

1.4.1 Environmental factors

“Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.”

Rio Declaration, United Nations 1993¹⁶³

Queenslanders enjoy a relatively healthy physical environment. We have one of the safest food supplies in the world, the overall quality of our air and drinking water is good, and the built environment is generally clean and healthy. The quality of the physical environment cannot be taken for granted however, because there are regional differences.

Population health status is influenced by the interaction of social, economic and environmental health determinants.¹⁶⁴ The biological, physical and chemical environments have the potential to impact on health. The extent of this impact is modified by the scale and nature of human activities. Human activities include agricultural, industrial and energy production; the use and management of water and wastes; urbanisation; the quality of health services; and the extent of protection for the living, working, and natural environment.

The impact of environmental factors on population health outcomes is difficult to assess due to the multi-factorial nature of many outcomes of importance. Thus, indicators relating exposure to environmental determinants and processes to manage such exposures are commonly used to measure the influence of the environment on health, rather than health outcomes indicators. The need for environmental health indicators was highlighted by the National Environmental Health Strategy (1999).¹⁶⁴ Development of a national set of environmental health indicators is now occurring. In future, indicators to monitor environmental health and quality data to support these indicators should be more readily available and more clearly defined.

This section examines some key environmental factors that influence health. Other environmental factors are included in other sections in this document. These include: Mosquitoes (notifications of vector-borne conditions – section 1.3.8), UV radiation (sun protection attitudes, knowledge and behaviours – section 1.4.4), and passive or environmental tobacco smoke (*Children* chapter). Specific environmental factors relating to Indigenous health are described in the *Indigenous peoples* chapter.

There are other less well characterised environmental factors that have the potential to impact on health. Many of these factors have evolved from changes in our society and present new potential health risks. These include changes in the ways in which we manage our waste, changes in construction materials for our housing, issues relating to securing adequate and safe water supplies, increased urbanisation and urban densities, and global climate change resulting from increased greenhouse gas emissions. The extent to which these emerging issues impact on the environment and population health is not well characterised.

External environmental factors

Air quality

Air quality is influenced by emissions of pollutants from industrial sources (eg power stations, oil refineries); transport sources (eg motor vehicles, trucks, aircraft) domestic sources (eg lawn mowers, wood burning), agricultural sources (eg cane burning, chemical spraying) and other sources, such as controlled burning, bushfires and vegetation.

Respiratory health is the primary health outcome related to exposure to a range of air pollutants. A number of health endpoints such as lung function, respiratory symptoms and exacerbations of respiratory disease, hospital admissions and mortality are commonly used when investigating relationships between air pollution and health. As a number of the air toxic pollutants are known carcinogens, cancer is also an outcome of interest. There also is increasing evidence of impacts from air quality on cardiovascular health. A quantitative measure of the contribution of air pollution to respiratory, cardiovascular and cancer burden in the Queensland population has not been derived.

One way the quality of the air environment is assessed in Australia is by comparing monitored air pollution levels with the National Environment Protection Measure (NEPM) for air quality. The NEPM provides a common set of air quality standards designed to protect the health of the majority of Australians. In Queensland in 2002, ambient air quality was measured at up to seven sites, where the locations of sites varied depending upon the pollutant. Excess levels of ozone, sulfur dioxide and particles measured as PM¹⁰ (particulate matter with a diameter of <10 micrometres), were recorded at some sites (Table

1.24).¹⁶⁵ No excess carbon monoxide, nitrogen dioxide or lead levels were recorded at the monitoring sites. The recorded particle exceedences mainly resulted from dust storms and bush fire smoke, and the ozone exceedences mainly resulted from bush fires. In south-east Queensland, biomass burning accounts for 4% of total oxides of nitrogen (NO_x) emissions, 66% of total PM₁₀ emissions, 24% of total carbon monoxide emissions and 6% of total volatile organic compounds (VOC) emissions. These activities are commonly associated with exceedence of NEPM standards.

