Determinants: keys to prevention

KEY POINTS

- Risk factors contribute to over 30% of Australia's total burden of death, disease and disability.
- Tobacco smoking is the single most preventable cause of ill health and death in Australia.
- However, Australia's level of smoking continues to fall and is among the lowest for OECD countries, with a daily smoking rate of about 1 in 6 adults in 2007.
- Three in 5 adults (61%) were either overweight or obese in 2007–08.
- One in 4 children (25%) aged 5–17 years were overweight or obese in 2007–08.
- One out of every 20 children aged 14–16 years consumed the recommended intake of vegetables in 2007.
- Rates of sexually transmissible infections continue to increase, particularly among young people.
- Use of illicit drugs has generally declined in Australia, including the use of methamphetamines (the drug group that includes 'ice').
- Among Australians aged 15–74 years in 2006–2007, less than half (41%) had an adequate or better level of health literacy.

Many things can affect how healthy we are. They range from society-wide influences right down to highly individual factors such as blood pressure and genetic makeup—and of course they include the health care we receive. This chapter focuses on these various influences, which are known as health determinants because they help determine how likely we are to stay healthy or become ill or injured. (Health services, however, are discussed in Chapter 7.)

The chapter begins by discussing determinants using a framework to show how they relate to each other in their influence on health. The remainder of the chapter presents information on patterns and trends for selected determinants.

3.1 What are health determinants?

As Figure 1.1 in Chapter 1 shows, a person's health and wellbeing has many facets. They result from complex interplay between societal, environmental, socioeconomic, biological and lifestyle factors, nearly all of which can be modified to some extent by health care and other interventions. Figure 3.1 summarises the main determinants of health (excluding health care) and the pathways through which they can act.

It is important to note that some determinants are positive in their effects on health and others are negative. A high daily intake of fruit and vegetables, for example, or being vaccinated against disease are known as protective factors.

Those things that increase our risk of ill health are known as risk factors. Examples include behaviours such as smoking or being physically inactive, or the wider influence of lower socioeconomic status.

Measuring and monitoring determinants helps to explain trends in health. This information can then be used to help understand why some groups have poorer health than others (see Chapter 5), and to develop and evaluate policies and interventions to prevent disease and promote health.

Measuring determinants

How do we measure the effects of different determinants to decide how important it is to act on them? This can be done at both the individual and community level. For individuals, the first point to note is that nearly all risk and protective factors are not 'all or nothing' in their effect. Also, they vary in the amount of risk they pose, and the level and duration of a person's exposure to them. For a person with a blood pressure level above optimal, for example, there is no exact point where their risk begins but each increment in their level carries a further increase in the risk of stroke or heart attack. Similarly, a smoker's risk of various diseases increases with the number of cigarettes they smoke each day and how long they have been smoking.

An individual's risk can be described in either 'relative' or 'absolute' terms. The risk of a smoker getting lung cancer, relative to a non-smoker, is about 10-fold, so the relative risk is 10. The absolute risk in this case, however, refers to the chance of that smoker—or a non-smoker, for that matter—coming down with lung cancer within a given time period or over their lifetime. Smoking carries both a high relative and a high absolute risk for lung cancer. Some risk factors, however, may carry a very high relative risk but a low absolute risk if the disease in question is rare. On the other hand, a risk factor may have a moderate relative risk for a disease, but have a large effect on the population because the disease is very common, for example obesity and coronary heart disease.

A final point about individual risk is that many people have more than one risk factor for one or more health problems. The more risk factors, the greater the risk for a particular problem and the greater the overall risk of ill health. This total risk is important, and all these considerations can be the basis for personalised advice or treatment.

At the community level there are further considerations about risk and prevention: the seriousness of the particular problem for the individuals affected, the number of people currently at risk of it, the prospects for its onset and prevalence in the community, and the means and cost of tackling the relevant risk factors.

Health determinants also vary in how modifiable they are. The more 'upstream' (social) determinants such as education, employment, income and family structure can be complex to modify and are more directly influenced by the broad features of society; that is, our culture, resources and policies. For the more 'downstream' determinants, modification can be more specific. Programs and policies aimed at influencing health behaviours (for example, legislation against tobacco smoking in cars with children, restricting alcohol sales to young persons, and enforcing the wearing of seatbelts) help to reduce the burden of illness and injury, and result in better health for the whole population. On the other hand, age is one risk factor that is not modifiable but which is strongly associated with many health conditions.

A framework for determinants

Determinants are often described as a web of causes, but they can also be thought of as part of broad causal 'pathways' that affect health. Figure 3.1 presents a conceptual framework that illustrates some of the complexity involved. It divides determinants into four broad groups whose main direction of influence goes from left to right—that is, from the 'upstream' background factors (such as culture and affluence) through to more immediate or direct influences (such as blood pressure).

The figure shows how one main group—the broad features of society and environmental factors—can determine the nature of another main group; that is, people's socioeconomic characteristics such as their level of education and employment. Both these main groups also influence people's health behaviours, their psychological state and factors relating to safety. These in turn can influence biomedical factors, such as body weight and glucose metabolism, which may have health effects through various further pathways.

At all stages along the path these various factors interact with an individual's genetic composition. In addition, the factors within a box often interact and are closely related to each other.

Despite the general direction of these influences, they can occur in reverse. For example, an individual's health can also influence physical activity levels, employment status and wealth.

Five of these clusters of determinants are described in the major sections of this chapter. A summary of the remaining four groups, with some related statistics, follows here.

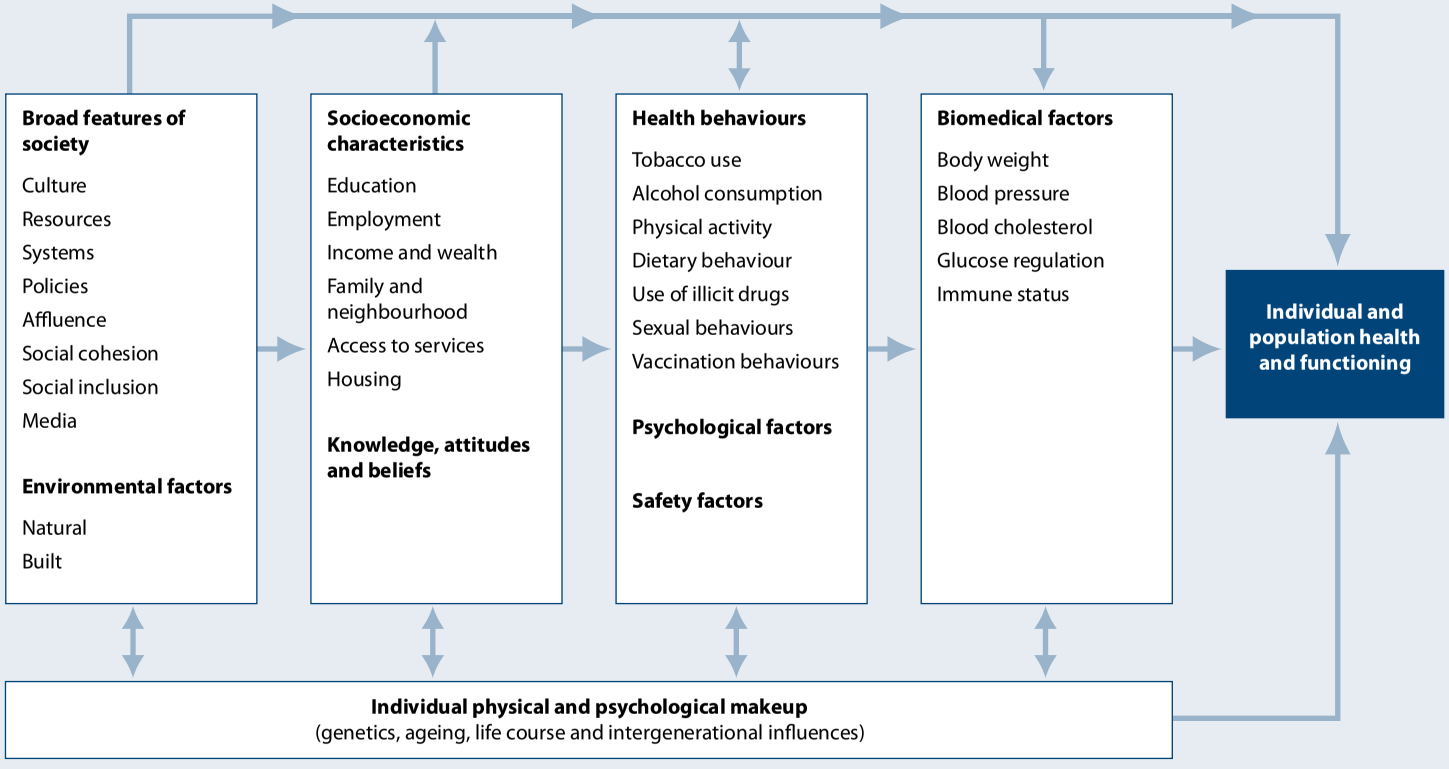


Figure 3.1: A conceptual framework for determinants of health

Broad features of society

Broad features of society are those widespread factors that affect all individuals to some extent. Alone or together, these characteristics influence the basic levels of security, safety, hygiene, nourishment, knowledge, technology, development, freedom and morale of societies. They can also influence how much equality or inequality there is among individuals or groups in society. Despite their widespread influence, the specific effects of these characteristics are difficult to measure.

Psychological factors

Apart from being valuable in its own right, the degree of a person's psychological wellbeing can affect their health in various ways. This can include how they seek care or look after themselves, whether they smoke or not, drink heavily or not, and are physically active or not. There are also suggestions that various forms of stressors can harm health directly. For example, there is evidence that heart disease can result from psychological stress, depression or major adverse life events, regardless of whether the people affected have risk factors such as smoking or low socioeconomic status (Rosengren et al. 2004). Risk behaviours such as the use of illicit drugs, alcohol misuse and dependence, and eating disorders often occur together with depression (AIHW 2008a).

Safety factors

Safety generally refers to the notion of being and feeling protected against harm, and is an important aspect of physical and mental wellbeing. Governmental policies—such as road standards, compulsory wearing of seatbelts, and food and industry regulations—influence levels of safety in our environment. Knowledge, attitudes and personal behaviours can also modify this protection.

Australians generally have a high level of safety and have enjoyed some marked safety improvements. For example, deaths from motor vehicle traffic accidents have declined dramatically since the early 1970s. This is generally attributed to the success of policies and campaigns aimed at enhancing road safety (for example, compulsory wearing of seat belts, enforced speed limits and random breath testing for alcohol) and improved motor vehicle construction and road infrastructure (AIHW 2006a). The 2005 International Crime Victim Survey asked people about their experience of conventional crime (for example, theft of or from a vehicle, theft of other personal property, robbery, assault and, for females, sexual offences). The results from this study ranked Australia in the middle third of the countries surveyed (OECD 2009a).

Personal safety is often measured in terms of both the perception of feeling safe and of the actual experience of harm. Estimates from the 2005 Personal Safety Survey show that most Australian adults (95% of males and 83% of females) felt safe if alone in their own home at night (ABS 2006a). This survey also revealed that 11% of adult males and nearly 6% of adult females had experienced physical and/or sexual violence in the past 12 months. Among those aged 18–24 years, males were more likely to have experienced violence than females (31% versus 12%). However, in older ages, the rate of violence reported by females was higher than for males.

Personal behaviours aimed at injury prevention—perhaps supported by government regulations—help maintain a high level of safety. For example, in New South Wales in 2008, almost 94% of adults lived in homes fitted with smoke alarms or detectors—a substantial increase from 58% in 1997 (Centre for Epidemiology and Research 2009).

Individual makeup

An individual's makeup results from the complex interaction of their genetic makeup and physical, psychological and social influences, and from the interactions between these over various stages of their life.

Some conditions are more determined by genetic factors than others. Muscular dystrophy, for example, is entirely genetic whereas many other diseases have a variable mix of genetic and external factors.

How much of the disease burden is due to health determinants?

The effect of risk factors on health depends not only on their prevalence in the population but also on the relative amount they contribute to the level of ill health in the population. Studies that quantify this burden use a measure of disability-adjusted life years (DALYs) to describe the relative contribution of specific illnesses and risk factors to the overall burden of ill health (Begg et al. 2007. See Chapter 2 for an explanation of DALYs.). Australia's most recent national study of the burden of illness and injury applied to 2003 and summarised the contribution of risk factors to the national burden for that year. Tobacco smoking was estimated to contribute the greatest burden (7.8% of the total health burden), followed by high blood pressure (7.6%) and overweight/obesity (7.5%). The joint contribution of 14 selected health determinants to the total burden was 32.2%. That is, of all the ill health, disability and premature death that occurred in Australia in 2003, almost one-third was attributed to the presence of health risk factors.

Most of the total burden of disease and injury in Australia in 2003 was attributed to chronic conditions, the leading contributors being cancers (19%) and cardiovascular diseases (18%). These conditions are strongly related to most of the health determinants described in this chapter. Determinants that contribute to the development of one or more chronic diseases include lifestyle behaviours such as tobacco smoking, physical inactivity, alcohol consumption, illicit drug use and unsafe sex; physiological conditions such as excess body weight, high blood pressure and high blood cholesterol; and social and environmental factors such as occupational exposures, intimate partner violence and air pollution. Some of these associations are presented in Table 3.1.

It is interesting to note that the effect of a risk factor can be multiplied because the disease it is linked to may increase the risk of developing another. For example, people with high blood pressure have a greater risk of developing chronic kidney disease as well as heart attack and stroke; and kidney disease itself increases the risk of heart attack and stroke as well as further increasing a person's blood pressure levels (AIHW 2007).

When diseases have common risk factors—such as tobacco smoking being common to heart disease and cancer—the diseases are more likely to occur together. At the same time, controlling such risk factors offers great potential for prevention.

Table 3.1: Relationship between selected chronic diseases (conditions) and risk factors (determinants)

	Condition							
Risk factor	Arthritis	Asthma	COPD	Coronary heart disease[a]	Depression	Type 2 diabetes	Osteoporosis	Stroke
Behavioural								
Tobacco smoking	✓ (b)	✓	✓	✓			✓	✓
Physical inactivity	✓ (c)			✓	✓	✓	✓	✓
Alcohol misuse				✓	✓	✓	✓	✓
Poor nutrition				✓		✓	✓	✓
Biomedical								
Obesity	✓ (c)			✓	✓	✓		✓
High blood pressure				✓				✓
High blood cholesterol				✓				✓

COPD Chronic obstructive pulmonary disease.

(a) Also known as ischaemic heart disease.

(b) Relates to rheumatoid arthritis.

(c) Relates to osteoarthritis.

Source: Table adapted from AIHW 2008a.

3.2 Environmental factors

The term 'environment' has a broad definition and can refer to whatever surrounds us or is outside us, both physical and social. This section applies only to the physical environment. Of particular interest are factors such as the quality of air, food and water, which are fundamental to human life, health and wellbeing. Other factors include the built environment, which extends to urban design and safety, and can also influence our levels of physical activity. In addition, environmental health issues are re-emerging as potential threats, especially with global warming and its far-reaching effects.

Like other determinants, environmental influences on health may be direct or indirect, immediate or delayed, obvious or subtle. Some of the relationships between the environment and health are straightforward, others are much more complex. They include demographic, economic and social influences, and it is very difficult to factor these in to assess the full scope and size of the environmental effect, both positive and negative. Some of the harmful health effects include:

- diseases due to microbial contamination of food and water
- vectorborne diseases transmitted by insects and other animals
- respiratory and heart diseases attributed to air pollution and chemical exposure in the workplace
- injuries associated with workplaces and traffic systems
- disasters or changes in ecological systems associated with climate change.

The following pages describe the effects of selected environmental determinants on human health.

Food safety

The safety of our food supply can be affected by harmful levels of microorganisms, natural toxins, chemicals and foreign matter—all of which can potentially cause illness in the population. Food safety can be affected anywhere in the food chain: production, packaging, transport, storage and meal preparation.

Foodborne disease

Common causes of foodborne disease include the bacteria *Campylobacter* and *Salmonella*, viruses such as norovirus and toxins such as ciguatoxin. Sometimes the disease is part of a recognised 'outbreak', with a known or unknown food source responsible for causing illness in a number of people. Preventing foodborne diseases depends on appropriate practices in food production, storage, transport and preparation, and there is a complex system of regulations to that end.

Foodborne disease places a considerable burden on Australian society, costing an estimated $1.2 billion annually (Abelson et al. 2006). It has been estimated that there are between 4.0 and 6.9 million cases of foodborne gastroenteritis each year in Australia (Hall et al. 2005).

Notification rates for suspected foodborne diseases have increased over recent decades. This is partly due to better identification and reporting systems but changes in consumer behaviour are believed to have also played a role. More foods are prepared outside the home, which may carry higher risks if poorly prepared (Hall et al. 2002). The increase in globalisation has also increased the potential for widespread outbreaks of foodborne disease due to the larger scale of production. OzFoodNet was established by the Australian Government in 2000 in collaboration with the state and territory health authorities to provide better information about the incidence and causes of foodborne disease and to use this as an evidence base for policy formulation.

In 2007, 149 foodborne disease outbreaks were recorded in Australia and they affected 2,290 people (Table 3.2). Of these people, 266 were hospitalised and five died. The number of outbreaks increased from the previous two years: there were 115 in 2006 (affecting 1,522 people) and 102 in 2005 (affecting 1,975 people) (OzFoodNet 2008).

A wide variety of foods was responsible for the 2007 outbreaks. Fish was the food most commonly associated with outbreaks, although eggs, fresh produce, poultry, and meat and meat products were also implicated. Most outbreaks occurred where food was prepared in restaurants and private residences (OzFoodNet 2008).

Table 3.2: Foodborne disease outbreaks, selected characteristics, 2007

Agent category	Number of outbreaks	Persons affected	Average outbreak size (persons)	Persons hospitalised	Deaths
Bacterial toxin	5	78	16	0	0
Campylobacter	4	20	5	1	0
Ciguatoxin	8	24	3	1	0
Cyclospora	1	8	1	0	0
Histamine poisoning	7	17	2	4	0
Norovirus	16	520	33	6	0
Plant toxins	1	2	2	2	0
Salmonella Typhimurium	39	914	23	225	5
Salmonella other	11	125	11	15	0
Shigella	1	55	55	3	0
Unknown	56	527	9	9	0
Total	**149**	**2,290**	**15**	**266**	**5**

Source: OzFoodNet 2008.

Chemical contaminants

Chemical contaminants include pesticide residues, metals and dioxins. Pesticide use is common in the agricultural industry for controlling pests and diseases. Although its use aims to increase the availability, quality and variety of food, there are associated risks. Metals that may contaminate the food supply include cadmium, lead, mercury, tin and zinc.

Exposure to chemical contaminants is monitored by Food Standards Australia New Zealand as part of the Australian Total Diet Study. The study, run about every 2 years, assesses the population's dietary exposure to a range of food chemicals. It has consistently shown that Australia's dietary exposure to chemical contaminants is well within international health standards and poses very little risk to public health and safety (FSANZ 2008).

Air pollution

Air pollution can aggravate a range of health conditions, including respiratory ailments and cardiovascular disease (Anderson et al. 2004). Air pollution has a range of sources, both natural and human. Natural sources include bushfires, dust storms and vegetation (for example, the volatile organic compounds released by some trees). Industrial activities and motor vehicle emissions are examples of human sources.

Pollutants directly emitted into the atmosphere are known as 'primary' pollutants, some of which undergo chemical changes in the atmosphere and form 'secondary' pollutants. For example, the primary pollutants nitrogen oxide and volatile organic compounds react in sunlight to form the secondary pollutant ozone. Table 3.3 outlines the main sources of air pollutants in Australia and describes their health effects.

