, 293-8.

Australian Bureau of Statistics (2004) *Year Book Australia: Population, Households and families*, Cat No 1301.0.

Australian Bureau of Statistics (2003) *Causes of death, Australia, 2002*, Cat No 3303.0.0, December.

Australian Bureau of Statistics (2002) *National Health Survey 2001: Summary of Results*, Cat No 4364.0, October.

Australian Chronic Disease Prevention Alliance (2004) *Chronic Illness: Australia's Health Challenge: The Economic Case for Physical Activity and Nutrition in the Prevention of Chronic Disease*, available on **www.heartfoundation.com.au/index.cfm?page=199**

Australian Institute of Health and Welfare (2004a) *Heart, stroke and vascular diseases – Australian Facts 2004* AIHW Cat No CVD 27, Canberra: AIHW and National Heart Foundation of Australia (Cardiovascular Disease Series No 22).

Australian Institute of Health and Welfare (2004b) *Health system expenditure on disease and injury in Australia 2000-01,* AIHW Cat No HWE 26, Canberra: AIHW (Health and Welfare Expenditure Series No 19).

Australian Institute of Health and Welfare / Heart Foundation (2004) *The relationship between overweight, obesity and cardiovascular disease* AIHW Cat No CVD 29, November.

Australian Institute of Health and Welfare (2003a) *Health expenditure Australia*, *2001-02* AIHW Cat No HWE 20, September, Canberra.

Australian Institute of Health and Welfare (2003b) "Heart Failure – what of the future?" *Bulletin* No 6, see **www.aihw.gov.au/publications/aus/bulletin06/bulletin06.pdf**

Australian Institute of Health and Welfare (2002a) *Diabetes – Australian facts 2002*, Diabetes Series No.3, AIHW Cat No CVD 20, Canberra.

Australian Institute of Health and Welfare (2002b) *Chronic diseases and associated risk factors in Australia*, *2001* AIHW Cat No PHE 33, Canberra.

Bauman A, Bellew B, Vita P, Brown W, Owen N (2002) *Getting Australia active: Towards better practice for the promotion of physical activity,* National Public Health Partnership, Melbourne.

Bauman A, Ford I, Armstrong T (2001) *Trends in population levels of reported physical activity in Australia, 1997, 1999 and 2000*, Australian Sports Commission, Canberra.

Berry E, Kelly S, Hutton J et al (2000) "Intravascular ultrasound-guided interventions in coronary artery disease: a systematic literature review with decision-analytic modelling, of outcomes and cost-effectiveness" *Health Technol Assess* 4:1-117.

Blackledge HM, Tomlinson J, Squire IB (2003) "Prognosis for patients newly admitted to hospital with heart failure: Survival trends in 12 220 index admissions in Leicestershire 1993-2001" *Heart* 89:615-620.

Brown MM, Brown GC, Sharma S (2004) "Value-based medicine and vitreoretinal diseases" *Curr Opin Opthalmol* 15:167-172.

Bureau of Transport Economics (2000) *Road Crash Costs in Australia*, Bureau of Transport Economics, Report 102, Canberra.

Bureau of Transport and Regional Economics (2002) *Rail Accident Costs in Australia*, Report 108, Commonwealth of Australia, Canberra.

Capomolla S, Febo O, Ceresa M, Caporotondi A, Guazzotti G, La Rovere M, Ferrari M, Lenta F, Baldin S, Vaccarini C, Gnemmi M, Pinna G, Maestri R, Abelli P, Verdirosi S, Cobelli F (2002) "Cost/utility ratio in chronic heart failure: comparison between heart failure manage.ment program delivered by day-hospital and usual care" *J Am Coll Cardiol* 40:1259.

Clarke R, McLennan S, Dawson AP, Wilkinson D, Stewart S (2004) "Uncovering a hidden epidemic – a study of the current burden of heart failure in Australia" *Heart Lung & Circulation* 13:266-73.

Cleland JG, Cohen-Solal A, Cosin Aguilar J et al (2002) "Management of heart failure in primary care (the IMPROVEMENT of Heart Failure Programme): An international survey" *Lancet* 360:1631-1639.

Cowie MR, Mosterd A, Wood DA (1997) "The epidemiology of heart failure" *Eur Heart J* 18:208-225.

Cutler DM and Richardson E (1998) The Value of Health: 1970-1990, JCPR Working Paper 28, prepared for the AEA session on "What we get for health care spending" downloadable from www.jcpr.org/wpfiles/value.pdf

Cutler DM and Richardson E (1997) "Measuring the health of the US population" *Brookings Paper on Economic Activity, Microeconomics*, Brookings Institute, Washington DC.

Davies MK, Hobbs FDR, Davis RC, Kenkre JE, Roalfe AK, Hare R, Wosornu D, Lancashire RJ (2001) "Prevalence of left-ventricular systolic dysfunction and heart failure in the Echocardiographic Heart of England Screening study: a population based study" *Lancet* 358:439-44.

Department of Health and Ageing (2003) *Returns on investment in public health: An epidemiological and economic analysis*, Report to the Department of Health and Ageing by Applied Economics.

Edwards A, Elwyn G, Mulley A (2002) "Explaining risks: turning numerical data into meaningful pictures" *British Medical Journal,* 324: 827-30.

Elliot and Shannahan Research (1998) *In-Depth Investigation: Meaning and Potential for the Tick Program*, April 1998.

Feldman DE, Thivierge C, Guerard L et al (2001) "Changing trends in mortality and admissions to hospital for elderly patients with congestive heart failure in Montreal" *CMAJ* 165:1033-1036.

Fonarow GC, Stevenson LW, Walden JA et al (1997) "Impact of a comprehensive management program on the hospital readmission and functional status of patients with advanced heart failure" *J Am Coll Cardiol* 30:725-32.

Frisch J (2001) *Towards a Disability Allowance: Offsetting the Costs of Disability - An Analysis,* Prepared for the Physical Disability Council of Australia, June 2001.

Galbreath AD, Krasuski RA, Smith B, Stajduhar KC, Kwan MD, Ellis R, Freeman GL (2004) "Long-Term Healthcare and Cost Outcomes of Disease Management in a Large, Randomized, Community-Based Population With Heart Failure" *Circulation* 110.

Ganz D, Kuntz G, Avorn J (2000) "Cost-effectiveness of 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitor therapy in older patients with myocardial infarction" *Ann Intern Med* 2000; 132:780-787

Hanumanthu S, Butler J, Chomsky D, Davis S, Wilson JR (1997) "Effect of heart failure program on hospitalization frequency and exercise tolerance" *Circulation* 96:2842-8.

Hingorani A and Vallance P (1999) "A simple computer program for guiding management in cardiovascular risk factors and prescribing" *British Medical Journal* 318: 101-5.

Hobbs FDR, Kenkre JE, Roalfe AK, Davis RC, Hare R, Davies MK (2002) "Impact of heart failure and left ventricular systolic dysfunction on quality of life: A cross-sectional study comparing common chronic cardiac and medical disorders and a representative adult population" *Eur Heart J* 23:1867-76.

Hobbs FDR, Jones MI, Allan TF, Wilson S, Tobias R (2000) "European survey of primary care physician perceptions on heart failure diagnosis and management (Euro-HF)" *Eur Heart J* 21:1877-1887.

Johannesson M, Jönsson B, Kjekshus J, Olsson A, Pedersen T, Wedel H (1997) "Cost Effectiveness of Simvastatin Treatment to Lower Cholesterol Levels in Patients with Coronary Heart Disease" *New England Journal of Medicine*, Vol 336: 332-336.

Kniesner TJ and Leeth JD (1991) "Compensating wage differentials for fatal injury risk in Australia, Japan and the United States" *Journal of Risk and Uncertainty* 4(1), 75-90.

Krum H, Tonkin AM, Currie R, Djundjek R, Johnston CI (2001) "Frequency, awareness and pharmacological management of chronic heart failure in Australian general practice: The Cardiac Awareness Survey and Evaluation (CASE) Study" *Med J Aust* 174: 439-444.

Lattimore R (1997) *Research and Development Fiscal Incentives in Australia: Impacts and Policy Lessons*, Paper Presented to the OECD Conference on Policy Evaluation in Innovation, Paris, 26 27 June, 81:574-577.

Laurier D, Chau N, Cazelles B, Segond P (1994) "Estimation of CHD risk in a French working population using a modified Framingham model" *J Clin Epidemiol*, (47) 12: 1353-64.

Law M and Wald NJ (2002) "Risk factor thresholds: their existence under scrutiny" *British Medical Journal* 324:1570-1576.

Lawes C, Feigin V, Rodgers A (2002) "Estimating reductions in blood pressure following reductions in salt intake by age, sex and WHO region" *Clinical Trials Research Unit,* University of Auckland, New Zealand.

Mathers C, Vos T, Stevenson C (1999) *The burden of disease and injury in Australia*, AIHW Cat No PHE-17, Australian Institute of Health and Welfare, Canberra.

Mathur S (2002) *Epidemic of coronary heart disease and its treatment in Australia,* Australian Institute of Health and Welfare, AIHW Cat No CVD 21, September 2002.

McAlister FA, Murphy NF, Simpson CR, Stewart S, MacIntyre K, Kirkpatrick M, Chalmers J, Redpath A, Capewell S, McMurray JJV (2004) "Influence of socioeconomic deprivation on the primary care burden and treatment of patients with a diagnosis of heart failure in general practice in Scotland: population based study" *British Medical Journal* 328:1110.

McClure J (2002) "Are biomarkers useful treatment aids for promoting healthy behavior change? An empirical review" *Am J Prev Med* 22:200-7.

McMurray JJV, Stewart S (2003) "The burden of heart failure" *Eur Heart J* 5(Suppl I):I3-I113.

McMurray JJV, Stewart S (2000) "Epidemiology, aetiology and prognosis of heart failure" *Heart* 83:596-602.

McMurray JJV, Stewart S (1998) "Nurse-led, multidisciplinary intervention in chronic heart failure" *Heart* 80:430-1.

McNeil J, Peeters A, Vos T, Liew D, Lim S (1994) *Prevention Model of Cardiovascular Disease in Australia – IT medical modelling* Epidemiological Modelling Unit, Monash University, available on **www.med.monash.edu.au**

Miller P, Mulvey C, Norris K (1997) "Compensating differentials for risk of death in Australia" *Economic Record* 73(223), 363-372.

Murphy KM and Topel R (1999) *The Economic Value of Medical Research,* University of Chicago Business School.

Murray C, Lopez A, Mathers C, Stein C (2001) *The Global Burden of Disease 2000 Project: aims, methods & data sources*, Discussion Policy Paper No. 36, WHO, November.

Murray C and Lopez A (1996) *The Global Burden of Disease: a comprehensive assessment of mortality & disability from diseases, injuries & risk factors in 1990 & projected to 2020*, Volume 1, Global Burden of Disease & Injury Series, Harvard: Harvard School of Public Health.

Newnham H and Silberberg (1999) "Does estrogen therapy have a role in cardiovascular prevention?" *American Family Physician*, 1 March, editorial.

Nordhaus W (1999) *The Health of Nations: The Contribution of Improved Health to Living Standards*, research papers presented at a conference sponsored by Lasker/Funding First, December, Department of Economics, Yale University, downloaded 2 April 2003 from www.laskerfoundation.org/reports/pdf/healthofnations.pdf

Petersen S, Peto V, Rayner M (2003) *Coronary heart disease statistics: 2003 edition,* British Heart Foundation Health Promotion Research Group, Department of Public Health, University of Oxford, UK.

Practical Implementation Taskforce for the Prevention of Cardiovascular Disease (2004) "Prevention of cardiovascular disease: an evidence-based clinical aid 2004" Focus document *MJA* 181 (6): F1-F14.

Productivity Commision (2003) "Evaluation of the Pharmaceutical Industry Investment Program" *Research Report*, AusInfo, Canberra.

Remme W, Cline C, Cohen-Solal A, Dietz R, Hobbs R, Keukelaar K, Sendon JL, Macarie C, McMurray J, Rauch B, Ruzyllo W, Zannad F (2004) "Increasing awareness and perception of heart failure in Europe and improving care – rationale and design of the SHAPE study" *Cardiovascular Drugs and Therapy* 18:153-159.

Rich MW, Beckham V, Wittenberg C, Leven CL, Freedland K, Carney RM (1995) "A multidisciplinary intervention fo prevent the readmission of elderly patients with congestive heart failure" *N Engl J Med* 333:1190-5.

Robson J, Boomla K, Hart B, Feder G (2000) "Estimating cardiovascular risk for primary prevention: outstanding questions for primary care" *British Medical Journal* 320:720-4.

Rose G (1985) "Sick individuals and sick populations" *International Journal of Epidemiology,* 14:32-8.

Scandinavian Simvastatin Survival Group (1994) "Randomized trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S)" *Lancet* 344:1383-9.

Schelling (1968) "The life you save may be your own" in SB Chase (ed) *Problems in public expenditure and analysis,* Brookings Institution, Washington DC, p127-162.

Senes S and Britt H (2001) *A general practice view of cardiovascular disease and diabetes in Australia,* AIHW and University of Sydney, AIHW Cat No CVD17, Canberra, June 2001.

Shah NB, Der E, Ruggiero C, Heidenreich PA, Massie BM (1998) "Prevention of hospitalizations for heart failure with an interactive home monitoring program" *Am Heart J* 135:373-8.

Shepherd J, Cobbe S, Ford I, Isles C, Lorimer A, MacFarlane P et al (1995) "Prevention of coronary heart disease with pravastatin in men with hypercholesterolemia", West of Scotland Coronary Prevention Study Group, *N Engl J Med* 333:1301-7.

Stewart S, MacIntyre K, Capewell S, McMurray JJV (2003) "An ageing population and heart failure: An increasing burden in the 21st Century?" *Heart* 89:49-53.

Stewart S, Blue L, Walker A, Morrison C, McMurray JJV (2002a) "An economic analysis of specialist heart failure nurse management in the UK: Can we afford not to implement it?" *Eur Heart J* 23:1369-1378.

Stewart S, Jenkins A, Buchan S, Capewell S, McGuire A, McMurray JJV (2002b) "The current cost of heart failure in the UK: An economic analysis" *Eur J Heart Fail*; 4:361-371.

Stewart S, MacIntyre K, MacLeod MMC, Bailey AEM, Capewell S, McMurray JJV (2001a) "Trends in hospitalisation for heart failure in Scotland" *Eur Heart J* 22:209-217.

Stewart S, Blue L, Capewell S, Horowitz JD, McMurray JJV (2001b) "Poles apart, but are they the same? A comparative study of Australian and Scottish patients with chronic heart failure" *Eur J Heart Fail* 2:249-55.

Stroupe KT, Teal MS, Weiner M, Gradus-Pizlo I, Brater DC, Murray MD (2004) "Health care and medication costs and use among older adults with heart failure" *Am J Med* 116:443-450.

Thomas B, ed. (1988) *Manual of Dietetic Practice,* Blackwell Scientific Publications, Oxford.

Tolley GS, Kenkel DS, Fabian RG, eds (1994) *Valuing Health for Policy: An Economic Approach,* University of Chicago Press, Chicago.

Tonkin A (2004) "The metabolic syndrome – a growing problem" *Eur Heart J Supplements* 6:A37-A42

Turrell G and Mathers C (2001) "Socioeconomic inequalities in all-cause and specific-cause mortality in Australia: 1985-1987 and 1995 – 1997" *International Journal of Epidemiology* 30:231-239.

Utting P (2002) "Regulating business via multi-stakeholder initiatives: a preliminary assessment" in *Voluntary approaches to corporate responsibility,* United Nations Non-Government Liaison Service, Geneva, p61-30.

Van der Pligt J (1998) "Perceived risk and vulnerability as predictors of cautionary behaviour" *British Journal of Health Psychology,* 1998: 3: 1-14.