In the urban areas of Queensland, and particularly the south-east region, motor vehicle emissions account for 62% of NO_x emissions, 68% of carbon monoxide emissions and a significant amount of VOC emissions.¹⁶⁶ The total number of emissions produced in any one region is influenced by the emissions per vehicle kilometre travelled (VKT) and the number of vehicle kilometres travelled. These two factors are influenced by many variables including fuel type, vehicle technology, and number and length of trips.

Table 1.24: Sites of excess pollutants in monitored ambient air, Queensland 2002

Pollutant and NEPM reporting time	Days reported excess (site)
Carbon monoxide	0
Nitrogen dioxide	0
Ozone - 1 hour	2 (Rocklea)
- 4 hour	1 (Rocklea)
Sulfur dioxide - 1 hour	49 (Mt Isa)
- 24 hour	1 (Mt Isa)
PM ₁₀ - 24 hour	8 (Mountain Creek, Sunshine Coast), 7 (Rocklea), 7 (Springwood), 1 (Helensvale, Gold Coast), 7 (Flinders View), 5 (Gladstone) and 6 (West Mackay)
Lead	0

Source: Environmental Protection Agency 2002

In south-east Queensland, regional VKT is expected to increase at more than twice the rate of the population from 2000 to 2011, due mainly to the continued trend towards higher private mode share, lower vehicle occupancies and longer trip lengths. Around 75% of estimated PM₁₀ emissions are attributed to diesel fuelled vehicles, which only contribute to 19% of all VKT to the region. Diesel fuelled vehicles also contribute a higher proportion of NO_x emissions (39%) compared to their 10% VKT contribution.

Water quality

Water is used for a variety of purposes, eg drinking, irrigation and recreation. Depending on its intended use, the source and potential for human exposure, water is subject to different levels of treatment. Human exposure to polluted water (potable or otherwise) or a limited potable water supply can present a risk to human health. The promotion of water recycling, within the context of future demand and sustainability, can increase public health risks if not managed correctly.

Microbiological contamination of water supplies can lead to many adverse health effects ranging from diarrhoeal disease to death. Outbreaks of Cryptosporidiosis, *E. coli* and *Campylobacter* can have severe impacts on communities. Notification rates for conditions associated with these microbiological contaminants are reported in Table 1.23 in section 1.3.8. The contribution that contaminated water makes to the incidence of conditions reported in Table 1.23 is not known. Chemical pollutants (dioxins, heavy metals, arsenic, pesticides, etc) may also pose a serious health hazard, although effects may not be immediate.

The proportion of human disease that can be attributed to poor water quality in Australia is unknown and the importance of some micro-organisms and chemicals to health is unclear. Water contamination has the potential to present a significant risk to human health, and the greatest risk comes from contamination of drinking water.¹⁶⁷ Queensland Health is investigating mechanisms to require drinking water providers to develop 'Water Quality Management Plans'.

Water fluoridation

In 2003, less than 5% (4.7%) of the Queensland population live in areas with satisfactory fluoridation levels,¹⁶⁸ compared with 69.1% of Australians. Queensland has the lowest proportion of population living in areas with fluoridated water in Australia, with the proportion in other states and territories in the range 77-100%.¹⁶⁹ Both children and adults benefit from fluoridation. Water fluoridation at optimal levels

provides significant benefits in the prevention of caries for both deciduous and permanent teeth. Current estimates are that fluoridation reduces coronal and root caries over a lifetime by 20-40%.^{170,171} These benefits are additional to those obtained from discretionary sources of fluoride such as toothpaste.

Food safety and security

The safety and wholesomeness of the food supply is critical to human health and wellbeing, making food safety and food standards significant public health issues.

