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The relationship between health risk factors and the neighbourhood environment

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The relationship between health risk factors and the neighbourhood environment

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Summary

The design of neighbourhoods can influence our health in various ways. It can affect how much physical activity we do, our access to nutritious food, where we work, our contact with nature, and the spaces we have for social interactions. These factors can affect health risk factors, such as obesity, and the associated risk of developing chronic conditions, such as cardiovascular disease and diabetes.

This report examines whether selected elements of the neighbourhood environment are associated with socioeconomic disadvantage and health risk factors. It explores how a person's socioeconomic position and proximity from where they live to fast-food outlets, supermarkets, and public open spaces are associated with obesity, insufficient physical activity, insufficient fruit and vegetable consumption, and daily consumption of sugar sweetened drinks. The report uses the 2017–18 Australian Bureau of Statistics' National Health Survey and looks only at Australian adults aged 18 and over.

The effects of population density (that is, how many people live in the neighbourhood) and the distances they travel to work are also examined.

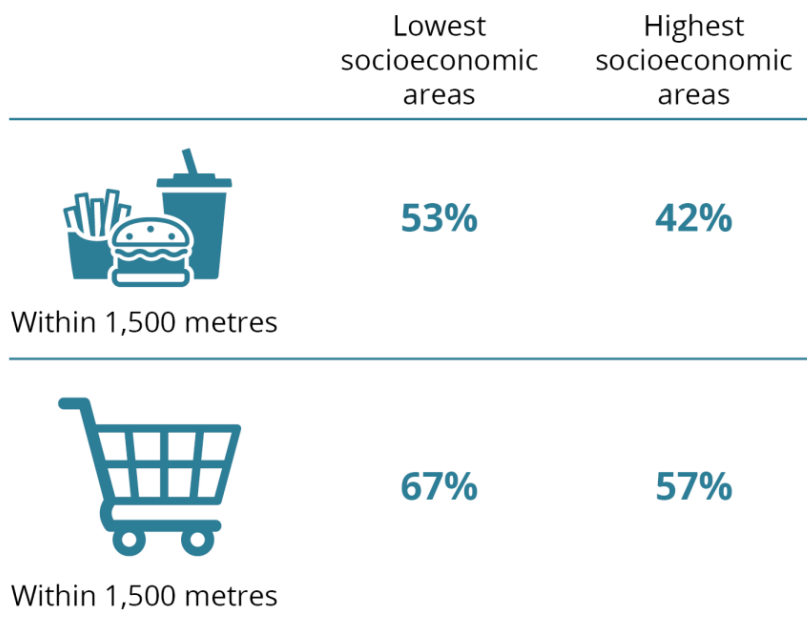
Australian adults living in the lowest socioeconomic areas tend to have a higher prevalence of obesity, lower adherence to national physical activity guidelines, higher consumption of sugar sweetened drinks, and lower consumption of fruits and vegetables, than those living in the highest socioeconomic areas (ABS 2018c; AIHW 2020c, 2020d, 2020e).

Previous research has investigated whether greater proximity to fast-food and lack of accessibility to public open spaces are why it is difficult for people living in disadvantaged areas to undertake healthy behaviours, with mixed results (Fleischhacker et al. 2011; Jones et al. 2009; Thornton et al. 2016).

This report shows that these factors do not necessarily account for the inequalities in health risk factors often observed for people living in the lowest socioeconomic areas. While shorter commuting distances and increased population density were generally associated with lower prevalence of health risk factors, the relationship between health risk factors and proximity to amenities was complex.

People living in the lowest socioeconomic areas generally had the greatest access to both major fast-food outlets and supermarkets (see Figure 1).

Figure 1: Proportion of adults aged 18 and over who lived within 1,500 m of a fast-food outlet or supermarket, by socioeconomic area



Proximity to these amenities, generally, was not associated with obesity or inadequate fruit or vegetable intake.

Additional neighbourhood factors, such as population density and commuting distance, were associated with inequalities in obesity and insufficient physical activity levels.

The prevalence of obesity generally decreased as population density increased for those in the middle to highest socioeconomic areas.

Living in an area with an average commuting distance to work of between 5 and 10 km was associated with lower prevalence of obesity (26%) and insufficient physical activity (48%) compared with living in an area with an average commuting distance of 20km or more (38% and 55%, respectively).

This report focussed on the proximity of amenities to where people live, it might not necessarily capture all the amenities people may use. For example, people could access a fast-food outlet near their place of work, rather than near their place of residence.