Viscusi WK and Aldy JE (2002) "The value of a statistical life: a critical review of market estimates throughout the world" *Discussion Paper No. 392*, Harvard Law School, Cambridge MA, November, downloadable from www.law.harvard.edu/programs/olin_center/

Viscusi WK (1993) "The value of risks to life and health" *Journal of Economic Literature*, 13:1912-46.

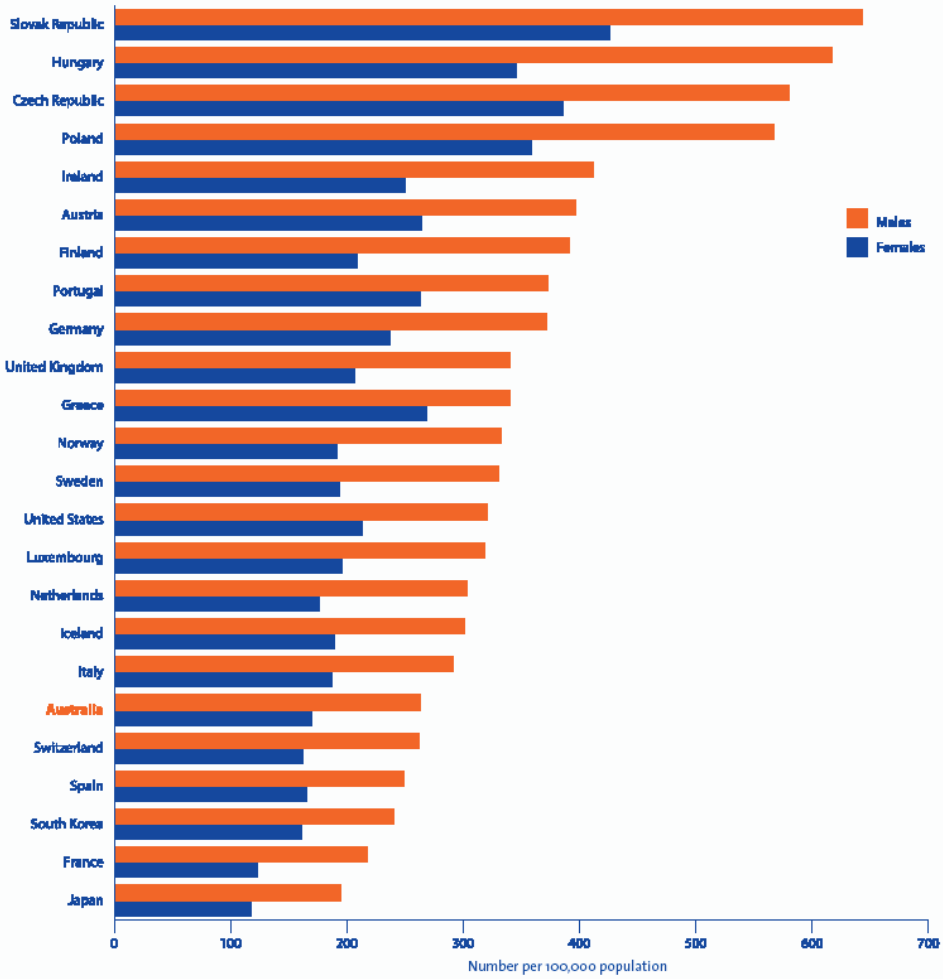
West JA, Miller NH, Parker KM et al (1997) "A comprehensive management system for heart failure improves clinical outcomes and reduces medical resource utilization" *Am J Cardiol* 79:58-63.

World Health Organization (2002) *The World Health Report 2002: Reducing Risks, Promoting Healthy Life*, WHO, Switzerland.

Yusuf S, Hawken S, Ôunpuu S, Dans T, Avezum A, Lanas F, McQueen M, Budaj A, Pais P, Varigos J, Lisheng L, on behalf of the INTERHEART Study Investigators (2004) "Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study" *Lancet* 364: 937–52

APPENDIX A – FIGURES

FIGURE A-1 DEATHS FROM CVD FOR OECD COUNTRIES, 1999



Note: Rates have been age-standardised to the 1980 OECD population.

Source: OECD Health Data 2003.

APPENDIX B – TABLES

TABLE B-1 HEALTH ACTIONS BY PEOPLE WITH CVD RELATIVE TO AVERAGES, BY AGE, AUSTRALIA, 2001

	0-24	25-44	45-64	65 and over	Total
People with CVD					
Hospital inpatient (a)	np	2.4%	1.2%	1.5%	1.5%
Visited					
Casualty/emergency	2.3%	1.0%	1.1%	0.7%	1.0%
Outpatients	2.8%	3.5%	2.8%	4.4%	3.5%
Day clinic	np	4.7%	5.0%	4.7%	4.6%
Consultation with					
Doctor (b)	29.4%	32.5%	37.3%	49.0%	40.9%
Dentist	9.8%	6.3%	6.1%	5.6%	6.1%
Other health practitioner	15.1%	17.1%	16.3%	16.4%	16.4%
Total who took an action (c)	**51.5%**	**52.7%**	**54.1%**	**62.9%**	**57.3%**
Took no action (d)	**48.5%**	**47.3%**	**45.9%**	**37.1%**	**42.7%**
All Australians					
Hospital inpatient (a)	0.6%	0.9%	0.9%	1.6%	0.9%
Visited					
Casualty/emergency	1.4%	0.8%	0.9%	0.6%	1.0%
Outpatients	1.5%	1.8%	1.9%	3.8%	1.9%
Day clinic	1.2%	2.4%	3.2%	3.9%	2.3%
Consultation with					
Doctor (b)	18.3%	21.7%	28.1%	42.5%	24.5%
Dentist	6.9%	4.8%	6.9%	5.6%	6.1%
Other health practitioner	10.6%	14.8%	13.8%	15.0%	13.1%
Total who took an action (c)	**37.9%**	**40.6%**	**44.9%**	**56.7%**	**42.6%**
Took no action (d)	**62.1%**	**59.4%**	**55.1%**	**43.3%**	**57.4%**

(a) People discharged from hospital in the 2 weeks prior to interview.

(b) Includes GPs and specialists.

(c) People may have reported more than one type of action hence components may not sum to totals.

(d) Took none of the actions covered in this survey.

np Not publishable (eg, due to confidentiality reasons).

Source: Access Economics based on special ABS data request.

TABLE B-2 HEALTH ACTIONS - RATIOS OF SELECTED CVD RATES RELATIVE TO AVERAGES, AUSTRALIA, 2001

	Hosp. in-patient (b)	Visited			Consultation with			Total took action (e)	Took no action (f)
		Cas/ A&E	Out-patient	Day clinic	Doctor (c)	Den-tist	OHP		
Hypertension	1.4	0.9	1.6	2.0	1.8	1.0	1.1	1.3	0.7
CHD	3.7	1.4	4.4	3.0	2.2	1.0	1.6	1.7	0.5
Tachycardia	2.9	0.5	2.2	2.4	1.9	1.1	1.7	1.5	0.7
Stroke	np	Np	4.9	3.4	2.3	0.9	2.0	1.7	0.5
Oedema	3.1	2.0	3.6	1.8	2.0	1.1	1.6	1.6	0.5
Diseases of arteries, arterioles & capillaries	2.4	1.5	3.7	2.1	2.3	1.0	1.4	1.6	0.5
Veins & lymphatic vessels	1.8	0.9	1.4	2.4	1.6	1.3	1.4	1.3	0.7
Signs and symptoms	2.0	1.4	2.6	1.4	1.6	1.2	1.6	1.4	0.7
CVD total	**1.7**	**1.0**	**1.8**	**2.0**	**1.7**	**1.0**	**1.3**	**1.3**	**0.7**

(a) Any component omitted was omitted due to insufficient data or confidentiality reasons.

(b) People discharged from hospital in the 2 weeks prior to interview.

(c) Includes GPs and specialists.

(d) People may have reported more than one type of action hence components may not sum to totals.

(e) Took none of the actions covered in this survey.

np Not publishable (eg, due to confidentiality reasons).

Source: Access Economics based on ABS special data request.

TABLE B-3 GP TREATMENT OF 14 CVD AND DIABETIC PROBLEMS, 2001, AUSTRALIA

	% of total problems managed	Encounters per 100	Encounters p.a.
Hypertension	5.7	8.2	8.5m
Lipid disorders	1.7	2.5	2.5m
Type 2 diabetes	1.6	2.3	2.4m
Ischaemic heart disease	1.1	1.5	1.6m
Cardiovascular check-up	0.8	1.2	1.3m
Heart failure	0.6	0.9	899,000
Overweight and obesity	0.5	0.7	710,000
Atrial fibrillation or flutter	0.4	0.6	589,000
Smoking	0.2	0.3	292,000
Peripheral vascular disease	0.1	0.2	228,000
Type 1 diabetes	0.1	0.2	222,000
Stroke	0.1	0.2	181,000
Transient ischaemic attack	0.1	0.2	166,000
Palpitations	0.1	0.1	148,000

Source: Senes and Britt (2001).

Key points in relation to this table:

- hypertension was the most common problem managed (8.5m encounters p.a. in total);
- lipid disorders were second (2.5m encounters p.a.), with 333,000 new cases diagnosed each year;
- there were strong comorbidities linking hypertension, lipid disorders and diabetes;
- compared with prevalence of obesity and overweight problems in the study (51%), the management rate was very low, which was also true for smoking; and
- a large proportion of patients aged 25-44 had first-time CVD check-ups, indicating growing awareness of the importance of prevention and monitoring.

TABLE B-4 USE OF PHARMACEUTICAL MEDICATIONS TO TREAT CVD, 2001

Condition	% people with condition using pharmacotherapy for a heart or circulatory condition
Hypertension	91.2%
CHD	89.6%
Other heart diseases	64.5%
Tachycardia	66.5%
Stroke	91.3%
Oedema	85.6%
Diseases of arteries, arterioles and capillaries	86.1%
Diseases of veins lymphatic vessels etc	37.8%
Other diseases of circulatory system	35.4%
Symptoms signs involving circulatory system	39.8%
Total CVD	**69.4%**

Source: Access Economics derived from ABS special data request. Self-reported data.

TABLE B-5 DEATHS DUE TO CVD, 2002

	Number of deaths			Rate per 100,000 deaths	% total deaths
	Males	Females	Total		
All heart disease	17,278	16,895	34,173	170.0	25.6%
Ischaemic heart diseases	13,855	12,208	26,063	129.7	19.5%
Acute myocardial infarction	*7,474*	*6,844*	*14,318*	*71.2*	*10.7%*
Pulmonary heart disease, diseases of pulmonary circulation and other forms of heart disease	3,117	4,023	7,140	35.5	5.3%
Heart failure	*1,033*	*1,696*	*2,729*	*27.0*	*2.0%*
Hypertension	457	896	1,353	6.7	1.0%
Acute rheumatic fever & chronic rheumatic heart diseases	83	191	274	1.4	0.2%
Cerebrovascular diseases	4,969	7,564	12,533	62.2	9.4%
Diseases of arteries, arterioles and capillaries	1,382	1,259	2,641	13.2	2.0%
Atherosclerosis	175	324	499	2.5	0.4%
Aortic aneurysm and dissection	836	550	1,386	6.9	1.0%
Total, CVD	**23,988**	**26,306**	**50,294**	**250.0**	**37.6%**
Total, all diseases	**68,885**	**64,822**	**133,707**	**667.3**	**100%**

Source: ABS (2003), Tables 1.1 and 1.3, based on 'underlying' cause of death.

TABLE B-6 DISABILITY WEIGHTS FOR CVDS AND SELECTED OTHER CONDITIONS, 1996

Cardiovascular conditions	Weight	Comparator conditions	Weight
Rheumatic heart disease, untreated	0.323	Early stage skin cancer*	0.190
Rheumatic heart disease, treated	0.171	Early stage lung cancer*	0.440
Angina pectoris	0.178	Terminal stage cancer	0.930
Acute myocardial infarction	0.395	Osteoarthritis	0.010 – 0.420
Heart failure	0.353	Rheumatoid arthritis	0.210 – 0.940
Stroke with mild permanent impairment	0.360	Asthma	0.030 – 0.230
Stroke with moderate permanent impairment	0.630	Type 2 diabetes	0.070 – 0.430
Stroke with severe permanent impairment	0.920	Road traffic accidents	0.149
Inflammatory heart disease	0.353	Fractures	0.077 – 0.431
Hypertensive heart disease	0.352	Depression	0.140 – 0.760
Aortic aneurysm	0.430	Dementia	0.270 – 0.940
Peripheral arterial disease	0.248	Anxiety disorders	0.110 – 0.600

* Skin cancer has the lowest initial disability weighting and lung cancer the highest of the cancers.

Source: Access Economics derived from Mathers et al (1999), Annex Table B.

TABLE B-7 REDUCED ACTIVITY FOR PEOPLE WITH CVDS BY AGE, AUSTRALIA

Days of reduced activity	0-24	25-44	45-64	65 and over	Total
People with CVD	14.5%	16.2%	16.0%	15.3%	15.7%
All Australians	8.4%	11.5%	12.3%	13.3%	10.8%

Source: Access Economics derived from ABS special data request.

TABLE B-8 REDUCED ACTIVITY FOR PEOPLE WITH CVDS BY CONDITION, AUSTRALIA, 2001

Condition	Days of reduced activity for condition relative to Australian average
Hypertension	1.3
Ischaemic heart disease	2.3
Tachycardia	2.1
Cerebrovascular diseases	2.2
Oedema	2.5
Arteries, arterioles & capilliaries	2.1
Veins & lymphatic vessels	1.5
Signs and symptoms	1.7
CVD total	**1.4**

Source: Access Economics derived from ABS special data request.

TABLE B-9 INCOME OF PEOPLE WITH CVDS BY GENDER AND QUINTILE (ALL AGES), 2001

Income Quintile	Males		Females		Persons	
	CVD	Australian average	CVD	Australian average	CVD	Australian average
1st quintile (most disadvantaged)	32%	18%	42%	21%	37%	20%
2nd quintile	26%	20%	22%	21%	24%	20%
3rd quintile	14%	20%	14%	20%	14%	20%
4th quintile	14%	21%	11%	19%	13%	20%
5th quintile (least disadvantaged)	14%	22%	10%	18%	12%	20%

Source: Access Economics derived from ABS special data request. The different age distribution should be borne in mind, although age-standardised data was not available for publication.

TABLE B-10 RURALITY OF PEOPLE WITH CVDS BY CONDITION, 2001

	Major Cities of Australia	Inner Regional Australia	Outer regional / other areas	Total
Hypertension	62.9%	23.9%	13.2%	100.0%
Ischaemic heart diseases	65.4%	23.4%	11.2%	100.0%
Other heart diseases	43.5%	27.4%	29.0%	100.0%
Tachycardia	62.6%	25.3%	12.1%	100.0%
Cerebrovascular diseases	68.5%	21.9%	9.6%	100.0%
Oedema	57.7%	26.1%	16.2%	100.0%
Diseases of arteries arterioles and cap	63.3%	28.9%	7.8%	100.0%
Diseases of veins lymphatic vessels etc	68.5%	19.9%	11.6%	100.0%
Other diseases of circulatory system	68.1%	18.4%	13.4%	100.0%
Symptoms signs involving circulatory system	64.4%	24.0%	11.6%	100.0%
Total CVD	**63.9%**	**23.5%**	**12.6%**	**100.0%**
Total Australia	**67.1%**	**20.9%**	**12.0%**	**100.0%**

Source: Access Economics derived from ABS special data request.

