

20. Biological and behavioural factors

Poor health is associated with a range of personal and behavioural factors. This section describes data on the status of a number of these factors in children. While some of these risk factors are common to a number of diseases, such as the association between poor nutrition, physical inactivity, smoking and cardiovascular disease and diabetes, others are more specific to a particular disease. The biological and behavioural factors described here include low birthweight, breastfeeding, eating breakfast, physical activity, overweight and obesity, substance use, sun protection and immunisation.

Low birthweight

Low birthweight babies (those born weighing less than 2,500 g) are at increased risk of hospitalisation and neonatal death and are more likely to suffer from physical and neurological complications than babies with normal birthweight. They are also at increased risk of death and hospitalisation later in life (McIntire et al. 1999; Power & Li 2000). These babies are more likely to develop high blood pressure, non-insulin dependent diabetes and impaired glucose tolerance later in life (Barker et al. 1990; Hales et al. 1991). Frankel et al. (1996) found that low birthweight was associated with increased risk of coronary heart disease among obese adults. Stein et al. (1996) suggest that coronary heart disease has its origins in foetal under-nutrition.

In addition to the increased risk of morbidity and mortality, children with an extremely low birthweight (less than 1,000 g) have also been found to have more psychosocial problems. These children are at risk of having difficulties at school. Teenagers who had an extremely low birthweight were less likely to achieve well on intellectual measures, particularly arithmetic, than their peers (Saigal 2000).

Risk factors for low birthweight include younger gestational age, younger or older maternal age, higher number of previous births and multiple births. Cigarette smoking, alcohol consumption and inadequate nutrition are also risk factors for low birthweight. Low birthweight is more common in babies born to families with low socioeconomic status (James et al. 1997), single mothers and Indigenous mothers.

The indicator for low birthweight is the number of infants born weighing less than 2,500 grams in a given year as a percentage of all births (live and still).

The number and proportion of infants born with a low birthweight in 1999 are shown in Table 20.1.

Table 20.1: Infants weighing less than 2,500 grams at birth, 1999

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Infants born at less than 2,500 g	5,541	4,340	3,286	1,720	1,218	415	332	356	17,208
Total births	87,289	62,689	48,747	25,771	18,519	6,092	4,688	3,599	257,394
Proportion of low birthweight infants (per cent)	6.3	6.9	6.7	6.7	6.6	6.9	7.1	10.0	6.7

Source: AIHW NPSU: Nassar et al. 2001.

- In 1999, 17,208 infants had a birthweight less than 2,500 grams. This represented 6.7% of all infants born in the year.
- The proportions of low birthweight infants varied across States and Territories, and was highest in the Northern Territory: 10.0%, compared with 7.1% or less in other States and Territories. This is a reflection of the higher number of Aboriginal and Torres Strait Islander infants with low birthweight in the Northern Territory (Table 20.2).

The proportion of low birthweight infants in Australia remained relatively consistent during the 1990s, ranging from 6.3% to 6.7% (AIHW NPSU: Lancaster et al. 1994; AIHW NPSU: Nassar et al. 2001).

Aboriginal and Torres Strait Islander infants

Table 20.2: Indigenous infants weighing less than 2,500 grams at birth, 1999

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Indigenous infants born at less than 2,500 g	261	70	321	232	75	7	4	184	1,154
Total Indigenous births	2,059	445	2,849	1,545	445	129	55	1,295	8,822
Proportion of low birthweight Indigenous infants (per cent)	12.6	15.5	11.1	14.8	16.7	5.3	7.3	14.3	13.0

Note: Data for Tasmania unavailable; 1998 data used as estimate.

Source: AIHW NPSU: Nassar et al. 2001.

- In 1999, 1,154 (13.0%) Aboriginal and Torres Strait Islander infants were born weighing less than 2,500 grams, compared with 6.7% of all Australian infants.

Nutrition

Childhood is a time of rapid growth and development, and a balanced, nutritious diet is an important contributor to this growth and to health in general. Poor nutrition is associated with a number of illnesses, including obesity, coronary heart disease, stroke, hypertension, some cancers, Type 2 diabetes, and osteoporosis (AIHW: Lester 1994). Establishing a healthy diet in childhood is likely to encourage the development of a healthy diet through adolescence and into adulthood, as eating habits begin early in childhood and are maintained through life (Campbell 1999).

The National Health and Medical Research Council (NHMRC 1995) suggests that a healthy diet for children should include a wide variety of nutritious foods: bread, cereals, fruit and vegetables, foods containing calcium and iron, a moderate amount of sugars, age-appropriate fat intake and low salt intake. Children are encouraged to drink water and engage in physical activity. Breastfeeding for infants is also encouraged and supported.

Cashel (2000) summarised data on the nutritional intake of Australian children from the 1995 ABS National Nutrition Survey. While the fat intake of children aged 2–15 years approximated that recommended by the NHMRC dietary guidelines, the intake of saturated fats for all children was higher than recommended. Calcium intake was lower than recommended, as was the intake of iron by girls. While over 98% of children ate cereal foods prior to the day of the survey, girls aged 4–7 years and boys aged 8–11 years did not eat the recommended amounts of breads and cereals.

The National Nutrition Survey also showed that children consumed less fruits and vegetables than recommended, with 30% of children aged 2–7 years eating no fruit, and a similar percentage consuming no vegetables, on the day prior to the survey (ABS & DHFS 1997). Consumption of fruit declined with age for both boys and girls, with 50% of boys and 42% of girls aged 12–15 years consuming no fruit on the day prior to the survey. The proportion of boys who had eaten no vegetables on the day prior to the survey ranged from 32% (children aged 2–3 years) to 21% (children aged 12–15 years), while for girls the proportion ranged from 20% (children aged 2–5 years) to 14% (children aged 12–15 years).

Inadequate consumption of fruit and vegetables is responsible for 2.7% of the total burden of disease among Australians, with most of this burden (75%) due to cancer, and much of the remaining burden relating to heart disease and stroke (AIHW: Mathers et al. 1999).

Two particularly important nutritional factors which impact on the health of infants and children are breastfeeding and eating breakfast.

Breastfeeding

Breastfeeding has many positive effects on the survival, growth, development and health of infants and young children, as well as greater social and economic benefits (American Academy of Pediatrics 1997). Babies are born with an immune system that is not fully developed, and the mother's antibodies in breastmilk protect the infant from disease while its own immune system is developing, particularly in the first 4–6 months of life (NHMRC 1995, 1996a). A number of studies have shown that breastfeeding has a protective effect against many acute conditions, such as diarrhoea, respiratory infection, otitis media, bacterial meningitis, urinary tract infection, and necrotising enterocolitis (a serious gastrointestinal disease which can lead to death). Other studies show a protective effect of breastmilk against sudden infant death syndrome (SIDS), as well as against chronic diseases such as diabetes mellitus and allergic diseases such as eczema and asthma (American Academy of Pediatrics 1997). Raisler et al. (1999) found that breastfed infants made fewer visits to health professionals, a finding supported by Weimer (1998), who suggested that breastfeeding can lead to reduced health care costs, as well as reducing the time parents are absent from work in order to care for a sick child.

Breastfeeding also has beneficial health effects for the mother. Breastfeeding is thought to encourage bonding between mother and baby (NHMRC 1996a). In addition, studies have shown that breastfeeding can lead to less bleeding after giving birth, as well as delaying ovulation and menstruation (cited in American Academy of Pediatrics 1997).

In view of the importance of appropriate feeding practices for the survival, growth and health of infants, the World Health Organization commissioned a systematic review of the current scientific evidence on the optimal duration of exclusive breastfeeding. This review compared the benefits of exclusive breastfeeding for up to 6 months versus 4 months of age and concluded that exclusive breastfeeding up to 6 months of age has several benefits for the mother and infant. It was therefore recommended that infants should be breastfed up to 6 months, with the introduction of complementary food and continued breastfeeding thereafter (WHO 2001).

In Australia, the NHMRC (1995) has placed breastfeeding first on the list of 'Dietary guidelines for children and adolescents', emphasising the importance of breastmilk as the only food necessary for infants up to 4–6 months. Currently, Australia is working to harmonise breastfeeding definitions with those of WHO to allow international comparability (DHAC, pers. comm., October 2001).

The indicator for breastfeeding is the number of infants fully breastfed at 3 and at 6 months of age in a given year as a percentage of all infants aged 3 and 6 months in the same year. Data for this indicator come from two sources. In the 1995 ABS National Health Survey (NHS), parents were asked about breastfeeding of infants aged 0–3 years, for the years 1992–95. More recent data at the State level are available from the 1999–00 Victorian Maternal and Child Health Survey.

Donath & Amir (2000) used unit record data from the NHS to estimate the percentage of children breastfed at discharge from hospital, at 3 months (13 weeks) of age, and at

6 months (25 weeks) of age, who were born between 1992 and 1995 (Table 20.3). Children were said to be breastfed 'exclusively' if they did not consume infant formula, cow's milk, other milk substitutes or solid food on a regular basis.

Table 20.3: Proportion of infants breastfed at discharge from hospital, 13 and 25 weeks, 1992-95 (per cent)

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
At discharge from hospital	78.4	82.2	84.1	87.0	82.2	78.1	90.1	88.5	81.8
Exclusively breastfed at 13 weeks	56.6	56.0	56.3	62.8	53.3	60.2	63.8	70.9	57.1
Exclusively and partially breastfed at 13 weeks	60.0	61.7	63.8	69.0	62.2	63.0	68.7	76.3	62.6
Exclusively breastfed at 25 weeks	17.2	18.3	19.2	21.9	18.4	22.3	17.0	24.6	18.6
Exclusively and partially breastfed at 25 weeks	44.2	45.0	47.7	50.6	46.1	43.9	53.8	64.7	46.2

Source: Donath & Amir 2000.