Table 3.3: Air pollutant sources and effects

Pollutant and sources	Health effects
Particulates	
Produced in combustion processes such as power generation, industrial activities and motor vehicle use as well as agricultural burning, bushfires and emissions from domestic solid fuel heaters and woodstoves.	Aggravates respiratory and cardiovascular diseases, and irritates upper airways and eyes.
Ozone (O_3)	
Formed when nitrogen oxides (NO and NO_2) and volatile organic compounds react in sunlight. Sources include combustion in motor vehicles, power generation and bushfires.	Aggravates respiratory and cardiovascular diseases, decreases lung function and irritates airways.
Nitrogen dioxide (NO_2)	
Formed when nitric oxide (NO) is combined with oxygen (O_2) in the atmosphere. Sources of nitric oxide include industrial activities and motor vehicles.	Aggravates respiratory disease and decreases resistance to infection.
Carbon monoxide (CO)	
Formed when substances containing carbon (such as fossil fuels) are burned with an insufficient air supply. The major sources include industrial activities and motor vehicles.	Aggravates cardiovascular disease and affects mental function.
Sulfur dioxide (SO_2)	
Major sources include natural sources such as erupting volcanoes as well as the burning of fossil fuels and smelting of mineral ores that contain sulfur.	Aggravates cardiovascular disease, irritates eyes and throat, and can damage lungs.

Sources: Anderson et al. 2004; BTRE 2005; DEH 2005; Katsouyanni 2003.

In recognition of the effects of these pollutants on health and climate, a range of standards has been introduced across Australia over recent decades. The National Environment Protection Measures describe standards for six main pollutants (Table 3.4). A description of the averaging period used to determine whether or not the maximum allowable levels have been exceeded is in Box 3.1.

Table 3.4: National ambient air quality standards and goals

Pollutant	Averaging period	Maximum ambient concentration	Maximum days per year [a]
Particulates (as PM_{10})[b]	1 day	50 µg/m^3	5 days a year
Ozone (O_3)	1 hour	0.10 ppm	1 day a year
	4 hours	0.08 ppm	1 day a year
Nitrogen dioxide (NO_2)	1 hour	0.12 ppm	1 day a year
	1 year	0.03 ppm	None
Carbon monoxide (CO)	8 hours	9.00 ppm	1 day a year
Sulfur dioxide (SO_2)	1 hour	0.20 ppm	1 day a year
	1 day	0.08 ppm	1 day a year
	1 year	0.02 ppm	None

ppm Parts per million.

(a) Goal for the maximum number of times the standard may be exceeded.

(b) Particulate matter, or inhalable particles, over 10 microns in diameter.

Source: DEH 2005.

Box 3.1: Air quality standards averaging period

The averaging period in Table 3.4 refers to the period over which the air pollution readings are averaged. In the case of an averaging period of 1 hour, for example, data are grouped by the hour of the day in which they were recorded—for example, from 1 am to 2 am or from 4 pm to 5 pm. The average reading is then calculated for each hour of the day. The highest average hourly reading is taken as the reading for that day.

The level specified as the maximum allowable is generally lower where the averaging period is longer. Averaging the readings over a longer period means that the result is less influenced by brief peaks in pollutant levels. Selecting an averaging period is a balance, however. On the one hand, it is important to avoid results being skewed by very short-term peaks in pollutant readings that may not relate to substantive increases in exposure in the community. On the other hand, long averaging periods can become less sensitive to relatively sustained increases in pollutant levels that do relate to real increases in exposure in the community.

Table 3.5 describes trends in pollutant concentrations against the National Environment Protection Measures since 1991. Most of these pollutants have declined considerably since the standards were introduced. The air pollutants of most concern are particulates and ozone. High temperatures are the main contributors to both these pollutants in Australia. Sunlight and high temperatures play a key role in chemical reactions associated with the production of ozone and also contribute to extreme events, such as bushfires and dust storms, that produce particulates.

Table 3.5: Trends in concentration of air pollutants

Pollutant	Trend
Particulates (as PM_{10})[(a)]	All capital cities except Hobart had PM_{10} concentrations above the standard between 1991 and 2001. In Melbourne the levels of PM_{10} remained above the standard from 2001 to 2006, with concentration peaks seen in 2003 and 2006. New South Wales also recorded PM_{10} levels above the standard from 2001 to 2006, with a peak in 2003. The peaks can be attributed to severe bushfires and dust storms in those years (DECC 2007).
Ozone (O_3)	In most Australian cities, ozone standards were exceeded every year in the period 1991 to 2001. The only capital city with ozone levels consistently below the standards was Canberra. Ozone levels in Sydney and Melbourne remained above the standards from 2001 to 2006.
Nitrogen dioxide (NO_2)	All major cities showed an overall decline in NO_2 concentrations between 1991 and 2001. NO_2 concentrations remained below the standards in Sydney and Melbourne from 2001 to 2006.
Carbon monoxide (CO)	Since the introduction of unleaded petrol and catalytic convertors in 1985, CO levels have dropped considerably. Sydney, Adelaide and Canberra were the only capital cities that exceeded the standard between 1991 and 2001. The levels in these three cities dropped below the standard in 1996.
Sulfur dioxide (SO_2)	Most capital cities have shown a fairly steady rate of sulfur dioxide emissions and met the National Environment Protection Measures standards for highest daily average and highest daily maximum between 1991 and 2001. This trend was maintained in Sydney and Melbourne from 2002 to 2006. Until 1996, Adelaide exceeded the standards but since then the levels have been below the standard.

(a) Refers to particulate matter, or inhalable particles, over 10 microns in diameter.

Sources: BTRE 2005; DECC 2007; DEH 2005; Katsouyanni 2003.

Water

Access to an adequate and safe supply of water is a fundamental requirement for good personal and public health. This includes both drinking and recreational water. As the term implies, 'drinking water' is water that is intended for human consumption, but since the source is usually the same it also includes water used for other domestic purposes such as bathing and washing. Water availability and usage in Australia is described in Box 3.2.

Water quality in Australia is generally of a very high standard; contamination is rare, especially in and around major population centres. However, many things can affect water quality and a safe water system requires constant surveillance and monitoring to control concentrations of potentially harmful chemical and microbial contaminants.

Some viruses (for example, adenovirus, hepatitis viruses and rotaviruses), bacteria (for example, *Escherichia coli*, *Enterococci*, *Campylobacter* and *Salmonella*) and protozoa (for example, *Cryptosporidium* and *Giardia*) can be transmitted by contaminated water supplies. The presence of harmful microbes in drinking water is due mainly to contamination by human or animal faeces. The quality of natural recreational water bodies may be affected by discharges of sewage, stormwater and agricultural runoff, whereas risks to swimming pool water quality arise from microbial contaminants originating from bathers themselves.

Drinking or bathing in contaminated water can result in health effects ranging from irritated eyes, skin and throat and mild gastroenteritis, to more severe diarrhoea and potentially life-threatening dysentery, hepatitis and cholera. Some chemical contaminants in water are suspected of causing cancer.

Almost all water supplied through utilities in Australia meets the guidelines for microbial and chemical contamination. The Australian Drinking Water Guidelines use *E. coli* as an indicator for faecal contamination, and to meet the guidelines for microbial contamination there must be zero counts of *E. coli* in 98% of routinely monitored samples over a 12-month period. However, each jurisdiction may have more stringent guidelines than this. In 2007–08, 82% of all water utilities reported full compliance with microbiological and chemical contamination standards (National Water Commission 2009).

Low flows and warm water temperatures can alter water chemistry and pathogen content, often resulting in blue-green algae (cyanobacteria) blooms which are toxic to humans and animals. The growth of algae is also encouraged by the phosphorous and nitrogen in fertilisers that can run off into waterways. Bushfires that occur near water catchment areas can also affect water quality when runoff from rain on the bare landscape, ash and debris fall into the catchment.

The fluoridation of tap water delivers a public health benefit by reducing the incidence of tooth decay. In 2001, more than three-quarters of the population, in every state or territory except Queensland, had access to fluoridated drinking water. In December 2008, fluoride was introduced to the water supply for Brisbane and parts of south-east Queensland (Brisbane City Council 2009).

Box 3.2: Water availability and usage

Based on a range of measures—average rainfall, distribution of rainfall and potential evaporation—Australia is considered the driest inhabited continent on the planet. Water availability depends largely on rainfall, but also on the amounts stored in aquifers (underground storage), dams, rivers and lakes. This in turn determines how much water can be used for agricultural, recreational, industrial and domestic purposes.

In Australia, rainfall varies by year, season and geographical location. The average annual rainfall in Australia in 2008 was around 480 mm, slightly higher than the average for 1961–2008 of about 470 mm (Bureau of Meteorology 2009). Some areas in Australia have an average annual rainfall between 600 and 1500 mm, which is comparable to that across most of Europe and North America (ABS 2006b), while for half of Australia the average is less than 300 mm (ABS 2008a). Annual rainfall variability is greater for Australia than for any other continental region (Smith 1998 cited by ABS 2006b).

In 2005, 96% of Australia's water supply was sourced from surface water stored mainly in catchments, while groundwater (that is, water occurring below the ground) supplied nearly 4%. Desalinated sea water accounted for the remainder (less than 0.5%) of the water supply (ABS 2008a).

Prolonged drought over south-eastern Australia since the beginning of this century has heavily affected rural communities, their amenities and their livelihoods. This drought exceeds all previous droughts in both duration and intensity. It is no longer considered a drought, which implies there will be a return to 'normal' conditions, but rather a new rainfall regime (Hennessy et al. 2008).

Water usage patterns in Australia are changing. Water restrictions have been in place in most states and territories since 2002. Between 2000–01 and 2004–05 there was a 7% decrease in household water consumption and this could be due partly to the restrictions (ABS 2008a). These restrictions have achieved broad acceptance, along with the use of rainwater tanks and domestic water recycling. The proportion of households that reported using a rainwater tank as a source of water increased from 17% in 2004 to 19% in 2007 (ABS 2007a). South Australia, the driest state, had the highest proportion (45%) of households using rainwater as a source of water.

Environmental changes, climate and health

There are growing concerns that large-scale changes to the environment will expose Australians to a range of increased environmental hazards, such as extreme temperature, natural disasters, famine and vectorborne diseases. Human settlements, industrialisation, land clearing and farming practices all affect environmental systems, including climate systems (Corvalan et al. 2005; IPCC 2007). Changes to the global environment will have both direct and indirect implications for human health. This may be of particular concern for vulnerable groups, such as Indigenous Australians and the elderly.

Climate change

Australians now see climate change as a pre-eminent social, economic and environmental issue—82% of adults in a large national survey in 2007–08 reported that they were concerned about environmental problems (ABS 2009a). Further, international health

experts have labelled climate change as the biggest global health threat of the 21st century (Costello et al. 2009).

The most topical area of concern about the environment is the threat of global warming through a mechanism known as the greenhouse effect. This is a natural and necessary effect in which gases are trapped in the Earth's atmosphere so the earth is warmed to a level that supports life. The three main long-lived greenhouse gases that are of interest are carbon dioxide, nitrous oxide and methane: if too much of these gases is released into the atmosphere then the greenhouse effect is increased, causing the earth to warm excessively.

Human activities contribute to climate change by causing changes in the Earth's atmosphere in the amounts of greenhouse gases, aerosols (small particles) and clouds. The largest known contribution comes from the burning of fossil fuels, which releases carbon dioxide gas into the atmosphere. According to the Intergovernmental Panel on Climate Change (IPCC 2007), since the start of the industrial era (about 1750), the overall effect of human activities on climate has been a warming influence.

In Australia, average temperatures have risen by around 1°C since the first half of the last century, with an increase in the frequency and intensity of heatwaves and a decrease in the numbers of frosts and cold days (Bureau of Meteorology 2009).

Some effects of climate change and other environmental changes may be beneficial, such as increased crop yields or displacement of disease-carrying animals and insects in some areas; however, most of the effects are expected to be harmful, and are further discussed below.

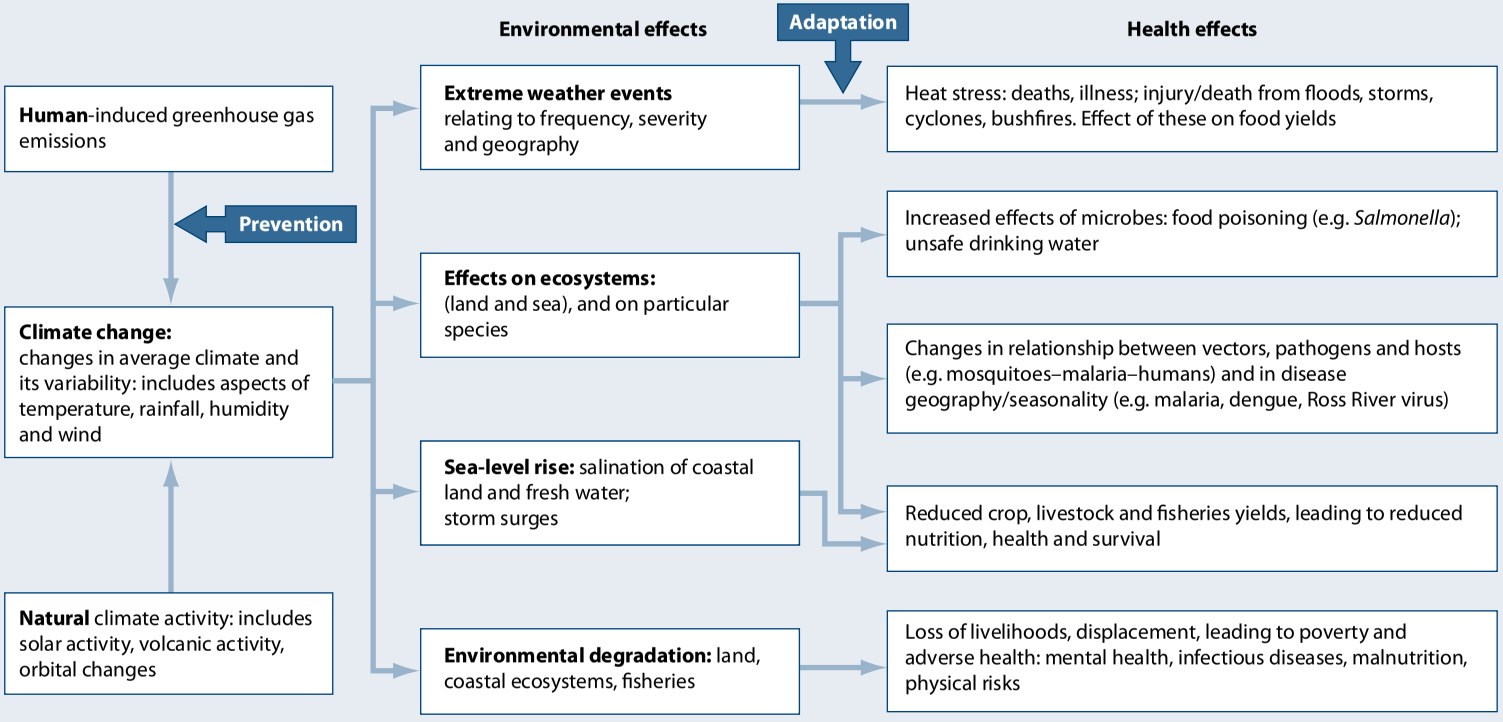
Health effects of climate change

Attributing health effects to climate change, and quantifying these associations, is difficult for a number of reasons:

- the links between climate and health may involve indirect and complex relationships
- the effects are often delayed or displaced
- the chains of effect mean there would be great uncertainty in showing that climate change over time—not just a particular climate event—has caused ill health in any particular individual (however, it may well be possible to show effects at a population level)
- there is no clear 'baseline'; that is, climate change has been occurring for many years
- any future effects are subject to global efforts to reduce the effects of human activity on climate.

The changes and increased variability of climate and environment will result in both direct and indirect effects on health. The direct risks to health caused by climate change include extreme heat or cold, storms, bushfires, floods and other weather-related disasters (Corvalan et al. 2005; McMichael et al. 2006). Indirect health effects include increased exposure to air pollutants, contaminated food and water, and changes in patterns of transmission of various infectious diseases. Moreover, mental and physical illness may be caused by climate change-induced social upheaval and disruption (Confalonieri et al. 2007). Dislocation of populations often leads to poor health, and limited resource availability raises the potential for conflict in the areas that people migrate to (GHF 2009; United Nations 2007).

Figure 3.2 summarises the main pathways by which climate change can affect population health, and suggests where interventions—both as prevention and adaptation—may reduce health damage.



Note: Prevention refers to ways of reducing greenhouse gas emissions. Adaptation entails interventions to reduce health damage.

Source: Adapted from McMichael et al. 2006.

Figure 3.2: Main pathways by which climate change affects population health

On the basis of data collected over the past 150 years, heat waves in Australia are increasing in frequency and intensity, with record high temperatures observed in 2009 across South Australia, Tasmania and Victoria. In January 2009, Victoria recorded 374 deaths over what would usually be expected, equating to a 62% increase in total all-cause mortality (DHS 2009). Currently there are an estimated 1,115 heat-related deaths per year in Australia's five largest capital cities, and this number is projected to double by 2020 (Whetton et al. 2005). A threshold maximum temperature above which mortality is observed to increase in eastern Australian cities is about 28–30°C (Guest et al. 1999). Australia can therefore expect significant increases in heat-related health problems, especially among the elderly, arising from the additional number of very hot days.

The extreme weather across Australia during the summer of 2008–09 was associated with floods in Queensland and New South Wales, and bushfires in the southern states. A warming climate is expected to lengthen bushfire seasons and increase the frequency and intensity of bushfires. Total fire weather, measured as the daily Forest Fire Danger Index, has increased by 40% since the late 1990s, such that the measure for Melbourne airport is already at twice the projection for 2020 using the most severe warming scenarios (Lucas et al. 2007). The Black Saturday fires in Victoria in 2009 were the most intense and most lethal in Australia's recorded history. Over 170 people perished, and many suffered severe burns and were hospitalised.

Some activities contribute to preventing further climate change while at the same time providing a benefit to individuals' health. For example:

- riding bicycles or walking instead of driving not only decreases greenhouse gas emissions, but also improves overall health and fitness
- shopping locally for fruit and vegetables, say at farmers' markets, decreases greenhouse gas emissions caused by transport and refrigeration.

The built environment

The built environment refers to aspects of our surroundings that are created or modified by people rather than occurring naturally. It includes our homes, schools and workplaces, recreation areas and transport systems.

The built environment is an important determinant of lifestyle and health. Its design and structure can shape both our physical health (for example, road traffic accidents or occupational injuries) and mental wellbeing (for example, stress due to noise or light pollution). More broadly, human-made surroundings such as public recreation spaces can influence the quality of social relationships and sense of community in an area.

The effects of the built environment on human health and wellbeing are most apparent in cities and towns, and Australia is one of the most urbanised countries in the world. At the latest Census, two-thirds of Australians (66%) lived in urban areas of greater than 100,000 people, with most (60% of the total population) living in cities of more than 1 million people (ABS 2008b).

Urban design, housing and transport are three aspects of the built environment that have received considerable attention from policy makers, urban planners and public health experts.

Urban design plays a role in influencing physical activity, particularly walking and cycling for transport. Residents are more likely to be physically active (and less likely to be overweight and obese) in neighbourhoods that are pedestrian-friendly and designed

to include footpaths and cycle paths, public open spaces, well-connected street networks and access to shops and services (Gebel et al. 2005; NHFA 2009a).

An increasing body of evidence has linked housing quality with morbidity from infectious and chronic illness, and injuries. For example, living in a home that is damp and mouldy can increase the risk of developing respiratory and asthma-related symptoms such as coughing, wheezing and irritation of the upper respiratory tract by 30–50% (Fisk et al. 2007).