TABLE B-11 PREVALENCE ('000) OF LONG TERM CVDS, BY GENDER AND AGE GROUP, 2001

'000	0-14	15-24	25-34	35-44	45-44	55-64	65-74	75 & over	Total
Males									
Hypertension	2.1	10.8	22.1	70.2	180.5	222.4	217.7	143.1	868.8
Angina	-	-	-	2.5	14.2	29.6	49.7	41.6	137.6
Other ischaemic heart disease	1.3	-	-	4.4	15.4	17.5	26.0	15.0	79.6
Other heart disease	-	-	0.2	-	0.4	2.1	2.5	0.8	6.0
Tachycardia	1.2	2.0	5.2	12.1	28.6	26.1	33.8	34.4	143.5
Oedema	1.0	2.4	2.9	1.5	7.1	17.7	27.9	27.8	88.2
Diseases of arteries, arterioles & capillaries	0.7	0.3	0.8	5.2	16.8	24.0	43.2	33.8	124.7
Haemorrhoids	0.3	-	3.7	13.8	27.6	25.2	5.0	13.2	88.8
Varicose veins	-	2.5	5.2	12.9	25.6	20.4	13.0	18.2	97.8
Other diseases of the CV system	1.4	0.9	5.4	2.9	10.9	22.9	26.5	22.9	93.7
Cardiac murmurs and sounds	24.2	15.4	13.4	19.3	21.9	23.8	27.3	14.0	159.3
Other CV system signs & symptoms	0.6	0.6	2.8	3.0	4.1	2.4	5.1	6.1	24.6
Total	**32.0**	**33.3**	**54.1**	**133.3**	**286.9**	**314.6**	**306.0**	**227.2**	**1,387.6**
Females									
Hypertension	-	3.2	12.5	59.4	179.8	242	276.1	267.3	1,040.3
Angina	-	1.0	1.8	3.3	4.9	19.2	26.1	66.5	122.6
Other ischaemic heart disease	-	0.4	-	2.0	1.1	12.0	13.2	17.4	46.0
Other heart disease	-	-	-	1.5	0.9	0.9	2.5	0.6	6.3
Tachycardia	3.1	9.1	14.2	24.4	23.8	35.2	41.3	43.9	194.9
Oedema	-	2.1	6.2	11.1	31.6	40.3	48.0	69.0	208.2
Diseases of arteries, arterioles & capillaries	-	4.0	2.8	1.3	8.0	13.1	22.3	22.9	74.4
Haemorrhoids	-	1.0	14.8	33.3	23.7	19.2	17.9	9.9	119.7
Varicose veins	-	5.4	26.6	64.0	84.5	61.4	59.6	40.4	341.8
Other diseases of the CV system	3.0	8.0	5.4	11.4	14.7	12.6	16.0	40.2	111.3
Cardiac murmurs and sounds	20.0	7.3	29.2	39.6	34.8	20.1	24.2	31.0	206.1
Other CV system signs & symptoms	1.3	5.1	2.8	4.4	5.9	6.5	5.8	9.8	41.6
Total	**25.8**	**42.1**	**105.2**	**216.6**	**317.7**	**345.1**	**369.7**	**376.2**	**1,798.3**
Persons									
Hypertension	2.1	14.0	34.6	129.6	360.3	464.3	493.9	410.3	1,909.1
Angina	-	1.0	1.8	5.7	19.1	48.8	75.8	108.1	260.2
Other ischaemic heart disease	1.3	0.4	-	6.4	16.5	29.5	39.1	32.4	125.6
Other heart disease	-	-	0.2	1.5	1.3	3.0	5.1	1.3	12.4
Tachycardia	4.3	11.1	19.4	36.5	52.4	61.3	75.1	78.3	338.4
Oedema	1.0	4.4	9.1	12.6	38.7	58.1	75.9	96.8	296.4
Diseases of arteries, arterioles & capillaries	0.7	4.3	3.6	6.5	24.8	37.1	65.5	56.6	199.1
Haemorrhoids	0.3	1.0	18.5	47.2	51.3	44.4	22.9	23.0	208.6
Varicose veins	-	7.9	31.8	76.9	110.1	81.8	72.6	58.6	439.6
Other diseases of the CV system	4.5	8.9	10.8	14.3	25.5	35.5	42.5	63.1	205.0
Cardiac murmurs and sounds	44.2	22.6	42.6	58.9	56.7	43.9	51.5	45.0	365.4
Other CV system signs & symptoms	1.9	5.6	5.6	7.4	10.0	8.9	10.9	15.9	66.2
Total	**57.8**	**75.3**	**159.3**	**349.9**	**604.6**	**659.8**	**675.7**	**603.4**	**3,185.9**

Source: ABS (2002) Table 5, self-reported.

TABLE B-12 PREVALENCE (%) OF LONG TERM CVDS, BY GENDER AND AGE GROUP, 2001

%	0-14	15-24	25-34	35-44	45-44	55-64	65-74	75 & over	Total
Males									
Hypertension	0.1%	0.8%	1.5%	4.8%	13.6%	24.0%	34.1%	32.7%	9.0%
Angina	-	-	-	0.2%	1.1%	3.2%	7.8%	9.5%	1.4%
Other ischaemic heart disease	0.1%	-	-	0.3%	1.2%	1.9%	4.1%	3.4%	0.8%
Other heart disease	-	-	-	-	-	0.2%	0.4%	0.2%	0.1%
Tachycardia	0.1%	0.1%	0.4%	0.8%	2.2%	2.8%	5.3%	7.9%	1.5%
Oedema	-	0.2%	0.2%	0.1%	0.5%	1.9%	4.4%	6.4%	0.9%
Diseases of arteries, arterioles & capillaries	-	-	0.1%	0.4%	1.3%	2.6%	6.8%	7.7%	1.3%
Haemorrhoids	-	-	0.3%	0.9%	2.1%	2.7%	0.8%	3.0%	0.9%
Varicose veins	-	0.2%	0.4%	0.9%	1.9%	2.2%	2.0%	4.2%	1.0%
Other diseases of the CV system	0.1%	0.1%	0.4%	0.2%	0.8%	2.5%	4.1%	5.2%	1.0%
Cardiac murmurs and sounds	1.2%	1.1%	0.9%	1.3%	1.6%	2.6%	4.3%	3.2%	1.7%
Other CV system signs & symptoms	-	-	0.2%	0.2%	0.3%	0.3%	0.8%	1.4%	0.3%
Total	**1.6%**	**2.5%**	**3.8%**	**9.0%**	**21.6%**	**33.9%**	**47.9%**	**51.9%**	**14.4%**
Females									
Hypertension	-	0.2%	0.9%	4.0%	13.5%	26.8%	40.5%	39.5%	10.6%
Angina	-	0.1%	0.1%	0.2%	0.4%	2.1%	3.8%	9.8%	1.3%
Other ischaemic heart disease	-	-	-	0.1%	0.1%	1.3%	1.9%	2.6%	0.5%
Other heart disease	-	-	-	0.1%	0.1%	0.1%	0.4%	0.1%	0.1%
Tachycardia	0.2%	0.7%	1.0%	1.6%	1.8%	3.9%	6.1%	6.5%	2.0%
Oedema	-	0.2%	0.4%	0.7%	2.4%	4.5%	7.0%	10.2%	2.1%
Diseases of arteries, arterioles & capillaries	-	0.3%	0.2%	0.1%	0.6%	1.4%	3.3%	3.4%	0.8%
Haemorrhoids	-	0.1%	1.0%	2.2%	1.8%	2.1%	2.6%	1.5%	1.2%
Varicose veins	-	0.4%	1.8%	4.3%	6.3%	6.8%	8.7%	6.0%	3.5%
Other diseases of the CV system	0.2%	0.6%	0.4%	0.8%	1.1%	1.4%	2.3%	5.9%	1.1%
Cardiac murmurs and sounds	1.0%	0.6%	2.0%	2.6%	2.6%	2.2%	3.5%	4.6%	2.1%
Other CV system signs & symptoms	0.1%	0.4%	0.2%	0.3%	0.4%	0.7%	0.9%	1.4%	0.4%
Total	**1.3%**	**3.2%**	**7.3%**	**14.5%**	**23.9%**	**38.2%**	**54.2%**	**55.6%**	**18.4%**
Persons									
Hypertension	0.1%	0.5%	1.2%	4.4%	13.5%	25.4%	37.4%	36.8%	9.8%
Angina	-	-	0.1%	0.2%	0.7%	2.7%	5.7%	9.7%	1.3%
Other ischaemic heart disease	-	-	-	0.2%	0.6%	1.6%	3.0%	2.9%	0.6%
Other heart disease	-	-	-	0.1%	-	0.2%	0.4%	0.1%	0.1%
Tachycardia	0.1%	0.4%	0.7%	1.2%	2.0%	3.3%	5.7%	7.0%	1.7%
Oedema	-	0.2%	0.3%	0.4%	1.5%	3.2%	5.7%	8.7%	1.5%
Diseases of arteries, arterioles & capillaries	-	0.2%	0.1%	0.2%	0.9%	2.0%	5.0%	5.1%	1.0%
Haemorrhoids	-	-	0.6%	1.6%	1.9%	2.4%	1.7%	2.1%	1.1%
Varicose veins	-	0.3%	1.1%	2.6%	4.1%	4.5%	5.5%	5.3%	2.3%
Other diseases of the CV system	0.1%	0.3%	0.4%	0.5%	1.0%	1.9%	3.2%	5.7%	1.1%
Cardiac murmurs and sounds	1.1%	0.9%	1.5%	2.0%	2.1%	2.4%	3.9%	4.0%	1.9%
Other CV system signs & symptoms	-	0.2%	0.2%	0.2%	0.4%	0.5%	0.8%	1.4%	0.3%
Total	**1.4%**	**2.8%**	**5.5%**	**11.8%**	**22.7%**	**36.0%**	**51.2%**	**54.1%**	**16.4%**

Source: Access Economics based on ABS (2002) Table 5 (self-reported) and ABS population data (AusStats).

TABLE B-13 PREVALENCE ('000) OF LONG TERM CVD CONDITIONS, BY GENDER, 2001-2051

'000	2001	2011	2021	2031	2041	2051
Males						
Hypertension	868.9	1,109.5	1,372.4	1,597.3	1,754.8	1,860.7
Angina	137.6	183.2	242.8	300.1	340.5	367.6
Other ischaemic heart disease	79.6	102.8	130.6	154.6	171.0	181.8
Other heart disease	6.0	8.0	10.3	12.0	13.0	13.8
Tachycardia	143.4	182.2	228.9	275.2	308.9	330.3
Oedema	88.3	116.2	152.7	189.0	215.1	232.7
Diseases of arteries, arterioles & capillaries	124.8	163.5	213.9	261.6	295.0	317.0
Haemorrhoids	88.8	109.6	127.0	144.5	158.3	166.9
Varicose veins	97.8	121.2	145.1	169.3	187.5	198.7
Other diseases of the circulatory system	93.8	121.9	156.0	187.7	210.2	225.8
Cardiac murmurs and sounds	159.3	187.3	217.3	241.7	257.5	267.9
Other circulatory system signs & symptoms	24.7	30.4	37.8	45.6	51.2	54.7
Total	**1,387.4**	**1,743.1**	**2,131.5**	**2,475.8**	**2,718.8**	**2,878.6**
Females						
Hypertension	1,040.3	1,318.8	1,642.5	1,935.2	2,140.1	2,258.6
Angina	122.8	155.7	200.6	258.1	302.6	328.1
Other ischaemic heart disease	46.1	59.7	76.6	93.9	106.2	113.7
Other heart disease	6.4	7.8	9.8	11.0	11.7	12.0
Tachycardia	195.0	238.0	288.1	335.0	367.3	385.9
Oedema	208.3	261.6	326.2	393.5	443.1	471.4
Diseases of arteries, arterioles & capillaries	74.4	93.5	118.6	142.3	159.2	169.0
Haemorrhoids	119.8	140.6	161.1	176.2	184.5	188.9
Varicose veins	341.9	410.9	479.7	533.3	567.8	585.8
Other diseases of the circulatory system	111.3	134.2	162.2	197.5	224.9	239.8
Cardiac murmurs and sounds	206.2	235.9	269.0	301.8	323.7	335.2
Other circulatory system signs & symptoms	41.6	49.9	58.7	68.0	75.0	78.9
Total	**1,798.4**	**2,204.2**	**2,656.8**	**3,069.0**	**3,354.2**	**3,515.7**
Persons						
Hypertension	1,909.1	2,428.3	3,014.9	3,532.6	3,894.9	4,119.3
Angina	260.3	338.9	443.4	558.2	643.0	695.7
Other ischaemic heart disease	125.6	162.4	207.3	248.5	277.2	295.5
Other heart disease	12.4	15.8	20.1	23.0	24.7	25.8
Tachycardia	338.4	420.2	517.1	610.3	676.1	716.2
Oedema	296.6	377.8	478.9	582.5	658.2	704.1
Diseases of arteries, arterioles & capillaries	199.1	257.1	332.5	403.9	454.2	486.0
Haemorrhoids	208.6	250.2	288.1	320.7	342.8	355.8
Varicose veins	439.7	532.1	624.8	702.6	755.3	784.5
Other diseases of the circulatory system	205.1	256.2	318.2	385.2	435.1	465.6
Cardiac murmurs and sounds	365.4	423.3	486.3	543.5	581.2	603.1
Other circulatory system signs & symptoms	66.2	80.3	96.5	113.6	126.2	133.7
Total	**3,185.8**	**3,947.3**	**4,788.3**	**5,544.8**	**6,073.0**	**6,394.3**

Source: Access Economics based on ABS special data request, self-reported.

TABLE B-14 PREVALENCE (%) OF LONG TERM CVD CONDITIONS, BY GENDER, 2001-2051

%	2001	2011	2021	2031	2041	2051
Males						
Hypertension	9.0%	10.4%	11.8%	12.9%	13.7%	14.2%
Angina	1.4%	1.7%	2.1%	2.4%	2.7%	2.8%
Other ischaemic heart disease	0.8%	1.0%	1.1%	1.2%	1.3%	1.4%
Other heart disease	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Tachycardia	1.5%	1.7%	2.0%	2.2%	2.4%	2.5%
Oedema	0.9%	1.1%	1.3%	1.5%	1.7%	1.8%
Diseases of arteries, arterioles & capillaries	1.3%	1.5%	1.8%	2.1%	2.3%	2.4%
Haemorrhoids	0.9%	1.0%	1.1%	1.2%	1.2%	1.3%
Varicose veins	1.0%	1.1%	1.3%	1.4%	1.5%	1.5%
Other diseases of the circulatory system	1.0%	1.1%	1.3%	1.5%	1.6%	1.7%
Cardiac murmurs and sounds	1.7%	1.8%	1.9%	2.0%	2.0%	2.0%
Other circulatory system signs & symptoms	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%
Total	**14.4%**	**16.3%**	**18.4%**	**20.0%**	**21.2%**	**21.9%**
Females						
Hypertension	10.6%	12.2%	14.0%	15.4%	16.4%	17.0%
Angina	1.3%	1.4%	1.7%	2.1%	2.3%	2.5%
Other ischaemic heart disease	0.5%	0.6%	0.7%	0.7%	0.8%	0.9%
Other heart disease	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Tachycardia	2.0%	2.2%	2.5%	2.7%	2.8%	2.9%
Oedema	2.1%	2.4%	2.8%	3.1%	3.4%	3.5%
Diseases of arteries, arterioles & capillaries	0.8%	0.9%	1.0%	1.1%	1.2%	1.3%
Haemorrhoids	1.2%	1.3%	1.4%	1.4%	1.4%	1.4%
Varicose veins	3.5%	3.8%	4.1%	4.2%	4.4%	4.4%
Other diseases of the circulatory system	1.1%	1.2%	1.4%	1.6%	1.7%	1.8%
Cardiac murmurs and sounds	2.1%	2.2%	2.3%	2.4%	2.5%	2.5%
Other circulatory system signs & symptoms	0.4%	0.5%	0.5%	0.5%	0.6%	0.6%
Total	**18.4%**	**20.3%**	**22.6%**	**24.5%**	**25.7%**	**26.4%**
Persons						
Hypertension	9.8%	11.3%	12.9%	14.2%	15.0%	15.6%
Angina	1.3%	1.6%	1.9%	2.2%	2.5%	2.6%
Other ischaemic heart disease	0.6%	0.8%	0.9%	1.0%	1.1%	1.1%
Other heart disease	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Tachycardia	1.7%	2.0%	2.2%	2.4%	2.6%	2.7%
Oedema	1.5%	1.8%	2.0%	2.3%	2.5%	2.7%
Diseases of arteries, arterioles & capillaries	1.0%	1.2%	1.4%	1.6%	1.8%	1.8%
Haemorrhoids	1.1%	1.2%	1.2%	1.3%	1.3%	1.3%
Varicose veins	2.3%	2.5%	2.7%	2.8%	2.9%	3.0%
Other diseases of the circulatory system	1.1%	1.2%	1.4%	1.5%	1.7%	1.8%
Cardiac murmurs and sounds	1.9%	2.0%	2.1%	2.2%	2.2%	2.3%
Other circulatory system signs & symptoms	0.3%	0.4%	0.4%	0.5%	0.5%	0.5%
Total	**16.4%**	**18.3%**	**20.5%**	**22.3%**	**23.5%**	**24.2%**

Source: Access Economics based on ABS special data request, self-reported.