- During 1992-95, 81.8% of infants were breastfed following discharge from hospital.
- At 13 weeks (3 months) of age, just over half (57.1%) were exclusively breastfed, and 63% exclusively or partially breastfed.
- At 25 weeks (6 months) of age, 18.6% were exclusively breastfed, and 46.2% exclusively or partially breastfed.
- The highest rates of breastfeeding were found in the Australian Capital Territory, the Northern Territory and Western Australia.
- The percentage of infants exclusively breastfed at 3 months of age (57.1%) comes close to the proposed target of 60% for the year 2000 (Nutbeam et al. 1993). However, the percentage exclusively breastfed at 6 months (18.6%) falls very short of the set target of 50%.

Donath & Amir (2000) found a strong relationship between breastfeeding and socioeconomic status based on the area in which the child lived. Infants from the most disadvantaged areas were significantly less likely to be breastfed at any age compared with those from other areas.

More recent information about breastfeeding is available from Victoria (Table 20.4). The definitions used in Victoria are different from those used in the ABS NHS, which affects comparability of the data, but in the absence of recent national data they are useful to consider.¹

1. In Victoria, the following definitions of breastfeeding apply: an 'exclusively' or 'fully breastfed' infant is one who does not regularly (at least once a day) receive any milk other than breast milk, but may receive some solids. A 'partly breastfed' infant is one who regularly (at least once a day) receives some breast milk

Table 20.4: Victorian infants breastfed at 3 and 6 months of age, 1992–93 to 1999–00

		Age			
		3 months		6 months	
		Number	Per cent	Number	Per cent
1992–93	Fully breastfed	n.a.	52.7	n.a.	39.0
	Partly breastfed	n.a.	5.0	n.a.	4.5
1995–96	Fully breastfed	33,829	53.0	25,071	39.0
	Partly breastfed	3,231	5.0	3,209	5.0
1998–99	Fully breastfed	32,118	52.4	24,557	40.1
	Partly breastfed	3,373	5.5	2,824	4.6
1999–00	Fully breastfed	32,703	52.1	24,986	39.8
	Partly breastfed	3,776	6.0	2,927	4.7

Source: Victoria DHS 1998, 2001.

- Breastfeeding rates remained fairly constant in Victoria between 1992–93 and 1999–00. Throughout this time, just over half of infants aged 3 months were fully or partly breastfed, and under half of infants aged 6 months were fully or partly breastfed.
- In 1999–00, 52.1% of infants aged 3 months, and 39.8% of infants aged 6 months, were fully breastfed, compared with 52.7% of infants aged 3 months, and 39.0% of infants aged 6 months, in 1992–93.

Aboriginal and Torres Strait Islander infants

Data from the ABS 1994 National Aboriginal and Torres Strait Islander Survey (ABS 1996b) indicate that 66.3% of Indigenous boys and 66.5% of Indigenous girls up to 12 years of age had been breastfed as infants. Of children up to 12 years of age, 12.2% had been breastfed for 1–3 months, 11.7% for 3–6 months, 14.5% for 6–12 months, and 27.4% for 12 months or more. A greater proportion of Indigenous babies in the Northern Territory (56.6%) were breastfed for 12 months or more than in any other State or Territory.

However, data from the 1995 ABS National Health Survey (ABS 1999c) suggest that a higher proportion (74.9%) of Aboriginal and Torres Strait Islander infants had been breastfed. While this rate is lower than the 86.3% reported for other Australian infants, a greater proportion of Aboriginal and Torres Strait Islander infants were breastfed for 24 weeks or more than other Australian infants (60.5% compared with 53.4%).

Proportion of children eating breakfast

Breakfast is an important contributor to nutritional wellbeing. It has been suggested that not eating breakfast may have negative effects on cognitive functioning (Shaw 1998), a factor very important for schoolchildren. Skipping breakfast (or lunch) has been suggested as a possible indicator of subclinical eating disorder (Melve & Baerheim 1994). Missing breakfast has also been associated with overweight and obesity. Ortega et al. (1998) found that overweight and obese children aged 9–13 years, especially girls, skipped breakfast more often than children with a healthy weight. Overweight and obese children were also likely to eat less nutritious breakfasts, and eat less breads and cereals. As a result, they consumed lower quantities of carbohydrates, thiamine, niacin, pyridoxine, vitamin D and iron. Ortega et al. (1998) suggest that eating an inadequate breakfast plays a part in the making of poor food choices through the rest of the day and may lead to an increased risk of obesity in the future.

Shaw (1998) undertook a study in Queensland to determine why children skipped breakfast, and found that out of approximately 700 children aged 13 years, 82 (12%) reported not eating breakfast. The only statistically significant variable was sex, with girls skipping breakfast more than 3 times as often as boys. Girls were also more likely to skip lunch, and to have been on a diet to lose weight. Missing breakfast was not related to income. The most common reason given for skipping breakfast was lack of time in the morning (52% of those who skipped breakfast), followed by being 'not hungry' (22%) and 'not feeling like it' (14%). A year after the initial survey, of those who had said that they skipped breakfast, 27% said they always or almost always ate breakfast, suggesting that breakfast habits may be somewhat subject to change.

The indicator for children eating breakfast is the number of children aged 2–15 years eating breakfast 5 or more days per week in a given year as a percentage of all children aged 2–15 years. The most current national data on the number of times per week Australian children usually have breakfast come from the 1995 ABS National Nutrition Survey (Table 20.5).

Table 20.5: Proportion of Australian children aged 2–15 years eating breakfast, 1995 (per cent)

Number of times breakfast is consumed per week	Age (years)					
	2–11			12–15		
	Males	Females	Persons	Males	Females	Persons
Rarely or never	0.2 ^(a)	0.6 ^(a)	0.3 ^(a)	0.9 ^(a)	6.4	3.6
One to two days	1.3	2.6	1.9	6.2	12.8	9.4
Three to four days	3.8	4.7	4.2	5.3	9.3	7.2
Five or more days	93.7	92.2	93.0	86.5	70.9	78.9
Total	100	100	100	100	100	100
Sample total (number)	970	951	1,921	349	304	653

(a) Estimates have a relative standard error of between 25% and 50% and should be used with caution.

Source: ABS & DHFS 1997.

- In 1995, the majority of children consumed breakfast 5 or more days per week: 93.0% of children aged 2–11 years and 78.9% of older children (12–15 years).
- Older children were more likely than younger children to rarely or never eat breakfast (3.6% compared with 0.3%) or to eat it on only 1 or 2 days per week (9.4% compared with 1.9%).

- A higher proportion of boys ate breakfast on 5 or more days than girls, with a higher proportion of girls rarely or never eating breakfast, or doing so on only 1 or 2 days per week. This was especially true for children aged 12–15 years.

Physical and other activities

Physical activity is important for the health of children. Children are naturally physically active, but contemporary life in urban communities can constrain activity (Booth 2000a). Physical activity in children is important for a number of reasons, including maintaining and improving physical fitness, health and wellbeing, growth and development, encouraging active lifestyles which will continue into adulthood, and reducing the risk of chronic diseases in adulthood (Biddle et al. 1998). Among adults, physical activity has been associated with a lowered risk of premature mortality, coronary heart disease, high blood pressure, colon cancer, and Type 2 diabetes (USDHSS 1996). Physical inactivity is estimated to be responsible for 6.7% of the total burden of disease in the entire Australian population, with ischaemic heart disease and stroke accounting for 60% of this disease burden (AIHW: Mathers et al. 1999). While there is only a weak association between physical activity in childhood and immediate or future health outcomes (Riddoch 1998), physical activity has been seen to prevent or delay, and help reduce, high blood pressure in some adolescents (USDHSS 1996). Physical activity in children has also been associated with good mental health and, in particular, good self-esteem (Mutrie & Parfitt 1998).

Many activities now widely undertaken by children involve very little physical activity, including watching television and videos and playing computer games. Being driven to school and other places that they may once have walked to has also decreased the amount of physical activity undertaken by children (Booth 2000b). It has been proposed that watching television limits spontaneous activity levels and encourages increased food intake, both of which can lead to overweight and obesity (Rossner 1998). Borzekowski & Robinson (2001) found that only one or two exposures to a 10–30-second food commercial on television can influence young children's short-term food preferences. Robinson (1999) found that reducing television viewing significantly reduced the body mass index (BMI) in children.

Despite the increase in sedentary activities, it is likely that the majority of children (an estimated 80%) are sufficiently active (Booth 2000a). However, the substantial minority who are not sufficiently active are probably also overweight, and at risk of becoming inactive and overweight adults. People of all ages are encouraged to engage in moderate amounts of daily physical activity (USDHSS 1996). This can be achieved in children through play, transport and recreation, with vigorous-intensity activity, such as organised sport, physical education, and dance, 3–4 times a week, providing additional benefits (Shilton & Naughton 2001; Booth 2000a).

There are no national data on the total amount of physical activity undertaken by children. However, in 2000, the Australian Bureau of Statistics (ABS 2001c) undertook a survey on the cultural and leisure activities of Australian children, which provides information on some types of physical activities undertaken by children. There are also State data available on New South Wales schoolchildren, from the 1997 New South Wales Schools Fitness and Physical Activity Survey (Table 20.6). This survey provides information on, among other things, physical activity for children aged 7–16 years. The information presented here is restricted to children aged 13–14 years (Year 8).

Children in New South Wales were considered to be 'active' using the following criteria: 'active' equated to 3.5 hours of moderate-intensity activity over five sessions

during a normal week, and 'vigorously active' was defined as participating in at least three 20-minute sessions of fairly vigorous activities per week.