Greater use of cars for transportation has been associated with higher levels of congestion and air pollution as well as traffic accident injuries and deaths (WHO 2000). More recently, car dependence has been identified as a major contributor to sedentary lifestyles and growing rates of overweight and obesity. In one study, residents of New South Wales who drove to work were 13% more likely than non-car commuters to be overweight or obese and significantly less likely to achieve recommended levels of physical activity (Wen et al. 2006).

These are just some of the numerous pathways through which the built environment can influence human health. With increasing urbanisation, the continued study of the built environment and its relationship with health is important to inform urban planning and create sustainable healthy cities.

3.3 Socioeconomic characteristics

Socioeconomic factors such as income, employment, education, social support and housing are all intricately linked to health. Disentangling the relationships between health and these factors is complex because the causal direction is often unclear. For example, people who have higher levels of education are more likely than others to be employed in white-collar or professional jobs, and also tend to have higher incomes than unskilled workers. Therefore, some of the connection between income and health is due to the indirect effects of education and occupation. Education promotes skills and knowledge that can help an individual understand information and seek services to improve their health. Further, illness or disability can contribute to unemployment, which in turn results in reduced income.

Burden-of-disease studies indicate greater burden among people who are relatively disadvantaged in society. Those with lower levels of socioeconomic status (SES) have markedly higher rates of diabetes, injuries and mental disorders than those with the highest SES (Begg et al. 2007). Features common to these conditions include lifestyle-related risk factors, which also show a similar pattern of being more common as SES declines. The relationship between SES and specific health conditions and behaviours is further described in Chapter 5.

The following section is about socioeconomic characteristics that have been shown to be determinants of health; that is, they play some causal role in health status. The most recent Australian data are presented along with an indication of trends over the past decade.

Education

The higher a person's levels of education and literacy, the better their health is likely to be. Having greater education carries better prospects of employment, occupation and income. All this serves to help people gain the knowledge and confidence throughout life to look after themselves well and obtain the best health care.

Education level can be summarised according to retention, attainment and literacy. The 'apparent retention rate' for Year 7/8 to Year 12 represents the percentage of school students in Year 12 of their respective Year 7/8 cohort. In Australia in 2008, the national apparent retention rate was 75% (ABS 2009b), an increase from 72% in 1998. The rates in Victoria, Queensland and the Australian Capital Territory were higher than the national rate. Rates were higher for females than for males in 2008—81% versus 69% respectively. Although the rate for Indigenous Australians was substantially lower than for non-Indigenous Australians, steady increases are evident for them—from 38% in 2002 to 47% in 2008.

Along with improvements in school retention, the proportion of Australians aged 15–64 years with post-school qualifications has also increased—54% in 2008 compared with 42% in 1998 (ABS 2008c) (Table 3.6). This has been due to a steady increase in the proportion attaining a bachelor or higher degree—22% in 2008 compared with 14% in 1998 (ABS 2008c).

Table 3.6: Highest post-school qualification of persons aged 15–64 years, 1998 to 2008 (per cent)

Qualification	1998	2000	2002	2004	2006	2008
Bachelor degree or above	14.3	15.7	17.8	18.9	20.6	21.9
Diploma or certificate	27.6	28.1	29.8	31.3	30.8	30.8
None	58.1	56.2	51.8	49.1	47.6	46.1

Note: Totals may not add to 100% because the level of highest non-school qualification of some persons could not be determined.
Source: ABS 2008c.

Income and wealth

Income influences health at multiple levels: there is a country's wealth, the typical wealth of its people, and how evenly wealth is distributed. From a global perspective, Australia is a very wealthy country and this allows its governments to provide many health services and to subsidise Australians' use of them (see chapters 7 and 8). For individual citizens, higher incomes give greater access to goods and services that provide health benefits—for example, better food and housing, health care and other healthy pursuits.

The Australian Bureau of Statistics' (ABS) measure of people's income is based on its Survey of Income and Housing and is known as the median equivalised disposable household income. It is the amount of income available per person after adjusting for household size. Due to changes to the latest of these surveys (2007–08) it is difficult to compare its results to those for previous years. However, it is clear that household incomes in Australia have grown considerably during the past decade in real (inflation-adjusted) terms—by about 35% between 1995–96 and 2005–06 (ABS 2007b).

This income varied between states and territories and with area of residence, with the average being 25% higher in capital cities than in other areas (ABS 2009c).

Despite Australia's high overall wealth, there is still a degree of inequality in wealth among its people. Income distribution across the population is commonly measured by percentile ratios. In 2007–08, the household income level of those at the 80th percentile (that is, the value dividing the top 20% of households from the 80% below them) was $1,079 per week, while that of the 20th percentile was $410. The ratio of these two income levels, known as the P80/P20 ratio, was 2.63 (ABS 2009c).

In lone-parent households there is poorer health among children and young people, and this has been attributed to material disadvantage (Mathers 1995; Spencer 2005). In 2007–08 the median income in those households with dependent children was $464 per week, one-third less than the national median of $692 per week.

3.4 Knowledge, attitudes and beliefs

Knowledge, attitudes and beliefs about health are important determinants of lifestyle and health behaviours. An understanding of good health and its importance can influence an individual to adopt health-protective behaviours (such as regular physical activity) rather than risky behaviours (such as unsafe sexual practices). Because these behaviours will shape both present and future health status, health interventions that aim to increase knowledge or modify attitudes and beliefs are a valuable component of health promotion.

Australians are exposed to, or seek out, health 'knowledge' from a wide range of sources. Health professionals are traditionally considered the first point of contact for a health concern, but there is now a range of other sources of information available. These include friends, family, the internet, and books, magazines and television programs focused on good health and positive lifestyle behaviours. A study conducted in 2002 found that 27% of regular internet users in Australia (1.4 million people) had sought health information on the internet (BHC 2008a). Of these internet users, three-quarters had used the internet to become better informed about their illness, and one-fifth to decide whether to seek medical attention. While more recent data on health-related internet use are unavailable, it is likely that an increasing number of Australians are looking to the internet for information about health concerns.

One way of discussing Australians' knowledge about health is through surveys of health literacy (see Box 3.3). Being health-literate involves knowing what constitutes good quality advice, how and where to seek further information when required and how to translate information into action. A person with a higher level of health literacy will find it easier to successfully manage their health. In contrast, low levels of health literacy (and poor health management) will be detrimental to both the individual concerned and the broader community.

Box 3.3: Health literacy

The 2006 Adult Literacy and Life Skills Survey derived an overall measure of health literacy from questions that pertain to five different health activities. These are:

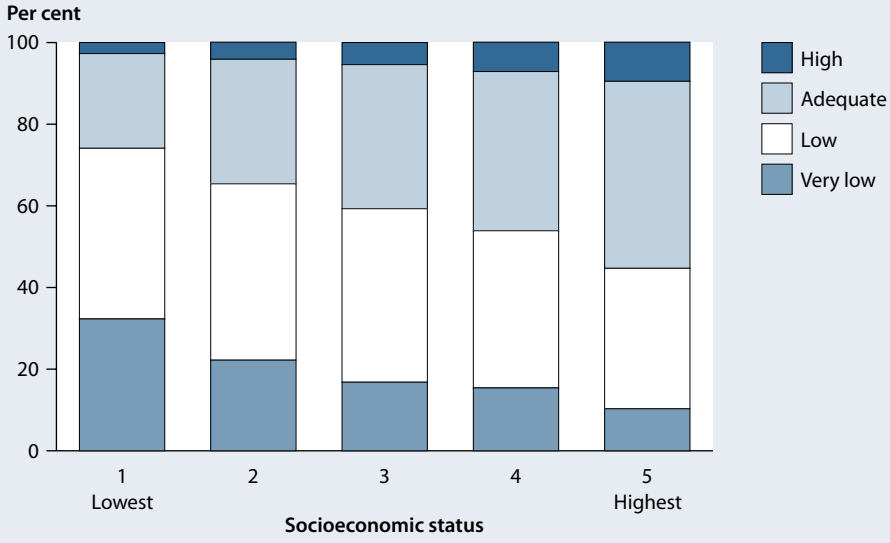
- health promotion—the ability to enhance and maintain health by locating and using health-related articles and information; for example, planning an exercise regime or using information on food charts or product safety labels
- health protection—the ability to safeguard individual or community health by reading newspaper articles, information about health and safety, or air and water quality reports, or participating in referenda
- disease prevention—the ability to take preventive measures and engage in early detection by understanding health alerts on television or in newspapers, or in letters about medical test results; for example, to determine risks, seek screening or diagnostic tests and follow up on courses of treatment

- health care information—the ability to seek and form a partnership with health care providers, provide a health history, follow directions on medicine labels, or understand and discuss the merits of alternative treatments with a health professional
- systems navigation—the ability to understand and access required health services by completing application forms, reading maps to locate appropriate facilities or understanding health benefits packages (notably about what private health insurance funds offer their members).

Literacy level is grouped into 5 levels, where Level 1 is the lowest level and Level 5 is the highest. Level 3 is regarded as the 'minimum required for individuals to meet the complex demands of everyday life and work in the emerging knowledge-based economy'. Level 1 tasks usually required respondents to find a single piece of literally stated information in a document, while Level 5 tasks involved multiple phrases in the question and required finding multiple pieces of information to arrive at the correct result.

Sources: Adapted from ABS 2007c; ABS 2008d.

In its 2006 Adult Literacy and Life Skills Survey, the ABS rated health literacy skills on a scale of 1 (lowest) up to 5, where 3 was regarded as the minimum required for meeting the complex demands of everyday life and work ('adequate health literacy'). Findings from the survey show that, overall, 41% of Australians aged 15–74 years had an adequate or better level of health literacy (2008d). However, people living in higher SES areas were more likely to have a higher level of health literacy than those in lower SES areas (Figure 3.3). Slightly over a quarter (26%) of people from the lowest SES areas had an adequate level of health literacy or above, compared with 55% of people from households in the highest SES areas.



Note: This figure is based on the Index of Relative Socioeconomic Disadvantage (IRSD), one of the four Socioeconomic Indexes for Areas (SEIFAs) developed by the ABS. See Box 5.5 Chapter 5 for further explanation of SEIFA.

Source: ABS 2008d.

Figure 3.3: Level of health literacy and socioeconomic status

The survey also showed that health literacy was higher among people who were employed, had higher levels of formal education, participated in social groups and organisations, or were born in a mainly English-speaking country. Males and females had similar levels of literacy—40% of males and 41% of females achieved an adequate level or above.

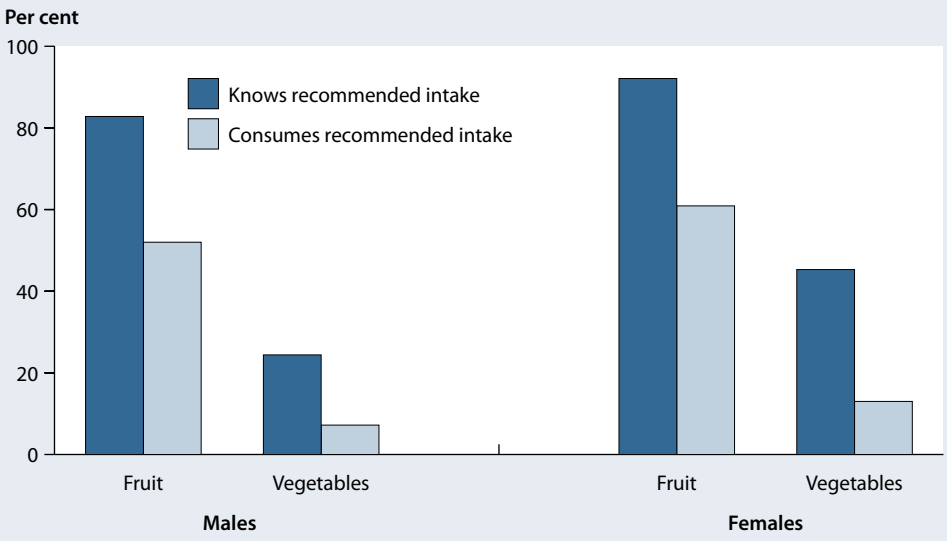
There is a reasonable assumption behind the notion of health literacy: that good knowledge about health will tend to lead to better health for the people concerned. However, common observation tells us that 'knowing' something is often not enough for a person to act in their own best interests. In the case of health, for example, people's underlying attitudes and beliefs interact with many other factors that can influence their behaviour, such as prior experience with a particular disease, physical addiction, financial and time constraints, and peer group norms. This means that health promotion campaigns and efforts to increase people's health awareness and knowledge will not automatically translate into health-protective behaviours.

As an example, there is a large inconsistency between knowledge and practice relating to sun exposure and protection. Despite widespread acceptance that excessive exposure to ultraviolet (UV) radiation increases the risk of developing skin cancer, many Australians have not adhered to sun safety messages. Findings from the National Sun Protection Survey show that 22% of Australian adolescents and 11% of adults deliberately tanned in the summer of 2006–07 (Cancer Council of South Australia 2008). For more information on sun protection, see Section 3.5.

For tobacco smoking there is also a discrepancy between knowledge and behaviour. Extensive efforts have been made to reduce the level of tobacco smoking among Australians by providing information about the health risks of this harmful behaviour. This has been quite successful in terms of increasing knowledge about the effects of smoking. Most smokers acknowledge the risks associated with smoking—in a survey conducted in 2007 in New South Wales, three-quarters of smokers believed they either definitely or probably would become seriously ill if they continued to smoke (Cotter et al. 2008). Furthermore, 83% of smokers agreed that smoking-related deaths are likely to be slow and painful. However, less than half of all smokers (45%) felt that they were 'seriously' thinking about quitting in the next 6 months. For further information on tobacco smoking, see Section 3.5.

The same survey found similar evidence in relation to nutritional knowledge and practice. Although 88% of adults (83% of males and 92% of females) knew the recommended number of daily serves of fruit, only 56% met that recommendation. Similarly, although 35% of adults knew the recommended daily intake for vegetables, only 10% consumed the recommended amount. Knowledge and consumption were greater for females than males—45% of females and 24% of males knew the recommended vegetable intake, while 13% and 7% respectively consumed the recommended amount (Figure 3.4).

Knowledge about sexually transmissible infections (STIs) and sexual health is another area of interest. Results from the Fourth National Survey of Australian Secondary Students and Sexual Health show that most students (88%) had sought information about sexual health (Smith et al. 2009). Sources of information included mothers (56%), female friends (55%) and the school sexual health program (49%). While not used as frequently, doctors (39%) were considered to be the most trusted source of information on sexual health.



Source: Centre for Epidemiology and Research 2009.

Figure 3.4: Knowledge and practice of recommended daily fruit and vegetable consumption, people aged 16 years and over, New South Wales, 2008

Despite the range of information sources reported, knowledge about sexual health was found to be inconsistent among secondary school students. Although knowledge about HIV/AIDS was high, knowledge about other STIs and their transmission was poorer, especially for chlamydia, hepatitis, gonorrhoea and genital warts. The majority of students did not perceive themselves to be at risk of STIs—less than 1 in 10 (7%) believed they were likely or very likely to become infected with an STI. The perceived risk of STIs was higher among students who were sexually active (12%), had three or more sexual partners in the past year (26%) or were attracted to people of the same sex (15%). The risk of becoming infected with an STI was considered more salient when the student's sexual partner was not previously known to them. Complementary research has shown that condom use among young adults was governed more by concerns about pregnancy than STIs, making condom use less likely (de Visser 2005). For further information on sexual behaviours, see Section 3.5.

Finally, apart from the imperfect link between knowledge and practice, there is evidence that health knowledge may be misinterpreted or missed altogether by some population groups. Studies have shown that some people from non-English-speaking backgrounds are not as informed about risky health behaviours as their English-speaking counterparts (Perusco et al. 2007). In some cases, those who come from countries where smoking is seen as the social norm are often not aware of the health and social problems associated with smoking (Lê & Lê 2006). Accordingly, health promotion programs that aim to increase knowledge and challenge beliefs require careful planning to ensure that they benefit all population groups.

3.5 Health behaviours

Many things can influence a person's health-related behaviours, including other health determinants and a person's individual makeup. For example, the consumption of alcohol or tobacco can be a function of a person's preferences, modified by cultural or family influences and socioeconomic resources. A person's knowledge, attitudes and beliefs may make a particular behaviour more or less likely. Further, behaviours may be affected by the presence of disease or disability.

Changing health behaviours is a primary goal of health promotion, which often operates at a population level (such as through television advertisements promoting physical activity). Other population health interventions such as legislation, regulation or price control may make it harder for people to continue with unhealthy behaviours. For example, these mechanisms have been used to make it harder to purchase cigarettes and to reduce the number of places where smoking is allowed, with the expectation that people will either not take up smoking or choose to quit. These population-level interventions may be supplemented by advice from health professionals, and perhaps by medication or other medical treatments.

Ultimately, individuals make their own choices about health-related behaviours based on this mix of determinants, interventions and other influences, and consequently have more power to change their own behaviours than many of the other determinants discussed in this chapter.

The following sections describe the levels, patterns and trends of the health-related behaviours that have been shown to have a major influence on health.

Tobacco smoking

Tobacco smoking is the single most preventable cause of ill health and death in Australia. It contributes to more hospitalisations and deaths than alcohol and illicit drug use combined (AIHW 2008c). It is a major risk factor for coronary heart disease, stroke, peripheral vascular disease, cancer and a variety of other diseases and conditions.

The usual measure of population smoking rates is 'daily' smoking (that is, smoking every day), as this reflects the pattern of smoking most harmful to health. The great majority of smokers do smoke every day, while around 7% of smokers smoke at least once per week but not every day, and around 8% smoke less often.

Prevalence

Estimates from the latest National Drug Strategy Household Survey (see Box 3.4) show that in 2007 around 2.9 million Australians—1 in 6 aged 14 years and over —smoked daily (AIHW 2008d). Males were more likely to be daily smokers (18.0%) than females (15.2%). More than half of the population had never smoked (55.4%), and around a quarter of the population were former smokers. Males were more likely to be ex-smokers (27.9%) than females (22.4%).

Some groups within the population were more likely to smoke than others: those who were unemployed (38.2%), unable to work (33.7%), living in areas with the least socioeconomic resources (25.9%) or living in remote areas (25.0%). Indigenous Australians were more likely to be smokers than other Australians (34.1% and 19.0% respectively) (AIHW 2008b).

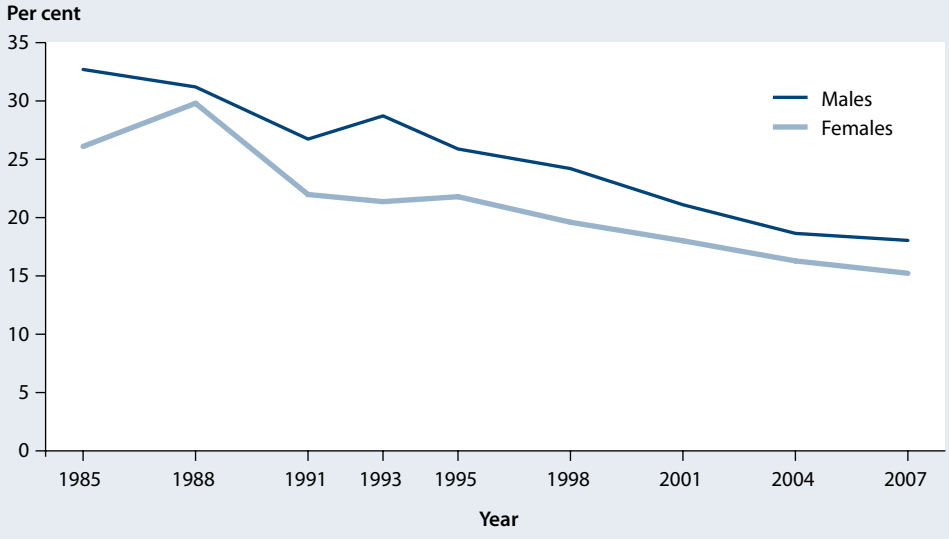
Box 3.4: National Drug Strategy Household Survey

The National Drug Strategy Household Survey is run by the Australian Institute of Health and Welfare at 3-yearly intervals. It collects comprehensive information about Australians' use of and attitudes towards tobacco, alcohol and illicit drugs; experiences of alcohol and other drug-related harm; and physical and mental health.