TABLE B-15 CORONARY HEART DISEASE, DIRECT HEALTH COSTS 2000-01 ($M), BY AGE, GENDER AND TYPE

	Hospitals								Medical services			Pharmaceuticals				
Age group	Hospitals	Inpatients Private in-hosp medical services	Out-patients	Total hospital	Aged care homes	Unreferred attend-ances	Imaging	Pathology	Other medical	Total out-of-hospital medical	Pre-scription	Over-the-counter	Total	Other health pro-fessionals	Research	Total
Male																
0-4	0.0	0.0	-	0.0	-	-	-	-	0.1	0.1	0.1	-	0.1	-	0.0	0.2
5–14	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
15–24	0.2	0.0	-	0.2	-	0.0	-	-	0.0	0.0	0.1	0.0	0.1	-	0.0	0.3
25–34	2.6	0.3	0.4	3.3	-	0.1	0.0	0.1	1.0	1.3	0.3	0.0	0.3	-	0.1	5.1
35–44	23.0	2.4	5.4	30.8	-	0.5	0.2	0.5	1.9	3.2	2.6	0.4	3.0	1.2	1.1	39.3
45–54	80.8	8.6	4.6	93.9	0.0	2.5	1.2	1.8	7.8	13.3	9.8	1.6	11.4	0.5	3.4	122.5
55–64	138.6	14.7	11.9	165.2	0.1	3.6	1.3	2.8	9.4	17.1	21.6	4.7	26.3	1.5	6.0	216.3
65–74	177.2	18.8	8.6	204.5	0.2	5.5	1.7	3.5	11.7	22.4	35.2	5.2	40.4	1.6	7.7	276.9
75-84	131.0	13.9	3.9	148.8	0.7	4.7	1.2	2.2	9.1	17.2	26.6	4.2	30.8	4.2	5.8	207.5
85+	31.0	3.3	0.9	35.2	1.1	1.0	0.1	0.4	2.5	4.0	5.3	0.8	6.1	0.9	1.4	48.7
Total M	**584.5**	**62.0**	**35.7**	**682.2**	**2.1**	**18.1**	**5.8**	**11.3**	**43.4**	**78.6**	**101.6**	**16.9**	**118.5**	**10.0**	**25.6**	**916.9**
Female																
0-4	0.0	0.0	-	0.0	-	0.0	-	-	0.0	0.0	0.0	-	0.0	-	0.0	0.1
5–14	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.0
15–24	0.1	0.0	-	0.1	-	0.0	-	0.0	0.0	0.1	0.0	-	0.0	-	0.0	0.2
25–34	1.0	0.1	-	1.1	-	0.0	-	-	0.0	0.0	0.1	0.1	0.2	-	0.0	1.4
35–44	6.3	0.7	0.8	7.8	-	0.2	0.0	0.3	0.2	0.7	0.9	0.1	1.0	-	0.3	9.8
45–54	21.0	2.2	6.1	29.3	0.4	1.2	0.2	1.0	3.5	5.9	4.3	1.3	5.7	0.2	1.2	42.7
55–64	42.4	4.5	2.8	49.8	0.7	1.4	0.9	0.8	4.5	7.6	7.8	2.2	9.9	0.2	2.0	70.2
65–74	84.8	9.0	4.8	98.6	1.1	3.6	1.7	2.2	10.8	18.3	21.3	5.1	26.4	1.6	4.2	150.1
75-84	105.1	11.2	7.9	124.2	7.0	4.1	1.8	1.9	6.1	13.9	24.5	5.9	30.4	2.5	5.1	183.2
85+	49.2	5.2	2.7	57.0	13.5	1.9	0.1	0.5	2.2	4.7	10.1	2.4	12.5	1.2	2.6	91.5
Total F	**309.9**	**32.9**	**25.2**	**368.0**	**22.6**	**12.5**	**4.7**	**6.7**	**27.3**	**51.2**	**69.1**	**17.1**	**86.2**	**5.8**	**15.3**	**549.1**
Person																
0-4	0.0	0.0	-	0.0	-	0.0	-	-	0.1	0.1	0.2	-	0.2	-	0.0	0.3
5–14	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
15–24	0.3	0.0	-	0.3	-	0.0	-	0.0	0.0	0.1	0.1	0.0	0.1	-	0.0	0.5
25–34	3.6	0.4	0.4	4.4	-	0.2	0.0	0.1	1.0	1.4	0.4	0.1	0.5	-	0.2	6.5
35–44	29.3	3.1	6.2	38.7	-	0.7	0.3	0.8	2.1	3.8	3.5	0.5	4.0	1.2	1.4	49.1
45–54	101.8	10.8	10.7	123.2	0.4	3.7	1.4	2.8	11.3	19.2	14.1	2.9	17.0	0.7	4.6	165.2
55–64	181.0	19.2	14.7	215.0	0.8	5.1	2.2	3.6	13.9	24.8	29.3	6.9	36.2	1.7	8.0	286.5
65–74	262.0	27.8	13.4	303.2	1.2	9.1	3.4	5.7	22.4	40.7	56.5	10.3	66.8	3.2	11.9	427.0
75-84	236.1	25.0	11.8	273.0	7.7	8.8	3.0	4.0	15.2	31.0	51.2	10.0	61.2	6.8	10.9	390.7
85+	80.2	8.5	3.6	92.3	14.6	3.0	0.1	0.9	4.7	8.7	15.4	3.2	18.6	2.2	3.9	140.2
Total	**894.4**	**94.9**	**60.9**	**1,050.2**	**24.7**	**30.6**	**10.4**	**18.0**	**70.7**	**129.7**	**170.7**	**34.0**	**204.6**	**15.8**	**41.0**	**1,466.0**

TABLE B-16 STROKE, DIRECT HEALTH COSTS 2000-01 ($M), BY AGE, GENDER AND TYPE

	Hospitals					Medical services					Pharmaceuticals					
	Inpatients															
Age group	Hospitals	Private in-hosp medical services	Out-patients	Total hospital	Aged care homes	Unreferred attend-ances	Imaging	Pathology	Other medical	Total out-of-hospital medical	Pre-scription	Over-the-counter	Total	Other health pro-fessionals	Research	Total
Male																
0-4	0.4	0.0	-	0.4		-	-	-	-	-	0.0	-	0.0	-	0.0	0.4
5–14	0.4	0.0	-	0.4		-	-	-	-	-	0.0	-	0.0	-	0.0	0.5
15–24	0.8	0.1	0.2	1.1		0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.2	0.0	1.4
25–34	2.7	0.3	-	3.0		0.0	0.1	-	0.2	0.3	0.2	0.0	0.2	0.1	0.1	3.7
35–44	5.3	0.6	-	5.9		0.1	0.2	0.1	0.3	0.6	0.1	0.1	0.3	-	0.2	7.0
45–54	12.5	1.3	0.3	14.1	9.7	0.3	0.5	0.1	0.7	1.6	0.5	0.2	0.8	0.1	0.8	27.0
55–64	19.6	2.1	-	21.7	26.6	0.7	0.9	0.2	0.8	2.6	2.4	0.9	3.3	0.3	1.6	56.1
65–74	38.0	4.0	9.9	51.9	69.5	1.1	0.8	0.6	0.6	3.0	4.8	1.0	5.8	1.4	3.8	135.4
75-84	46.7	5.0	-	51.6	68.4	1.5	2.3	0.7	1.2	5.7	4.4	0.7	5.1	4.2	3.9	139.0
85+	20.1	2.1	-	22.3	26.0	0.5	0.3	0.0	0.0	0.9	1.6	0.2	1.9	-	1.5	52.5
Total M	**146.4**	**15.5**	**10.4**	**172.4**	**200.2**	**4.2**	**5.2**	**1.7**	**3.7**	**14.8**	**14.0**	**3.2**	**17.2**	**6.5**	**11.8**	**422.9**
Female																
0-4	0.3	0.0	-	0.4		-	-	-	-	-	0.0	-	0.0	-	0.0	0.4
5–14	0.4	0.0	-	0.4		-	-	-	-	-	0.0	-	0.0	-	0.0	0.4
15–24	0.7	0.1	-	0.8		0.1	-	-	0.0	0.1	0.0	0.1	0.1	-	0.0	1.0
25–34	2.1	0.2	0.1	2.4		0.1	0.3	-	0.1	0.5	0.2	0.0	0.2	-	0.1	3.1
35–44	4.2	0.4	-	4.7		0.2	0.1	0.1	0.1	0.5	0.4	0.2	0.5	0.2	0.2	6.2
45–54	10.2	1.1	-	11.3	6.1	0.2	0.4	0.1	0.0	0.8	0.3	0.2	0.5	-	0.5	19.2
55–64	13.3	1.4	-	14.7	10.1	0.4	0.4	0.2	0.2	1.2	1.2	0.7	1.9	0.2	0.8	28.9
65–74	28.2	3.0	0.4	31.7	30.3	0.8	1.2	0.5	0.7	3.2	2.4	0.7	3.1	1.0	2.0	71.2
75-84	55.0	5.8	12.4	73.2	94.6	1.6	1.3	0.8	0.4	4.1	4.2	0.7	4.9	1.1	5.1	183.1
85+	38.0	4.0	6.2	48.3	101.0	1.0	0.4	0.1	0.7	2.1	1.9	0.3	2.2	0.7	4.4	158.6
Total F	**152.5**	**16.2**	**19.1**	**187.8**	**242.1**	**4.3**	**4.1**	**1.9**	**2.2**	**12.4**	**10.6**	**2.9**	**13.4**	**3.1**	**13.2**	**472.1**
Person																
0-4	0.7	0.1	-	0.8	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.8
5–14	0.8	0.1	-	0.8	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.9
15–24	1.5	0.2	0.2	1.9	-	0.1	-	-	0.0	0.1	0.0	0.1	0.1	0.2	0.1	2.3
25–34	4.8	0.5	0.1	5.4	-	0.1	0.3	-	0.3	0.8	0.3	0.0	0.4	0.1	0.2	6.8
35–44	9.5	1.0	-	10.6	-	0.3	0.3	0.2	0.4	1.2	0.5	0.3	0.8	0.2	0.4	13.1
45–54	22.6	2.4	0.3	25.3	15.8	0.5	0.9	0.2	0.8	2.4	0.8	0.4	1.2	0.1	1.3	46.2
55–64	32.9	3.5	-	36.4	36.7	1.1	1.4	0.4	0.9	3.8	3.6	1.6	5.2	0.5	2.4	85.0
65–74	66.3	7.0	10.3	83.6	99.8	1.8	2.1	1.1	1.2	6.2	7.2	1.7	8.9	2.4	5.8	206.6
75-84	101.7	10.8	12.4	124.9	163.0	3.1	3.6	1.4	1.6	9.8	8.6	1.4	10.0	5.3	9.0	322.0
85+	58.2	6.2	6.2	70.6	127.1	1.5	0.7	0.1	0.7	3.0	3.5	0.5	4.0	0.7	5.9	211.2
Total	**299.0**	**31.7**	**29.5**	**360.2**	**442.3**	**8.5**	**9.3**	**3.5**	**5.9**	**27.2**	**24.6**	**6.0**	**30.6**	**9.6**	**25.0**	**895.0**

TABLE B-17 PERIPHERAL VASCULAR DISEASE, DIRECT HEALTH COSTS 2000-01 ($M), BY AGE, GENDER AND TYPE

	Hospitals					Medical services					Pharmaceuticals					
Age group	Hospitals	Inpatients Private in-hosp medical services	Out-patients	Total hospital	Aged care homes	Unreferred attend-ances	Imaging	Pathology	Other medical	Total out-of-hospital medical	Pre-scription	Over-the-counter	Total	Other health pro-fessionals	Research	Total
Male																
0-4	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
5–14	0.0	0.0	0.0	0.0	-	-	-	-	-	-	0.0	0.0	0.0	-	0.0	0.1
15–24	0.3	0.0	0.5	0.8	-	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.2
25–34	0.5	0.1	-	0.5	-	0.0	0.0	-	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.9
35–44	0.9	0.1	3.7	4.7	-	0.0	0.1	0.0	0.0	0.2	0.0	0.1	0.2	-	0.1	5.2
45–54	3.8	0.4	0.4	4.6	-	0.2	0.5	0.2	0.4	1.3	0.4	0.2	0.6	0.1	0.2	6.9
55–64	10.9	1.2	3.0	15.1	-	0.5	0.6	0.2	0.9	2.2	1.1	1.2	2.3	0.3	0.6	20.4
65–74	21.9	2.3	4.6	28.8	-	0.9	0.8	0.7	2.1	4.6	1.9	1.1	3.0	0.3	1.1	37.6
75-84	26.3	2.8	-	29.1	-	1.1	1.1	0.3	1.3	3.9	2.6	1.0	3.6	2.1	1.1	39.8
85+	7.1	0.7	-	7.8	-	0.2	0.0	0.0	0.2	0.5	0.3	0.1	0.4	-	0.2	8.9
Total M	**71.8**	**7.6**	**12.2**	**91.6**	**-**	**3.0**	**3.2**	**1.5**	**4.9**	**12.7**	**6.3**	**3.8**	**10.1**	**3.2**	**3.4**	**121.0**
Female																
0-4	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.0
5–14	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.0
15–24	0.1	0.0	-	0.1	-	0.1	0.2	0.4	0.0	0.7	0.0	0.0	0.1	-	0.0	0.9
25–34	0.4	0.0	0.3	0.7	-	0.0	-	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.9
35–44	0.9	0.1	-	1.0	-	0.1	0.2	0.2	0.0	0.5	0.3	0.1	0.3	-	0.1	1.9
45–54	2.0	0.2	-	2.2	-	0.1	0.1	0.0	0.1	0.3	0.1	0.3	0.4	-	0.1	3.0
55–64	3.9	0.4	-	4.3	-	0.4	0.4	0.2	0.3	1.3	1.0	0.5	1.5	0.0	0.2	7.3
65–74	11.0	1.2	4.8	17.0	-	0.4	0.7	0.2	0.6	1.9	1.1	1.1	2.2	0.1	0.6	21.9
75-84	20.1	2.1	-	22.3	-	0.8	1.1	0.5	0.6	3.0	1.6	0.7	2.2	0.1	0.8	28.3
85+	11.3	1.2	-	12.5	-	0.4	0.1	0.1	0.1	0.6	0.6	0.3	0.9	-	0.4	14.4
Total F	**49.8**	**5.3**	**5.1**	**60.2**	**-**	**2.4**	**2.8**	**1.7**	**1.6**	**8.5**	**4.6**	**2.9**	**7.5**	**0.2**	**2.2**	**78.7**
Person																
0-4	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
5–14	0.0	0.0	0.0	0.1	-	-	-	-	-	-	0.0	0.0	0.0	-	0.0	0.1
15–24	0.5	0.0	0.5	1.0	-	0.1	0.2	0.4	0.0	0.7	0.1	0.0	0.1	0.3	0.1	2.1
25–34	0.9	0.1	0.3	1.3	-	0.1	0.0	0.1	0.0	0.2	0.1	0.0	0.1	0.2	0.0	1.8
35–44	1.9	0.2	3.7	5.7	-	0.2	0.3	0.2	0.0	0.7	0.3	0.2	0.5	-	0.2	7.1
45–54	5.8	0.6	0.4	6.8	-	0.4	0.6	0.2	0.4	1.7	0.5	0.5	1.0	0.1	0.3	9.9
55–64	14.8	1.6	3.0	19.4	-	0.9	1.0	0.4	1.2	3.5	2.0	1.7	3.7	0.3	0.8	27.7
65–74	32.9	3.5	9.4	45.8	-	1.3	1.6	0.9	2.7	6.5	3.0	2.1	5.1	0.4	1.7	59.5
75-84	46.5	4.9	-	51.4	-	1.9	2.2	0.8	1.9	6.8	4.1	1.7	5.8	2.1	1.9	68.1
85+	18.3	1.9	-	20.3	-	0.6	0.1	0.1	0.3	1.1	0.9	0.4	1.2	-	0.7	23.3
Total	**121.6**	**12.9**	**17.4**	**151.8**	**-**	**5.4**	**6.0**	**3.2**	**6.6**	**21.2**	**10.9**	**6.7**	**17.6**	**3.4**	**5.6**	**199.6**