Table 20.6: Proportion of New South Wales schoolchildren in Year 8 sufficiently active each week during summer and winter school terms, 1997 (per cent)

	Summer school terms			Winter school terms		
	Active, but not vigorously active	Vigorously active	Total active	Active, but not vigorously active	Vigorously active	Total active
Year 8 males	16	65	81	13	63	76
Year 8 females	18	63	81	21	48	69

Source: Booth et al. 1997.

- In 1997, boys and girls in Year 8 were physically active to the same degree in summer, but boys were more physically active in winter (76%, compared with 69% of girls).
- A higher percentage of boys in both summer and winter school terms were vigorously active, compared with girls (65% compared with 63% in summer, 63% compared with 48% in winter).
- Both the proportion of active children and the proportion of vigorously active children declined in the winter school terms.

The most common activities for boys in Years 8 and 10 (13–16 years) were recreational cycling, school sport, walking for transport, soccer, cricket, swimming and basketball, while the most common activities for girls in Years 8 and 10 were walking for transport, swimming, school sport, walking for pleasure, netball, recreational cycling and dancing.

The 2000 ABS Children's Participation in Cultural and Leisure Activities Survey (ABS 2001c) looked at participation of children aged 5–14 years in selected cultural and leisure activities (Table 20.7).

Table 20.7: Children aged 5–14 years participating in selected cultural and leisure activities, 2000

	Males		Females	
	Estimated number ('000)	Per cent	Estimated number ('000)	Per cent
Organised cultural activities^(a)	266.8	19.7	510.9	39.7
Playing musical instrument	213.8	15.8	260.1	20.2
Dancing	22.9	1.7	251.1	19.5
Singing	38.9	2.9	85.6	6.6
Drama	42.8	3.2	79.0	6.1
Organised sport^(a)	895.2	66.1	673.0	52.3
Leisure activities^(b)	1,342.6	99.1	1,276.0	99.1
Watching TV/videos	1,312.2	96.9	1,248.1	96.9
Playing electronic or computer games	1,071.5	79.1	747.5	58.1
Bike riding	963.1	71.1	723.0	56.1
Arts and crafts	466.1	34.4	704.6	54.7
Skateboarding/rollerblading	481.6	35.6	335.8	26.1
Computer activities^(c)	1,281.6	94.6	1,216.7	94.5
Using a computer but not the Internet	638.5	47.1	625.5	48.6
Accessing the Internet	643.1	47.5	591.3	45.9

(a) Outside of school hours during the 12 months prior to interview in April 2000.

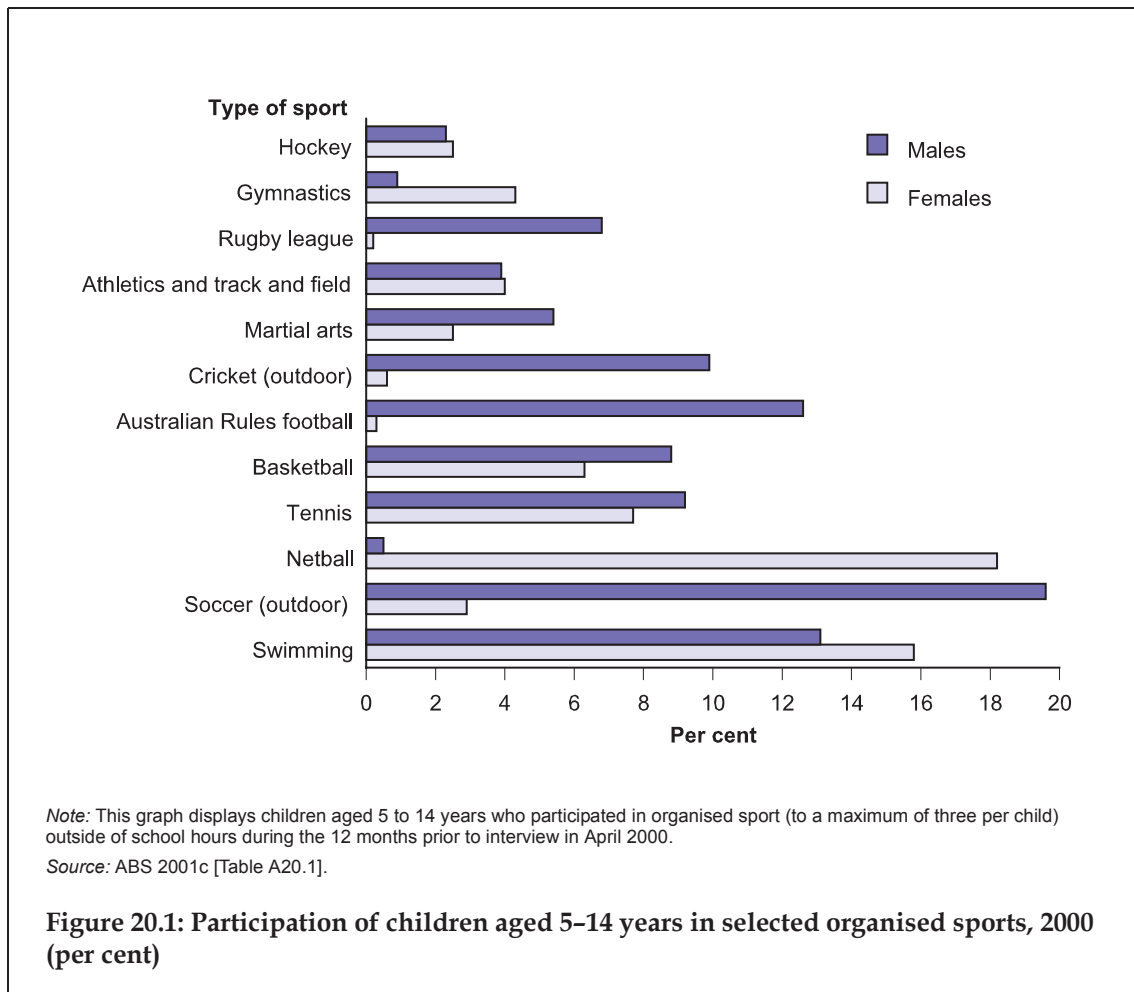
(b) Outside of school hours during the past 2 school weeks prior to interview in April 2000.

(c) During or outside of school hours during the 12 months prior to interview in April 2000.

Source: ABS 2001c.

- Over the year to April 2000, 29.4% of children participated in at least one of the four selected organised cultural activities out of school hours. Twice as many girls as boys participated in at least one of in these activities (39.7% compared with 19.7%). Playing a musical instrument was the most popular of these activities among both boys and girls (undertaken by 15.8% of boys and 20.2% of girls). Approximately three-quarters of children who played a musical instrument received lessons.
- Over the period, 1.6 million children (59.4%) took part in sports that had been organised by a school, club or association out of school hours. Organised sport was undertaken by 66.1% of boys and 52.3% of girls. The highest proportion of children participating in organised sport was in the age group 9–11 years, with 67.3% participating.
- The most popular leisure activity undertaken by children outside of school hours during the 2 school weeks prior to the survey was watching TV and videos, undertaken by 96.9% of boys and girls. Playing electronic or computer games was also undertaken by a large proportion of children (68.9%), but was more popular among boys (79.1% participating) than girls (58.1% participating).
- Computer activities during or outside of school hours were undertaken by the majority of boys and girls (94.6% and 94.5%, respectively). Accessing the Internet was more popular among children aged 12–14 years than among children aged 5–11 years. Most children (94%) used the computer at school, and a high proportion (75.5%) used the computer at home. For children using the computer at home, 84.3% used it to play games, and 83.9% used it for school or educational reasons. For children using the Internet at home, 82.6% for school or educational reasons, with just over half (51.5%) using it for e-mail or chat rooms.

Participation in selected organised sports is shown in Figure 20.1.



- Among all boys surveyed, the most popular sport was outdoor soccer, with a participation rate of 20%, followed by swimming and Australian rules football (13% each). Among all girls surveyed, the most popular sport was netball, with a participation rate of 18%, followed by swimming (16%) and tennis (8%).
- Participation in some sports, such as swimming, tennis, basketball, athletics and track and field, was fairly even between boys and girls. However, boys predominated in outdoor soccer, Australian rules football, outdoor cricket, and rugby league, while girls predominated in netball and gymnastics.

Overweight and obesity

The prevalence of overweight and obesity among Australian children has increased in recent years. The reasons for this increase are complex. Overweight and obesity are to some extent related to family factors. Hediger et al. (2001) found that maternal body mass index (BMI) is the strongest predictor of child BMI, with children of an overweight or obese mother 3-4 times more likely to be overweight. While genetic factors can play a role in determining body weight, modelling influences cannot be ruled out. Also, because the prevalence of obesity has been increasing so rapidly, genetic factors cannot be the only reason (Dietz 2000). Lifestyle factors such as poor diet and lack of physical

activity are also contributing causes, with an increase in the consumption of take-away foods and other foods that are high in fat and sugar contributing to a high daily energy intake in the absence of high levels of physical activity.

Children classified as overweight or obese have a range of health problems (Hansen 2000), including psychosocial problems and respiratory problems. Hill (2000) suggests that psychosocial problems are the most immediate common problems associated with childhood obesity, and include poor body image, disordered eating, decreased self-worth (particularly in obese adolescents), peer teasing and victimisation.