In 2002, 6,833 cases of food-borne illness due to nine pathogens or conditions were notified to Queensland Health. Notifications of specific gastrointestinal conditions are reported in section 1.3.8. These notification numbers are small in comparison to the estimated 1.6 to 1.9 million cases in Queensland,¹⁵⁴ and 100 deaths in Australia each year.¹⁷²

Many cases of food-borne illness could be reduced through better food handling practices. The Queensland Food Handling Baseline Survey 2002¹⁷³ examined the food handling practices in 403 Queensland food businesses and provides insights on the determinants of food-borne illness. The survey included restaurants, catering businesses, schools, child care centres, supermarkets, nursing homes, retirement villages, hostels, food manufacturers and food processors. One quarter (26%) of businesses had a food safety program at the time of the survey. A food safety program is a written document where potential food hazards of the business are identified. Control measures, regular monitoring and record keeping procedures are then put into place by the business. There was strong statistical evidence in 18 aspects of food safety practices, that possession of food safety plans was associated with safer food handling practices. Food safety programs are current industry best practice and a due diligence defence. To date, food businesses in Queensland are not legislatively required to have a food safety program, however, the review of the *Food Act 1981* has highlighted the need for 'high risk' food businesses to develop and implement such programs.

Hand washing is one of the most important practices to prevent contamination and the spread of illness. In 2002, hand washing facilities were inadequate at many Queensland food businesses. Only 64% of the businesses surveyed had hand washing facilities that met all requirements. That is, hand washing facilities that were sufficient, accessible, supplied with soap and/or hand cleanser, had running water and supplied with single use towels. Improving hand washing practices should lead to a reduction in food-borne illnesses.

In 2002 in Queensland, half (53%) of the food handling businesses had a probe thermometer, and in such businesses, most staff (97%) knew how to use the probe. Most businesses (91%) had adequate space to store potentially hazardous food in the cool room. Most Queensland businesses store, cook, transport and display potentially hazardous chilled and hot food at the correct temperature, or have an alternative system for ensuring that food is being stored safely. A minority of businesses do not check the temperature of potentially hazardous food when delivered or displayed (Table 1.25). Transporting food offered the greatest opportunity for breaches of food safety guidelines.

Table 1.25: Food safety practices in food handling businesses, Queensland 2002

Food safety criteria	% complying	% with an alternative system	% do not follow temperature guidelines
Chilled food stored at correct temperature	90	3	7
Hot food stored at the correct temperature	89	3	8
Food transported at correct temperature	67	13	20
Cooked at the correct temperature	90	1	9
Displayed at the correct temperature	84		16

Source: QH Queensland food handling baseline survey 2002

Healthy food access

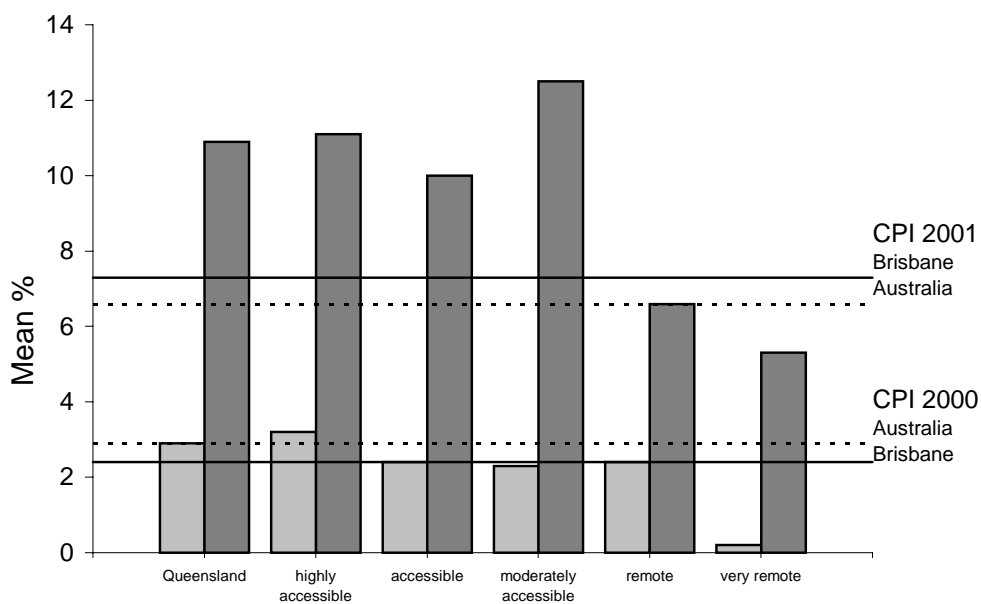
In 2001, as in previous years, basic healthy food costs more in rural and remote areas of Queensland, compared to urban and metropolitan areas.^{174,175} Items in a healthy food basket are defined as the most commonly available foods that meet nutritional requirements of a reference family of six people for two weeks. In Queensland in 2001, the cost of a healthy food access basket was 24% higher in the very remote ARIA category than in the highly accessible ARIA category. The difference in price between accessible and remote areas was greatest for meat and alternatives, and dairy food groups, and least for fruit, vegetables and legumes. There was little difference in the cost of tobacco and take away snack items between areas, with costs in the very remote category being only 11% higher than in the highly accessible category.