The last survey was conducted in 2007, the ninth in a series that started in 1985, and collected information from over 23,000 respondents. People living in non-private dwellings and institutions were not included in the sample. The first seven surveys covered people aged 14 years and over; and since 2004, people aged 12 years and over have been included.

Like many other surveys, the National Drug Strategy Household Survey is based on self-reported information. Individuals may be less inclined to report illegal drug use than to report the use of legal drugs (AIHW 2008c). Illicit drug users may also be marginalised and difficult to reach (AIHW 2008d). This means that survey results relating to illicit drug use may be underestimates of actual prevalence.

Smoking rates have been declining for several decades; it has been estimated that around 70% of adult males and 30% of adult females in Australia smoked in the 1950s. Between 1985 and 2007, the prevalence of smoking declined for both males and females (Figure 3.5). This trend is also apparent in data collected during general practitioner (GP) consultations: among adult patients, daily smoking rates decreased from 19.2% in 1998–99 to 16.5% in 2007–08 (Britt et al. 2008).



Sources: AIHW 2005a; 2008d.

Figure 3.5: Daily smokers, population aged 14 years and over, 1985–2007

Despite these positive trends, tobacco smoking continues to cause more ill health and death than other well-known health determinants such as high blood pressure, overweight/obesity and physical inactivity. It was estimated to be responsible for 7.8% of the burden of disease in Australia in 2003: 9.6% of the total burden for males and 5.8% for females (Begg et al. 2007). Another way of looking at the impact of smoking is through 'social costs'. Social costs comprise tangible costs which are borne by governments, businesses and households (such as health care, fires and lost productivity) and intangible costs which are borne by individuals through pain and suffering. For 2004/05, the social costs of tobacco smoking were estimated to be $31.5 billion, the majority (62%) being intangible (Collins & Lapsley 2008).

These social costs of tobacco smoking are expected to rise even as smoking rates decline due to the delay between past consumption and subsequent effects on health. However, it is expected that over time, and assuming that prevalence continues to fall, costs will eventually drop substantially (Collins & Lapsley 2008).

Smoking reduction

As mentioned above, around a quarter of Australians aged 14 years and over are former smokers—a larger proportion than current smokers in Australia. In the 2007 National Drug Strategy Household Survey, 71.8% of people aged 14 years and over who had smoked in the last 12 months reported attempting to reduce or quit their tobacco consumption. Among people who made such attempts, the most common reason for doing so was that smoking was affecting their health or fitness (45.0%). Those who attempted to reduce their smoking may have had more than one reason for doing so. Other common reasons included that smoking cost them too much (35.8%), the person wanted to get fit (27.4%) and family or friends asked them to quit (25.0%). A lower proportion (13.9%) said they cut down because of their doctor's advice (AIHW 2008b).

Smoking among young people

As a group, Australian teenagers are markedly less likely to smoke than those older than them: in 2007, among those aged 12–19 years, 5.6% smoked daily compared with 16.1% for the wider population aged 12 years and over (AIHW 2008d). Across this narrow 12–19 year age span, rates increased with age, from 2.0% among 12–15 year olds to 5.7% among 16–17 year olds and 12.6% for those aged 18–19 years.

Successive Australian Secondary Schools Alcohol and Drug surveys have found that smoking among young people has been declining. Between 1987 and 2005, the proportion of students aged 12–15 years who reported smoking in the week before the survey declined from 15% to 7% (Hill et al. 2002; White & Hayman 2006).

One of the strategies used to discourage smoking among young people is bans on the sale of cigarettes to people under the age of 18 years. Australian Secondary Schools Alcohol and Drug Surveys have estimated that the proportion of young smokers who purchased their most recent cigarette (instead of obtaining it some other way) fell markedly between 1987 and 2005 (White & Hayman 2006). For current smokers aged 12–15 years in 2005, 17% had purchased their most recent cigarette compared with 52% in 1987. For those aged 16–17 years, 29% purchased their most recent cigarette in 2005 compared with 64% in 1987.

Other data about the sources of tobacco for young people (AIHW 2005b, 2008b) show that people aged 12–17 years most commonly reported friends or relatives as their means of obtaining tobacco (Table 3.7). A smaller proportion of young tobacco smokers aged 12–17 years obtained their tobacco from shops in 2007, compared with 2004.

Table 3.7: Means of obtaining tobacco, smokers[(a)] aged 12–17 years, 2004 and 2007 (per cent)

Means of obtaining tobacco	2004	2007
Friend or relative	53.0	57.0
Bought at shop/retail outlet	70.0	49.5
Paid cash but not at retail outlet	26.4	*20.0
Stole or traded goods or services	18.6	*11.6
Other	19.3	**8.2

* Relative standard error > 25%.

** Relative standard error > 50%.

(a) Includes daily, weekly or less than weekly smokers.

Note: Recent smokers could indicate more than one means of obtaining tobacco.

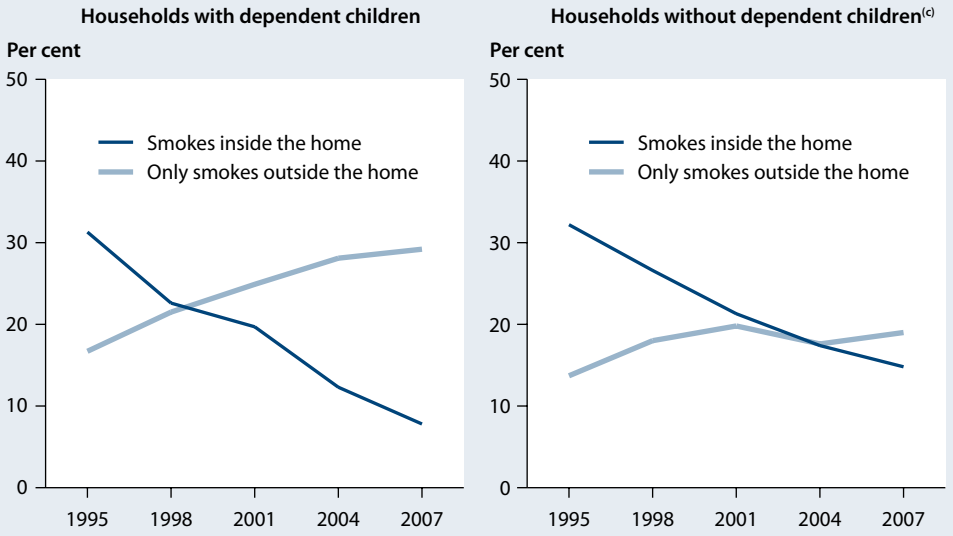
Source: AIHW analysis if the NDSHS 2004 and 2007.

Among those aged 14–19 years, 49.6% had the opportunity to smoke in the last year and 20.8% of those took up that opportunity when it presented itself. People aged under 20 years were less than half as likely to smoke as people over 20 years when they had the opportunity (AIHW 2008b).

Children exposed to tobacco smoke

The effects of passive smoking have become a focus of great concern in recent years, particularly for children who may be exposed to tobacco smoke. Such exposure increases the risk of a range of health problems in children, including chest infections, ear infections, asthma and sudden infant death syndrome (Dunn et al. 2008). The National Preventative Health Taskforce recently called for further action to reduce children's exposure to environmental smoke (NPHTTWG 2009).

Several states and territories have implemented bans on smoking in cars as a strategy to reduce children's exposure to environmental smoke. It also appears that parents' actions are reducing their children's exposure to smoke at home. Over the period 1995 to 2007, households with dependent children comprised about one-third of all households. During this period, among households with dependent children, the proportion having someone smoking inside the home fell from 31.3% to 7.8% (Figure 3.6). Of these same households, the proportion having smokers who chose to only smoke outside the home rose from 16.7% in 1995 to 29.2% in 2007. In households without dependent children, the shift from smoking inside the home to smoking outside the home was less pronounced (Figure 3.6). Overall there was little difference in smoking prevalence between households with and without dependent children.



(a) Household smoking status as reported by respondents aged 14 years and over.
(b) Households including dependent children aged 14 years and under.
(c) Includes dependents aged 15 and over.
Source: AIHW 2008c.

Figure 3.6: Household smoking status[(a)], by dependent children status[(b)], 1995–2007

International comparisons

Among the 30 member countries of the Organisation for Economic Co-operation and Development (OECD), Australia reported the third lowest daily smoking rate in 2007, behind Sweden and the United States (OECD 2009c). There was a nearly three-fold variation in prevalence between the lowest in Sweden (14.5%) and the highest in Greece (40%).

With few exceptions, all OECD countries saw a continuous decline in the prevalence of regular smoking between 1966 and 2006, with major reductions in the early part of this period and a slowing of the decline in the last decade (AIHW 2008c).

Alcohol consumption

Excessive alcohol consumption is a major risk factor for a variety of health problems such as stroke, coronary heart disease, high blood pressure, some cancers, and pancreatitis (Irving et al. 2009; WHO 2002a). It also contributes to motor vehicle accidents, drownings, homicides and falls (WHO 2002a). The most recent Australian Burden of Disease Study reported that the only group for whom alcohol benefits outweighed the harmful effects was females over the age of 65 years. In terms of the population overall, alcohol prevented 0.9% of the burden of disease and injury in 2003 while being responsible for 3.2% of the total burden (Begg et al. 2007). Other research suggests that benefits from alcohol consumption only occur at very low levels of drinking or that there is no protective effect from drinking (NHMRC 2009).

The impact of alcohol in Australia can be described in terms of social costs. In 2004/05, the total social costs of alcohol amounted to $15.3 billion, the majority (71%) being for tangible costs (Collins & Lapsley 2008). For alcohol, tangible costs include, for example, costs associated with lost productivity, road accidents and crime.

Measuring the health risks posed by different levels and patterns of drinking is complex and informed by a large body of research. The National Health and Medical Research Council (NHMRC) released new guidelines in March 2009 (Box 3.5) to help Australians reduce their health risks from drinking alcohol. These guidelines move away from previous threshold-based definitions of 'risky' or 'high risk' drinking in recognition of the fact that the lifetime risk of harm from consuming alcohol increases progressively with the amount consumed (NHMRC 2009).

Box 3.5: Australian guidelines to reduce health risks from drinking alcohol (2009)

These guidelines advise both men and women to drink no more than two drinks per day, to reduce their risk of health effects over their lifetime. Earlier guidelines set out four drinks for men and two for women, on average. Young people (under 18 years) and pregnant or breast feeding women are now advised not to drink at all.

The new guidelines have implications for the interpretation of data from surveys about alcohol use. In this *Australia's health* report, results from the 2007 National Drug Strategy Household Survey are analysed using the older guidelines, as these were current during the collection period.

The National Drug Strategy Household Survey series shows that the proportion of Australians who drink, and how frequently they do so, has remained relatively stable over the period 1993–2007. Most Australians drink alcohol (82.9% of those aged 14 years and older in 2007) and about 8.1% drink daily (Table 3.8). Almost half the population drank alcohol at least once a week.

Table 3.8: Alcohol drinking status, population aged 14 years and older, 1993–2007 (per cent)

Drinking status	1993	1995	1998	2001	2004	2007
Daily	8.5	8.8	8.5	8.3	8.9	8.1
Weekly	39.9	35.2	40.1	39.5	41.2	41.3
Less than weekly	29.5	34.3	31.9	34.6	33.5	33.5
Ex-drinkers[(a)]	9.0	9.5	10.0	8.0	7.1	7.0
Never a full serve of alcohol	13.0	12.2	9.4	9.6	9.3	10.1

(a) Ex-drinkers are those who consumed at least a full serve of alcohol in their lives, but not in the last 12 months.

Source: AIHW 2008c; AIHW 2008d.

Alcohol use, risk of harm and health status

This section reports against the 2001 NHMRC alcohol consumption guidelines as these were the guidelines in place when the data were collected. The guidelines were expressed in terms of short-term and long-term risk of harm (injury, ill health and death). In 2007, an estimated 17.1% of Australians aged 14 years and older had not consumed alcohol in the previous 12 months (AIHW 2008b), and so are not assessed for risk here. The majority of Australians (60.8%) had drunk at levels considered low risk for harm in the short and long term, and 8.6% had drunk at levels considered risky or high risk for both short- and long-term harm.

Perhaps unsurprisingly, people who drank at high-risk levels in 2007, both in the short and long term, were more likely than other drinkers to assess their own health as fair or poor (AIHW 2008b). People who abstained from alcohol consumption were more likely to report their health as fair or poor compared with risky or low-risk drinkers. It is important to note that other factors such as age and socioeconomic status may also affect self-assessment of health status.

Risky drinkers also appeared to have poorer mental health: a higher proportion of those who drank at levels considered to be high risk in the short term reported that they had a mental health illness (13.2%) compared with low-risk drinkers (10.2%) or the whole population aged 14 years and over (10.8%) (AIHW 2008b). The survey also showed that high-risk (15.3%) and risky (11.0%) drinkers were more likely than low-risk drinkers (8.5%) to experience high or very high levels of psychological distress. The relationship between mental health and alcohol consumption is not in one direction. In some cases, mental health issues may have preceded or prompted alcohol use, while for others the alcohol use may have occurred first.

Drinking reduction

Although almost half of all Australians aged 14 years and over drink at least once a week, a substantial number report taking action to reduce their drinking. In 2007, 48.2% of recent drinkers (those who had consumed at least one full drink of alcohol in the last 12 months) had taken actions to reduce their consumption. Around 8.3% of this group had stopped drinking and 7.4% had switched to drinking more low-alcohol drinks than in the past. The most common moderating actions were to reduce the amount of alcohol consumed at one time (29.0%) and/or to reduce the number of drinking occasions (29.4%).

Alcohol use among young people

Estimates of alcohol use by young people are affected by low prevalence and smaller sample sizes. Nonetheless, estimates suggest that in 2007 around two-thirds of those aged 12–15 years had never had a full serve of alcohol (AIHW 2008d). Around 1 in 50 drank at least once a week, and 1 in 4 drank less often than weekly. Among those aged 16–17 years, 20.3% had never had a full serve of alcohol. The majority of this age group (57.0%) drank less frequently than once a week. Few (0.8%) young people aged 16–17 years drank daily, compared with 7.9% of the Australian population aged 12 years and over.

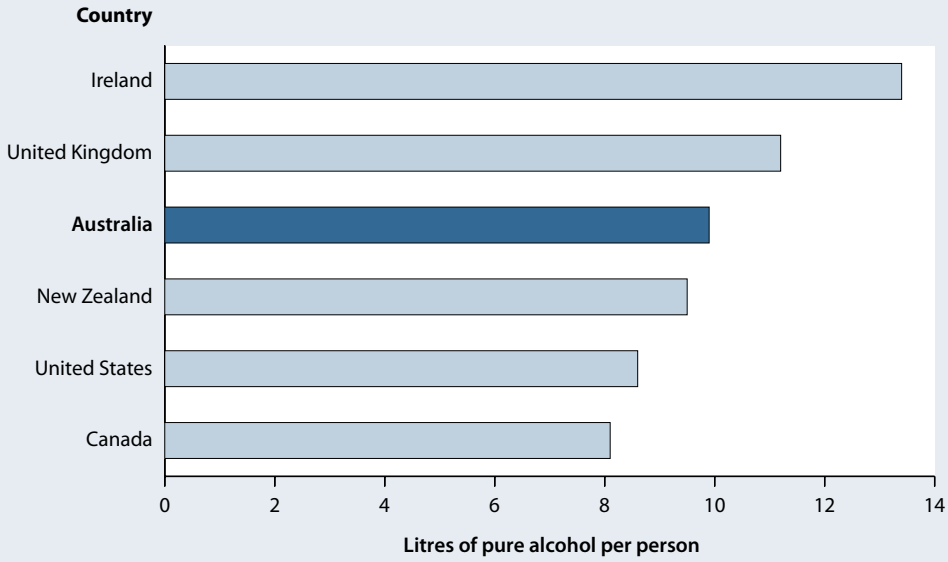
There were some differences in drinking patterns for young males and females. Generally, greater proportions of young females drank at risky or high-risk levels compared with young males (but note that, under the 2001 NHMRC guidelines, males could drink more than females before they were at risk) (AIHW 2008b). Girls aged 12–15 years drank more frequently than boys; 3.2% drank weekly compared with 1.0% of boys the same age

(AIHW 2008d). In the group aged 16–17 years, boys drank more often than girls: 22.0% drank daily or weekly compared with 15.4% of girls.

Levels of risky alcohol drinking among young people have been relatively stable between 2001 and 2007 (AIHW 2008b). Similarly, young people's choice of product has been stable over that period, with the youngest drinkers preferring spirits.

International comparisons

Measured in terms of per person consumption of pure alcohol (a means of taking account of the different alcohol content of different beverages), Australia ranks in the middle of all OECD countries and of key comparison countries (Figure 3.7), at around 10 litres of alcohol per person per year (OECD 2009b).



Note: Data are from 2006 or 2007.
Source: OECD 2009b.

Figure 3.7: Alcohol consumption, population aged 15 years and over, key comparison countries, 2006–2007

Over time the pattern of per-person alcohol consumption has varied among OECD countries. Australia, like the majority of OECD countries, appeared to have a peak in consumption in the 1970s and 1980s, followed by reductions over the 1990s and early 21st century. Notable among the key comparison countries, Ireland and the United Kingdom had an increase in consumption over the past 40 years.

Physical inactivity

Physical inactivity is linked to poor health, including many chronic conditions and injuries, excess body weight and low bone-mineral density. Of the modifiable health risk factors, physical inactivity is the second largest contributor—after tobacco smoking—to the burden of disease and injury in Australia. In 2003, it accounted for 6.6% of the disease burden and was mainly associated with coronary (ischaemic) heart disease (Begg et al. 2007). A recent study estimated that the direct cost of physical inactivity in Australia was almost $1.5 billion in 2006–07; the largest components of this cost were associated with falls ($469 million) and coronary heart disease ($372 million) (Econtech 2007).

Conversely, regular physical activity is associated with maintaining good health, and is important in helping to prevent the onset of some chronic diseases. It helps with better maintenance and control of certain conditions such as arthritis and Type 2 diabetes; and for those who have experienced heart attacks, physical activity can improve recovery and reduce the likelihood of further cardiovascular events (Briffa et al. 2006). Participating in regular physical activity, in conjunction with a healthy diet, helps to maintain a healthy body weight and reduce body fat, thereby preventing or eliminating obesity (see Box 3.6 and Section 3.6).

Box 3.6: Understanding physical activity

Put simply, physical activity is any bodily movement produced by the muscles that results in energy expenditure. Exercise is a subset of physical activity, and is defined as planned, structured and repetitive bodily movements done to improve or maintain one or more components of physical fitness. As an example, most sports include physical activity done for enjoyment, exercise or both.

Although most measures of physical activity focus on deliberate activity in leisure time, other forms of activity—such as walking or cycling for transport, and activity associated with a person's job—are important components of overall activity. Indeed, even the activity associated with everyday tasks such as shopping and housework—so-called incidental activity—is part of the physical activity spectrum and contributes to better health.

Physical activity is a critical factor in determining a person's body weight. If the energy taken in (from food and drink) is not balanced by energy expenditure (through activity and internal bodily functions) and the situation is sustained, the excess food is stored as body fat. Hence, at a population level, physical inactivity may be an important contributor to rising levels of obesity. Also see Section 3.6.