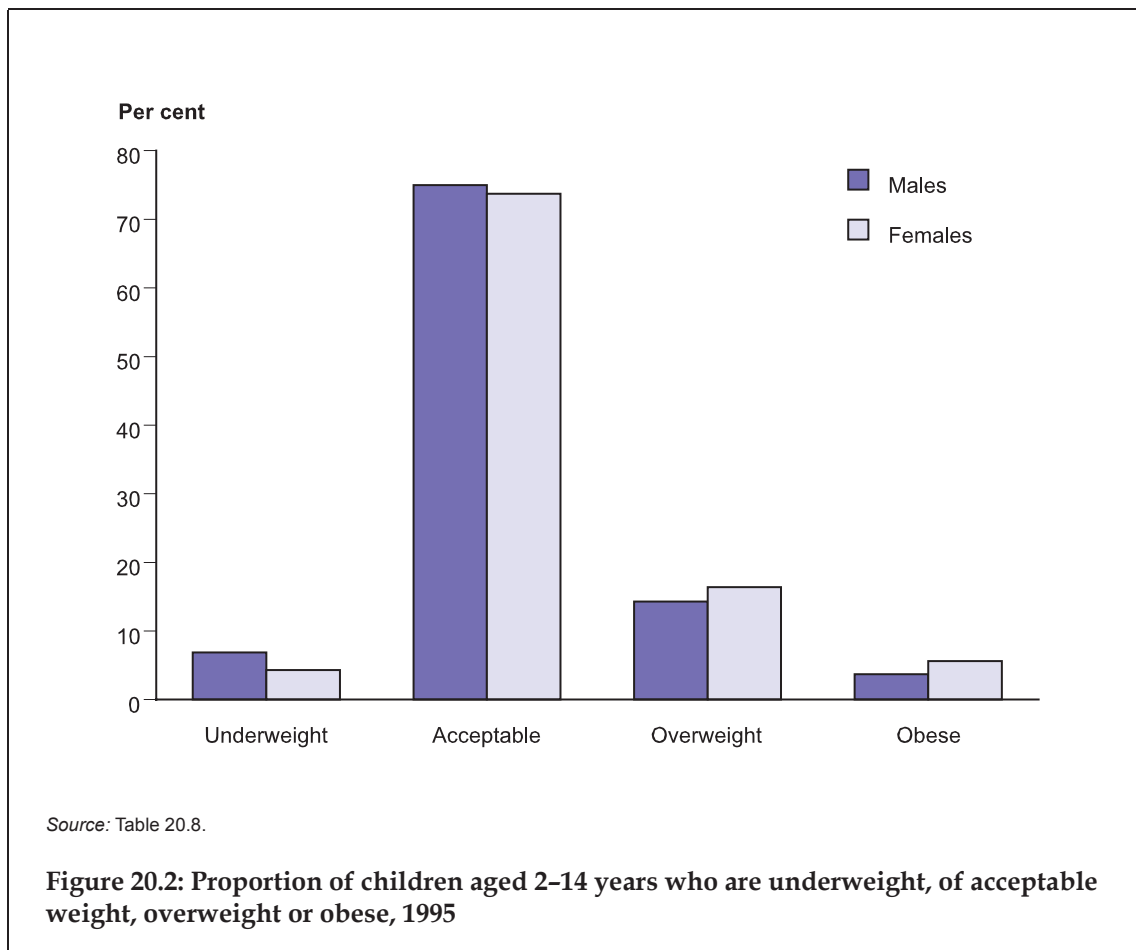
A number of chronic diseases, including increased risk of high blood pressure, heart disease, osteoarthritis, Type 2 diabetes, and some cancers, have been associated with obesity in adulthood (Eckersley 2001). While there are few data linking childhood obesity to chronic diseases in adulthood, childhood obesity can lead to obesity in adulthood, which in turn can lead to increased risk of poor health (Rossner 1998). In 1996, obesity was estimated to account for 4.3% of the total burden of disease among Australians, with cardiovascular diseases and hypertension accounting for 40% of this burden, and diabetes for 28% (AIHW: Mathers et al. 1999).

Overweight and obesity are measured by the BMI measurement, which is the ratio of weight in kilograms to the square of height in metres (kg/m^2). BMI is used to categorise people into one of four groups – underweight, acceptable weight, overweight, or obese. While there are standard adult cut-off points (a BMI of ≥ 25 and $< 30 \text{ kg}/\text{m}^2$ indicates overweight, and a BMI of $\geq 30 \text{ kg}/\text{m}^2$ indicates obesity), Cole et al. (2000) suggest that age- and sex-specific BMI cut-off points are more appropriate for use with children.

The indicator for overweight and obesity is the number of children aged 2–14 years whose BMI is above the cut-off points for overweight and obese for their age and sex in a given year as a percentage of all children aged 2–14 years. The most recent data on the weight of Australian children come from the 1995 ABS National Nutrition Survey.

Analyses of data from the 1995 survey using the age- and sex-specific cut-off points proposed by Cole et al. (2000) show that 19–23% of Australian children aged 2–18 years are overweight or obese, depending on age (Booth et al. 2001; Magarey et al. 2001). Between 1985 and 1995, the rate of overweight and obesity in children aged 7–15 years almost doubled. In 1985, 10.7% of boys and 11.8% of girls were overweight or obese, while in 1995, 20.0% of boys and 21.5% of girls were overweight or obese (Magarey et al. 2001).

As the data published by Magarey et al. (2001) included older children, the AIHW analysed the 1995 survey data using Cole et al.'s age- and sex-specific cut-off points for children aged 2–14 years (Figure 20.2).



- In 1995, while the majority of Australian children aged 2–14 years – 75.0% of boys and 73.7% of girls – were of an acceptable weight, a relatively high proportion were overweight and obese: 14.3% of boys and 16.4% of girls were overweight, and 3.7% of boys and 5.6% of girls were obese.
- A small percentage of children were underweight: 6.9% of boys and 4.3% of girls.

The proportion of children aged 2–14 years according to their weight status and by sex is presented in Table 20.8.

Table 20.8: Proportion of children aged 2–14 years who are underweight, of acceptable weight, overweight or obese, 1995 (per cent)

	Age (years)	Underweight	Acceptable	Overweight	Obese	Total (number)
Males	2–4	4.3	78.9	14.6	2.2	261
	5–9	8.0	77.2	10.4	4.3	489
	10–14	7.3	70.3	18.3	4.1	456
	2–14	6.9	75.0	14.3	3.7	1,206
Females	2–4	4.8	72.5	18.5	4.2	285
	5–9	3.3	74.7	14.9	7.1	465
	10–14	4.9	73.3	16.9	4.9	426
	2–14	4.3	73.7	16.4	5.6	1,176

Source: AIHW analysis of ABS NNS data, 1995.

- The proportion of children who were overweight or obese in 1995 was highest among boys aged 10–14 years (22.4%), and among girls aged 2–4 years (22.7%). While there were differences in the proportion of children who were overweight or obese among boys of different age groups, these differences were smaller among girls of different age groups.

Aboriginal and Torres Strait Islander children

Data from the ABS 1994 National Aboriginal and Torres Strait Islander Survey (NATSIS) (ABS 1998d) show that around 13% of boys and 19% of girls aged 7–15 years were above the 95th percentile for age and sex, indicating that they were overweight.

Data from the same survey show that, compared with all Australian children, a higher proportion of Indigenous children are underweight. Approximately 15% of boys and 11% of girls aged 7–15 years were below the 5th percentile for their age and sex, indicating they are underweight. While this methodology for estimating weight status is different from that using age- and sex-specific BMI cut-offs, it is unlikely that this alone accounts for the observed difference. Ruben & Walker (1995) have estimated that a minimum of 20% of all Aboriginal children in the Top End of the Northern Territory are malnourished.

The highest proportion of those underweight was among boys aged 11 years and girls aged 8 years. A greater proportion of Indigenous children who lived in rural areas were underweight than those in other areas.

Children in metropolitan, rural and remote areas

There are slight differences in the weight status of children in metropolitan, rural and remote areas (Table 20.9).

Table 20.9: Proportion of children aged 2–14 years who are underweight, of acceptable weight, overweight or obese, by area of residence, 1995 (per cent)

	RRMA area	Underweight	Acceptable	Overweight	Obese	Total (number)
Males	Metropolitan	7.9	72.8	14.5	4.8	725
	Rural and remote	5.3	79.0	13.7	2.0	481
Females	Metropolitan	3.8	72.9	16.8	6.5	697
	Rural and remote	5.1	75.1	15.8	4.0	479

Source: AIHW analysis of ABS NNS data, 1995.

- Among both boys and girls, a slightly higher percentage of children in rural and remote areas were of an acceptable weight, compared with children in metropolitan areas, in 1995.
- There was a higher percentage of underweight, overweight and obese boys in metropolitan areas than in rural and remote areas.
- There was a higher percentage of underweight girls in rural and remote areas than in metropolitan areas, but overweight and obesity were slightly more prevalent among girls in metropolitan areas.

Lynch et al. (2000) found that, in Sydney, BMI differed between different ethnic groups, with children of Mediterranean backgrounds having the highest BMI, followed by white (north European), mixed race (mainly Asian-white and Arab-white), and Asian children. Booth et al. (2001) suggest that the greater prevalence of overweight and obesity among boys in urban areas may be due to the confounding effects of ethnic background, as people from Middle Eastern and European backgrounds were more likely to live in the city. A higher proportion of girls in urban areas were also seen to be overweight and obese in this analysis of NNS data, and it is possible that this is also due, in part, to ethnic background.

Dieting and disordered eating

Australian studies have shown that a large proportion of children are worried about being overweight or want to be thinner, even among those children with an acceptable weight (Rolland et al. 1997; Thomas et al. 2000). Although eating disorders are fairly rare among children, Patton et al. (1999) stated that dieting is the most important predictor of new eating disorders, with risk of eating disorder increasing as severity of dieting increases. Thomas et al. (2000) found that the most significant predictors of dieting were lower self-esteem and higher BMI.

Australian studies have shown that a considerable proportion of children (31–40% of girls, 24% of boys) have dieted or are currently dieting to lose weight (Rolland et al. 1997; Thomas et al. 2000). Nowak (1998) found that, in Queensland, boys aged 12–15 years who dieted to lose weight reduced high-fat and high-sugar foods, and snacks, while increasing some low-fat foods such as yoghurt, fruit and low-fat milk. However, girls aged 12–15 years who dieted to lose weight reduced not only high-fat foods but also bread, meat and dairy products, and skipped meals and snacks. Often the lower intake of core foods and the tendency to skip meals continued after the dieting had ended.