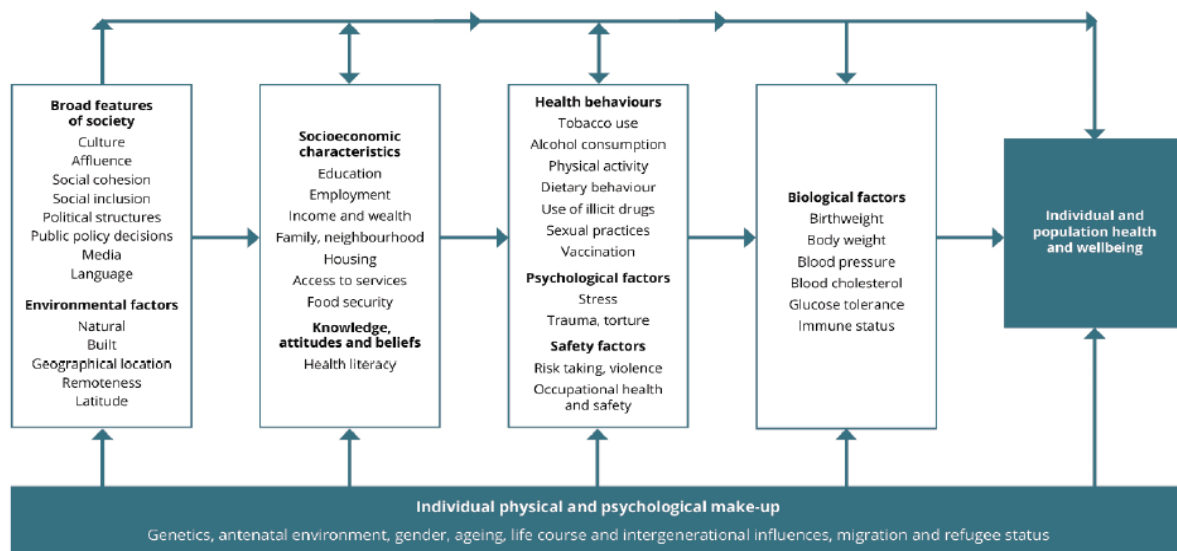
Examining additional components of the neighbourhood environment, such as the quality and safety of public open spaces, may help policy-makers and health providers develop more targeted strategies to improve health-related outcomes for the Australian population.

1 Introduction

1.1 The neighbourhood environment and determinants of health

The neighbourhood environment is one of many interconnected factors that influence our health. These can include genetics/physiology, environmental factors (including the neighbourhood environment), and the social and economic conditions of everyday life, such as family circumstances, housing, working conditions, income, and education (Figure 1.1) (AIHW 2020a; Lucyk and McLaren 2017; Marmot et al. 2010).

Figure 1.1: Framework for determinants of health



Note: Blue shading highlights selected social determinants of health.

Source: AIHW 2020a.

The design of neighbourhoods – their layout, size, and population density – can influence our health in various ways. Factors such as a neighbourhood’s amenities, open spaces and proximity to workplaces can influence our physical activity levels, our access to nutritious food, where we work, our contact with nature, and the spaces we have for social interactions (AIHW 2020b). For example, people who have long travel times to work have less time to engage in healthy behaviours such as physical activity.

The characteristics of a person’s neighbourhood environment can affect their exposure to health risk factors such as overweight and obesity, and the associated risk of developing chronic conditions such as cardiovascular disease and diabetes.

In 2018, the Australian Bureau of Statistics (ABS) released a report examining whether the distance a person lived from a supermarket or fast-food outlet differed by socioeconomic disadvantage or was associated with selected risk factors, using data from the 2017–18 National Health Survey (NHS) (ABS 2018d). Its report found that people living within:

- the lowest socioeconomic areas were more likely to have access to a fast-food outlet within 1,500 m (52%) than those in the highest socioeconomic areas (41%). Additionally, people in the lowest socioeconomic areas were less likely to be obese if they had access to a fast-food outlet within 1,500 m (36%), than those who did not have access to a fast-food outlet (41%)
- the lowest socioeconomic areas were more likely to have access to a supermarket within 1,500 m (66%) than those in the highest socioeconomic areas (55%). Additionally, people in the lowest socioeconomic areas were less likely to be obese if they had access to a supermarket within 1,500 m (36%) than those who did not have access to a supermarket (43%) (ABS 2018d).