National guidelines for physical activity, for both adults and children, provide recommendations about how much physical activity should be undertaken to gain a health benefit (see Box 3.7). Measuring compliance against these guidelines in the general population is usually done using surveys to ascertain the amount of time spent on various levels of activity, and the number of sessions undertaken for each level, over a 1-week period. The latest data about physical activity come from the 2007–08 ABS National Health Survey (NHS), which included questions about exercising for sport, recreation and fitness, as well as walking for transport. These data cannot be used to measure compliance with the national guidelines. However, by using the number of days on which exercise was

undertaken over a 1-week period as a proxy for the number of sessions, these data enable activity levels to be calculated (see Box 3.7).

Non-leisure time physical activity, such as activity at work or around the house, also contributes to overall physical activity. However, this component of physical activity is difficult to measure and the methods used to measure it are not generally practical for use in population surveys.

Box 3.7: National physical activity guidelines

The National Physical Activity Guidelines for Australians (DHAC 1999) are guidelines for adults and recommend at least 30 minutes of moderate-intensity physical activity on most, preferably all, days of the week. Recommendations for older adults are also available (DoHA 2009a). They build on the guidelines for adults and provide advice about adjusting physical activity to accommodate abilities and health problems common to older people. The recommendations for children and adolescents (DoHA 2004a,b) advise at least 60 minutes of moderate to vigorous activity every day and no more than 2 hours of screen-time activity each day.

Examples of moderate-intensity activity are brisk walking, swimming, doubles tennis and medium-paced cycling. More vigorous physical activity includes jogging and active sports like football and basketball. These guidelines correspond to the notion of 'sufficient' activity; that is, the amount needed to obtain health benefits.

For population-monitoring purposes, there are two ways of calculating 'sufficient' activity. These are:

- 'sufficient time' (at least 150 minutes per week of moderate-intensity physical activity, with each minute of vigorous activity counted as 2 minutes of moderate activity)
- 'sufficient time and sessions' (at least 150 minutes of moderate-intensity physical activity accrued over at least five sessions per week, with vigorous activity counted as double).

Sufficient time and sessions is the preferred measure of sufficient activity for health as it takes into account the frequency of physical activity as well as duration. Shorter sessions (down to 10 minutes) can also be beneficial, provided they add up to the required total over the week.

Sufficient physical activity—adults

In 2007–08, the proportion of adults who exercised sufficiently (in terms of both time and proxy sessions in a 1-week period) to obtain benefits to their health was 37% (Table 3.9). The NHS did not collect the number of sessions of physical activity, therefore the number of days on which physical activity was undertaken was used as a proxy for the number of sessions. A further 8% exercised for sufficient time, but not for five or more sessions, and another 10% had a sufficient number of sessions but not for enough accumulated time.

Slightly more males than females exercised at sufficient levels: 39% compared with 36%.

Table 3.9: Physical activity, by time and sessions[(a)], adults, 2007–08 (per cent)

	Sufficient time			Insufficient time			
	Fewer than 5 sessions	5 or more sessions	Total sufficient time	No sessions	Fewer than 5 sessions	5 or more sessions	Total insufficient time
Males	9.2	39.4	48.5	20.7	21.7	9.1	51.5
Females	7.5	35.5	43.0	19.6	27.2	10.1	57.0
Persons	8.3	37.4	45.7	20.1	24.5	9.6	54.3

(a) Defined as exercising for 150 minutes or more, over at least five sessions in a 1-week period, where the number of days doing exercise was used as a proxy for the number of sessions.

Notes

1. Insufficient time spent exercising equates to less than 150 minutes of moderate or vigorous exercise (including walking for exercise and transport) in a 1-week period. Sufficient time spent exercising equates to 150 minutes or more.
2. Achieving sufficient time and sessions, that is, complying with the recommended guidelines, equates to exercising for 150 minutes or more over at least five sessions in a 1-week period.

Source: AIHW analysis of the 2007–08 NHS.

People who exercised sufficiently (based on the time and proxy sessions as presented above) were more likely to assess their health as excellent or very good (65%) compared with those who did not meet the guidelines (49%) (Table 3.10). They were also more likely to report that their activity levels had increased in the last 12 months (31% compared with 17%).

Recent studies have indicated that the amount of time spent sitting during a day can affect a person's health, regardless of how much moderate or vigorous activity they do (Brown et al. 2009). Other studies have also found associations between the amount of daily sitting time and mortality rates, in particular for cardiovascular disease (Katzmarzyk et al. 2009). Results from the 2007–08 NHS show that more than 96% of adults spend between 1 and 11 hours sitting (during leisure time) per day. Interestingly, males who did not meet the guidelines for physical activity also reported slightly higher proportions of heavy physical activity levels at work.

Table 3.10: Whether undertook sufficient physical activity[a], by selected characteristics, 2007–08 (per cent)

	Sufficient			Insufficient		
Characteristic	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
18–24	15.5	14.4	15.0	11.5	11.2	11.4
25–34	19.8	21.0	20.4	17.8	16.2	17.0
35–44	18.5	19.2	18.8	19.9	19.4	19.6
45–54	16.8	18.0	17.4	19.3	18.5	18.9
55–64	14.9	14.1	14.5	15.2	15.0	15.1
65–74	10.0	9.0	9.5	8.5	9.4	8.9
75–84	3.9	3.9	3.9	6.6	7.7	7.2
85 and over	0.6	0.4	0.5	1.2	2.6	1.9
Self-assessed health status						
Excellent/very good	63.8	66.6	65.1	47.2	50.5	48.9
Good	10.8	9.3	10.1	19.5	18.3	18.9
Fair/poor	25.4	24.1	24.8	33.3	31.2	32.2
Activity level compared to 12 months ago						
Same	56.0	49.2	52.7	60.4	53.4	56.7
Less	15.0	17.3	16.1	24.3	27.7	26.1
More	29.0	33.5	31.1	15.3	18.9	17.2
Hours spent sitting at leisure on a usual day						
Less than 1 hour	0.2	0.5	0.4	0.3	0.4	0.4
1 to 11 hours	97.6	96.4	97.0	96.1	96.4	96.3
12 or more	1.8	2.5	2.1	2.9	2.7	2.8
Does not spend any time sitting	0.4	0.6	0.5	0.7	0.5	0.6
Activity level at work[b]						
Mostly sitting	49.4	58.5	52.7	41.2	54.1	45.7
Mostly standing	16.5	17.2	16.8	19.1	21.3	19.8
Mostly walking	17.0	18.6	17.5	17.0	19.3	17.8
Mostly heavy labour or physically demanding work	17.1	5.7	13.0	22.7	5.3	16.7
Hours spend sitting at work on a usual day[c]						
1 to 11 hours	35.4	36.9	35.9	50.9	52.4	51.4
12 or more	0.0	0.1	0.0	0.6	0.2	0.5
Does not spend any time sitting	4.2	3.7	4.1	8.8	6.6	8.0

(a) Defined as exercising for 150 minutes or more, over at least five sessions in a 1-week period, where the number of days doing exercise was used as a proxy for the number of sessions.

(b) Employed persons.

(c) Employed persons who usually work 34 hours or more in a week.

Source: AIHW analysis of the 2007–08 NHS.

Physical activity for children

Children's physical activity tends to be less structured than that of adults. For example, children may participate in organised sports or activities, at school or through clubs, or may just be physically active through unstructured activities such as playing with friends, in or out of school. The 2007 Australian National Children's Nutrition and Physical Activity Survey (ANCNPAS) collected information about activity levels of children by using the Multimedia Activity Recall for Children and Adolescents tool. This allows for different activities to be recorded for small blocks of time, over four 24-hour periods. From these data, time spent on moderate to vigorous physical activity and time spent on screen-based activities (for example, watching television or DVDs, or using a computer) was assessed against the national recommendations (see Box 3.8).

For both physical activity and screen time, there are four suggested ways of calculating whether a child meets the recommendations (see Box 3.8). These different methods are important to note because they can yield quite different results (Table 3.11).

Box 3.8: Methods of interpretation to assess compliance with the national recommendations

All days method: Children are considered compliant if they meet the guidelines (for both physical activity and screen time) on all 4 days.

Most days method: Children are considered compliant if they meet the guidelines (for both physical activity and screen time) on at least 3 of the 4 days.

Four-day average method: Children are considered compliant if their activity, averaged over 4 days, is 60 minutes per day or more, and their average daily screen time is 120 minutes per day or less.

Child by day method: Prevalence was calculated as the probability that a randomly chosen child on a randomly chosen day would meet the guidelines. To calculate this prevalence estimate, it is simply a matter of calculating the proportion of all days that meet the recommendations.

Source: Olds et al. 2007.

Results from the ANCNPAS show that most children (aged 9–16 years) met physical activity recommendations when analysed using three of the four suggested methods (Table 3.11). At all ages, boys were more likely than girls to meet the recommendations.

Table 3.11: Children aged 9–16 years who met physical activity recommendations, by method of interpretation, 2007 (per cent)

	Method of interpretation			
Sex and age group (years)	**All days**	**Most days**	**Four-day average**	**Child by day**
Boys				
9–13	46	74	94	80
14–16	25	53	77	64
Total 9–16	*38*	*66*	*87*	*74*
Girls				
9–13	33	60	86	71
14–16	13	33	59	51
Total 9–16	*25*	*50*	*75*	*64*
Persons				
9–13	40	68	90	76
14–16	19	43	68	58
Total 9–16	*32*	*58*	*82*	*69*

Source: DoHA 2008a.

Results from the ANCNPAS also show that few children met the recommendations for screen time, which is no more than 2 hours (120 minutes) per day. On any given day, there was a one in three chance that any given child would get only 2 hours or less of screen time (DoHA 2008a). On average, children aged 9–16 years engaged in 223 minutes of screen time each day (Table 3.12). Boys engaged in more screen-time activities than girls of the same age, particularly when playing video games.

Table 3.12: Children aged 9–16 years, average number of minutes per day engaged in screen time, 2007

	Type of screen activity[a] (minutes)			
Sex and age group (years)	**Television**	**Video games**	**Computer**	**Total screen[b]**
Boys				
9–13	157	55	21	233
14–16	159	60	52	272
Total 9–16	*158*	*57*	*33*	*248*
Girls				
9–13	149	21	24	194
14–16	144	15	47	205
Total 9–16	*147*	*18*	*33*	*198*
Persons				
9–13	153	38	22	214
14–16	152	38	50	239
Total 9–16	*153*	*38*	*33*	*223*

(a) Screen-time activity refers to the amount of time children spend watching television, including videos and DVDs, playing computer games on a games console or on personal computers, and using computers for other purposes. Using mobile phones is not included.

(b) Calculated on the amount of leisure time spent on screen time, because all in-school screen time was considered education, not entertainment.

Source: DoHA 2008a.

Illicit drug use

'Illicit drug use' refers to the use of illegal drugs (such as marijuana/cannabis, heroin, ecstasy and cocaine), the use of volatile substances as inhalants (such as glue, solvents and petrol) and the non-medical use of prescribed drugs. Illicit drug use is a substantial risk factor for ill health and death and it has been estimated to account for 2.0% of the burden of disease in Australia in 2003. In terms of its contribution to the burden of disease nationally, this is similar to occupational exposure and low fruit and vegetable consumption (Begg et al. 2007).

Illicit drug use is associated with bloodborne viruses, low birthweight, malnutrition, infective endocarditis (an infection that damages the heart valves), poisoning, mental illness, suicide, self-inflicted injury and overdose. The World Health Organization (WHO) has estimated that globally 0.4% of deaths (0.2 million) and 0.8% of the total burden of disease are attributable to illicit drug use (WHO 2002a).

As with tobacco and alcohol use, the impact of illicit drug use can be described as social costs made up of tangible and intangible costs. The total social costs of illicit drugs in 2004/05 were estimated at $8.2 billion. Most (84%) of these were tangible costs; that is, associated with crime, lost productivity and health care (Collins & Lapsley 2008).

Around 38.1% of Australians aged 14 years and over have tried or used an illicit drug at some time in their life. By far the most common illicit drug that Australians have used is marijuana/cannabis: around one-third of the population have tried or used marijuana/cannabis at least once in their lifetime. The average age for first use was around 19 years (Table 3.13) and this age of initiation has remained stable since 1995. However, for a number of other substances, the age of initiation has increased over this period, suggesting that drug strategies may be helping to prevent or delay the uptake of illicit drug use among many young Australians.

Table 3.13: Average age of initiation[(a)] of lifetime illicit drug use, people aged 14 years and over, 1995 to 2007 (years)

Drug	1995	1998	2001	2004	2007
Marijuana/cannabis	19.1	18.7	18.5	18.7	18.8
Pain killers/analgesics[(b)]	19.0	19.7	18.9	23.4	20.9
Tranquillisers/sleeping pills[(b)]	23.8	23.4	22.8	25.2	25.7
Steroids[(b)]	18.7	21.6	22.5	25.2	23.9
Barbiturates[(b)]	18.2	19.7	18.7	19.6	19.6
Inhalants	16.1	17.5	17.6	18.6	19.3
Heroin	20.6	21.5	20.7	21.2	21.9
Methadone[(c)] or buprenorphine[(d)]	n.a.	21.6	21.8	24.8	23.3
Meth/amphetamine[(b)]	20.2	19.9	20.4	20.8	20.9
Cocaine	21.1	22.3	22.6	23.5	23.1
Hallucinogens	19.1	18.8	19.1	19.5	19.6
Ecstasy[(e)]	22.7	22.7	21.9	22.8	22.6
Ketamine	n.a.	n.a.	n.a.	23.7	24.0
GHB	n.a.	n.a.	n.a.	23.7	24.6
Any illicit	*18.9*	*18.8*	*18.6*	*19.4*	*19.1*

n.a. Not available.

(a) Age first tried/used drug.

(b) For non-medical purposes.

(c) Not supplied for medical purposes.

(d) This category did not include buprenorphine before 2007.

(e) This category included substances known as 'Designer drugs' before 2004.

Source: AIHW 2008d.

Trends in illicit drug use

Over recent years there have been decreases in population-level estimates of the recent use (that is, used in the past year) of most illicit drugs (AIHW 2008d). For example, in 2007, 9.1% of the population aged 14 years and over had recently used marijuana/cannabis compared with 13.0% in most previous survey years since 1993. Heroin use has been stable at 0.2% of this population since 2001, after reaching a high of 0.8% in 1998. Methamphetamine use, including 'ice', has steadily declined from 3.7% in 1998 to 2.3% in 2007. Similarly, recent use of any illicit drug has decreased since 1998, from 22.0% to 13.4%.

More than half (60.7%) of recent heroin users found that they could not cut down even though they wanted or had tried to do so. A smaller proportion of recent meth/amphetamine users (13.3%) and marijuana/cannabis users (12.1%) had been unable to cut down. Among all illicit drugs, cocaine had the smallest proportion of users who had been unable to reduce their consumption when they wanted or had tried to (2.8%).

Illicit drug use among young people

Of the population aged 12–15 years, 4.6% had used an illicit drug in the previous year. Illicit drug use was more common for older teenagers: 18.9% of young people aged 16–17 years had used an illicit drug in the previous year, and 23.4% of 18–19 year olds had done so (AIHW 2008b).

In the 12–15 years age group, marijuana/cannabis was the most commonly used illicit substance (2.7%), followed by the non-medical use of pain-killers (1.1%). Less than 1.0% of young teenagers had used each of the other illicit drugs asked about in the survey.

When asked what influenced them to try illicit drugs, most teenagers reported they were curious, as did people aged 20 years and older. Young people who had decided never to use illicit drugs were most often 'just not interested'. Teenagers were more likely to have 'reasons related to the law or health' or 'fear of death' for never trying illicit drugs, compared with people aged over 20 years.

Illicit drug use and health status

Overall, illicit drug users reported poorer health than the general community. Marijuana/cannabis users were less likely to report excellent health (13.7%) than the general population (16.9%) (Table 3.14).

The association between illicit drug use and health appears strong in the case of mental illness. Heroin users were much more likely to have a mental illness (52.4%) than the general population (10.8%). Similarly, users of any illicit drug (17.6%) were more likely to have a mental illness. However, by themselves, these findings do not establish a causal link between mental illness and drug use—the mental illness may have preceded the drug use or vice versa.

Table 3.14: Self-assessed health status and mental illness, by selected drugs used, persons aged 14 and older, 2007 (per cent)

	Self-assessed health status[a]					
Illicit drug use[b]	Excellent	Very good	Good	Fair	Poor	Mental illness[c][d]
Marijuana/cannabis	13.7	34.4	39.4	10.6	1.9	16.8
Heroin	**8.1	23.9	46.3	13.9	**7.8	52.4
Methamphetamines	14.0	29.1	41.5	13.5	1.8	21.0
Ecstasy	16.1	35.0	38.4	9.2	1.2	15.5
Any illicit drug	14.1	33.4	38.9	11.5	2.1	17.6
All persons (14 and over)	**16.9**	**37.7**	**33.4**	**10.1**	**1.9**	**10.8**

** Relative standard error greater than 50%.

(a) In response to the question 'In general, would you say your health is…?'.

(b) Reported use in the last month.

(c) Respondents could select more than one condition in response to the question 'In the last 12 months have you been diagnosed or treated for…?'.

(d) Includes depression, anxiety disorder, schizophrenia, bipolar disorder, eating disorders and other forms of psychosis.

Sources: AIHW analysis of NDSHS 2007; AIHW 2008b.

International comparisons

Illicit drug use in Australia seems moderate to high among key comparison countries (Table 3.15). While these data need to be interpreted with caution, the most recent estimates for marijuana/cannabis use in these countries suggest that prevalence ranged from 6.3% in the Republic of Ireland to 17% in Canada, with Australia at 10.6%. Australia had the highest prevalence for ecstasy and meth/amphetamines and was in the middle of the range for cocaine (UNODC 2009).

Table 3.15: Annual prevalence of substance use, population aged 15–64 years, selected countries (per cent)[(a)]

Country	Marijuana/cannabis	Ecstasy	Amphetamine	Cocaine	Opiates
Australia	10.6	4.2	2.7	1.9	0.4
New Zealand	13.3	2.6	2.3	0.8	0.4
Republic of Ireland	6.3	1.2	0.4	1.7	0.5
USA	12.3	1.1	1.6	2.8	0.6
Canada	17.0	1.3	1.0	2.3	0.2–0.4
United Kingdom					
England and Wales	7.4	1.5	1.0	2.3	0.9–1.0
Scotland	11.0	3.2	2.2	3.8	1.5–1.7
Northern Ireland	7.2	1.8	1.0	1.9	0.1

(a) The methods, including age groups, vary for deriving prevalence. The specific data years also vary from 2000 to 2008 due to the timing of data collection in each country. See UNODC 2009 for details.

Source: UNODC 2009.

Injecting drug use

Injecting drug use is a significant risk factor for transmitting bloodborne viruses. In Australia, people with a recent history of injecting drug use continue to be the main group contracting both hepatitis C and hepatitis B (NCHECR 2008). However, there is some evidence of a decrease in injecting drug use and an associated fall in bloodborne virus infections. For example, the prevalence of injecting drug use among young people appears to have fallen at the same time that hepatitis C prevalence in this age group declined from 32% in 2003 to 28% in 2007. Around 8% of HIV (human immunodeficiency virus) diagnoses in the period 1998–2007 were in people who had injected drugs, although more than half of this group also reported homosexual contact.

There is a strong association between the length of injecting practice and the prevalence of infections with the hepatitis C virus (HCV). Of people with a history of injecting drug use for 10 years or more, around 72% tested positive to HCV antibody between 2004 and 2008 (Table 3.16) (NCHECR 2009). Such a relationship does not hold for HIV—less than 2% of the injecting drug users assessed over the same period tested positive for HIV antibody.