Prevalence data are not available for the number of children in Australia who suffer from disordered eating, or who are experiencing clinical eating disorders. The Child and Adolescent Component of the 1998 National Survey of Mental Health and Wellbeing gathered some data from children and adolescents aged 13–17 years on dieting and exercise behaviour (Table 20.10). The survey indicated that 17% of children and adolescents aged 13–17 years (26.1% of girls and 7.4% of boys) were dieting to control weight, and 36.2% (46.9% of girls and 25.5% of boys) were exercising to control weight. It is unlikely that all these adolescents were overweight and needed to lose weight, although this information is not available from the survey. A much smaller percentage of adolescents were using inappropriate weight loss behaviours, such as vomiting or using laxatives (1.9%) or taking medication (0.6%). These behaviours were more common among girls than boys.

Table 20.10: Proportion of children aged 13–17 years reporting dieting and exercise behaviours, 1998 (per cent)

Dieting and exercise behaviour	Males	Females	All adolescents
Dieting to control weight	7.4	26.1	16.8
Exercising to control weight	25.5	46.9	36.2
Losing weight by vomiting/laxatives	0.8	3.0	1.9
Losing weight by taking medication	0.3	0.9	0.6

Source: Sawyer et al. 2000.

In 1999–00, children aged 10–14 years were hospitalised for eating disorders (ICD-10-AM code F50) at a rate of 75.7 girls and 7.7 boys per 100,000 children. Of hospitalisations for an eating disorder, the majority (95%) were for anorexia nervosa.

Substance use

During childhood and adolescence, individuals develop attitudes and behaviours that may continue into adult life. These behaviours often include use of alcohol and other drugs. Experimentation with drugs often includes those that are used legally by adults, such as alcohol and tobacco, but can also include a range of illicit drugs (drugs that are illegal), ranging from cannabis to opiates such as heroin.

The younger the age of initiation to drug use, the more likely it is to continue, and the more likely there are to be longer-term adverse affects. These effects can include association with delinquent peers and participation in deviant behaviour and crime (Johnson 2001; Zhang et al. 1997). Alcohol use among children, especially when alcohol is consumed in binge quantities, is also a risk factor for future hazardous patterns of alcohol consumption (Grant & Dawson 1997).

A number of factors are known to influence a child's decision to experiment with alcohol and other drugs. While use of tobacco and illicit drugs is usually actively discouraged by society, and adult family members, initiation to responsible alcohol use, especially in older children, can begin during childhood depending on family values and attitudes towards drinking, and peer behaviours. A study commissioned in 1998 by the then Commonwealth Department of Health and Family Services (Shanahan & Hewitt 1999) found that peer group norms were very influential in adolescent alcohol use, with the types of drinking behaviours adopted depending on the drinking behaviours of peer groups. Adolescents indicated that they drank alcohol, among other reasons, to try a new experience, socialise or relax, because of peer pressure, to drown problems, or because they did not feel good about themselves.

Smoking behaviour can also be influenced by family and peer factors. One common finding is that children with parents or family members who smoke are more likely to take up smoking themselves. Similarly, children who believe that their parents would disapprove of smoking are less likely to experiment with tobacco. On the other hand, experimenting with cigarettes can also be a rebellion against adult authority, a way of bonding with peers or establishing personal identity. Other variables such as low education and poor socioeconomic circumstances may also be connected with children taking up smoking (Winstanley et al. 1995). Another widely researched influence is the smoking behaviour of friends. Peer pressure is well established as a reason that children take up smoking, but, equally, representations of smoking in popular culture such as movies and television can also make impressions on young people about the status and 'fashionable' aspects of smoking.

Since tobacco use is the risk factor associated with the greatest disease burden in Australia, responsible for about 9.7% of the total burden of disease in the Australian population (AIHW: Mathers et al. 1999), dissuading young people from taking up smoking is a high-priority public health issue. Given the wide variety of reasons that children start to smoke tobacco (Rugkasa et al. 2001), reduced smoking rates can be achieved as a result of health promotion and prevention action that targets health risk behaviour more generally. In addition, adult-focused initiatives (such as the National Tobacco Campaign) can have a beneficial flow-on effect for youth by contributing to effective prevention.

Tobacco and alcohol use

The indicator for tobacco and alcohol use is the number of children aged 12, 13 and 14 years who smoked tobacco/drank alcohol in the last week as a percentage of all children aged 12, 13 and 14 years. Data in this section are from the Australian Secondary Students Alcohol and Drug Survey (ASSAD). This survey is conducted in a sample of Australian schools. In 1999, 26,489 students in years 7–12 were included in the survey. The tobacco and alcohol findings from the 1999 ASSAD Survey for children aged 12, 13 and 14 years are presented in Table 20.11.

In interpreting data on smoking, alcohol and drug use, it should be noted that students' reporting of substance use might not reflect the true prevalence of these behaviours. Letcher & White (1999) suggest that their figures may underestimate substance use by young people, as their sample is biased towards children with good school attendance. However, they also point out that the prevalence of substance use among younger students may be inflated, because of misunderstanding of some aspects of the questionnaire, and/or because some children may have overestimated their use of illicit substances as an expression of bravado.

Table 20.11: Secondary students aged 12–14 years consuming alcohol and smoking tobacco at least once in the previous week, 1999

Substance		12 years		13 years		14 years		12–14 years	
		Number ^(a)	Per cent	Number ^(a)	Per cent	Number ^(a)	Per cent	Number ^(a)	Per cent
Tobacco	Males	8,119	6	15,119	11	27,245	21	50,482	13
	Females	7,024	6	16,846	13	27,437	22	51,307	14
	Persons	15,145	6	31,969	12	54,686	21	101,800	13
Alcohol	Males	25,180	19	32,586	25	45,312	34	103,078	26
	Females	14,261	11	27,592	22	37,560	30	79,413	21
	Persons	39,442	15	60,180	23	82,877	32	182,499	24

(a) Estimated number of secondary students aged 12–14 using tobacco or drinking alcohol in the week before the survey. Numbers are estimated from 1999 school enrolments and based on the portion of students smoking tobacco or drinking alcohol found in a sample of 26,489 secondary students in Years 7 to 12.

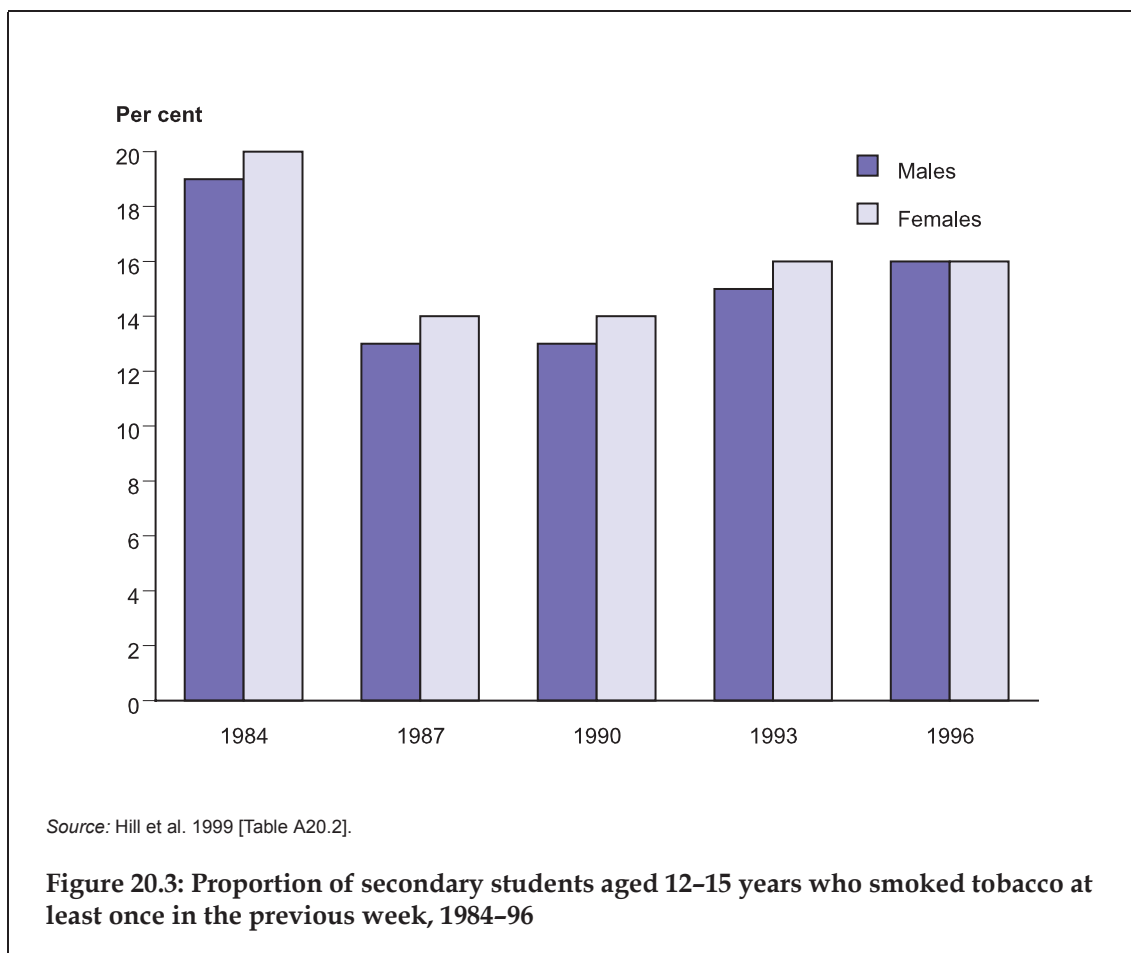
Source: 1999 ASSAD Survey, Centre for Behavioural Research in Cancer, Anti-Cancer Council of Victoria, unpublished data.