This difference is important. Every time we buy food, we make a decision whether to buy healthy food or unhealthy food, and cost is a factor in this decision. In the very remote areas of Queensland, healthy food costs 24% more than in highly accessible areas, yet snack and takeaway food costs only 11% more. The cost differential favours take away and snack foods more, in very remote areas, than it does in the highly accessible areas of Queensland.

There has been a marked increase in the price of basic healthy food throughout Queensland in the period from April-June 2000 to April-June 2001, in excess of consumer price index changes. Contrary to expectations, price rises were greatest in the three most accessible ARIA categories (Figure 1.38). Price increases were most dramatic for vegetables and fruit, which increased by nearly 30% in moderately accessible areas.

Many social determinants impact on good nutrition and access to food namely: transport for delivery of goods and access to nutritious food outlets; education and literacy to interpret labels and nutrition panels; housing and associated whitegoods for appropriate storage and preparation of foods; income, especially where the price and availability of healthy food is high; and discrimination issues around cultural appropriateness of foods.

Figure 1.38: Mean percent annual change in costs in the same stores, by accessibility, Queensland, 1998-2000 to 2001



Source: QH Healthy food access basket survey

Physical activity environment

In 2002, half the population of Brisbane (53.3%) reported that availability of facilities influenced their participation in recreational physical activity.¹⁷⁶ Specifically, easy access to bike paths, walking trails, gyms and swimming pools were reported as influencing physical activity levels. Physical activity levels were also influenced by safety (43.3%), aesthetics (31.6%) and neighbourhood design (23.3%), specifically footpaths, lighting, hills, local shops and services.

Increasing physical activity in communities is linked to the physical environment as well as behavioural and social determinants. Proximity and density of places for physical activity within neighbourhoods is associated with physical activity participation.¹⁷⁶⁻¹⁸² Evidence is accumulating that indicates the importance of accessibility to facilities such as cycleways, footpaths, health clubs and swimming pools.¹⁷⁶⁻¹⁷⁸ Other neighbourhood and environmental characteristics such as safety lighting, hilly terrain, frequent observation of others engaging in physical activity and enjoyable scenery also affect physical activity levels.^{181,182} In addition, people living in 'traditional' neighbourhoods, characterised by higher residential density, mixture of land uses and grid-like street patterns with short block lengths, engage in more walking and cycling trips for transport than people living in sprawling neighbourhoods.¹⁷⁹

Household environmental factors

There are many facets of housing that have the potential to influence health. Access to quality housing is a key determinant, along with aspects of housing design and construction, adequate maintenance, uptake and use of household safety devices and the appropriate use of household appliances.