This report expands on the work of the ABS by examining the association of socioeconomic disadvantage when exploring the associations between:

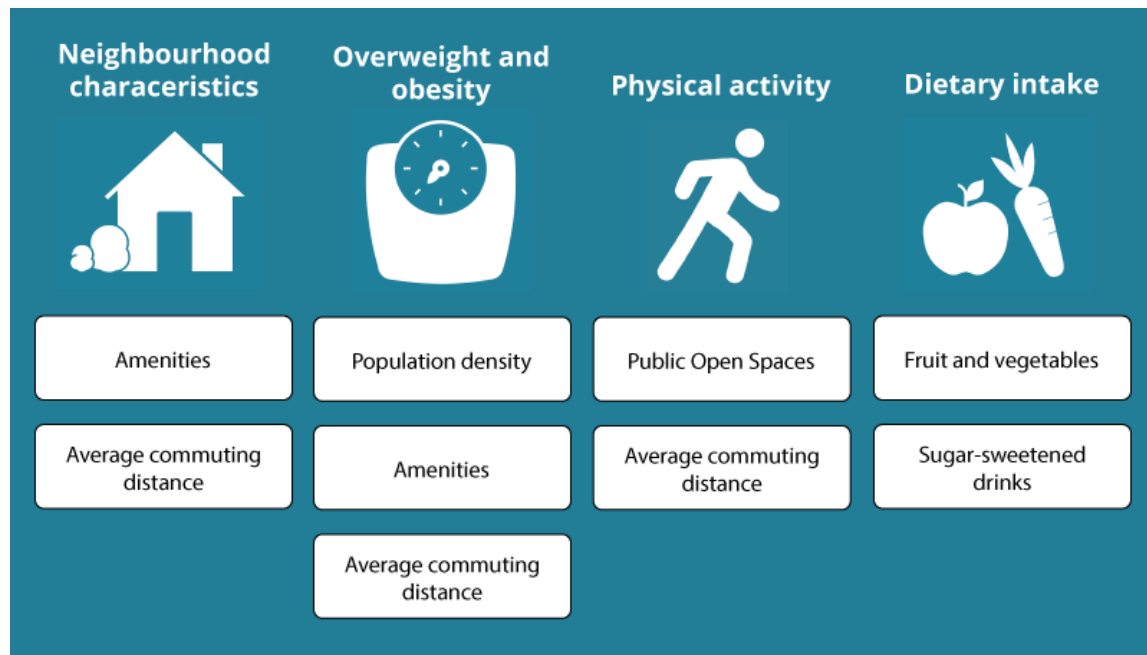
- obesity and population density, access to fast-food outlets, supermarkets, and public open spaces greater than 1 hectare, and average commuting distance.
- insufficient physical activity and access to public open spaces greater than 1 hectare, and average commuting distance.
- dietary intake and access to fast-food outlets and supermarkets.

Results in this report are aged-standardised to account for differences in the age structure of the population and only pertain to adults aged 18 years and over.

The Australian Institute of Health and Welfare (AIHW) has previously reported on how obesity, insufficient physical activity, insufficient fruit and vegetable consumption and daily consumption of sugar sweetened drinks differ across socioeconomic characteristics and remoteness area (see 'Related publications'). This report also expands on this work.

Key findings are presented throughout this report, with detailed findings presented in [Interactive data on health risk factors and the neighbourhood environment](#) and the accompanying [supplementary data tables](#). A visual representation of the amenities and risk factors presented in this report can be found in Figure 1.2.

Figure 1.2: Visual representation of the relationship between health risk factors and the neighbourhood environment presented in this report



Notes:

a) This figure provides a static representation of the interactive data visualisation. To explore this visualisation further please refer to [Interactive data on health risk factors and the neighbourhood environment](#).

b) Amenities includes proximity to fast-food outlets, supermarkets and public open spaces.

1.2 How common are health risk factors?

According to the NHS, in 2017–18, among Australian adults:

- 1 in 3 (31%) were obese
- 1 in 2 (55%) did not meet the recommended physical activity guidelines
- 1 in 2 (49%) did not eat the recommended 2 serves of fruit per day
- 9 in 10 (92%) did not eat the recommended 5–6 serves of vegetables per day
- 1 in 11 (9.1%) consumed sugar sweetened drinks daily (ABS 2018c, 2019a).

In 2018, the following modifiable risk factors contributed towards preventable disease burden in Australia:

- overweight and obesity (8.4% of total disease burden)
- all dietary risks (for example, diets low in fruit, vegetables and legumes or diets high in sodium and processed meat) (5.4%)
- physical inactivity (2.5%) (AIHW 2021).

The total Australian health system spending in 2018–19 attributable to specific modifiable risk factors was about:

- \$4.3 billion for overweight (including obesity)
- \$1.2 billion for dietary risks (for example, diets low in fruit, vegetables and legumes or diets high in sodium and processed meat)
- \$560 million for physical inactivity (AIHW 2022).