- In 1999, more children aged 12–14 years were estimated to have consumed alcohol in the past week than had smoked tobacco. Approximately 1 in 4 (24%) children aged 12–14 years were estimated to have consumed alcohol, and more than 1 in 8 (13%) were estimated to have smoked tobacco, in the previous week.
- Use of tobacco and alcohol increased with age. It was estimated that 22% of girls aged 14 years had smoked tobacco in the last week, compared with 13% of girls aged 13 years and 6% of girls aged 12 years.
- Boys of all ages were more likely to have consumed alcohol in the past week than girls (26% of boys compared with 21% of girls aged 12–14 years). There was no marked sex difference in the estimated percentage of children reporting recent tobacco use (around 13%).

The Australian National Drug Strategy Household Survey conducted in 1998 also found that a number of 14-year-old children had had experience with tobacco, alcohol and other drugs. Of children aged 14 years, 11.4% were estimated to be either occasional or regular smokers, and 32% occasional or regular drinkers (AIHW, unpublished data).

Time-series information on tobacco and alcohol use by children aged 12–15 years is presented in Figures 20.3 and 20.4.²

2. Note the different age grouping from Table 20.11.



- Between 1984 and 1990, the estimated proportion of students who had smoked in the previous week fell from 20% to 14%. However, the proportion of students increased again after 1990.
- With the exception of 1996, the proportion of female students was consistently higher than that of male students.



- Between 1984 and 1990, the proportion of students estimated to have drunk alcohol in the previous week fell, from 33% to 25% for male students, and from 30% to 21% for female students. The proportion then increased, to reach 29% and 24% of male and female students, respectively, in 1996.
- The proportion of male students was consistently higher than that of female students.

Other drugs

An additional component of the ASSAD Survey was conducted nationally for the second time in 1999. The expanded survey was aimed at gathering information about the use of illicit drugs, such as marijuana, opiates and amphetamines as well as other substances such as pain-killers and inhalants.

The survey estimated that, in 1999, 29% of males and 23% of females aged 12-15 years had taken an illicit drug at least once in their lifetime. Approximately half that number reported taking any illicit drug in the previous month (15% of males and 11% of females).

The percentage of children aged 12-14 years who had used illicit drugs in the previous 12 months is shown in Table 20.12.

Table 20.12: Illicit drug use among secondary school students aged 12–14 years in the previous 12 months, 1999 (per cent)

Substance	Males			Females		
	12 years	13 years	14 years	12 years	13 years	14 years
Marijuana	9	16	26	6	13	23
Pain-killers/analgesics ^(a)	90	90	92	93	94	96
Tranquillisers ^(b)	9	10	10	6	9	10
Steroids ^(b)	3	3	3	2	1	1
Inhalants	24	23	22	27	26	24
Opiates ^(b)	2	2	3	1	3	3
Amphetamines ^(b)	3	4	6	1	3	6
Cocaine	2	3	3	1	3	3
Hallucinogens	2	2	5	1	3	5
Ecstasy/designer drugs	2	3	3	1	2	3

(a) For medical and non-medical purposes.

(b) For non-medical purposes.

Source: 1999 ASSAD Survey, Centre for Behavioural Research in Cancer, Anti-Cancer Council of Victoria, unpublished data.

- In 1999, apart from pain-killers/analgesics, marijuana, inhalants and tranquillisers were the drugs used by the highest proportion of students aged 12–14 years in the previous 12 months.
- Use of marijuana increased with age, with estimates showing that 9% of boys aged 12 years, 16% aged 13 years, and 26% aged 14 years had used it in the previous 12 months. A similar pattern was seen for girls: 6%, 13% and 23% of girls of corresponding ages.
- Inhalants are substances which vaporise in air and which cause intoxication when inhaled. Many ordinary household products readily available to children are inhalants, such as glue, aerosol sprays, butane gas (from cigarette lighters), some cleaning fluids, felt-tipped pens, liquid paper, chrome-based paints and petrol. Use of inhalants decreased slightly with age: 24% of boys aged 12 years, 23% aged 13 years and 22% aged 14 years. The corresponding proportions of girls were 27%, 26% and 24%. This was one group of drugs which was used by a slightly higher proportion of girls than boys.
- The use of tranquillisers (for non-medical purposes) among boys aged 12–14 years was fairly evenly spread across the age groups (9–10%), but estimated use increased with age for girls (6%, 9% and 10%). Proportions of girls and boys using tranquillisers were similar among those aged 13 and 14 years.

The Australian National Drug Strategy Household Survey found that, of children aged 14 years, 15.5% had used an illicit drug in the last year (AIHW, unpublished data). This proportion mostly comprised marijuana use.

Sun protection

Exposure to sunlight in childhood is the main risk factor for melanoma and other types of skin cancer in adulthood. The rates of melanoma in Australia are among the highest in the world, matched only by New Zealand. The origins of this disease are strongly linked to patterns of sun (UV radiation) exposure (AIHW & AACR 2000). While adult sun exposure (especially sunburn) can increase the risk of melanoma, it is childhood exposure which is the greatest risk factor. The relationship between the risk of

melanoma and sun exposure is also affected by a person's sensitivity to sunlight, so that those who tan poorly have a greater risk of melanoma if exposed to an increased level of sunlight than those who tan well.

According to the Cancer Council of Australia (2001), one in two Australians will develop some form of skin cancer during their lifetime. Thousands of people are treated for skin cancer and more than 1,000 die from the disease each year. Every year, doctors remove more than 720,000 lesions from the skins of Australians because they are suspected skin cancers.

There are three main types of skin cancer: basal cell and squamous cell carcinomas (also known as non-melanocytic skin cancers), and melanoma. Non-melanocytic skin cancer is the most frequently occurring cancer in Australia (almost 300,000 new cases each year), but the least life-threatening, although some cases can be fatal. Melanoma is the most dangerous type. Overall, it is the third most prevalent cancer in women, and the fourth most prevalent in men (AIHW 2000a). Among people aged 15–44 years, melanoma is the most frequently occurring cancer. It accounts for 0.8% of the total burden of disease in the Australian population (AIHW: Mathers et al. 1999).

Children and adolescents spend long periods of time in the sun and do not always take precautions to avoid over-exposure. A Queensland study of 133 mothers on the use of appropriate skin protection for themselves and their children found that, even though use of protection was relatively high, by 6 months of age, one-third of toddlers had been sunburnt (Stanton et al. 2000). By 3 years of age, it was shown that 8 out of 10 children had been sunburnt and one-third had suffered painful sunburn. The National Health and Medical Research Council (NHMRC) continues to recommend education programs that target primary prevention behaviours in young people, including staying out of the sun during the hottest part of the day, wearing protective clothing including hats, making use of shade and applying sunscreen correctly.

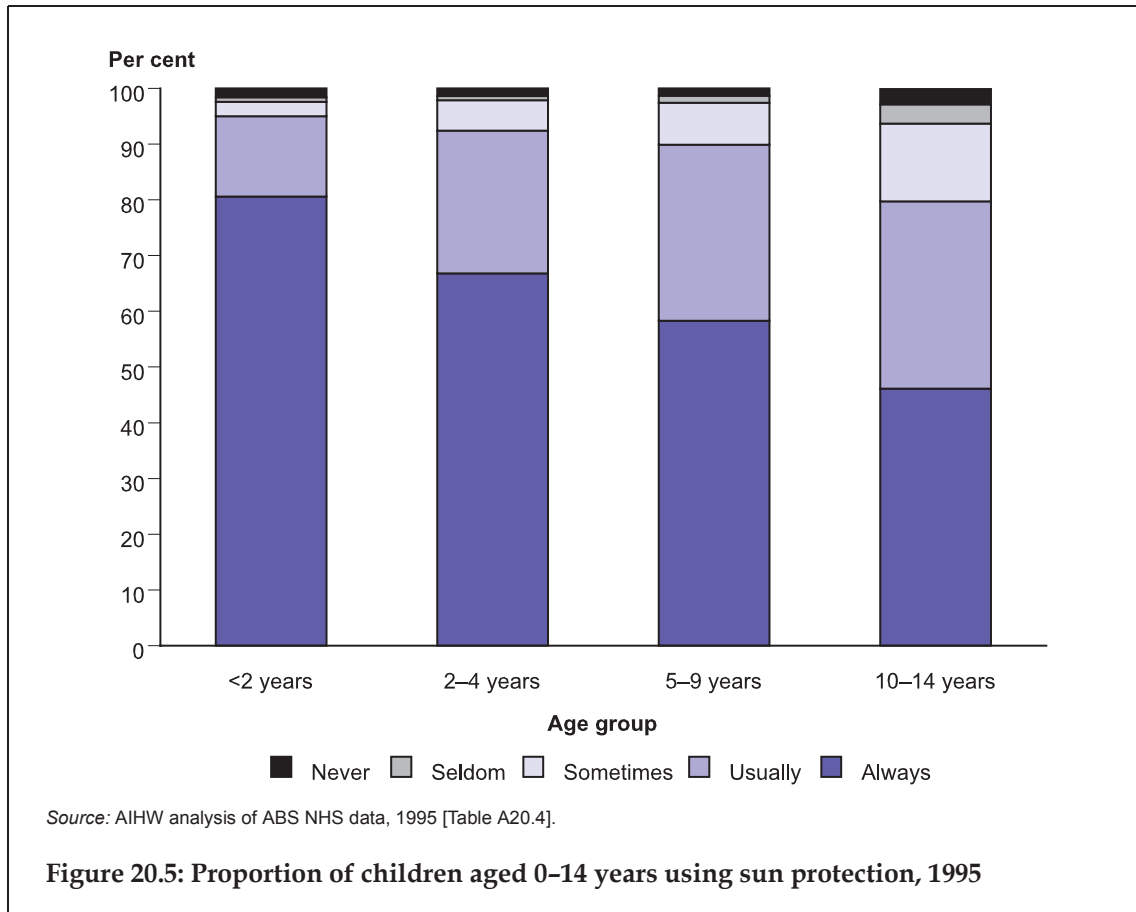
Skin cancer rates in young Australians have levelled out and decreased recently. This is thought to be the result of public education campaigns about skin cancer and increasing awareness of the damaging effects of UV light (Cancer Council Australia 2001). Recent policy changes are also likely to have affected sun protection, such as 'no hat, no play' policies in schools, and the funding of shade provision for outside play areas (NHMRC 1996b).