TABLE B-18 TOTAL CARDIOVASCULAR DISEASE, DIRECT HEALTH COSTS 2000-01 ($M), BY AGE, GENDER AND TYPE

	Hospitals				Medical services						Pharmaceuticals					
Age group	Hospitals	Inpatients Private in-hosp medical services	Out-patients	Total hospital	Aged care homes	Unreferred attend-ances	Imaging	Pathology	Other medical	Total out-of-hospital medical	Pre-scription	Over-the-counter	Total	Other health pro-fessionals	Research	Total
Male																
0-4	1.9	0.2	4.3	6.5	-	0.3	0.1	0.1	0.4	0.9	1.1	0.1	1.2	-	0.2	8.8
5–14	3.0	0.3	4.0	7.4	-	0.4	0.1	0.1	0.6	1.3	0.6	0.2	0.8	-	0.3	9.8
15–24	7.5	0.8	7.6	15.9	-	1.4	0.7	0.4	0.8	3.4	1.7	0.4	2.1	0.5	0.6	22.6
25–34	18.2	1.9	8.5	28.6	-	3.8	1.7	2.3	3.2	11.0	7.0	1.8	8.7	1.3	1.4	51.0
35–44	50.7	5.4	15.3	71.3	-	9.9	2.4	5.6	6.7	24.6	26.5	7.7	34.2	6.5	3.9	140.6
45–54	133.9	14.2	22.1	170.2	9.8	22.7	6.6	12.8	18.3	60.4	75.5	16.9	92.4	2.4	9.6	344.8
55–64	229.4	24.3	24.2	278.0	28.0	31.5	7.8	16.0	22.2	77.5	128.0	29.8	157.8	6.3	15.7	563.3
65–74	337.1	35.8	50.9	423.8	71.4	38.6	10.3	20.7	32.5	102.2	169.2	30.0	199.1	7.0	23.1	826.6
75-84	309.0	32.8	9.1	350.8	74.9	30.4	9.4	14.6	25.3	79.7	122.0	17.2	139.2	16.9	19.0	680.7
85+	85.5	9.1	2.4	97.0	37.2	7.0	2.5	3.1	9.0	21.7	23.3	3.3	26.6	1.0	5.3	188.8
Total M	**1,176.2**	**124.8**	**148.5**	**1,449.5**	**221.4**	**146.0**	**41.7**	**75.8**	**119.1**	**382.6**	**554.9**	**107.3**	**662.3**	**41.8**	**79.3**	**2,836.8**
Female																
0-4	2.0	0.2	0.5	2.7	-	0.2	0.1	0.0	0.4	0.8	1.7	0.1	1.7	-	0.2	5.4
5–14	2.8	0.3	0.9	4.0	-	0.4	0.1	0.1	0.1	0.7	0.4	0.1	0.5	-	0.1	5.4
15–24	6.1	0.7	1.7	8.5	-	1.9	0.8	1.1	2.0	5.8	1.6	0.5	2.1	-	0.5	16.9
25–34	16.5	1.8	14.1	32.4	-	4.6	1.9	2.3	6.4	15.3	6.7	2.5	9.3	1.4	1.7	59.9
35–44	31.9	3.4	8.6	43.9	-	9.8	3.7	5.2	8.7	27.3	20.3	8.5	28.8	1.8	2.9	104.6
45–54	61.9	6.6	45.0	113.5	7.1	22.2	6.2	12.0	13.1	53.5	66.8	22.4	89.2	5.4	7.7	276.5
55–64	99.6	10.6	20.4	130.5	11.9	31.1	8.1	15.3	18.5	73.0	116.5	32.7	149.2	2.4	10.6	377.6
65–74	194.4	20.6	18.0	233.0	33.2	41.7	10.4	18.2	26.6	96.8	173.8	39.4	213.2	9.7	16.8	602.8
75-84	279.6	29.7	28.8	338.1	114.2	42.4	11.2	16.8	24.1	94.4	163.9	29.7	193.6	13.4	21.7	775.4
85+	149.5	15.9	11.7	177.0	138.4	16.0	2.9	4.3	9.1	32.4	51.1	9.7	60.8	2.0	11.8	422.4
Total F	**844.3**	**89.6**	**149.7**	**1,083.6**	**304.9**	**170.3**	**45.3**	**75.3**	**108.9**	**399.8**	**602.9**	**145.5**	**748.4**	**36.1**	**74.0**	**2,646.8**
Person																
0-4	3.9	0.4	4.9	9.2	-	0.6	0.2	0.1	0.8	1.7	2.8	0.2	2.9	-	0.4	14.2
5–14	5.8	0.6	4.9	11.3	-	0.8	0.3	0.3	0.7	2.0	1.0	0.3	1.3	-	0.4	15.1
15–24	13.6	1.4	9.3	24.4	-	3.3	1.5	1.5	2.9	9.2	3.4	0.9	4.2	0.5	1.1	39.4
25–34	34.7	3.7	22.6	61.0	-	8.4	3.6	4.5	9.7	26.3	13.7	4.3	18.0	2.6	3.1	110.9
35–44	82.6	8.8	23.8	115.2	-	19.7	6.0	10.8	15.4	51.9	46.8	16.2	63.0	8.3	6.9	245.2
45–54	195.8	20.8	67.1	283.7	17.0	44.8	12.8	24.8	31.4	113.8	142.3	39.3	181.6	7.8	17.4	621.3
55–64	329.0	34.9	44.6	408.5	39.9	62.5	15.9	31.3	40.7	150.5	244.5	62.5	307.0	8.7	26.3	940.9
65–74	531.5	56.4	68.9	656.8	104.6	80.3	20.7	38.9	59.1	199.0	343.0	69.3	412.3	16.7	39.9	1,429.3
75-84	588.6	62.4	37.9	688.9	189.1	72.8	20.6	31.4	49.4	174.1	285.9	46.9	332.8	30.4	40.7	1,456.0
85+	235.1	24.9	14.1	274.1	175.6	23.0	5.4	7.5	18.1	54.0	74.4	13.0	87.4	3.0	17.1	611.2
Total	**2,020.6**	**214.3**	**298.2**	**2,533.0**	**526.3**	**316.3**	**87.0**	**151.1**	**228.0**	**782.4**	**1,157.9**	**252.8**	**1,410.7**	**78.0**	**153.2**	**5,483.6**

TABLE B-19 CORONARY HEART DISEASE, DIRECT HEALTH COSTS 2004 ($M), BY AGE, GENDER AND TYPE

	Hospitals				Medical services						Pharmaceuticals					
Age group	Hospitals	Inpatients Private in-hosp medical services	Out-patients	Total hospital	Aged care homes	Unreferred attend-ances	Imaging	Pathology	Other medical	Total out-of-hospital medical	Pre-scription	Over-the-counter	Total	Other health pro-fessionals	Research	Total
Male																
0-4	0.0	0.0	-	0.0	-	-	-	-	0.1	0.1	0.1	-	0.1	-	0.0	0.2
5–14	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
15–24	0.2	0.0	-	0.3	-	0.0	-	-	0.0	0.0	0.1	0.0	0.1	-	0.0	0.4
25–34	2.9	0.3	0.5	3.7	-	0.2	0.0	0.1	1.1	1.5	0.3	0.0	0.3	-	0.2	5.6
35–44	25.7	2.7	6.0	34.5	-	0.6	0.3	0.5	2.1	3.5	2.9	0.4	3.4	1.4	1.2	44.0
45–54	92.1	9.8	5.2	107.0	0.0	2.9	1.3	2.1	8.9	15.1	11.2	1.8	12.9	0.6	3.9	139.6
55–64	176.0	18.7	15.1	209.8	0.2	4.6	1.7	3.6	11.9	21.7	27.4	6.0	33.3	1.9	7.7	274.6
65–74	204.8	21.7	9.9	236.4	0.2	6.3	2.0	4.0	13.5	25.9	40.7	6.0	46.7	1.9	8.9	320.1
75-84	163.6	17.3	4.9	185.8	0.8	5.9	1.5	2.7	11.4	21.5	33.2	5.2	38.4	5.3	7.2	259.1
85+	39.6	4.2	1.2	45.0	1.4	1.3	0.1	0.5	3.2	5.1	6.7	1.1	7.8	1.2	1.7	62.3
Total M	**704.9**	**74.8**	**42.8**	**822.5**	**2.7**	**21.8**	**6.9**	**13.6**	**52.1**	**94.4**	**122.7**	**20.5**	**143.2**	**12.2**	**30.9**	**1,105.9**
Female																
0-4	0.0	0.0	-	0.0	-	0.0	-	-	0.0	0.0	0.0	-	0.0	-	0.0	0.1
5–14	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.0
15–24	0.1	0.0	-	0.1	-	0.0	-	0.0	0.0	0.1	0.0	-	0.0	-	0.0	0.2
25–34	1.1	0.1	-	1.2	-	0.0	-	-	0.0	0.0	0.2	0.1	0.2	-	0.0	1.6
35–44	7.1	0.8	0.9	8.8	-	0.2	0.1	0.3	0.2	0.8	1.0	0.1	1.1	-	0.3	11.0
45–54	24.1	2.6	7.0	33.7	0.4	1.4	0.2	1.1	4.1	6.8	5.0	1.5	6.5	0.3	1.4	49.1
55–64	54.3	5.8	3.6	63.7	0.9	1.9	1.1	1.1	5.8	9.8	9.9	2.8	12.7	0.3	2.5	89.8
65–74	96.7	10.3	5.5	112.5	1.2	4.2	1.9	2.6	12.3	20.9	24.3	5.8	30.1	1.8	4.8	171.2
75-84	125.4	13.3	9.4	148.2	8.4	4.8	2.2	2.2	7.3	16.5	29.3	7.0	36.3	3.0	6.1	218.5
85+	60.6	6.4	3.3	70.3	16.6	2.4	0.1	0.6	2.7	5.7	12.4	3.0	15.4	1.5	3.1	112.7
Total F	**369.4**	**39.2**	**29.8**	**438.4**	**27.5**	**14.9**	**5.5**	**7.9**	**32.3**	**60.6**	**82.1**	**20.3**	**102.4**	**6.9**	**18.3**	**654.2**
Person																
0-4	0.0	0.0	-	0.0	-	0.0	-	-	0.1	0.1	0.2	-	0.2	-	0.0	0.3
5–14	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
15–24	0.3	0.0	-	0.4	-	0.0	-	0.0	0.0	0.1	0.1	0.0	0.1	-	0.0	0.6
25–34	4.0	0.4	0.5	4.9	-	0.2	0.0	0.1	1.1	1.5	0.5	0.1	0.6	-	0.2	7.2
35–44	32.8	3.5	6.9	43.2	-	0.8	0.3	0.8	2.3	4.3	3.9	0.6	4.5	1.4	1.5	54.9
45–54	116.2	12.3	12.2	140.8	0.4	4.3	1.6	3.2	12.9	21.9	16.2	3.3	19.5	0.9	5.3	188.7
55–64	230.2	24.4	18.7	273.4	1.0	6.5	2.8	4.6	17.7	31.5	37.3	8.8	46.1	2.2	10.2	364.4
65–74	301.5	32.0	15.4	348.9	1.4	10.5	3.9	6.6	25.8	46.8	64.9	11.8	76.8	3.7	13.7	491.3
75-84	289.0	30.6	14.3	334.0	9.2	10.7	3.6	4.9	18.7	38.0	62.5	12.2	74.7	8.3	13.3	477.5
85+	100.2	10.6	4.5	115.3	18.0	3.7	0.2	1.1	5.9	10.9	19.2	4.0	23.2	2.7	4.9	174.9
Total	**1,074.4**	**114.0**	**72.6**	**1,260.9**	**30.1**	**36.7**	**12.4**	**21.5**	**84.4**	**155.1**	**204.8**	**40.8**	**245.6**	**19.1**	**49.2**	**1,760.0**