Table 3.16: Prevalence of HIV or HCV antibodies among injecting drug users aged 14 years and over, by history of injecting drug use, 2004 to 2008 (per cent)

History of injecting drug use	Tested positive to HIV antibody					Tested positive to hepatitis C antibody				
	2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
Less than 3 years	1.5	2.4	1.0	1.0	4.5	25	31	18	20	27
3–5 years	0.9	1.1	1.4	1.6	1.8	33	33	30	42	31
6–10 years	0.6	0.0	1.5	0.6	0.3	56	51	55	48	51
10 or more years	1.3	0.8	1.6	1.8	1.5	73	72	72	71	72

HIV Human immunodeficiency virus.

HCV Hepatitis C virus.

Source: NCHECR 2009.

Dietary behaviours

The food we eat plays a major role in our health and wellbeing. The dietary guidelines for Australians provide guidance on healthy food choices and lifestyle patterns that promote good nutrition and health. Each guideline deals with a key health issue; however, they are designed to be followed together to achieve the best health.

Dietary guidelines are provided for different life stages and there are two current publications: the *Dietary Guidelines for Australian Adults* (NHMRC 2003a) and the *Dietary Guidelines for Children and Adolescents in Australia incorporating the Infant Feeding Guidelines for Health Workers* (NHMRC 2003b). The guidelines have a clear emphasis on enjoying a wide variety of nutritious foods from the five food groups, namely vegetables and legumes, fruit, cereals, dairy, and meat or meat alternatives. They also recommend that care should be taken to limit saturated fat and restrict total fat intake, to choose foods low in salt and to limit sugar intake. The guidelines also highlight the importance of breastfeeding, and preparing and storing food safely. The *Australian Guide to Healthy Eating* (Smith et al. 1998) recommends amounts based on the dietary guidelines, and provides a basis for evaluating Australian eating patterns.

The various dietary guidelines are currently under review and are expected to be reissued in mid-2011. They will include guidelines for children, adults, older Australians and, for the first time, for pregnant and breastfeeding females.

Detailed national information on food and nutrient intakes for Australian adults was last collected in 1995 through the National Nutrition Survey. More recently, a nutrition and physical activity survey for children aged 2–16 years was undertaken (2007 Australian National Children's Nutrition and Physical Activity Survey). The regular NHS collects limited information on nutrition-related behaviours and there are also data available from state and territory health surveys.

Planning is currently underway for an ongoing survey covering nutrition, physical activity and various biomedical risk factors. The survey proposes to collect data on the food intake, physical activity participation and physical measurements of the Australian population.

Fruit and vegetable consumption

Fruit and vegetable consumption is strongly linked to the prevention of chronic disease and to better health (NHMRC 2003a). Inadequate fruit and vegetable consumption was estimated to be responsible for 2.1% of the total burden of disease in Australia in 2003, ranking seventh of 14 risk factors studied (Begg et al. 2007).

The *Australian Guide to Healthy Eating* recommends that adults consume two to four serves of fruit and four to eight serves of vegetables per day—see Box 3.9 for examples of serves. Self-reported data from the 2007–08 NHS survey show that just over half (51%) of the population aged 15 years and over consumed two or more serves of fruit per day, while 1 in 11 (9%) consumed five or more serves of vegetables. Females had a slightly higher fruit and vegetable intake than males (ABS 2009d).

Results from the 2007 Australian National Children's Nutrition and Physical Activity Survey indicate that older children were less likely than younger ones to meet the recommended serves from the *Australian Guide to Healthy Eating* (1–3 serves of fruit; 2–4 serves of vegetables) (CSIRO & University of South Australia 2008). Around 9 in 10 children aged 2–13 years (between 90% and 93%) met the recommendation for fruit serves compared with about one-quarter (24%) of children aged 14–16 years (Figure 3.8). This decreased substantially when fruit juice was excluded from the analysis: then, only 1% of children aged 14–16 years met the recommendation, much less than 9–13 year olds (51%) and younger children (2–3 years: 68%; 4–8 years: 61%).

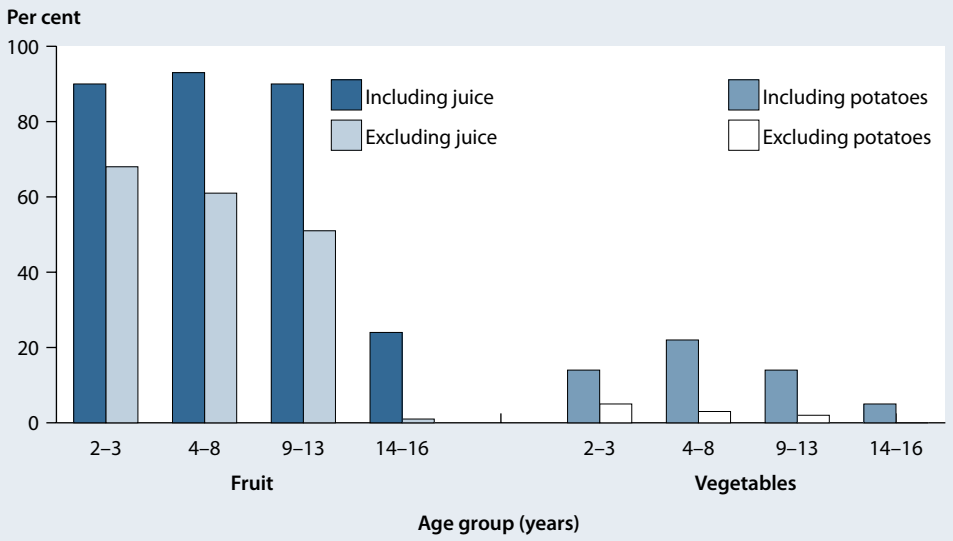
Box 3.9: How much is a serve?

By convention, a serve of fruit is 150 g, and a serve of vegetables is 75 g. The table below sets out some examples of everyday fruit and vegetables in terms of a 'serve'.

Fruit	Vegetables
1 medium apple, orange, banana	1 medium potato, ½ medium sweet potato
2 items of small fruit such as apricots, plums	1 cup of salad vegetables
About 8 strawberries	½ cup tomatoes, capsicum, cucumber
1 cup of canned fruit	½ cup carrots, swede, turnip
½ cup of fruit juice	½ cup peas, broad beans, lentils, green beans
About 4 dried apricots, 1½ tablespoons of sultanas	½ cup spinach, cabbage, broccoli
About 20 grapes or cherries	

Source: adapted from DoHA & NHMRC 2003.

The recommended serves of vegetables were met by 22% of children aged 4–8 years, 14% of children aged 2–3 and 9–13 years, and 5% of children aged 14–16 years. When potatoes were excluded from the analysis, no children aged 14–16 years met the recommendation; for the other age groups 5% or less met the recommendations.



Source: CSIRO & University of South Australia 2008.

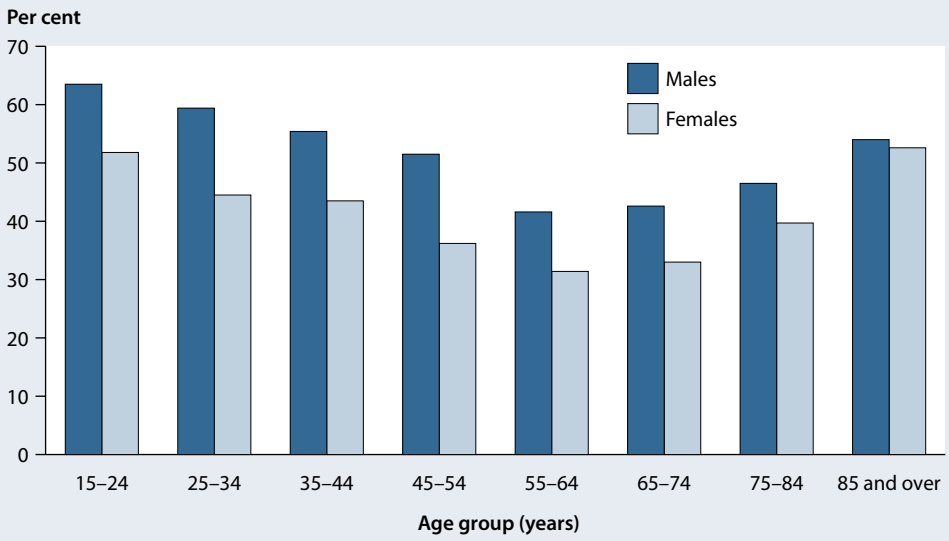
Figure 3.8: Proportion of children meeting the recommended serves of fruit and vegetables, 2007

Fat intake

The three main types of fats are saturated, polyunsaturated and monounsaturated. Saturated fats are usually solid at room temperature and are the main types of fats found in milk, cream, butter and cheese, some meats, and palm and coconut oil. A diet high in saturated fats increases the risk of coronary heart disease through their effect of raising the blood cholesterol level, notably its low-density lipoprotein component (NHMRC 2003a) (see Section 3.6 and Box 3.12).

Dairy products provide a major source of nutrients in the Australian diet and are one of the most complete of all foods. However, dairy products contribute over a quarter of the saturated fat in the diet of Australian adults; therefore reduced or low-fat varieties are generally recommended (NHMRC 2003a).

Data from the 2007–08 NHS indicate that, of the population aged 15 years and over, almost one in two (47%) usually consumed whole milk, and males were more likely than females to be whole milk drinkers (53% compared with 41%). Among males, the highest level of whole milk consumption was among 15–24 year olds (63%), while for females it was among those aged 85 years and over (53%). The lowest level of whole milk consumption was among 55–64 year olds for both males and females (42% and 31% respectively) (Figure 3.9). Results from the 2007 Australian National Children's Nutrition and Physical Activity Survey indicate that saturated fat accounted for around 13% of total energy intake among 2–16 year olds (CSIRO & University of South Australia 2008), higher than the maximum recommended level of 10% (NHMRC & NZMoH 2006).



Notes

1. Includes only those who consume milk (cow's, soy and 'other'—cow's milk is consumed by around 92% of the population).
2. Includes consumers of milk where the fat content was unknown.

Source: AIHW analysis of the 2007–08 National Health Survey.

Figure 3.9: Proportion consuming whole (full-cream) milk by age and sex, 2007–08

Trans fats are a type of unsaturated fat but they have an effect on blood cholesterol level similar to saturated fats. They are found naturally in products such as meat and milk, and are also formed when liquid vegetable oils are processed for use as fat spreads, for deep-frying and as shortening for baking. The WHO recommends obtaining no more than 1% of daily energy from trans fats, and Australians are currently below this mark at 0.6% (FSANZ 2007a). Food Standards Australia New Zealand are monitoring the intake of trans fats and whether changes in the levels in processed foods have led to changes in the saturated fat content.

Nutrient inadequacies

There is concern in Australia about deficiencies in three vital nutrients: iodine, folate and vitamin D. Recent evidence shows the re-emergence of iodine deficiency in Australia, with the population in south-eastern Australia experiencing mild iodine deficiency (APHDPC 2007). Iodine is required for the body to make thyroid hormones, which are important in the early growth and development of most organs, especially the brain during fetal and postnatal life (Delange 2000).

Folate, a B group vitamin, is another important nutrient for the development of healthy babies. Folic acid is the synthetic form of folate and is used in supplements or added to food (fortified). It is recommended that females who are capable of becoming pregnant consume 400 µg of folic acid per day, as a supplement or from fortified food, to help prevent neural tube defects such as spina bifida (NHMRC & NZMoH 2006). It is estimated that the current intake of folic acid by females of child-bearing age (16–44 years) in Australia is 108 µg per day (FSANZ 2007b), which is well below the recommended level.

To assist in overcoming these two deficiencies, from September 2009 most bread in Australia has contained added iodine and folic acid—so-called mandatory fortification. By reading the ingredient list, consumers are able to see if a bread product contains added iodine and folic acid.

Another growing area of concern in Australia is vitamin D deficiency, which can result in reduced bone-mineral density and osteoporosis. Vitamin D is primarily obtained through exposure to sunlight but it can also be obtained from foods such as fish (especially high fat fish), meat, milk and eggs. Margarine contains significant amounts through food fortification. The most 'at risk' populations for vitamin D deficiency are those with limited exposure to sunlight such as the elderly (particularly those in residential care), people with skin conditions who must limit sun exposure, and those whose clothes cover nearly all of their body (Nowson et al. 2004).

It is essential to find the balance between maintaining adequate vitamin D through sun exposure and minimising the risk of skin cancer. In summer in the southern parts of Australia, and year-round in northern Australia, a few minutes of sun exposure each day on the face, arms and hands is sufficient for most people to maintain adequate vitamin D. In winter in the southern parts of Australia, 2–3 hours spread over a week is recommended (Cancer Council Australia 2008).

Breastfeeding

Australian recommendations for breastfeeding reflect the international recommendations of exclusive breastfeeding up to 6 months of age, with the introduction of complementary foods and continued breastfeeding from around 6 months of age (NHMRC 2003b). These recommendations are based on the nutritional, health, social and economic benefits of breastfeeding. There is accumulating evidence of the protective role that breastfeeding has on several chronic diseases, including Type 1 diabetes, inflammatory bowel disease and allergic diseases (NHMRC 2003b).

In the 2007 Australian National Children's Nutrition and Physical Activity Survey, mothers of children included in the survey were asked whether they had 'ever breastfed' their children during infancy. Most children (around 90%) had been breastfed at sometime during their infancy (CSIRO & University of South Australia 2008).

The Growing Up in Australia longitudinal study of Australian children provides information on breastfeeding for a cohort of around 5,000 infants that were aged less than 12 months in 2004. Of this cohort, 91% were predominantly breastfed at birth (that is, receiving breast milk as the main source of nutrition; under this definition the infant may also receive water or water-based drinks). However, rates decreased steadily from month to month: by the time the children were 1 month old 71% were predominantly breastfed. At 3 months this rate had decreased to 56%, and it was 14% at 6 months. At 12 months, 28% of children were still fed breast milk as a complementary food source (Figure 3.10).

Source: AIFS 2008.

Figure 3.10: Breastfeeding experience of infants aged 0–12 months, 2004

Food security

The term 'food security' refers to the availability of healthy, affordable foods and the capacity of individuals and communities to obtain them. Surveys in New South Wales and Victoria have asked respondents whether there were times in the past 12 months when they ran out of food and could not afford to buy more. In New South Wales in 2007, around 1 in 20 (4.4%) adults reported that they had experienced food insecurity; however, the rate was higher among females (5.9%) than males (2.8%). Food insecurity was more common in the younger adult population than in the older population (Centre for Epidemiology and Research 2008). In Victoria in 2007, food insecurity was also experienced by around 1 in 20 (5.1%) adults and the rate was similar between sexes. As with New South Wales, food insecurity was more common in the younger adult population (DHS 2008).

Sexual behaviours

The risks associated with unprotected sexual activity include infections (such as chlamydia, gonorrhoea, HIV and syphilis), unwanted pregnancies and some cancers (such as cervical and anal cancer). In 2003, unsafe sexual practices accounted for an estimated 0.6% of the overall disease burden in Australia; most of this burden was associated with HIV/AIDS and cervical cancer (Begg et al. 2007). Important actions that can reduce these health risks include greater use of condoms and fewer sexual partners.

Over the past decade, rates of STIs have been steadily increasing. Data from the National Notifiable Diseases Surveillance System indicate a substantial increase in chlamydia—the most frequently reported STI—between 1999 (74 infections notified per 100,000 population) and 2008 (272 per 100,000 population). The large majority of notifications in 2008 were for 15–29 year old males and females—72% and 85% respectively. Sizeable increases in syphilis notifications are also evident. In 2008, there were 6.0 notifications of new (infectious) cases per 100,000 population, compared with 3.2 in 2004.

Results from the Australian Study of Health and Relationships—a national telephone survey of people aged 16–59 years that was run in 2001–02—indicated that fewer than half of respondents who had been sexually active in the previous year had used a condom during that time (de Visser et al. 2003). Use of condoms during heterosexual encounters was associated with younger age, higher education, living in major cities, lower income and having more than one sexual partner in the previous year (de Visser et al. 2003). Among the 16–24 year olds, males and females who identified as non-heterosexual were significantly more likely than heterosexual respondents to have engaged in unprotected sexual activity with a casual partner in the 6 months before interview (de Visser et al. 2006). Among young males, 29% of non-heterosexual males participated in unprotected intercourse with a casual partner compared with 5% of heterosexual males, while, among young females 17% of non-heterosexual females and 5% of heterosexual females engaged in casual unprotected intercourse.

Surveys gathering information from homosexually active men estimate that the proportion having unprotected anal intercourse with a casual partner increased between 2003 and 2007 in Adelaide (from 18% to 19%) and in Queensland (21% to 25%) (Imrie & Frankland 2008). However, the estimate decreased during the same period in Sydney (from 23% to 19%) and in Melbourne (21% to 19%).

Vaccination behaviours

Vaccination is the administration of a vaccine to stimulate the immune system and protect individuals against specific infectious diseases. Vaccination effectively protects an individual from disease, but also, if enough people in a population are vaccinated it limits the spread of infection, thereby controlling or even eliminating the disease. This concept is known as 'herd immunity'.

In 1980, the WHO declared that smallpox was eradicated worldwide and since that time routine smallpox vaccination has been discontinued (WHO 2002b). Similar eradication efforts for poliomyelitis are in progress, even though most parts of the world—including the western Pacific region—are free of polio. In 2008 there were four countries still considered polio-endemic, dramatically down from 125 in 1988 (WHO 2008). However, universal vaccination is maintained because otherwise these endemic areas could reintroduce polio to the rest of the world.

The NHMRC recommends specific vaccinations for all children, all older persons and others (including Indigenous Australians) who are at a high risk of contracting vaccine-preventable diseases. The Australian Government provides free vaccines for 16 vaccine-preventable diseases (DoHA 2009b), and these are set out in the National Immunisation Program Schedule (NIPS).

Vaccination for children

For children, the NIPS specifies hepatitis B, diphtheria, tetanus, pertussis (whooping cough), *Haemophilus influenzae* type b (Hib), poliomyelitis, pneumococcal disease, rotavirus, measles, mumps, rubella, meningococcal type C and varicella (chickenpox). For Aboriginal and Torres Strait Islander children living in high-risk areas, the schedule includes hepatitis A and additional coverage for pneumococcal disease. In 2007, vaccination against human papillomavirus (HPV) was introduced to the NIPS for 12–13 year old females, with a catch-up program for all females then aged 12–26 years.

The Australian Childhood Immunisation Register records vaccinations administered to children and monitors coverage for the conditions in NIPS. To be considered fully immunised, children should have received all the vaccinations appropriate to their age. In most age groups, fully immunised rates are lower than the rates for individual diseases because some children may not have received the entire schedule to which they are entitled by time the rate was calculated. Vaccination rates have remained stable since around 2001 for children up to 1 year old and since 2003 for up to 2 years old (AIHW 2008c).

For children aged 12–15 months (at 31 March 2009), 91.3% were fully immunised (Table 3.17). The highest coverage was for Hib, with 94.5% of children this age vaccinated against this condition. The fully-immunised rate for children of this age varied from 88.9% in Western Australia to 93.6% in the Australian Capital Territory.

In 2009, 92.9% of children aged 24–27 months were fully immunised, the coverage being highest for hepatitis B at 95.8%. Full coverage varied from 91.8% in Western Australia to 94.6% in the Northern Territory. Among older children (60–63 months) 82.4% were fully vaccinated; the highest rate was in Victoria (85.8%) and the lowest was in South Australia (75.6%). For this age group, coverage was highest against diphtheria, tetanus and pertussis.

Table 3.17: Vaccination status for children, selected diseases, by age group, June 2009 (per cent)

	Age in months[a]		
Measure	**12–15**	**24–27**	**60–63[b]**
Diphtheria, tetanus and pertussis	91.7	95.0	83.2
Poliomyelitis	91.6	95.0	83.1
Haemophilus influenzae type b	94.5	94.6	..
Hepatitis B	94.4	95.8	..
Measles, mumps and rubella	..	94.0	82.9
Fully immunised	**91.3**	**92.9**	**82.4**

.. Not applicable.