However, it may be easier to protect younger children from the sun than older children and adolescents. While the level of knowledge among adolescents about the importance of protection is high, the type of sun protection they actually use depends on their perceptions of acceptability and fashion (NHMRC 1996b).

Children who employ sun-protective behaviours

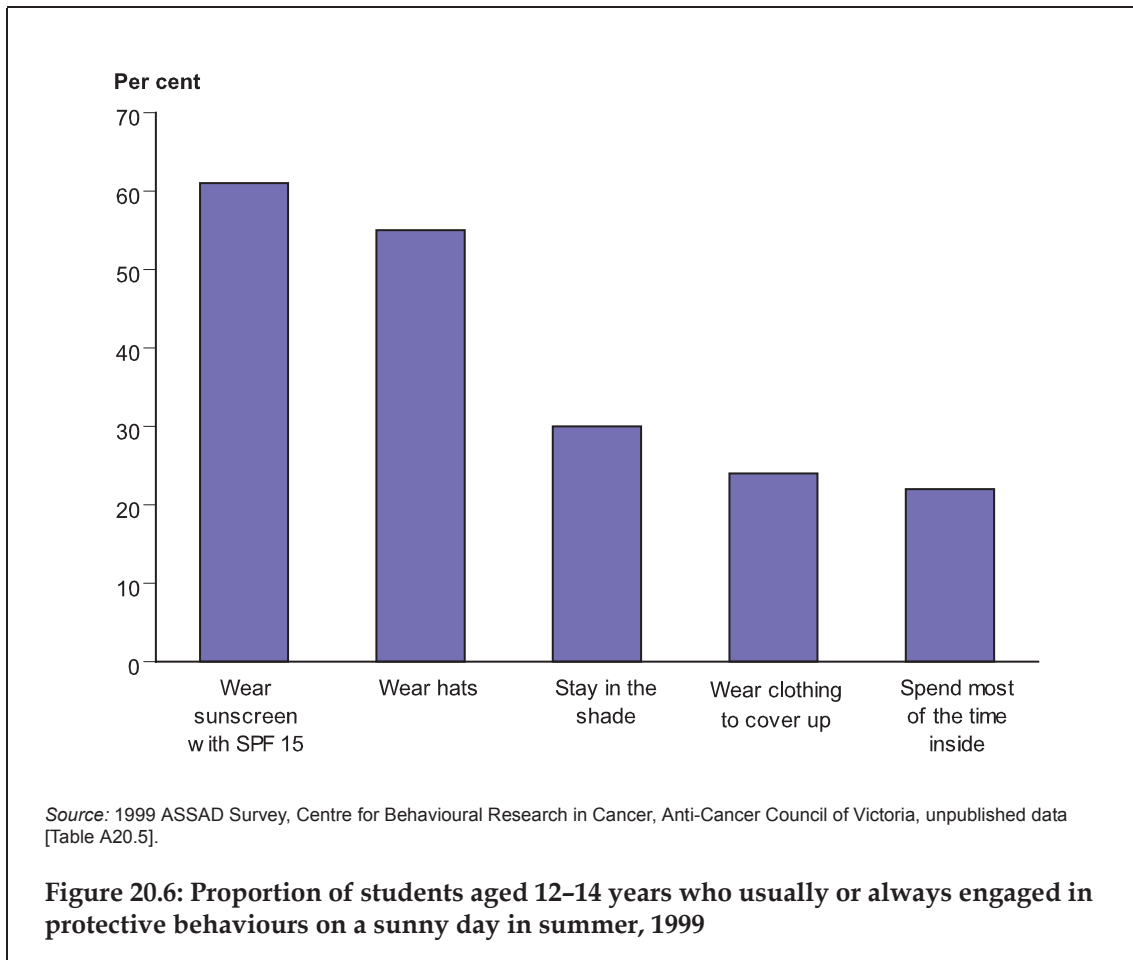
The indicator for sun protection is the number of children aged 0–14 years usually or always carrying out sun-protective behaviours as a percentage of children aged 0–14

years who are exposed to the sun. Data on children who use sun protection are available from the 1995 ABS National Health Survey (Figure 20.5).



- In 1995, most children (87%) aged 0-14 years always or usually used sun protection when they were in the sun.
- Of all children exposed to the sun, 58% were estimated to have always used sun protection. The proportion always using protection decreased with age, from 81% of those less than 2 years, to 46% of those aged 10-14 years.

National estimates of the proportion of children aged 12–14 years using different types of sun protection during sunny days in summer were derived from the Australian Secondary Students Alcohol and Drug survey (1999) (Figure 20.6).



- Among students aged 12–14 years in 1999, the most common form of sun protection was sunscreen with SPF 15 (61% of students), followed by wearing hats (55%). Staying in the shade was used by 30% of students as a form of sun protection.
- Wearing clothing to cover up was used by 24% of students, while 22% spent most of the time inside.

The 1995 ABS National Health Survey showed that the majority of children aged 0–14 years (89%) who had been exposed to the sun had used some sun protection in the month prior to the survey. The types of sun protection which were used by the greatest proportion of children were sunscreen and wearing a hat (Table 20.13).

Table 20.13: Type of sun protection used by children aged 0–14 years who had used sun protection in the previous month, 1995 (per cent)

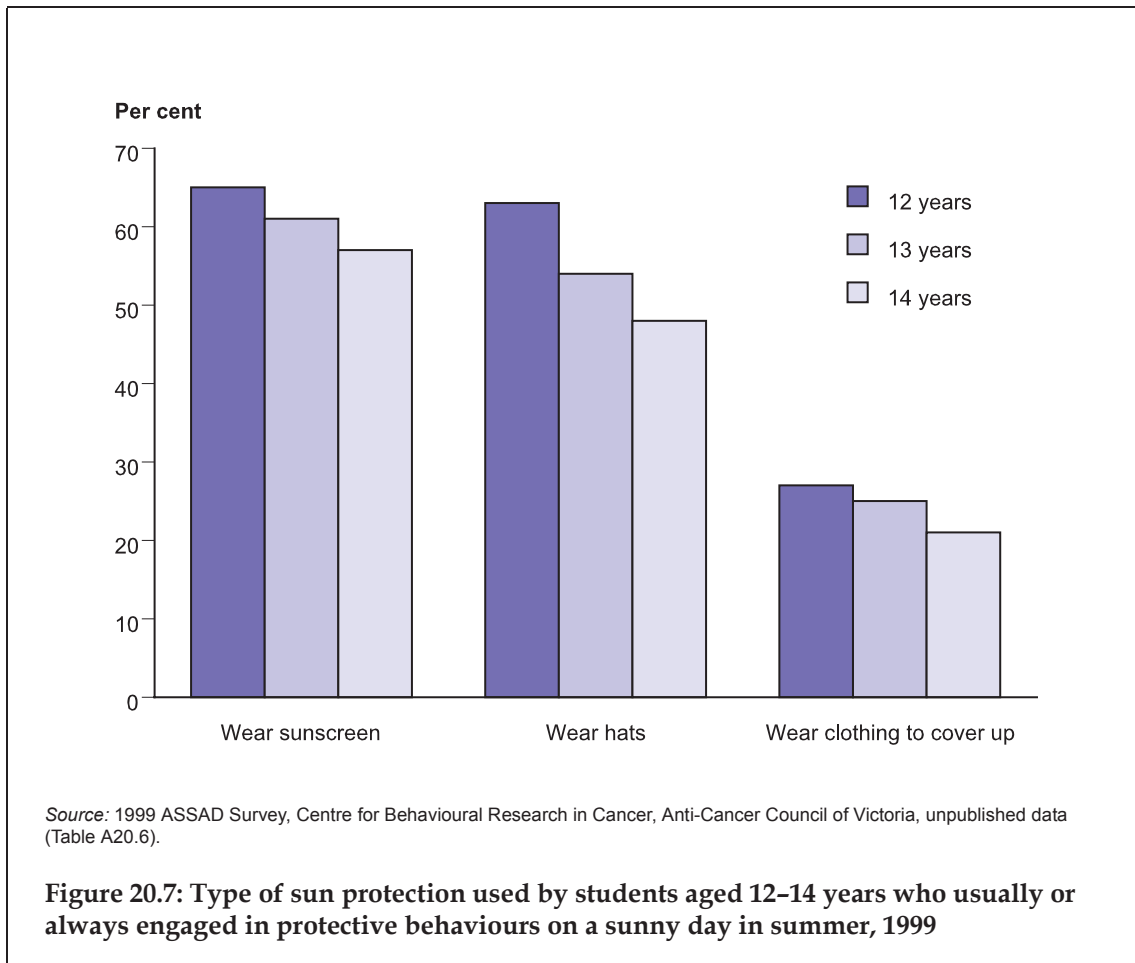
	Age (years)	Hat	Sunscreen	Clothing	Avoided			
					sun	Sunglasses	Umbrella	Other
Males	<2	84.5	64.6	64.4	51.0	10.8	11.3	3.5
	2–4	94.7	75.9	64.9	35.6	25.4	5.9	0.3
	5–9	96.6	71.5	58.4	24.9	20.2	3.4	0.6
	10–14	93.0	63.9	51.2	15.9	21.6	1.9	0.3
	0–14	93.7	69.1	58.0	27.0	20.7	4.3	0.8
Females	<2	81.2	62.5	66.4	54.6	13.8	10.6	4.1
	2–4	93.5	78.5	64.0	39.7	29.5	6.6	0.6
	5–9	94.5	76.6	58.6	28.2	26.2	5.3	0.6
	10–14	79.9	80.1	54.3	24.2	32.4	3.6	0.4
	0–14	87.8	76.6	59.1	32.1	27.6	5.6	0.9

Source: AIHW analysis of ABS NHS data, 1995.