TABLE B-20 STROKE, DIRECT HEALTH COSTS 2004 ($M), BY AGE, GENDER AND TYPE

	Hospitals				Medical services						Pharmaceuticals					
Age group	Hospitals	Inpatients Private in-hosp medical services	Out-patients	Total hospital	Aged care homes	Unreferred attend-ances	Imaging	Pathology	Other medical	Total out-of-hospital medical	Pre-scription	Over-the-counter	Total	Other health pro-fessionals	Research	Total
Male																
0-4	0.4	0.0	-	0.4	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.4
5–14	0.4	0.0	-	0.5	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.5
15–24	0.9	0.1	0.2	1.2	-	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.6
25–34	3.0	0.3	-	3.3	-	0.0	0.1	-	0.2	0.3	0.2	0.0	0.2	0.1	0.1	4.1
35–44	6.0	0.6	-	6.6	-	0.1	0.2	0.1	0.3	0.7	0.1	0.2	0.3	-	0.2	7.8
45–54	14.2	1.5	0.3	16.0	11.1	0.3	0.6	0.1	0.8	1.8	0.6	0.3	0.9	0.1	0.9	30.8
55–64	24.9	2.6	-	27.5	33.8	0.9	1.2	0.3	1.0	3.3	3.0	1.2	4.2	0.4	2.0	71.2
65–74	43.9	4.7	11.5	60.0	80.3	1.2	1.0	0.6	0.6	3.5	5.6	1.1	6.7	1.6	4.4	156.5
75-84	58.3	6.2	-	64.5	85.4	1.9	2.9	0.8	1.5	7.2	5.5	0.8	6.3	5.3	4.8	173.5
85+	25.7	2.7	-	28.4	33.2	0.7	0.4	0.1	0.0	1.2	2.1	0.3	2.4	-	1.9	67.1
Total M	**177.7**	**18.8**	**12.0**	**208.5**	**243.8**	**5.1**	**6.3**	**2.0**	**4.5**	**18.0**	**17.1**	**3.9**	**21.0**	**7.9**	**14.3**	**513.5**
Female																
0-4	0.4	0.0	-	0.4	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.5
5–14	0.4	0.0	-	0.4	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.4
15–24	0.8	0.1	-	0.9	-	0.1	-	-	0.0	0.1	0.0	0.1	0.1	-	0.0	1.1
25–34	2.3	0.2	0.1	2.7	-	0.1	0.3	-	0.1	0.5	0.2	0.0	0.2	-	0.1	3.5
35–44	4.7	0.5	-	5.2	-	0.2	0.1	0.2	0.2	0.6	0.4	0.2	0.6	0.3	0.2	6.9
45–54	11.7	1.2	-	13.0	7.0	0.3	0.5	0.2	0.0	0.9	0.3	0.2	0.5	-	0.6	22.1
55–64	17.0	1.8	-	18.9	12.9	0.5	0.6	0.3	0.2	1.6	1.5	0.9	2.4	0.2	1.0	37.0
65–74	32.2	3.4	0.5	36.1	34.6	0.9	1.4	0.6	0.8	3.6	2.7	0.8	3.5	1.1	2.3	81.2
75-84	65.7	7.0	14.8	87.4	112.9	1.9	1.6	0.9	0.5	4.9	5.1	0.8	5.9	1.3	6.1	218.4
85+	46.9	5.0	7.7	59.5	124.5	1.2	0.4	0.1	0.8	2.5	2.3	0.4	2.7	0.8	5.5	195.4
Total F	**182.1**	**19.3**	**23.0**	**224.4**	**291.8**	**5.1**	**4.8**	**2.2**	**2.6**	**14.7**	**12.6**	**3.4**	**16.0**	**3.7**	**15.8**	**566.5**
Person																
0-4	0.7	0.1	-	0.8	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.9
5–14	0.8	0.1	-	0.9	-	-	-	-	-	-	0.0	-	0.0	-	0.0	1.0
15–24	1.8	0.2	0.2	2.2	-	0.1	-	-	0.0	0.1	0.0	0.1	0.1	0.3	0.1	2.7
25–34	5.3	0.6	0.1	6.0	-	0.1	0.4	-	0.3	0.8	0.4	0.0	0.4	0.1	0.2	7.6
35–44	10.7	1.1	-	11.8	-	0.3	0.3	0.3	0.5	1.3	0.5	0.4	0.9	0.3	0.4	14.7
45–54	25.9	2.8	0.3	29.0	18.1	0.6	1.1	0.2	0.9	2.8	0.9	0.4	1.4	0.1	1.5	52.9
55–64	41.9	4.4	-	46.4	46.6	1.4	1.7	0.5	1.2	4.9	4.6	2.1	6.6	0.6	3.0	108.2
65–74	76.1	8.1	11.9	96.1	114.8	2.1	2.4	1.2	1.4	7.1	8.3	1.9	10.2	2.7	6.6	237.7
75-84	123.9	13.1	14.8	151.8	198.3	3.8	4.5	1.8	2.0	12.0	10.6	1.7	12.2	6.6	11.0	391.9
85+	72.6	7.7	7.7	87.9	157.7	1.9	0.9	0.2	0.9	3.7	4.4	0.7	5.0	0.8	7.3	262.6
Total	**359.8**	**38.2**	**35.0**	**433.0**	**535.6**	**10.2**	**11.2**	**4.2**	**7.1**	**32.7**	**29.7**	**7.3**	**37.0**	**11.6**	**30.2**	**1,080.0**

TABLE B-21 PERIPHERAL VASCULAR DISEASE, DIRECT HEALTH COSTS 2004 ($M), BY AGE, GENDER AND TYPE

	Hospitals				Medical services						Pharmaceuticals					
	Inpatients															
Age group	Hospitals	Private in-hosp medical services	Out-patients	Total hospital	Aged care homes	Unreferred attend-ances	Imaging	Pathology	Other medical	Total out-of-hospital medical	Pre-scription	Over-the-counter	Total	Other health pro-fessionals	Research	Total
Male																
0-4	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
5–14	0.0	0.0	0.0	0.0	-	-	-	-	-	-	0.0	0.0	0.0	-	0.0	0.1
15–24	0.4	0.0	0.5	1.0	-	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.4
25–34	0.5	0.1	-	0.6	-	0.0	0.1	-	0.0	0.1	0.0	0.0	0.1	0.2	0.0	0.9
35–44	1.0	0.1	4.1	5.3	-	0.1	0.1	0.0	0.0	0.2	0.0	0.2	0.2	-	0.2	5.8
45–54	4.3	0.5	0.5	5.3	-	0.3	0.5	0.2	0.5	1.5	0.5	0.3	0.7	0.2	0.2	7.9
55–64	13.8	1.5	3.9	19.2	-	0.6	0.7	0.2	1.1	2.8	1.3	1.5	2.9	0.4	0.7	25.9
65–74	25.3	2.7	5.3	33.3	-	1.1	0.9	0.8	2.4	5.3	2.2	1.2	3.4	0.3	1.2	43.5
75-84	32.9	3.5	-	36.3	-	1.3	1.4	0.4	1.6	4.8	3.2	1.3	4.5	2.6	1.4	49.6
85+	9.0	1.0	-	10.0	-	0.2	0.0	0.0	0.3	0.6	0.3	0.1	0.5	-	0.3	11.4
Total M	**87.4**	**9.3**	**14.3**	**111.0**	**-**	**3.6**	**3.9**	**1.8**	**6.0**	**15.3**	**7.7**	**4.6**	**12.3**	**3.9**	**4.1**	**146.6**
Female																
0-4	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.0
5–14	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.0
15–24	0.2	0.0	-	0.2	-	0.1	0.2	0.4	0.0	0.8	0.1	0.0	0.1	-	0.0	1.1
25–34	0.4	0.0	0.3	0.8	-	0.0	-	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	1.0
35–44	1.0	0.1	-	1.1	-	0.1	0.2	0.2	0.0	0.6	0.3	0.1	0.4	-	0.1	2.2
45–54	2.3	0.2	-	2.5	-	0.1	0.2	0.0	0.1	0.4	0.1	0.3	0.4	-	0.1	3.4
55–64	5.0	0.5	-	5.5	-	0.5	0.5	0.3	0.4	1.7	1.2	0.6	1.9	0.1	0.3	9.4
65–74	12.6	1.3	5.5	19.4	-	0.5	0.8	0.2	0.6	2.2	1.2	1.2	2.5	0.1	0.7	24.9
75-84	24.0	2.5	-	26.6	-	1.0	1.3	0.6	0.7	3.5	1.9	0.8	2.7	0.1	0.9	33.8
85+	13.9	1.5	-	15.3	-	0.5	0.1	0.1	0.1	0.8	0.8	0.3	1.1	-	0.5	17.7
Total F	**59.4**	**6.3**	**5.8**	**71.5**	**-**	**2.9**	**3.4**	**2.0**	**1.9**	**10.1**	**5.6**	**3.4**	**9.0**	**0.3**	**2.6**	**93.5**
Person																
0-4	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
5–14	0.0	0.0	0.0	0.1	-	-	-	-	-	-	0.0	0.0	0.0	-	0.0	0.1
15–24	0.5	0.1	0.5	1.1	-	0.1	0.2	0.4	0.0	0.8	0.1	0.0	0.1	0.3	0.1	2.4
25–34	1.0	0.1	0.3	1.4	-	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.2	0.1	2.0
35–44	2.1	0.2	4.1	6.4	-	0.2	0.3	0.2	0.0	0.8	0.3	0.3	0.6	-	0.2	8.0
45–54	6.6	0.7	0.5	7.8	-	0.4	0.7	0.3	0.5	1.9	0.6	0.6	1.2	0.2	0.3	11.3
55–64	18.8	2.0	3.9	24.7	-	1.1	1.3	0.5	1.5	4.4	2.6	2.2	4.8	0.4	1.0	35.3
65–74	37.9	4.0	10.8	52.7	-	1.5	1.8	1.1	3.1	7.5	3.4	2.4	5.9	0.4	1.9	68.4
75-84	56.9	6.0	-	62.9	-	2.3	2.7	1.0	2.4	8.4	5.1	2.1	7.1	2.7	2.3	83.4
85+	22.9	2.4	-	25.3	-	0.7	0.1	0.1	0.4	1.4	1.1	0.5	1.6	-	0.8	29.1
Total	**146.8**	**15.6**	**20.2**	**182.6**	**-**	**6.5**	**7.2**	**3.8**	**7.9**	**25.4**	**13.2**	**8.0**	**21.3**	**4.2**	**6.7**	**240.1**

TABLE B-22 TOTAL CARDIOVASCULAR DISEASE, DIRECT HEALTH COSTS 2004 ($M), BY AGE, GENDER AND TYPE

	Hospitals					Medical services					Pharmaceuticals					
Age group	Hospitals	Inpatients Private in-hosp medical services	Out-patients	Total hospital	Aged care homes	Unreferred attend-ances	Imaging	Pathology	Other medical	Total out-of-hospital medical	Pre-scription	Over-the-counter	Total	Other health pro-fessionals	Research	Total
Male																
0-4	2.1	0.2	4.7	7.0	-	0.3	0.2	0.1	0.4	1.0	1.2	0.1	1.3	-	0.3	9.6
5–14	3.4	0.4	4.5	8.2	-	0.4	0.1	0.2	0.7	1.4	0.7	0.2	0.9	-	0.3	10.9
15–24	8.7	0.9	8.8	18.4	-	1.6	0.9	0.5	1.0	3.9	2.0	0.5	2.5	0.6	0.7	26.1
25–34	20.2	2.1	9.4	31.8	-	4.2	1.9	2.5	3.6	12.2	7.7	2.0	9.7	1.4	1.6	56.7
35–44	56.7	6.0	17.1	79.8	-	11.1	2.6	6.3	7.5	27.5	29.7	8.6	38.3	7.3	4.4	157.3
45–54	152.5	16.2	25.2	193.9	11.2	25.9	7.5	14.6	20.8	68.8	86.1	19.3	105.3	2.7	11.0	392.9
55–64	291.2	30.9	30.7	352.9	35.5	40.0	10.0	20.3	28.2	98.4	162.5	37.9	200.3	8.0	20.0	715.1
65–74	389.6	41.3	58.9	489.8	82.5	44.6	11.9	24.0	37.6	118.1	195.5	34.6	230.2	8.1	26.7	955.4
75-84	385.8	40.9	11.3	438.0	93.6	38.0	11.8	18.2	31.6	99.6	152.3	21.4	173.8	21.2	23.7	849.8
85+	109.3	11.6	3.1	124.0	47.5	8.9	3.2	4.0	11.5	27.7	29.8	4.2	34.0	1.3	6.7	241.2
Total M	**1,419.5**	**150.6**	**173.8**	**1,743.9**	**270.4**	**175.1**	**50.0**	**90.6**	**142.9**	**458.5**	**667.5**	**128.8**	**796.3**	**50.4**	**95.4**	**3,414.9**
Female																
0-4	2.2	0.2	0.6	3.0	-	0.3	0.1	0.1	0.4	0.8	1.8	0.1	1.9	-	0.2	5.8
5–14	3.1	0.3	1.0	4.4	-	0.4	0.1	0.1	0.1	0.8	0.5	0.1	0.6	-	0.2	6.0
15–24	7.1	0.8	2.0	9.9	-	2.2	0.9	1.3	2.3	6.7	1.9	0.5	2.4	-	0.5	19.6
25–34	18.3	1.9	15.6	35.8	-	5.1	2.1	2.5	7.1	16.9	7.4	2.8	10.2	1.5	1.9	66.3
35–44	35.6	3.8	9.6	49.0	-	10.9	4.1	5.8	9.7	30.5	22.7	9.5	32.2	2.0	3.3	116.9
45–54	71.3	7.6	51.9	130.7	8.2	25.5	7.1	13.8	15.1	61.6	77.0	25.8	102.7	6.2	8.9	318.4
55–64	127.4	13.5	26.0	167.0	15.3	39.7	10.3	19.6	23.7	93.4	149.1	41.8	190.9	3.1	13.5	483.1
65–74	221.7	23.5	20.6	265.7	37.9	47.5	11.8	20.7	30.3	110.4	198.3	44.9	243.2	11.0	19.2	687.4
75-84	333.5	35.4	34.4	403.2	136.2	50.5	13.3	20.0	28.7	112.6	195.5	35.4	230.9	16.0	25.8	924.9
85+	184.2	19.5	14.4	218.1	170.5	19.7	3.6	5.3	11.2	39.9	62.9	11.9	74.9	2.4	14.5	520.3
Total F	**1,004.4**	**106.5**	**175.9**	**1,286.8**	**368.1**	**202.1**	**53.5**	**89.3**	**128.7**	**473.6**	**717.0**	**172.9**	**889.9**	**42.4**	**88.0**	**3,148.8**
Person																
0-4	4.3	0.5	5.3	10.0	-	0.6	0.2	0.1	0.8	1.8	3.0	0.2	3.2	-	0.4	15.4
5–14	6.4	0.7	5.5	12.6	-	0.8	0.3	0.3	0.8	2.2	1.2	0.3	1.5	-	0.5	16.8
15–24	15.8	1.7	10.8	28.3	-	3.8	1.7	1.7	3.3	10.6	3.9	1.0	4.9	0.6	1.3	45.7
25–34	38.5	4.1	25.0	67.6	-	9.3	4.0	5.0	10.7	29.1	15.2	4.8	19.9	2.9	3.4	123.0
35–44	92.3	9.8	26.7	128.8	-	22.0	6.7	12.1	17.2	58.0	52.3	18.1	70.5	9.3	7.7	274.2
45–54	223.9	23.7	77.1	324.7	19.4	51.4	14.6	28.4	35.9	130.3	163.0	45.1	208.1	9.0	19.9	711.3
55–64	418.6	44.4	56.8	519.8	50.8	79.7	20.3	39.9	51.9	191.8	311.6	79.7	391.2	11.1	33.5	1,198.2
65–74	611.3	64.8	79.4	755.6	120.4	92.2	23.7	44.7	67.9	228.5	393.8	79.5	473.3	19.1	45.9	1,642.9
75-84	719.3	76.3	45.7	841.3	229.8	88.5	25.1	38.2	60.3	212.2	347.8	56.9	404.7	37.2	49.6	1,774.7
85+	293.5	31.1	17.5	342.1	218.1	28.7	6.8	9.3	22.7	67.5	92.7	16.2	108.9	3.7	21.3	761.5
Total	**2,423.9**	**257.1**	**349.7**	**3,030.7**	**638.5**	**377.1**	**103.5**	**179.9**	**271.5**	**932.1**	**1,384.5**	**301.7**	**1,686.2**	**92.8**	**183.4**	**6,563.7**

APPENDIX C – VALUING A STATISTICAL LIFE

VALUING LIFE AND HEALTH

Since Schelling's (1968) discussion of the economics of life saving, the economic literature has properly focused on **willingness to pay** (willingness to accept) measures of mortality and morbidity risk. Using evidence of market trade-offs between risk and money, including numerous labour market and other studies (such as installing smoke detectors, wearing seatbelts or bike helmets etc), economists have developed estimates of the **value of a 'statistical' life (VSL).**

> The willingness to pay approach estimates the value of life in terms of the amounts that individuals are prepared to pay to reduce risks to their lives. It uses stated or revealed preferences to ascertain the value people place on reducing risk to life and reflects the value of intangible elements such as quality of life, health and leisure. While it overcomes the theoretical difficulties of the human capital approach, it involves more empirical difficulties in measurement (BTE, 2000, pp20-21).

Viscusi and Aldy (2002) summarise the extensive literature in this field, most of which has used econometric analysis to value mortality risk and the 'hedonic wage' by estimating compensating differentials for on-the-job risk exposure in labour markets, in other words, determining what dollar amount would be accepted by an individual to induce him/her to increase the possibility of death or morbidity by x%. They find the VSL ranges between US$4 million and US$9 million with a median of US$7 million (in year 2000 US dollars), similar but marginally higher than the VSL derived from US product and housing markets, and also marginally higher than non-US studies, although all in the same order of magnitude. They also review a parallel literature on the implicit value of the risk of non-fatal injuries.

> A particular life may be regarded as priceless, yet relatively low implicit values may be assigned to life because of the distinction between identified and anonymous (or 'statistical') lives. When a 'value of life' estimate is derived, it is not any particular person's life that is valued, but that of an unknown or statistical individual (Bureau of Transport and Regional Economics, 2002, p19).