Housing

In 2001, two thirds (62.4%) of Queenslanders either fully own their own home or are currently purchasing a home (Table 1.26).¹⁸³ In Queensland, just under a third of the population live in rented premises, and a small proportion in caravan parks. Less than a third (32%) of Indigenous peoples own their homes, in comparison with 69% of other Australian households.⁹² Households with Indigenous peoples (63%) were more than twice as likely as other households (27%) to be living in rented accommodation. Rental occupancy is more commonly associated with low affordability of home purchase, but can also be related to lifestyle choice, increased job mobility and higher reliance on superannuation as the main source of investment for retirement.¹⁸⁴

Table 1.26: Distribution of occupied private dwellings by type of occupancy, Queensland 2001

	% of dwellings
Fully owned	36.6
Being purchased	25.8
Rented	
Housing authority	3.5
Other	26.2
Other and not stated	7.9

Source: ABS Census of population and housing 2001

Many Queenslanders on low incomes or with complex needs are not having their housing needs met by the private market. About 62% of low income renters were able to meet their need in the private market in 2001. Moderate affordability need was experienced by 17%, with rental payments ranging between 31% and 40% of their income. The remaining 21% had greater need. This pattern is similar to the Australian average.¹⁸⁵

Just over half (55%) of all Queensland households have one or two people in the household, and 10.7% of households contain five or more people (Table 1.27). In comparison, 27% of households, which include Indigenous peoples, have five or more people in the dwelling. Using the international occupancy standard that there should be no more than two persons per bedroom and other criteria, 3.3% of Queensland households have insufficient bedrooms, compared to 3.7% for Australia (Table 1.28).⁹² Considering households including Indigenous peoples, the proportion with insufficient bedrooms increased to 12.7% in Australia. Housing for Indigenous peoples is further discussed in the *Indigenous peoples* chapter.

Housing tenure is directly linked to mortality rates, specifically cardiovascular disease. People in rented accommodation have higher death rates than owner-occupiers, even after other socioeconomic variables are considered.¹⁸⁶ Housing insecurity increases relocation rates, which have a significant impact on the educational attainment of children in these situations. Those living in poor quality housing where overcrowding and damp conditions are present are more likely to suffer both physical and mental health problems.¹⁸⁴ Inadequate housing and housing stress caused by the need to spend more than 30% of a low income on housing can lead to family conflict and breakdown.¹⁸⁷

Table 1.27: Number of persons usually resident in occupied private dwellings as a percentage of total dwellings, all dwellings and dwellings containing Indigenous households, Queensland 2001

Persons	% of Dwellings	
	Queensland total	Containing Indigenous households
1	24.3	14.6
2	33.1	21.8
3-4	32.0	36.4
5-6	9.8	20.2
7-9	0.9	5.6
10 or more	0.1	1.3

Source: ABS Census of population and housing 2001

Table 1.28: Selected housing indicators, percentage of total dwellings, Queensland 2001

	Households with insufficient bedrooms	Households with two or more bedrooms above requirements
Queensland	3.3	39.4
New South Wales	4.4	35.8
Victoria	4.5	33.1
South Australia	2.4	35.7
West Australia	2.2	44.8
Tasmania	1.6	37.9
Northern Territory	6.3	22.0
Australian Capital Territory	3.0	40.2
Australia	3.7	36.8

Source: ABS Census of population and housing 2001

In 2001, the majority of Queenslanders rated their housing as adequate, based on a number of criteria (Table 1.29). More males generally rated their housing adequate than females, although no significant differences were reported. Results for Australia were similar to those for Queensland. Distance from public transport was rated as the least satisfactory feature of housing for both males and females. Only 73.9% of the population perceived the distance as adequate, in contrast with five other housing characteristics. Adults in remote (47.4%) and outer regional (55.8%) areas perceived significantly less adequacy of their housing in relation to distance from public transport than in metropolitan areas (83.6%).