(a) Age at 31 March 2009.

(b) Since 31 March 2008, coverage is measured for the 60–<63-month age cohort. In previous years, coverage was measured among the 72–<75-month age cohort.

Source: Medicare Australia 2009.

Human papillomavirus vaccination for girls and young women

Since 2007, the Australian Government has funded the National HPV Vaccination Program to protect against the types of HPV that cause around 70% of all cases of cervical cancer. The program offers a course of three injections to be given over a 6-month period, largely using school-based programs for females aged 12–18 years, and general practice and community care services for those aged 18–26 years. The HPV vaccine is now part of the NIPS and is given to girls in their first year of high school (that is, those aged 12–13 years).

The National HPV Vaccination Program Register was established under Commonwealth legislation to record administered HPV vaccines. The register provides a means to monitor and evaluate the program, derive coverage rates and also maintain records for notification should a booster dose be required. The register receives notification of each HPV vaccine administered through the school-based program and other vaccine providers. Although

notification by GPs is not compulsory, there is a financial incentive for GPs to register each dose of HPV vaccine they administer. As at February 2010, 94% of GPs had registered to notify HPV vaccinations.

During the initial phase of program implementation, school-based programs varied by jurisdiction in that they were aimed at different school years. In the first year of the program, New South Wales, the Northern Territory, Queensland and Western Australia provided vaccinations to schoolgirls in years 10, 11 and 12; the Australian Capital Territory and Victoria to girls in years 7, 10, 11 and 12; South Australia to girls in years 8, 9, 10, 11 and 12; and Tasmania to all girls in years 6 to 12 (Brotherton et al. 2008).

Coverage rates for the first year of the program represent minimum estimates and include only doses provided in school-based programs. These estimates may not cover all catch-up vaccinations given to school-aged girls through a non-school program. For any school year, full coverage (all three doses) was highest (77%) among Year 8 girls in South Australia (Table 3.18). Full coverage among girls in years 10 to 12 was highest in New South Wales (75% for Year 10 and Year 12 girls and 72% for Year 11 girls).

Regardless of whether an individual is fully immunised against HPV, females are encouraged to practice safe sexual behaviours. The National Cervical Screening Program recommends that those aged 18–69 years who have ever been sexually active should continue having Pap smears to screen for cervical cancer.

Table 3.18: Preliminary coverage[(a)] estimates of HPV vaccination in school-based programs, by school year and state and territory, 2007 (per cent)

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Year 6	..	..	..	..	..	64	..	..
Year 7	..	75	..	..	..	61	68	..
Year 8	..	..	..	..	77	58	..	..
Year 9	..	..	..	..	65	55	..	..
Year 10	75	69			64	57		
Year 11	72	70			57	50		
Year 12	75	71			55	44		
Years 10–12			62	60			61	64

.. Not applicable as this school year was not targeted by the state and territory in 2007.

(a) Coverage refers to full coverage, indicated by having received all three doses of the vaccine.

Notes

1. Coverage does not include catch-up doses delivered to school-aged girls outside the school-based programs, except for South Australia where these are partially recorded.
2. Data are for years 10 to 12 combined for Queensland, Western Australia, the Australian Capital Territory and the Northern Territory.

Source: Brotherton et al. 2008.

Influenza and pneumococcal vaccination for adults

Vaccination against influenza and pneumococcal infection (which typically causes pneumonia) is available in Australia and is free for all Indigenous Australians aged 50 years and over, for all others aged 65 years and over, and for Indigenous Australians aged 15–49 years in high-risk groups. The influenza vaccines summarised here are for those strains of flu that occur seasonally and not the types that are established in animals other than humans (such as bird flu and swine flu).

Results from a national telephone survey on adult vaccination produced estimates that, in 2006, 77.5% of Australians aged 65 years and over were vaccinated against influenza that year. After accounting for aged-care residents, the national coverage estimate increased to 78.0% (AIHW 2008c). Australia has the highest coverage of any OECD country for influenza vaccine (based upon estimates obtained by OECD countries between 2003 and 2007) (OECD 2009c).

For pneumococcal disease, the estimated vaccination coverage of Australians aged 65 years and over in 2006 was 62.2%, compared with 51.1% in 2004. More of this target group may have been vaccinated, but the currency of their vaccination could not be fully determined from the survey (AIHW 2008c).

Sun protection

Excessive exposure to UV radiation can lead to several forms of skin cancer, eye disease and premature ageing (WHO 2009). Since the 1980s, cancer councils and health departments have delivered public education messages urging Australians to reduce their exposure to the sun with the ultimate aim of reducing the burden of skin cancer in Australia.

Despite the level of public awareness, many Australians have not adhered to sun safety messages. Compliance is particularly low among those in adolescence—a life stage where high sun exposure greatly increases the lifetime risk of developing skin cancer (DoHA 2008a). Findings from the National Sun Protection Survey in 2006–07 show that 24% of Australian adolescents aged 12–17 years and 14% of Australian adults aged 18–69 years were sunburnt on an average summer weekend (Cancer Council of South Australia 2008). During the summer, 29% of adolescents and 50% of adults generally wore a hat when outdoors in the peak UV hours (11 am to 3 pm). Overall, 37% of both adolescents and adults used sunscreen, while 19% of adults and only 9% of adolescents wore a three-quarter or long-sleeved top while outdoors during this time.

There are strong social norms driving sun tanning and sun exposure behaviour among Australians. Having a suntan is often seen as desirable and closely associated with beauty and health (DoHA 2006). Most adolescents have a preference for getting a tan—from the New South Wales School Students' Health Behaviours Survey in 2005, 70% of boys and 80% of girls want to have tanned skin (Centre for Epidemiology and Research 2007). Findings from the National Sun Protection Survey show that 22% of Australian adolescents—15% of boys and 29% of girls—deliberately tanned in the summer of 2006–07. Adults were less likely to attempt a tan than adolescents—11% of Australian adults indicated that they deliberately tanned.

Although too much sun exposure can damage skin and eyes, too little can lead to a deficiency in vitamin D, which can weaken bones and affect overall health. See 'Dietary behaviours' for more information on vitamin D deficiency in Australia.

3.6 Biomedical factors

Unlike behaviours and other determinants discussed earlier in this chapter, biomedical factors represent actual bodily states. Biomedical factors such as high blood pressure and high blood cholesterol can be regarded as relatively 'downstream' in the process of causing ill health. They carry relatively direct and specific risks for health, and they are often influenced by behavioural factors, which are in turn influenced by other 'upstream' determinants.

Health behaviours tend to interact with each other and influence a variety of biomedical factors. Both physical activity and diet, for example, can affect body weight, blood pressure and blood cholesterol. They can each do this independently, or, with greater effect, they can act together. Further, behavioural and biomedical risk factors tend to increase each other's effects when they occur together in an individual.

Note that several of the biomedical risk factors discussed here are often highly interrelated in causing disease. Excess body weight, high blood pressure and high blood cholesterol, for example, can all contribute to the risk of heart disease and amplify each other's effects if they occur together. In addition, obesity can in itself contribute to high blood pressure and high blood cholesterol.

Similarly, Type 2 diabetes is often regarded as a biomedical risk factor, as it is essentially defined by an abnormal biomedical process (see 'Glucose regulation' later in this chapter), and because an individual with diabetes is more at risk of other diseases, particularly cardiovascular disease (Barr et al. 2007). Diabetes is discussed in more detail in Chapter 4.

Also, it is important to note that biomedical factors are commonly managed in clinical practice as well as being a target of some population-based interventions. High blood pressure and high cholesterol, for example, are often controlled by prescription medication, typically in conjunction with diet and exercise.

A national health survey covering biomedical indicators of chronic disease, as well as nutrition and physical activity, is being planned for the near future.

The next section describes the levels, patterns and trends of the four major biomedical determinants of health: body weight, blood pressure, blood cholesterol and glucose regulation.

Body weight

There are health problems associated with being either underweight or having excess weight (overweight and obesity) (see Box 3.10 for definitions).

Being significantly underweight may lead to malnutrition and a range of health problems such as osteoporosis and the inability to fight infections. Although underweight is mainly a problem in developing countries, eating disorders—for example anorexia and bulimia—among people in developed countries such as Australia also result in poor health, including dental problems, dehydration, fertility problems, impaired kidney function and sometimes death. As Table 3.19 shows, measurements in the 2007–08 NHS suggest that about 1 in 50 Australian adults are underweight, with the proportion being considerably higher among young adults, especially females.

Although underweight can be a serious risk to health, the material presented here focuses on excess body weight in the Australian population, as the scale of this problem is markedly greater than that of underweight.

Excess weight, especially obesity, is a risk factor for cardiovascular disease, Type 2 diabetes, some musculoskeletal conditions and some cancers. As the level of excess weight increases, so does the risk of developing these conditions. In addition, being overweight can hamper the ability to control or manage chronic disorders.

Rates of overweight and obesity are continuing to increase in Australia and overseas (OECD 2009d). The WHO has estimated that by 2015 there will be 2.3 billion adults who are overweight, and more than 700 million who will be obese (WHO 2006).

Once considered a problem only in wealthier countries, obesity is now an increasing concern in low- or middle-income countries, where problems associated with it often exist along with the effects of undernutrition.

In 2008, Australian health ministers announced obesity as a National Health Priority Area, and charged the recently formed National Preventative Health Taskforce with the development of a strategy for tackling the burden of chronic disease caused by risk factors such as obesity (NPHT 2009).

Box 3.10: Classifying body weight

Body mass index (BMI) and waist circumference are the two main measures used for monitoring body weight. The BMI assesses people's weight in relation to their height, and is more commonly used in surveys than the waist circumference. This is especially so if the survey relies on self-reported information, because people are more likely to know their height and weight than their waist circumference. The BMI is calculated by dividing a person's weight in kilograms by the square of their height in metres (kg/m^2).

The standard classification of BMI recommended by the World Health Organization for adults is based on the association between BMI and illness and mortality (WHO 2000), and is as follows:

- underweight: BMI < 18.5
- healthy weight: BMI ≥ 18.5 and BMI < 25
- overweight but not obese: BMI ≥ 25 and BMI < 30
- obese BMI ≥ 30.

This classification may not be suitable for all ethnic groups and it is unsuitable for children. Compared with the rest of the population, some groups may have equivalent levels of risk at lower BMI (for example Asians) or higher BMI (for example Polynesians).

For children and adolescents aged 2–17 years, Cole and colleagues (2000, 2007) have developed a separate classification of overweight, obesity and thinness, based on age and sex.

For adults, a waist circumference of 94 cm or more in males and 80 cm or more in females indicates increased risk (referred to here as abdominal overweight). A waist circumference of 102 cm or more in males and 88 cm or more in females indicates substantially increased risk. This classification is not applicable for people aged under 18 years and the cut-off points may not be suitable for all ethnic groups.

Height and weight data may be collected in surveys as measured or self-reported data. Some people tend to overestimate their height and underestimate their weight, leading to an underestimate of BMI. Thus rates of overweight and obesity based on self-reported data are likely to be underestimates of the true rates, and should not be directly compared with rates based on measured data.

Excess weight arises through an energy imbalance over a sustained period. Although many factors may influence a person's weight, weight gain is essentially due to the energy intake from the diet being greater than the energy expended. Energy expenditure occurs in three ways: basal metabolism (that is, the energy used to maintain vital body processes), thermic processes (that is, the energy taken to digest and absorb food), and physical activity. Physical activity is the most variable component of energy expenditure, and the only component a person has any direct control over. In a normally active person, physical activity contributes about 20% to daily energy expenditure (BHC 2008b). For related information, see 'Dietary behaviours' and 'Physical inactivity' in this chapter.

Prevalence

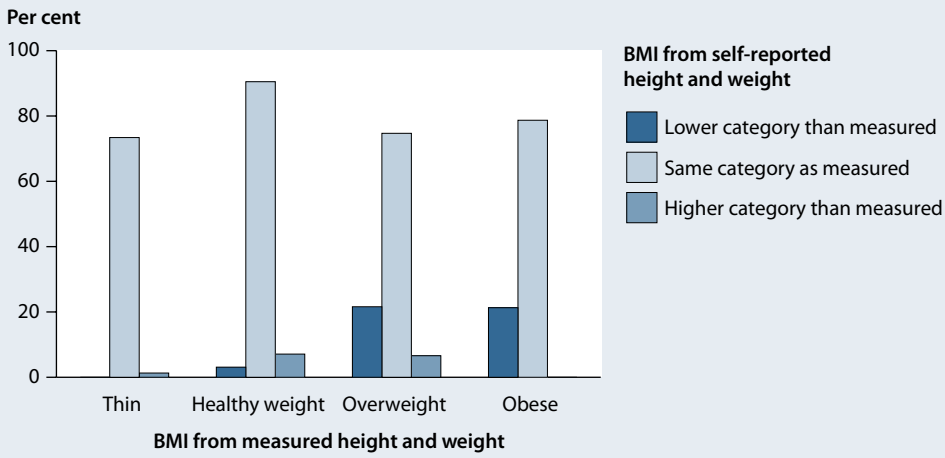
In the 2007–08 NHS, the majority of adults (61%) had a body mass index (BMI) (based on measured data) that indicated they were either overweight or obese. A larger proportion of males than females were overweight or obese (68% compared with 55%) (Table 3.19).

Table 3.19: Body mass index based on measured data, by age and sex, persons aged 18 years and over, 2007–08 (per cent)

Sex and BMI	18–24	25–34	35–44	45–54	55–64	65–74	75 and over	Total 18 and over
Males								
Underweight	3.6	2.3	0.8	0.5	0.1	0.4	1.0	1.2
Normal	56.6	35.8	28.5	22.8	25.0	20.7	24.7	31.1
Overweight	28.0	42.4	44.2	47.0	40.0	45.1	52.8	42.2
Obese	11.9	19.5	26.6	29.8	34.9	33.8	21.5	25.4
Total males	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Females								
Underweight	7.2	3.4	1.9	2.0	1.2	1.3	2.8	2.8
Normal	57.7	52.2	42.8	39.2	30.9	27.5	40.5	42.5
Overweight	20.7	26.5	32.5	32.5	34.7	41.9	32.5	31.1
Obese	14.4	18.0	22.8	26.4	33.2	29.3	24.2	23.7
Total females	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: AIHW analysis of the 2007–08 NHS.

Most people's self-reported BMI was similar to their BMI based on measured height and weight (Figure 3.11). The largest inconsistency between self-reported and measured BMI was for people who measured overweight or obese; 21% of these people self-reported lower than the measured BMI.



BMI Body mass index.

Note: Excludes people who did not report their height or weight or did not have their height or weight measured.

Source: AIHW analysis of the 2007–08 NHS.

Figure 3.11: BMI from self-reported height and weight compared with BMI from measured height and weight, persons aged 18 years and over, 2007–08

A person's waist circumference can be used to measure what is known as abdominal obesity. Waist circumference is regarded as an independent risk factor for Type 2 diabetes and the risk increases with increasing waist circumference (see Box 3.10). In 2007–08, almost 60% of Australian adults had a waist circumference that put them at increased risk of poor health, including 35% at a substantially increased risk (Table 3.20). The proportion of people at increased risk of poor health due to their waist circumference increases with age for both males and females.

Table 3.20: Persons aged 18 years and over, waist circumference by risk level, 2007–08 (per cent)

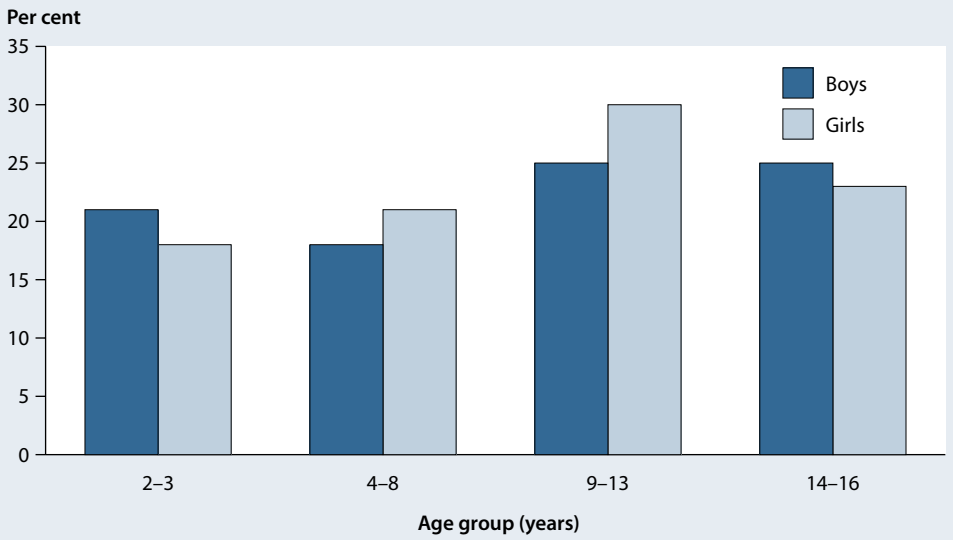
Sex and risk level	18–24	25–34	35–44	45–54	55–64	65–74	75 and over	18 and over
Males								
Not at risk	79.6	59.7	42.8	37.1	28.4	22.1	25.1	46.4
Increased risk	11.1	19.4	27.5	28.4	28.7	31.9	29.9	24.0
Substantially increased risk	9.2	20.9	29.7	34.6	42.9	46.1	45.1	29.6
Females								
Not at risk	66.7	45.7	37.7	33.2	22.0	16.6	20.6	29.0
Increased risk	14.6	22.2	23.8	24.2	22.0	28.3	22.3	31.0
Substantially increased risk	18.7	32.1	38.5	42.6	55.9	55.1	57.2	40.0
Persons								
Not at risk	72.3	53.1	40.2	35.2	25.3	19.4	22.6	42.2
Increased risk	12.9	20.7	25.7	26.3	25.5	30.1	25.7	23.1
Substantially increased risk	13.9	26.2	34.1	38.5	49.2	50.6	51.6	34.8

Source: AIHW analysis of the 2007–08 NHS.

Body weight of children

Excess weight in children increases the risk of poor health, both during childhood and later in adulthood. Children who are overweight or obese are at greater risk of developing chronic conditions such as asthma and Type 2 diabetes than those who are not. In addition, children who are overweight or obese can experience discrimination, victimisation and teasing that can affect their psychological wellbeing.

Recent estimates show that among children aged 5–17 years, 17% were overweight and 8% were obese. The proportion of children who have excess weight is similar in boys and girls, both peaking in the 9–13 years age group (Figure 3.12).



Note: From measured height and weight.

Source: DoHA 2008a.

Figure 3.12: Children aged 2–16 years who are overweight or obese, by age group, 2007

Between 1985 and 1995, levels of excess body weight in children almost doubled for both boys and girls (Magarey et al. 2001). Since 1995, the levels continued to increase, but not as dramatically (Table 3.21). There is currently a debate in Australia as to whether these increases are still continuing or whether the levels of excess weight in children have stabilised (Gill et al. 2009; Roberts et al. 2009). However, the evidence is somewhat blurred by the absence of directly comparable information over time.

Table 3.21: Excess body weight in children by year of survey (per cent)

Sex and excess weight	1985 Australian Health and Fitness Survey[a]	1995 National Nutrition Survey[b]	2007 Australian National Children's Nutrition and Physical Activity Survey[c]	2007–08 NHS[b]
Boys				
Overweight only	9.3	16.0	17.0	16.1
Obese only	1.4	4.5	5.0	9.7
Overweight or obese	10.7	20.5	21.0	25.8
Girls				
Overweight only	10.6	15.3	18.0	18.2
Obese only	1.2	5.8	6.0	5.8
Overweight or obese	11.8	21.1	24.0	23.0

(a) Children aged 7–15 years.