Weaknesses in this approach, as with human capital, are that there can be substantial variation between individuals. Extraneous influences in labour markets such as imperfect information, income/wealth or power asymmetries can cause difficulty in correctly perceiving the risk or in negotiating an acceptably higher wage.

Viscusi and Aldy (2002) include some Australian studies in their meta-analysis, notably Kniesner and Leeth (1991) of the Australian Bureau of Statistics (ABS) with VSL of US2000 $4.2 million and Miller et al (1997) of the National Occupational Health and Safety Commission (NOHSC) with quite a high VSL of US2000$11.3m-19.1 million (Viscusi and Aldy, 2002, Table 4, pp92-93). Since there are relatively few Australian studies, there is also the issue of converting foreign (US) data to Australian dollars using either exchange rates or purchasing power parity and choosing a period.

Access Economics (2003) presents outcomes of studies from Yale University (Nordhaus, 1999) – where VSL is estimated as $US2.66m; University of Chicago (Murphy and Topel, 1999) – US$5m; Cutler and Richardson (1998) – who model a common range from US$3 million to US$7m, noting a literature range of $US0.6 million to $US13.5 million per fatality prevented (1998 US dollars). These eminent researchers apply discount rates of 0% and 3% (favouring 3%) to the common range to derive an equivalent of $US 75,000 to $US 150,000 for a year of life gained.

DALYs AND QALYs

In an attempt to overcome some of the issues in relation to placing a dollar value on a human life, in the last decade an alternative approach to valuing human life has been derived. The approach is non-financial, where pain, suffering and premature mortality are measured in terms of Disability Adjusted Life Years (DALYs), with 0 representing a year of perfect health and 1 representing death (the converse of a QALY or "quality-adjusted life year" where 1 represents perfect health). This approach was developed by the World Health Organization (WHO), the World Bank and Harvard University and provides a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990, projected to 2020 (Murray and Lopez, 1996). Methods and data sources are detailed further in Murray et al (2001).

The DALY approach has been adopted and applied in Australia by the Australian Institute for Health and Welfare (AIHW) with a separate comprehensive application in Victoria. Mathers et al (1999) from the AIHW estimate the burden of disease and injury in 1996, including separate identification of premature mortality (YLL) and morbidity (YLD) components. In any year, the disability weight of a disease (for example, 0.18 for a broken wrist) reflects a relative health state. In this example, 0.18 would represent losing 18% of a year of healthy life because of the inflicted injury.

The DALY approach has been successful in avoiding the subjectivity of individual valuation and is capable of overcoming the problem of comparability between individuals and between nations, although nations have subsequently adopted variations in weighting systems. For example, in some countries DALYs are age-weighted for older people although in Australia the minority approach is adopted – valuing a DALY equally for people of all ages.

The main problem with the DALY approach is that it is not financial and is thus not directly comparable with most other cost measures. In public policy making, therefore, there is always the temptation to re-apply a financial measure conversion to ascertain the cost of an injury or fatality or the value of a preventive health intervention. Such financial conversions tend to utilise "willingness to pay" or risk-based labour market studies described above.

The Department of Health and Ageing (based on work by Applied Economics) adopted a very conservative approach to this issue, placing the value of a human life year at around A$60,000 per annum, which is lower than most international lower bounds on the estimate.

> *"In order to convert DALYs into economic benefits, a dollar value per DALY is required. In this study, we follow the standard approach in the economics literature and derive the value of a healthy year from the value of life. For example, if the estimated value of life is A$2 million, the average loss of*

healthy life is 40 years, and the discount rate is 5 per cent per annum, the value of a healthy year would be $118,000.[13] Tolley et al (1994) review the literature on valuing life and life years and conclude that a range of US$70,000 to US$175,000 per life year is reasonable. In a major study of the value of health of the US population, Cutler and Richardson (1997) adopt an average value of US$100,000 in 1990 dollars for a healthy year.

Although there is an extensive international literature on the value of life (Viscusi, 1993), there is little Australian research on this subject. As the Bureau of Transport Economics (BTE) (in BTE, 2000) notes, international research using willingness to pay values usually places the value of life at somewhere between A$1.8 and A$4.3 million. On the other hand, values of life that reflect the present value of output lost (the human capital approach) are usually under $1 million.

The BTE (2000) adopts estimates of $1 million to $1.4 million per fatality, reflecting a 7 per cent and 4 per cent discount rate respectively. The higher figure of $1.4 million is made up of loss of workforce productivity of $540,000, loss of household productivity of $500,000 and loss of quality of life of $319,000. This is an unusual approach that combines human capital and willingness to pay concepts and adds household output to workforce output.

For this study, a value of $1 million and an equivalent value of $60,000 for a healthy year are assumed.[14] In other words, the cost of a DALY is $60,000. This represents a conservative valuation of the estimated willingness to pay values for human life that are used most often in similar studies.[15]" (DHA, 2003, pp11-12)."

As the citation concludes, the estimate of $60,000 per DALY is very low. The Viscusi (1993) meta-analysis referred to reviewed 24 studies with values of a human life ranging between $US 0.5 million and $US 16m, all in pre-1993 US dollars. Even the lowest of these converted to 2003 Australian dollars at current exchange rates, exceeds the estimate adopted ($1m) by nearly 25%. The BTE study tends to disregard the literature at the higher end and also adopts a range (A$1-$1.4m) below the lower bound of the international range that it identifies (A$1.8-$4.3m).

The rationale for adopting these very low estimates is not provided explicitly. Certainly it is in the interests of fiscal restraint to present as low an estimate as possible.

In contrast, the majority of the literature as detailed above appears to support a higher estimate for VSL, as presented in Table C, which Access Economics believes is important to consider in disease costing applications and decisions. The US dollar values of the lower bound, midrange and upper bound are shown at left. The 'average' estimate is the

[13] *In round numbers, $2,000,000 = $118,000/1.05 + $118,000/(1.05)^2 + … + $118,000/(1.05).*[40] [AE comment: The actual value should be $116,556, not $118,000 even in round numbers.]

[14] The equivalent value of $60,000 assumes, in broad terms, 40 years of lost life and a discount rate of 5 per cent. [AE comment: More accurately the figure should be $58,278.]

[15] In addition to the cited references in the text, see for example Murphy and Topel's study (1999) on the economic value of medical research. [AE comment. Identical reference to our Murphy and Topel (1999).]

average of the range excluding the high NOHSC outlier. Equal weightings are used for each study as the:

- Viscusi and Aldy meta-analysis summarises 60 recent studies;
- ABS study is Australian; and
- Yale and Harvard studies are based on the conclusions of eminent researchers in the field after conducting literature analysis.

Where there is no low or high US dollar estimate for a study, the midrange estimate is used to calculate the average. The midrange estimates are converted to Australian dollars at purchasing power parity (as this is less volatile than exchange rates) of USD=0.7281AUD for 2003 as estimated by the OECD.

Access Economics concludes the VSL range in Australia lies between $3.7 million and $9.6m[16], with a mid-range estimate of $6.5m. These estimates have conservatively not been inflated to 2004 prices, given the uncertainty levels.

TABLE C-1 INTERNATIONAL ESTIMATES OF VSL, VARIOUS YEARS

	US$m			A$m
	Lower	**Midrange**	**Upper**	**0.7281**
Viscusi & Aldy meta-analysis 2002	4	7	9	**9.6**
Australian: ABS 1991		4.2		5.8
NOHSC 1997	11.3		19.1	
Yale (Nordhaus) 1999		2.66		**3.7**
Harvard (Cutler & Richardson) 1998	0.6	5	13.7	6.9
Average*	2.9	**4.7**	7.4	**6.5**

* Average of range excluding high NOHSC outlier, using midrange if no data; conservatively not inflated.

A$m conversions are at the OECD 2003 PPP rate.

DISCOUNT RATE

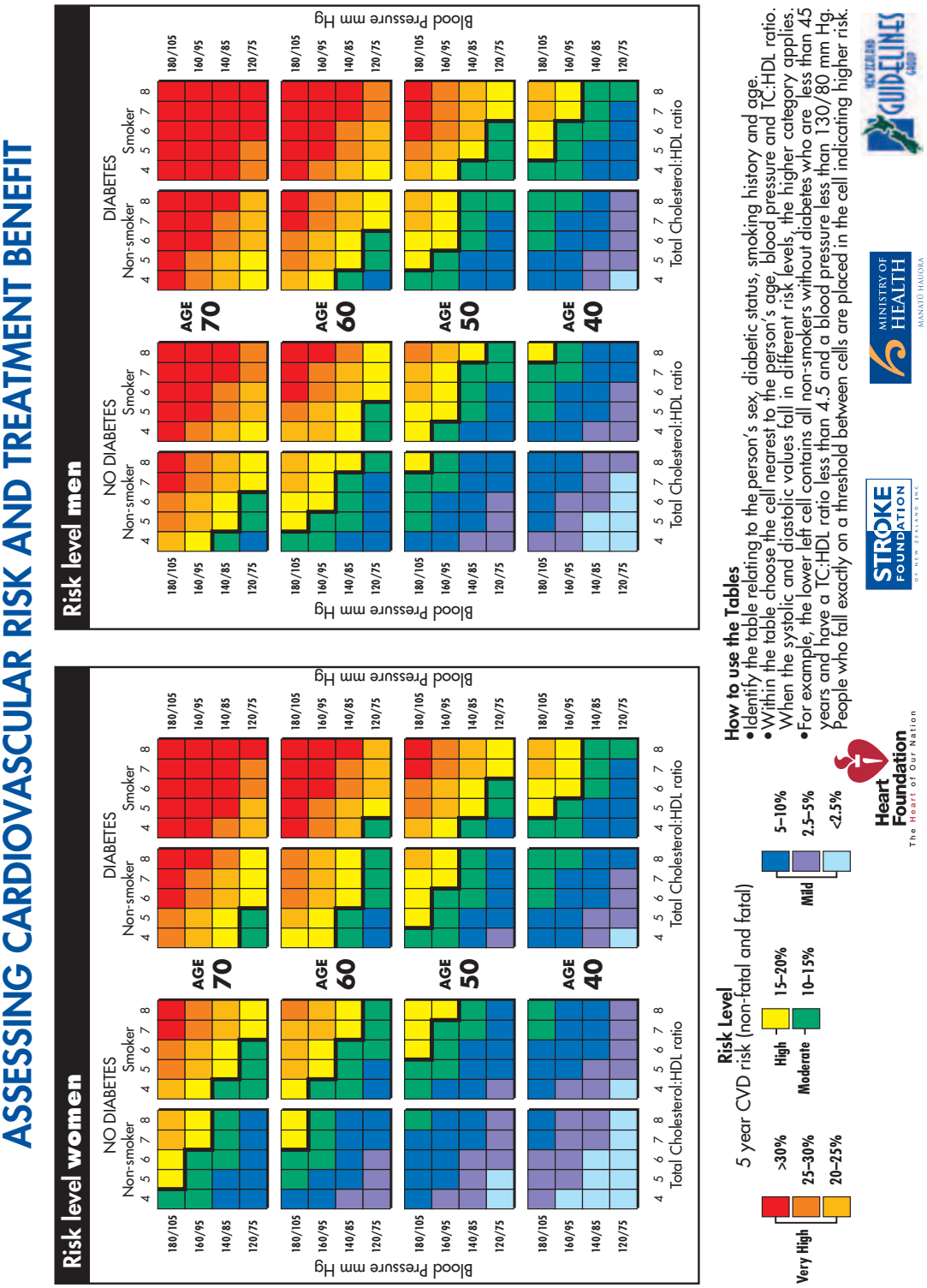
Choosing an appropriate discount rate for present valuations in cost analysis is a subject of some debate, and can vary depending on which future income or cost stream is being considered. There is a substantial body of literature, which often provides conflicting advice, on the appropriate mechanism by which costs should be discounted over time, properly taking into account risks, inflation, positive time preference and expected productivity gains.

The absolute minimum option that one can adopt in discounting future income and costs is to set future values in current day dollar terms on the basis of a risk free assessment about the future (that is, assume the future flows are similar to the certain flows attaching to a long term Government bond).

[16] Calculated from the non-indexed studies themselves. Converting the AE average estimates from USD to AUD at PPP would provide slightly higher estimates - $3.9 million and $10.2m, with the same midrange estimate.

APPENDIX D – CARDIOVASCULAR RISK CALCULATOR

Figure 2: Assessing 5-year cardiovascular risk and treatment benefit



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Source: www.nzgg.org.au April 2005

Notes for Figure 2

People at very high risk (>20% over 5 years) determined clinically

- People who have had a previous cardiovascular event (angina, myocardial infarction, angioplasty, coronary artery bypass grafts, transient ischaemic attack, ischaemic stroke or peripheral vascular disease).
- People with genetic lipid disorders (familial hypercholesterolaemia, familial defective ApoB and familial combined dyslipidaemia).
- People with diabetes and overt nephropathy (albumin:creatinine ratio >30 mg/mmol) or diabetes and other renal disease.

Where CV risk is determined using the Framingham risk equation and tables

The following groups should be moved up one risk category (5%), as their cardiovascular risk may be underestimated in the Framingham risk equation:

- people with a family history of premature coronary heart disease or ischaemic stroke in a first-degree male relative before the age of 55 years or a first-degree female relative before the age of 65 years
- Māori
- Pacific peoples or people from the Indian subcontinent
- people with both diabetes and microalbuminuria
- people who have had type 2 diabetes for more than 10 years or who have an HbA1c consistently greater than 8%
- people with the metabolic syndrome.

These adjustments should be made once only for people who have more than one criteria (the maximum adjustment is 5%).

Where risk factor levels are extreme

- If blood pressure is consistently greater than 170/100 mm Hg or total cholesterol greater than 8 mmol/L or TC:HDL ratio greater than 8 the person is classified at least at high risk (>15%) and should receive specific lifestyle advice and medication to lower their risk, irrespective of their calculated cardiovascular risk.
- For age greater than 75 years the 5-year cardiovascular risk is greater than 15% in nearly all individuals.

Risk level: 5-year CV risk (fatal and non-fatal)	**Benefits: NNT for 5 years to prevent one event** (CVD events prevented per 100 people treated for 5 years)		
	1 intervention (25% risk reduction)	**2 interventions (45% risk reduction)**	**3 interventions (55% risk reduction)**
30%	13 (7.5 per 100)	7 (14 per 100)	6 (16 per 100)
20%	20 (5 per 100)	11 (9 per 100)	9 (11 per 100)
15%	27 (4 per 100)	15 (7 per 100)	12 (8 per 100)
10%	40 (2.5 per 100)	22 (4.5 per 100)	18 (5.5 per 100)
5%	80 (1.25 per 100)	44 (2.25 per 100)	36 (3 per 100)

Based on the conservative estimate that each intervention: aspirin, blood pressure treatment (lowering systolic blood pressure by 10 mm Hg) or lipid modification (lowering LDL-C by 20%) reduces CV risk by about 25% over 5 years.