Table 1.29: Adequacy of housing by selected aspects, percentage of dwellings (95%CI), by sex, Queensland and Australia 2001

	Queensland 18+ years		Queensland persons 18+ years	Australia persons 18+ years
	Male	Female		
Living space	89.4 (89.3-89.5)	89.3 (89.2-89.3)	89.3 (89.3-89.4)	88.4 (88.4-88.4)
Number of bedrooms	91.2 (91.7-91.8)	91.3 (91.3-91.4)	91.6 (91.5-91.6)	90.4 (90.4-90.4)
Comfort	94.3 (94.2-94.3)	93.4 (93.4-93.5)	93.8 (93.8-93.9)	92.6 (92.6-92.6)
Distance from public transport	74.8 (74.7-74.9)	74.2 (74.1-74.3)	74.5 (74.4-74.5)	81.5 (81.5-81.6)
Access to services normally used	84.5 (84.5-84.6)	84.2 (84.1-84.3)	84.4 (84.3-84.4)	87.5 (87.5-87.5)
Housing needs in general	94.8 (94.7-95.0)	93.7 (93.6-93.7)	94.2 (94.2-94.2)	94.2 (94.1-94.2)

Source: HILDA 2001

Homelessness

It was estimated that in 2001, 24,569 people in Queensland were homeless.¹⁸⁸ This represented 69.8 persons per 100,000 people. Queensland and Western Australian rates of homelessness were significantly higher than southern states. In Australia, of those people defined as homeless, about 50% were aged less than 24 years of age; including 10% who were children under 12 years of age (Table 1.30). More males than females were homeless (58% and 42% respectively). Compared with 30-40 years ago, women make up a substantial minority of homeless people in Australia.

Homelessness in childhood can contribute to ill health, behavioural problems and poor educational outcomes.¹⁸⁹ Homeless young people have a much higher prevalence of physical and psychological problems (including sexual health, nutrition and oral health problems as well as higher levels of substance abuse) than the general population.¹⁹⁰ Homelessness is further discussed in the *Young people* and *Children* chapters.

Table 1.30: Estimates of homelessness by age, Australia 2001

	Number	% age group	% total homeless
under 12	9,941	0.3	10.0
12-18	26,060	1.4	26.1
19-24	10,113	0.7	10.1
25-34	16,567	0.6	16.6
35-44	12,992	0.5	13.0
45-54	10,349	0.4	10.4
55-64	7,883	0.5	7.9
65+	5,995	0.3	6.0
total	99,900	0.5	100.0

Source: ABS Counting the homelessness 2001

Household safety devices

The home was the location of 38% of adults unintentional injuries and 57% of such injuries in children, where those injuries resulted to presentation to selected emergency departments in Queensland, occurred in the home.^{191,192}

In 2001, the majority (69.1%) of Queensland households had smoke alarms or smoke detectors fitted (Table 1.31). In 1998, of the 58.7% households with one or more smoke detectors installed, the majority (92.8%) were functioning properly.¹⁰³ Since 1994, installation of hard wired smoke alarms has been a requirement in new dwellings constructed in Queensland. Almost half (48.6%) of Queensland households have adjustable hot water thermostats fitted (Table 1.31). Since 1997, hot water tempering devices must be installed in the hot water delivery system to bathrooms in all new domestic dwellings in Queensland. Two thirds (67.9%) of Queensland households reported having a circuit breaker on the electrical system in their home in 1998. The majority of Queensland households do not have anti-slip surfaces or strips in bath or shower, or handrails fitted in bathroom or toilet. Anti-slip and hand rail features in bathrooms and toilets are recommended, but not required by law.

Table 1.31: Percentage of households with selected safety features, Queensland 2001

Households with safety features	%
Anti-slip surfaces or strips in bath or shower	26.2
Internal or external steps or stairs with guards or gates	70.2
Smoke alarm or smoke detector	69.1
Handrails fitted in bathroom or toilet	9.8
Floor rugs or mats	25.9
Adjustable hot water thermostat	48.6
Resident with first aid training & CPR during the last 3 years	33.1

Source: ABS Safety in the home 2001