(b) Children aged 5–17 years.

(c) Children aged 2–16 years.

Note: From measured height and weight.

Sources: ABS 2009d; DoHA 2008a; Magarey et al. 2001.

Blood pressure

High blood pressure (often referred to as hypertension; see Box 3.11) is a major risk factor for coronary heart disease, stroke, heart failure and chronic kidney disease. Studies have shown that the lower the blood pressure, the lower the risk of cardiovascular disease, chronic kidney disease and death (NHFA 2009b). When high blood pressure is controlled, the risk is reduced, but not necessarily to the levels of unaffected people (WHO-ISH 1999).

Worldwide, high blood pressure has been found to be responsible for more deaths and disease than any other biomedical risk factor (Lopez et al. 2006). In Australia, nearly 8% of the burden of disease in 2003 was attributed to high blood pressure. It ranked as a close second to tobacco use on this score, with coronary heart disease and stroke accounting for 93% of the burden of high blood pressure. Four-fifths of the burden of high blood pressure related to premature death and the remainder to disability.

Major causes of high blood pressure include diet (particularly a high salt intake), obesity, excessive alcohol consumption and insufficient physical activity. Attention to health determinants such as body weight, physical activity and nutrition plays an important role in maintaining healthy blood pressure.

Despite the definition of high blood pressure in Box 3.11, blood pressure is a continuum with no threshold level of risk as it rises. Starting from quite low levels, as blood pressure increases so does the risk of stroke, heart attack and heart failure. This means that, for people's usual, day-to-day blood pressure, the lower the better. This is true with rare exceptions.

Box 3.11: High blood pressure

Blood pressure represents the forces exerted by blood on the wall of the arteries, and is written as systolic/diastolic (for example, 120/80 mmHg, stated as '120 over 80'). Systolic blood pressure reflects the maximum pressure in the arteries when the heart muscle contracts to pump blood; diastolic blood pressure reflects the minimum pressure in the arteries when the heart muscle relaxes before its next contraction.

There is a continuous relationship between blood pressure levels and cardiovascular disease risk. This makes the definition of high blood pressure somewhat arbitrary. The World Health Organization defines 'high blood pressure' as:

- systolic blood pressure of 140 mmHg or more, or
- diastolic blood pressure of 90 mmHg or more, or
- receiving medication for high blood pressure.

In this report, high blood pressure is defined using these guidelines.

Source: Whitworth JA; WHO, International Society of Hypertension Writing Group 2003.

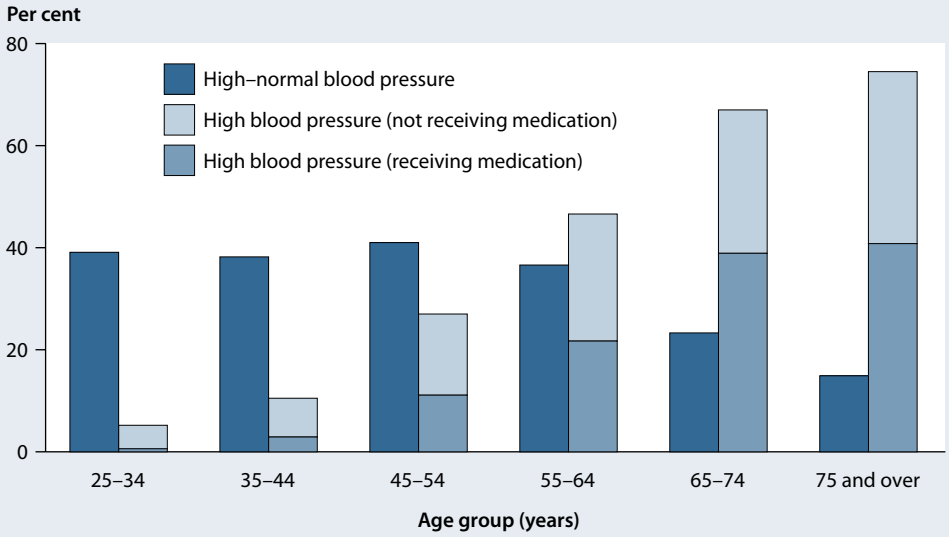
Prevalence

The 1999–2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab) measured people's blood pressure. The results indicated that 30% of Australians aged 25 years and over (3.7 million) had high systolic or diastolic blood pressure or were on medication for high blood pressure—32% of males and 27% of females. The proportion of people with high blood pressure increased markedly with age (Figure 3.13).

Figure 3.13 also shows the proportion of people who were classified as having 'high-normal' blood pressure, which is defined as systolic blood pressure of 120–139 mmHg and/or diastolic blood pressure of 80–89 mmHg (NHFA 2009b). People in this category therefore have blood pressure levels that are in between what is classified as normal and high—in other words, they are on the border of having high blood pressure. Lifestyle modification such as regular physical activity and quitting smoking is advised for people with blood pressure levels in this category (NHFA 2008). The AusDiab found that, although a smaller proportion of people aged 25–54 years had clinical hypertension compared with those aged 55 years and over, around 40% of people in each of these age groups were classified as having high-normal blood pressure (Figure 3.13). This places them at risk of clinical hypertension in the future if lifestyle modification is not pursued or if it is ineffective in controlling their blood pressure.

Figure 3.13 also shows that a large proportion of Australians with high blood pressure were not receiving medication to lower their blood pressure. In 1999–2000, about half of those with high blood pressure aged 55 years and above were not receiving medication. Although fewer people in the younger age groups had high blood pressure, a greater proportion of those who did were not receiving any medication for it. Over the past decade, however, much effort has been put into more aggressively treating people with high blood pressure. Hence, it is likely that these figures underestimate the current proportion of people on blood pressure lowering medicines.

More recent Pharmaceutical Benefit Scheme (PBS) data show that during the 2007–08 financial year, almost 3 million people in Australia filled prescriptions for medicines with a blood pressure lowering effect. The actual number of users of these medicines is likely to be higher as this figure includes only people receiving medicines subsidised under the PBS. It is important to note that a number of these medicines, while very commonly used to lower blood pressure, can also be used for other conditions.



Notes

1. Based on NHFA (2009b) high blood pressure guidelines and WHO definition of high blood pressure (see Box 3.11).
2. High-normal blood pressure is defined as systolic blood pressure of 120–139 mmHg and/or diastolic blood pressure of 80–89 mmHg, putting the person on the border of having high blood pressure.

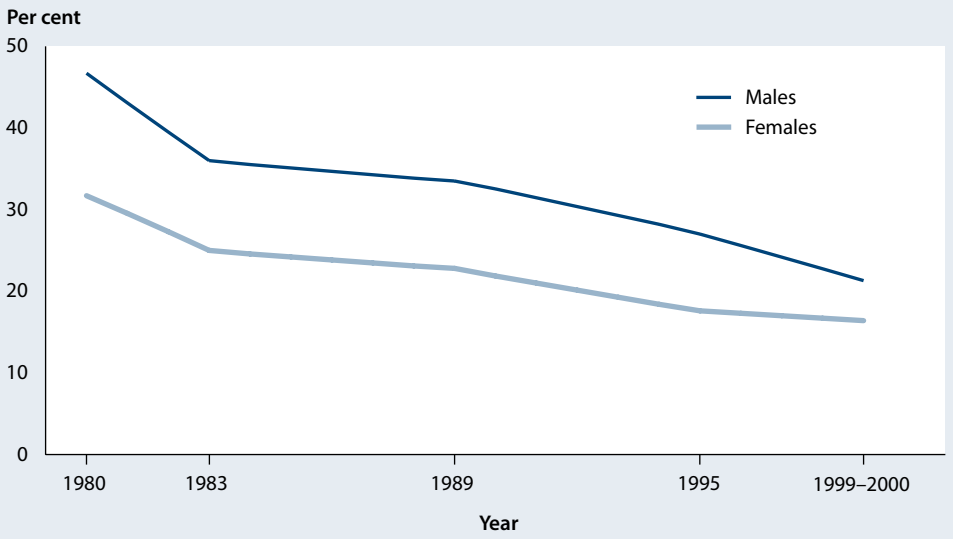
Source: AIHW analysis of the 1999–2000 AusDiab.

Figure 3.13: Proportion of adults with high-normal and high blood pressure, 1999–2000

Trends

Between 1995 and 1999–2000 the prevalence of measured high blood pressure among Australians aged 25 years and over remained about the same—31% in 1995 and 30% in 1999–2000. However, looking at just the urban population aged 25–64 years—the population for which longer term trends are available—the prevalence of high blood pressure decreased appreciably over the final two decades of the 20th century for both males and females (Figure 3.14). The proportion of males aged 25–64 years with high blood pressure more than halved, from 47% in 1980 to 21% in 1999–2000. It similarly halved for females, from 32% to 16%.

There have been no national surveys of blood pressure levels (or of blood cholesterol levels) since 1999–2000, so there are no data to show if these patterns have continued or not.



Notes

1. Age-standardised to the 2001 Australian population.
2. People aged 25–64 years, in urban areas only.
3. Based on the WHO definition of high blood pressure (see Box 3.11).

Sources: AIHW analysis of the 1980, 1983 and 1989 Risk Factor Prevalence Study surveys, the 1995 National Nutrition Survey and the 1999–2000 AusDiab.

Figure 3.14: Proportion of adults with high blood pressure, 1980 to 1999–2000

Blood cholesterol

High blood cholesterol (see Box 3.12) is a major risk factor for coronary heart disease and ischaemic stroke. It is a basic cause of plaque, the process by which the blood vessels that supply the heart and certain other parts of the body become clogged.

High blood cholesterol was estimated to have caused about 6% of the total burden of disease among Australians in 2003, with coronary heart disease and stroke accounting for the whole of cholesterol's burden. About 80% of the burden was related to premature deaths and 20% to disability.

For most people, saturated fat in the diet is the main factor that raises blood cholesterol levels. Genetic factors can also affect blood cholesterol, severely in some individuals. Physical activity and diet play an important role in maintaining a healthy blood cholesterol level.

Box 3.12: High blood fats—cholesterol and triglyceride

Cholesterol is a fatty substance produced by the liver and carried by the blood to the rest of the body. Its natural function is to provide material for cell walls and for steroid hormones. If levels in the blood are too high, this can lead to artery-clogging plaques that can bring on heart attacks, angina or stroke. The risk of heart disease increases steadily from a low base with increasing blood cholesterol levels. A total cholesterol level of 5.5 mmol/L or more is considered 'high' but this is an arbitrary definition.

Two important parts of blood cholesterol are:

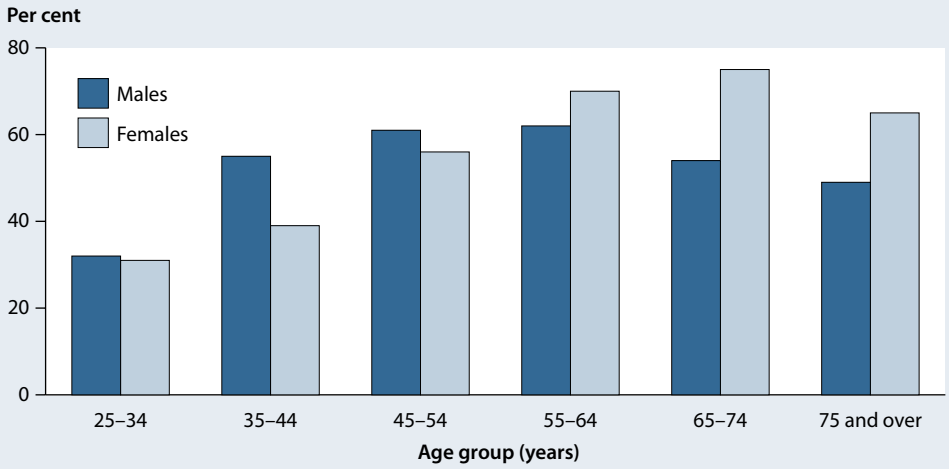
- low-density lipoprotein (LDL) cholesterol, often known as 'bad' cholesterol. Excess levels of LDL cholesterol are the main way that cholesterol contributes to plaque
- high-density lipoprotein (HDL) cholesterol, often known as 'good' cholesterol. High levels have a protective effect against heart disease by helping to reduce plaque.

Triglyceride is another form of fat that is made by the body. Its levels can fluctuate according to dietary fat intake, and under some conditions excess levels may contribute to plaque.

In this report, levels of high blood cholesterol are based on a total cholesterol level of 5.5 mmol/L or more.

Prevalence

The 1999–2000 AusDiab study estimated that around half of those aged 25 years and over had blood cholesterol levels of 5.5 mmol/L or more, corresponding to nearly 6.5 million Australians. The prevalence of high blood cholesterol increased with age to a peak for females aged 65–74 years and for males aged 55–64 years. In the younger age groups there was a greater proportion of males with high blood cholesterol than females; however, at 55 years of age females overtook males (Figure 3.15).



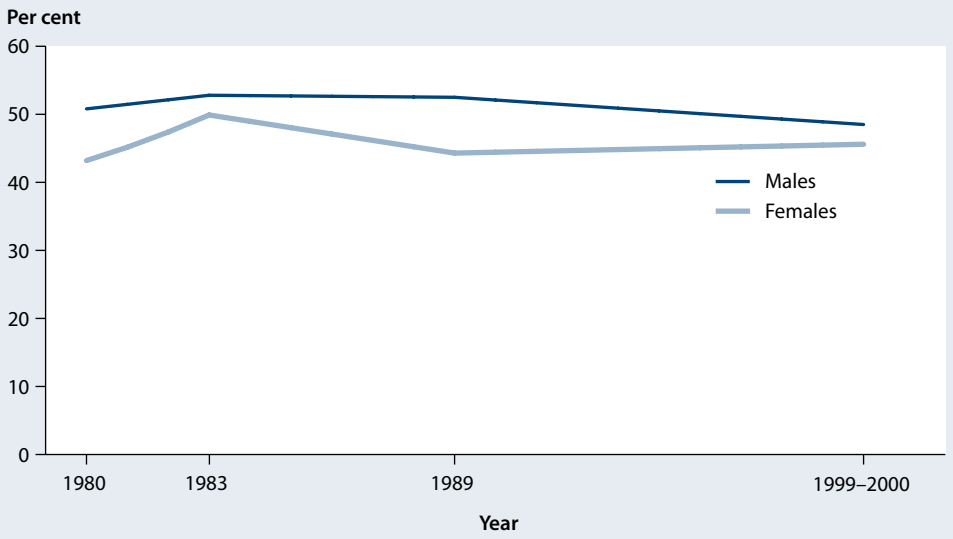
Note: High blood cholesterol is defined as a total cholesterol level of 5.5 mmol/L or more.
Source: AIHW analysis of the 1999–2000 AusDiab.

Figure 3.15: Proportion of adults with high blood cholesterol, 1999–2000

Recent PBS data show that, during the 2007–08 financial year, just over 2 million people in Australia filled prescriptions for medicines with a blood cholesterol lowering effect. The actual numbers of users of these medicines is likely to be higher as this figure includes only people receiving medicines supplied through the PBS.

Trends

Data on trends in average blood cholesterol and high blood cholesterol prevalence are available only to the year 2000 and for people aged 25–64 years living in capital cities. Average blood cholesterol levels of adults in 1999–2000 were very similar to those 20 years earlier. Consistent with the trends in average levels, there was no apparent reduction in the prevalence of people with high blood cholesterol over that period (Figure 3.16).



Notes

1. Age-standardised to the 2001 Australian population.
2. People aged 25–64 years in capital cities only.
3. High blood cholesterol is a total cholesterol level of 5.5 mmol/L or more.

Source: AIHW analysis of 1980, 1983, 1989 Risk Factor Prevalence Study surveys and the 1999–2000 AusDiab.

Figure 3.16: Proportion of adults with high blood cholesterol, 1980 to 1999–2000

Glucose regulation

Every cell in the body depends on glucose for energy. Insulin is a hormone that helps regulate the movement of glucose from the bloodstream and into the cells. Changes in the production and action of insulin can affect glucose regulation.

Impaired glucose regulation is the metabolic state between normal glucose regulation and the state of failed regulation known as diabetes (WHO 1999). For more information on diabetes, see Chapter 5. There are two categories of impaired glucose regulation: impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) (see Box 3.13).

IFG and IGT are not considered to be clinical entities in their own right but rather risk factors for the future development of diabetes and cardiovascular disease (Dunstan et al. 2001; NHMRC 2001). Studies have found that about 60% of people who developed diabetes had either IGT or IFG 5 years before they were diagnosed with diabetes (Unwin et al. 2002).

Box 3.13: Defining impaired glucose regulation

Impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) are measured using an oral glucose tolerance test (OGTT)—the same test that is used to assess for diabetes. In the OGTT a blood glucose measurement is taken after a period of about 8 hours of fasting; then an additional measurement is taken 2 hours after consuming 75 g of glucose (typically in the form of a high-sugar drink).

IFG indicates an abnormality in fasting glucose regulation and is diagnosed when the OGTT results show that the fasting blood glucose level (that is, the first measurement) is 6.0 mmol/L or more but less than 7.0 mmol/L, and the blood glucose level at 2 hours is less than 7.8 mmol/L.

IGT indicates an abnormality in glucose regulation after eating and is diagnosed when the OGTT results show that the fasting blood glucose level is less than 7.0 mmol/L and the blood glucose level 2 hours after consuming the glucose is more than 7.8 mmol/L but less than 11 mmol/L.

Note that diabetes—rather than just impaired glucose regulation—is diagnosed when the fasting blood glucose level is 7.0 mmol/L or more, or the OGTT result is 11.1 mmol/L or more, or both.

Risk and prevention

Impaired glucose regulation is most common in people who also have other risk factors for diabetes or cardiovascular disease, including being overweight or obese, being physically inactive, and having high levels of triglyceride, low HDL (high-density lipoprotein) cholesterol, high total cholesterol or high blood pressure (Twigg et al. 2007). Preventing these risk factors, as well as early treatment and improved management of impaired glucose regulation, can reduce the progression to Type 2 diabetes. A study by Tuomilehto and colleagues (2001) showed that lifestyle interventions among obese adults with IGT—such as counselling aimed at reducing weight and total fat intake, increasing fibre intake, and increasing physical activity—reduced the rate of progression to diabetes by 40–60% over a 3–6 year period.

Prevalence

Based on measured data from the 1999–2000 AusDiab, it is estimated that about 1 in 6 (16%) Australians aged 25 years or over had impaired glucose regulation, with IGT more common than IFG—11% and 6% respectively (Table 3.22). In contrast to these measured data, only 1 in 600 respondents (less than 0.2%) reported having been told they had 'high sugar levels' in the 2007–08 NHS (ABS 2009d).

Table 3.22: Prevalence of impaired glucose regulation among adults aged 25 years and over, 1999–2000 (per cent)

Measure	Males	Females	Persons
Impaired fasting glucose	8.1	3.4	5.8
Impaired glucose tolerance	9.2	11.9	10.6
Total impaired glucose regulation	**17.4**	**15.4**	**16.4**

Note: Column totals may not add up due to rounding.

Source: AIHW analysis of the 1999–2000 AusDiab.

Variations by age and sex

The two types of impaired glucose regulation, IFG and IGT, have very different age and sex distributions. Results from the 1999–2000 AusDiab suggested that the overall prevalence of IFG was significantly higher in males (8%) than in females (3%), and that the prevalence of IGT was significantly higher among females (12%) than males (9%) (Table 3.22). The age-specific rates for IFG were highest among males aged 55–64 years and females aged 75 years and over. While there was no consistent trend in the prevalence of IFG with age, the prevalence of IGT generally increased with age (Figure 3.17).

Source: AIHW analysis of the 1999–2000 AusDiab.

Figure 3.17: Prevalence of impaired fasting glucose and impaired glucose tolerance among adults aged 25 years and over, by age group and sex, 1999–2000

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