APPENDIX E – COST EFFECTIVENESS ANALYSES

TABLE E-1 CEAS IN HARVARD REGISTRY: ANGIOPLASTY AND STENTS

Year of study	Description of intervention	US$/QALY
2000	Angioplasty with repeated angioplasty for long-term failure vs. Angioplasty with selective stent placement in 60-year-old patients with intermittent claudication caused by iliac artery stenosis.	Dominated
2000	Initial angioplasty, then angioplasty with selected stent placement for long-term failure vs. Angioplasty initially, and repeated angioplasty for long-term failure in 60-year-old patients with intermittent claudication caused by iliac artery stenosis.	Dominated
1997	Percutaneous transluminal angioplasty (PTA)-PTA for patients with: stenosis, claudication or rest pain, and vein or PTFE above-the-knee graft; stenosis, necrosis and PTFE above-the-knee graft; or occlusion and claudication with any type of graft. vs No treatment in 65-yo male patients with femoropopliteal lesions < 10cm requiring revascularization	Cost-saving
1997	Percutaneous transluminal angioplasty with PTFE below-the-knee graft for 65-yo male patients with stenotic femoropoplitieal lesions < 10cm vs All other strategies (NoTx-NoTx, PTA-NoTx, PTA-PTA, PTA-BS, BS-NoTx, BS-Rev) in 65-yo male patients with femoropopliteal lesions < 10cm requiring revascularization	Cost-saving
1998	Angioplasty with selective stent placement vs. Angioplasty alone in 60yo men with intermittent lifestyle-limiting claudication and iliac artery stenosis for whom percutaneous coronary intervention is indicated.	4,800
1998	Angioplasty with selective stent placement, initially and for long-term failure vs. Initial angioplasty, then angioplasty with selected stent placement for long-term failure in 60yo men with intermittent lifestyle-limiting claudication and iliac artery stenosis for whom percutaneous coronary intervention is indicated.	5,300
1996	Secondary use of laser-assisted angioplasty with the Nd/YAG laser vs Conventional guidewire angioplasty in patients with peripheral vascular occlusions and claudication	5,700
1985	Percutaneous transluminal coronary angioplasty for patients with severe angina and one vessel disease vs Medical management in patients with severe angina and one vessel disease	6,600
2000	Angioplasty with selective stent placement vs. Angioplasty alone in 60-year-old patients with intermittent claudication caused by iliac artery stenosis.	8,400
1985	Percutaneous transluminal coronary angioplasty vs Medical management in patients with moderate angina and one vessel disease	9,300
2000	Angioplasty with selective stent placement, initially and for long-term failure vs. Initial angioplasty, then angioplasty with selected stent placement for long-term failure in 60-year-old patients with intermittent claudication caused by iliac artery stenosis.	9,400
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with severe angina from coronary artery disease with type A lesions	17,000
1994	Initial stent vs Angioplasty in 55 yo male with symptomatic single vessel coronary disease	20,000
2001	Current coronary stenting (updated costs) vs. Primary balloon angioplasty in patients with AMI	24,000
1985	Percutaneous transluminal coronary angioplasty for patients with mild angina and one vessel disease vs Medical management in patients with mild angina and one vessel disease	29,000
1994	Angioplasty with stenting for restenosis vs Angioplasty in 55 yo male with symptomatic single vessel coronary disease	40,000
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, 3-vessel coronary artery disease and type A lesions	62,000
2001	Old coronary stenting vs. Primary balloon angioplasty in patients with AMI	70,000
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, depressed ventricular function, 3-vessel coronary artery disease (with PTCA only partially effective) & type A lesions	81,000

Continued next page

Year of study	Description of intervention (continued)	US$/QALY
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, normal ventricular function, 2-vessel coronary artery disease and type A lesions	96,000
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, normal ventricular function, 3-vessel coronary artery disease (with PTCA only partially effective) and type A lesions	100,000
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, normal ventricular function & 1-vessel coronary artery disease with LAD involvement and type A lesions	110,000
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, depressed ventricular function & 1-vessel coronary artery disease with LAD involvement and type A lesions	110,000
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, depressed ventricular function, 2-vessel coronary artery disease and type A lesions	110,000
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, normal ventricular function & 1-vessel coronary artery disease with no LAD involvement and type A lesions	130,000
1990	Percutaneous transluminal coronary angioplasty (PTCA) vs Conservative treatment in 55-yo men with mild angina, depressed ventricular function & 1-vessel coronary artery disease with no LAD involvement and type A lesions	130,000

TABLE E-2 CEAS IN HARVARD REGISTRY: PACEMAKERS

Year of study	Description of intervention	US$/QALY
1985	Pacemaker implantation for atrioventricular heart block vs No implantation in cardiac patients	1,900
1999	Pacemaker vs. ?? in patients at high risk of recurrent syncope	11,000

TABLE E-3 CEAS IN HARVARD REGISTRY: DIET, BETA-BLOCKERS; REHABILITATION (EXERCISE/COUNSELLING)

Year of study	Description of intervention	US$/QALY
2001	A diet that includes enriched grain products projected to increase folic acid intake by 100mg/day including Cyanocobalamin supplementation vs. Same diet with folic acid fortification alone in women aged 35-84 years (Secondary prevention)	1,300
2000	Current rate of use of beta-blockers (44% of the post-myocardial infarction population) vs. No beta-blocker use in patients with myocardial infarction aged 35-84 years	4,500
2000	Target rate of use of beta-blockers (92% of the post-myocardial infarction population) vs. Current rate of use of beta-blockers (44% of the post-myocardial infarction population) in patients with myocardial infarction aged 35-84 years	4,700
1993	Rehabilitation program (exercise & counseling) vs Usual community care in eligible patients with a diagnosis of Acute Miocardial Infarction who were moderately anxious or depressed while in hospital	9,000

TABLE E-4 CEAS IN HARVARD REGISTRY: BYPASS OPERATION

Year of study	Description of intervention	US$/QALY
1981	Aortocoronary bypass operation vs Medical management in 50 yo male pats. w/CAD of 2 arteries, LAD involved, 2 operable, class I or II angina, sev. hrt. fxn. impairment, neg. post-exercise ECG	Dominated
1981	Aortocoronary bypass operation vs Medical management in 50 yo male pats. w/CAD of 3 arteries, LAD involved, 3 operable, class III or IV angina, normal hrt. fxn., pos. post-exercise ECG	6,200
1981	Aortocoronary bypass operation vs Medical management in 40 yo male pats. w/CAD of 3 arteries, LAD involved, 3 operable, no angina, mod. hrt. fxn. impairment, pos. post-exercise ECG	7,400
1981	Aortocoronary bypass operation vs Medical management in 50 yo male pats. w/CAD of 1 artery, LAD involved, 1 operable, class III or IV angina, sev. hrt. fxn. impairment, pos. post-exercise ECG	7,700
1981	Aortocoronary bypass operation vs Medical management in 55 yo male pats. w/CAD of 2 arteries, LAD involved, 2 operable, class III or IV angina, mod. hrt. fxn. impairment, pos. post-exercise ECG	9,200
1981	Aortocoronary bypass operation vs Medical management in 60 yo male pats. w/CAD of 3 arteries, LAD involved, 3 operable, class III or IV angina, mod. hrt. fxn. impairment, pos. post-exercise ECG	10,000
1981	Aortocoronary bypass operation vs Medical management in 60 yo male pats. w/CAD of 3 arteries, LAD involved, 2 LAD operable, class III or IV angina, mod. hrt. fxn. impairment, pos. post-exercise ECG	11,000
1981	Aortocoronary bypass operation vs Medical management in 50 yo male pats. w/CAD of 2 arteries, no LAD involved, 2 operable, class III or IV angina, sev. hrt. fxn. impairment, pos. post-exercise ECG	12,000
1981	Aortocoronary bypass operation vs Medical management in 50 yo male pats. w/CAD of 2 arteries, LAD involved, 1 LAD operable, no angina, normal hrt. fxn., pos. post-exercise ECG	14,000
1981	Aortocoronary bypass operation vs Medical management in 50 yo male pats. w/CAD of 1 artery, no LAD, 1 operable, class III or IV angina, mod. hrt. fxn. impairment , pos. post-exercise ECG	15,000
1998	Bypass surgery vs. Medical management+ Aspirin Over 10 years in Ischemic Heart Disease Patients	18,000
1981	Aortocoronary bypass operation vs Medical management in 50 yo male pats. w/CAD of 3 arteries, LAD involved, 2 operable, class I or II angina, sev. hrt. fxn. impairment, neg. post-exercise ECG	18,000
2000	PET screening with selective extracranial-to-intracranial (EC/IC) bypass vs. Medical management in patients with symptoms of recent cerebral ischemia (TIAs) and documented complete occlusion of the ipsilateral carotid artery (does NOT include folks whose only symptoms are of retinal artery ischemia).	22,000
1981	Aortocoronary bypass operation vs Medical management in 45 yo male pats. w/CAD of 3 arteries, LAD involved, 1 LAD operable, class I or II angina, normal hrt. fxn., pos. post-exercise ECG	30,000
1998	Bypass surgery vs. Medical management+ Aspirin Over 5 years in Ischemic Heart Disease Patients	35,000
1981	Aortocoronary bypass operation vs Medical management in 50 yo male pats. w/CAD of 2 arteries, no LAD involved, 1 operable, class III or IV angina, mod. hrt. fxn. impairment, neg. post-exercise ECG	44,000
1981	Aortocoronary bypass operation vs Medical management in 50yo male pats. w/CAD of 1 artery, LAD involved, 1 operable, class I or II angina, mod. hrt. fxn. impairment, neg. post-exercise ECG	45,000

TABLE E-5 CEAS IN HARVARD REGISTRY: OTHER COST-SAVING THERAPIES

Year of study	Description of intervention	US$/QALY
2001	Short-term treatment (2 to 8 days) with Enoxaparin vs. Unfractionated heparin in patients with unstable coronary artery disease	Cost-saving
2001	Tissue plasminogen activator (t-PA) strategy vs. No tissue plasminogen activator (t-PA) in patients with acute ischemic stroke presenting to hospital within 3 hours of symptom onset	Cost-saving
2000	Aspirin, 50mg/day, and dipyridamole, 400mg/day vs. Aspirin, 325mg/day in patients aged 65 years or older at high risk of stroke or transient ischemic attack (who have experienced one in the past and are not candidates for carotid surgery)	Cost-saving
1998	Duplex ultrasound screening (one time screen) vs. Screening every 5 years in 60 year old patients with 5% prevalence of 60-99% asymptomatic stenosis	Cost-saving
1998	Tissue Plasminogen Actuator (tPA) vs. Placebo in patients aged 67 with acute ischemic stroke presenting within 3 hours of symptom onset	Cost-saving
1998	Enalapril in addition to usual therapy vs. Placebo in addition to usual therapy in patients with either elevated systolic (SBP >= 140mm Hg) or diastolic (DBP >= 90mm Hg) blood pressure	Cost-saving
1997	Treansesophageal echocardiography guided cardioversion vs Conventional therapy, treansesophageal echocardiography plus warfarin for one month before cardioversion in 70 yo patients admitted to hospital with atrial fibrillation	Cost-saving
1996	Carotid endarterectomy vs Observation in symptomatic 65 yo at risk for stroke	Cost-saving
1996	Carotid endarterectomy vs ASA in symptomatic 65 yo at risk for stroke	Cost-saving
1995	Warfarin vs ASA in high risk stroke-65 yo with NVAF	Cost-saving
1995	Warfarin vs No therapy in medium risk stroke-65 yo with NVAF	Cost-saving
1976	Mobile unit (well-equipped emergency vehicle with trained personnel) vs Diet low in cholesterol and saturated fat and high in polyunsaturated fat in 30-yo male at risk for heart attack	Cost-saving
1976	Mobile unit (well-equipped emergency vehicle with trained personnel) vs Diet low in cholesterol and saturated fat and high in polyunsaturated fat in 30-yo male at risk for heart attack	Cost-saving

TABLE E-6 CEAS IN HARVARD REGISTRY: OTHER DOMINANT THERAPIES

Year of study	Description of intervention	US$/QALY
2000	Anticoagulation clinic testing vs. Patient self-testing in 57 year-old patients initiating long-term warfarin therapy	Dominated
1999	Screening with magnetic resonance angiography for unruptured, asymptomatic intracranial aneurysms, followed by surgical repair if found vs. No screening for unruptured, asymptomatic intracranial aneurysms in 50-year-old asymptomatic individuals	Dominated
1999	Surgical Clipping vs. No treatment in 50 year old women with unruptured cerebral aneurism (no symptoms, <10mm, no past subarachnoid hemorrhage)	Dominated
1999	Endovascular Coil Embolization vs. No treatment in 50 year old women with unruptured cerebral aneurism (no symptoms, <10mm, no past subarachnoid hemorrhage)	Dominated
1999	Surgical Clipping vs. No treatment in 50 year old women with unruptured cerebral aneurism (no symptoms, <10mm, past subarachnoid hemorrhage)	Dominated
1999	Thrombolysis vs. Surgery in 65 year-old patient presenting with acute (<14 days) lower extremity ischemia	Dominated
1998	Anticoagulation treatment with Warfarin vs. No anticoagulation treatment in elderly patients with nonvalvular atrial fibrillation at high risk for stroke	Dominated
1998	Anticoagulation treatment with Warfarin vs. No anticoagulation treatment in elderly patients with nonvalvular atrial fibrillation at low risk for stroke	Dominated
1997	PTA-PTA for patients with: stenosis, necrosis, and vein graft; or occlusion, rest pain, or necrosis, and any type of graft. PTA-BS for patients with: stenosis and any other indication, and PTFE below-the-knee graft; or occlusion, rest pain or necrosis, and any type of graft. BS-Rev for patients with: stenosis (all groups); or occlusion, claudication, and any type of graft. vs Another strategy in 65-yo male patients with femoropopliteal lesions < 10cm requiring revascularization	Dominated
1997	Selective-sequential-1 diagnostic strategy (transthoracic echocardiography done in patients who have had stroke and a history of cardiac problems, transesophageal echocardiography done in patients with negative findings on transthoracic echocardiography, and no echocardiography done in patients who do not have a cardiac history) vs Selective-transesophageal diagnostic strategy in 65-yo patients in normal sinus rhythm with new-onset stroke	Dominated
1997	Selective-transthoracic diagnostic strategy (transthoracic echocardiography done in all patients who have had stroke and a history of cardiac problems) vs Selective-transesophageal diagnostic strategy in 65-yo patients in normal sinus rhythm with new-onset stroke	Dominated
1997	All-transthoracic diagnostic strategy (transthoracic echocardiography done in all patients who have had stroke) vs Selective-transesophageal diagnostic strategy in 65-yo patients in normal sinus rhythm with new-onset stroke	Dominated
1997	Treat-all diagnostic strategy (no imaging done, all patients receive anticoagulants) vs Treat none (no imaging or anticoagulation) in 65-yo patients in normal sinus rhythm with new-onset stroke	Dominated
1997	Selective-sequential-2 diagnostic strategy (transthoracic echocardiography done in all patients who have had stroke and who have a history of cardiac problems, and transesophageal echocardiography done in patients who have negative findings on transthoracic echocardiography and all patients who do not have a history of cardiac problems) vs All-transesophageal diagnostic strategy in 65-yo patients in normal sinus rhythm with new-onset stroke	Dominated
1997	All-sequential diagnostic strategy (transthoracic echocardiography done in all patients who have had stroke, and transesophageal echocardiography done in patients who have negative findings on transthoracic echocardiography) vs All-transesophageal diagnostic strategy in 65-yo patients in normal sinus rhythm with new-onset stroke	Dominated
1996	Annual Doppler ultrasound screening vs One-time Doppler ultrasound screening in asymptomatic 60-yo men with a high prevalence of >=60% carotid stenosis and risk factors such as MI, bruit, or peripheral vascular disease	Dominated
1996	Annual Doppler ultrasound screening vs One-time Doppler ultrasound screening in asymptomatic 60-yo men with a low prevalence of >=60% carotid stenosis (representative of general population)	Dominated
1996	Epoprostenol and best usual care vs Best usual care alone in patients with severe congestive heart failure (in a phase III clinical trial)	Dominated
1993	Observation with RFA for cardiac arrest survivors vs RFA with drug therapy if fail in 40 yo with WPW syndrome with history of PSVT	Dominated

NOTES:

NOTES:

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- Cardiovascular disease is the most costly condition in Australia in terms of its overall impact on quantity and quality of life
- CVD is Australia's number 1 killer
- 1 Australian dies every 10 minutes from CVD
- The cost of CVD in 2004:
  Direct = $7.6 billion
  Indirect = $6.6 billion
  TOTAL = $14.2 billion
- This equates to a cost of $706 for each Australian man, woman and child.

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