- For all children in 1995, there was a general trend of higher use of different types of sun protection in the age groups 2–4 and 5–9 years, and lower use among children aged 10–14 years.
- A higher proportion of boys was reported to wear hats in all age groups than girls. More girls than boys used sunscreen, except those less than 2 years. These differences were also noted in the ASSAD Survey, with 68% of girls and 55% of boys aged 12–14 years reporting using sunscreen, and 67% of boys and 42% of girls wearing hats.
- Data from the NHS show that girls were more likely to avoid the sun and to wear sunglasses than boys, while similar proportions of boys and girls used clothes to cover up. These data are slightly different from those of the ASSAD, where 30% of boys and only 19% of girls aged 12–14 reported wearing clothing to cover up.

Some of the sex differences may be explained in terms of current fashions. For example, boys are more likely than girls to wear caps or other types of hats as an accessory, rather than purely for sun protection. Similarly, boys are more likely to wear shirts with a collar, while girls will more often wear clothes which expose their skin, such as singlets, or other tops without sleeves.

Data from the ASSAD Survey show that younger adolescents are more likely to use sun protection, regardless of the type of protection, than older adolescents (Figure 20.7).



- Of children aged 12 years in 1999, 65% usually or always wore sunscreen with SPF 15, compared with 61% of children aged 13 years and 57% of children aged 14 years.
- Among children aged 12 years, 63% usually or always wore hats. This decreased to 54% of children aged 13 years, and to 48% aged 14 years. This was the greatest difference in all types of sun protection between younger and older children.
- Wearing clothing to cover up also declined with age: 27% of children aged 12 years, 25% aged 13 years and 21% aged 14 years employed this type of sun protection.

Immunisation

Vaccination coverage in Australia has been estimated in a number of ways, including using surveys conducted by the Australian Bureau of Statistics and other organisations (Lister et al. 1999). More recently, the implementation of the Australian Childhood Immunisation Register (ACIR) has provided a means of measuring coverage at a national level for vaccines on the Australian Standard Vaccination Schedule.

The ACIR was set up as part of the National Childhood Immunisation Program to collect information on the vaccination status of children under 7 years of age who live in Australia. The ACIR, which commenced in 1996, was developed in response to a decline in childhood immunisation in Australia and the resulting increase in the incidence of vaccine-preventable childhood diseases. The ACIR enables improved surveillance and reporting of vaccination coverage.

Since 1997, as part of the Immunise Australia Program, a number of incentives have been introduced to improve vaccination coverage. Schemes to encourage parental compliance with the immunisation schedule include linking the vaccination status of a child to the Commonwealth Child Care Benefit payment and to the Maternity Immunisation Allowance. The General Practice Immunisation Incentives scheme provides financial incentives to general practitioners who monitor, promote and provide age-appropriate immunisation services to children under 7 years of age.

This section provides information on the vaccination status of children. Vaccination coverage estimates are reported for birth cohorts at 1 and 2 years of age. The first estimates for coverage at 1 year of age for children born between 1 January and 31 March 1996 were published in 1998 (O'Brien et al. 1998). Subsequent reports have been published on a quarterly basis. Data are available on vaccination coverage of successive cohorts of children both nationally and by State and Territory.

Vaccination coverage estimates

According to the Australian Standard Vaccination Schedule, a child who is fully immunised at 1 year of age has received three doses of diphtheria/tetanus/pertussis (DTP) vaccine, three doses of oral polio vaccine and two or three doses of *Haemophilus influenzae* type b (Hib) vaccine (depending on the particular Hib vaccine used) (NHMRC 1997a, 2000). Full immunisation at 2 years of age requires a booster dose of DTP, a Hib booster and a dose of measles/mumps/rubella (MMR) vaccine.

Vaccination coverage goals for Australia for the year 2000, recommended by the NHMRC, called for greater than 90% coverage of children at 2 years of age and near 100% coverage of children at school entry age against diphtheria, tetanus, pertussis, poliomyelitis, measles, mumps, rubella and Hib. Vaccine coverage needs to exceed 90% in order to achieve and maintain the level of herd (or community) immunity necessary to interrupt the ongoing transmission of vaccine-preventable diseases (Lister et al. 1999).

The indicator for childhood vaccination at 1 year of age is the number of children fully vaccinated at 1 year of age as a percentage of the total number of children aged 1 year on the ACIR. The latest data on vaccination coverage for children fully immunised at 1 and 2 years of age are presented in Tables 20.14 and 20.15.

Table 20.14: Proportion of children immunised at 1 year of age, preliminary results for birth cohort 1/7/00–30/9/00 (per cent)

Vaccine	NSW	VIC	Qld	WA	SA	Tas	ACT	NT	Australia
Diphtheria, tetanus, pertussis	91.8	93.1	92.7	90.6	92.5	92.6	92.4	88.8	92.2
Poliomyelitis	91.7	93.1	92.6	90.6	92.4	92.4	92.2	89.1	92.1
<i>Haemophilus influenzae</i> type b	93.8	94.8	94.6	93.9	94.5	95.5	93.7	93.1	94.3
Fully immunised for age	89.9	91.0	91.5	89.1	90.5	91.3	90.9	87.2	90.4
Total number of children	21,750	15,190	12,373	6,256	4,362	1,477	1,049	792	63,249

Note: Age calculated at 30 September 2001.

Source: Australian Childhood Immunisation Register, Health Insurance Commission.

- Vaccination coverage for all vaccines due by 1 year of age for the cohort of children born between 1 July and 30 September 2000 was just over 90%.
- Coverage was highest for Hib vaccine (94.3%) and lowest for poliomyelitis vaccine (92.1%).

- Vaccination coverage for most States and Territories was around 90%, ranging from 91.5% in the Queensland to 87.2% in the Northern Territory.

The indicator for childhood vaccination at 2 years of age is the number of children fully vaccinated at 2 years of age as a percentage of the total number of children aged 2 years on the ACIR.

Table 20.15: Proportion of children immunised at 2 years of age, preliminary results for birth cohort 1/7/99–30/9/99 (per cent)

Vaccine	NSW	VIC	Qld	WA	SA	Tas	ACT	NT	Australia
Diphtheria, tetanus, pertussis	89.1	91.0	91.8	88.2	91.6	92.4	92.0	85.8	90.3
Poliomyelitis	93.6	95.2	94.4	93.1	95.4	96.0	95.3	93.9	94.3
<i>Haemophilus influenzae</i> type b	95.0	96.2	95.0	94.0	96.2	96.6	96.4	91.9	95.3
Measles, mumps, rubella	92.4	94.0	94.0	91.5	94.4	94.1	94.0	93.1	93.2
Fully immunised	86.3	88.8	90.2	85.5	89.8	90.0	90.1	83.5	88.0
Total number of children	22,173	15,838	12,660	6,245	4,578	1,534	1,065	786	64,879

Note: Age calculated at 30 September 2001.

Source: Australian Childhood Immunisation Register, Health Insurance Commission.

- Vaccination coverage for all vaccines due by 2 years of age for the cohort of children born between 1 July and 30 September 1999 was 88.0%.
- Coverage ranged from 90.2% in Queensland to 83.5% in the Northern Territory.
- As Medicare numbers are used as unique identifiers for matching vaccination records, the limited use of Medicare numbers in the Northern Territory has been suggested to be the most likely reason for the lower rates of vaccination there, due to difficulties in matching data (NHPC 2001).

A comparison of vaccination coverage at 1 and 2 years of age between the first birth cohort and the latest birth cohort for which data are available is shown in Table 20.16.

Table 20.16: Proportion of children fully immunised for all vaccines due by 1 year of age for birth cohorts 1/1/96–31/3/96 and 1/7/00–30/9/00 and by 2 years for the birth cohort 1/1/96–31/3/96 and 1/7/99–30/9/99

Vaccine	Immunisation by 1 year of age		Immunisation by 2 years of age	
	Birth cohort		Birth cohort	
	1/1/96–30/3/96	1/7/00–30/9/00	1/1/96–30/3/96	1/7/99–30/9/99
Diphtheria, tetanus, pertussis	77.4	92.2	76.0	90.3
Poliomyelitis	77.2	92.1	82.7	94.3
<i>Haemophilus influenzae</i> type b	77.2	94.3	76.5	95.3
Measles, mumps, rubella	n.a.	n.a.	82.5	93.2
All vaccines	74.9	90.4	63.8	88.0

Source: Australian Childhood Immunisation Register, Health Insurance Commission, unpublished data.

- Overall vaccination coverage at 1 year of age increased from 74.9% in 1996 to 90.4% in 2000.
- The increase in coverage was evident for all vaccines but was highest for the Hib vaccine.
- A similar increase in vaccination coverage over time was also evident at 2 years of age. Overall coverage of fully vaccinated children increased from 63.8% in 1996 to 88.0% in 1999.

- No data are yet available on vaccination coverage for children at school entry age.
- The data presented here indicate that, although the NHMRC target of 90% for coverage at 2 years of age has not been achieved, it is within reach in the near future.