Examining how the neighbourhood environment relates to health risk factors could help policy-makers and researchers to develop targeted promotion strategies to reduce the disease burden and associated economic costs of preventable diseases in Australia.

1.3 What is Australia doing to address health risk factors?

The National Preventive Health Strategy 2021–2030 was devised with the aim of improving Australian’s health and wellbeing by utilising prevention approaches to address the wider determinants of health, reduce health inequities and decrease overall disease burden. The strategy identifies nutrition and physical activity as key focus areas for action, and outlines targets and policy achievements within these areas that aim to decrease disease burden (Department of Health 2021b).

Additionally, the National Obesity Strategy 2022–2032 was released as a 10-year framework for action, with the aim to prevent, reduce and treat overweight and obesity in Australia.

The National Obesity Strategy 2022–2032 has 3 key ambitions – that all Australians:

- live, learn, work, play and age in supportive, sustainable, and healthy environments
- are empowered and skilled to stay as healthy as they can be
- have access to early intervention and supportive health care (Commonwealth of Australia 2022).

The strategies for action cover Australia’s food and physical activity systems, building knowledge and skills in communities, and early intervention and supportive health care.

Consistent with the National Preventive Health Strategy 2021–2030, one of 2 goals of the National Obesity Strategy 2022–2032 is to halt the rise and reverse the trend in the prevalence of obesity in adults by 2030.

1.4 How does the neighbourhood environment influence risk factors?

Access to, and the size of, public spaces are associated with increased levels of physical activity (Bull et al. 2015; Mavoa et al. 2016; Sugiyama et al. 2010).

Other aspects of the neighbourhood environment that are associated with increased physical activity include being within walking distance of destinations (including public transport services), and having well connected streets, higher residential densities, and access to public open spaces (Gebel et al. 2009; Kamruzzaman et al. 2016). Transport systems can positively influence active travel (such as cycling and walking), or negatively influence health through car dependence, long commuting times to work, and sedentary behaviour.

The availability, proximity and mix of food outlets have not produced clear findings in relation to dietary outcomes (Bivoltsis et al. 2018; Feng et al. 2018). For example, there is little association between supermarket access and fruit and vegetable intake (Aggarwal et al. 2014; Giskes et al. 2011; Pearce et al. 2008).

However, there is some evidence linking greater density of fast-food outlets with higher prevalence of obesity, while greater supermarket access has been associated with lower prevalence of overweight and obesity (Burgoine et al. 2018; Giskes et al. 2011; Hollands et al. 2014; Li et al. 2009; Mehta and Chang 2008).

1.5 What measures did we use?

This report uses the World Health Organization's guideline to classify obesity (body mass index of ≥ 30 kg/m²) (WHO 2000).

It reports physical activity against the Australian physical activity and exercise guidelines, and dietary intake against the Australian Dietary Guidelines (Department of Health 2021a; NHMRC 2013).

The neighbourhood environment is defined using these measures from the 2017–18 ABS NHS:

- population density
- proximity to a fast-food outlet or supermarket
- proximity to a public open space greater than 1 hectare
- average commuting distance to work (ABS 2018d).

Socioeconomic areas are reported using the Index of Relative Socio-economic Disadvantage (IRSD) (ABS 2018b).

All neighbourhood environment measures in this report are based on area; that is, they are shared by everyone in the same area and are not necessarily indicative of individual participants in the NHS.

Differences are reported only where they are considered statistically significant based on z-tests at a 95% confidence limit.

For more information, see 'Appendix A: Technical notes'.

2 Characteristics of the neighbourhood environment

Proximity to services and commercial areas in a neighbourhood contribute to higher levels of liveability (Coleman 2017). Poorly designed built environments can make it difficult for people to lead active lifestyles and follow a nutritious diet, and can lead to subsequent stress by interfering with social interactions (Perdue et al. 2003; Pinter-Wollman et al. 2018).

Consequently, cities such as Melbourne have adopted the idea of the ‘20-minute neighbourhood’; that is, people are able to meet most of their daily needs within a 20-minute return walk from home (about 800 m walk from home to a destination and back again), with access to safe cycling and local transport options to improve community liveability (State Government of Victoria 2021).

This section provides an overview of the neighbourhood environment by socioeconomic areas in Australia. It looks at the distance people live from their nearest amenity (fast-food outlets, supermarkets, and public open spaces greater than 1 hectare) and average commuting distance (distance travelled to work).

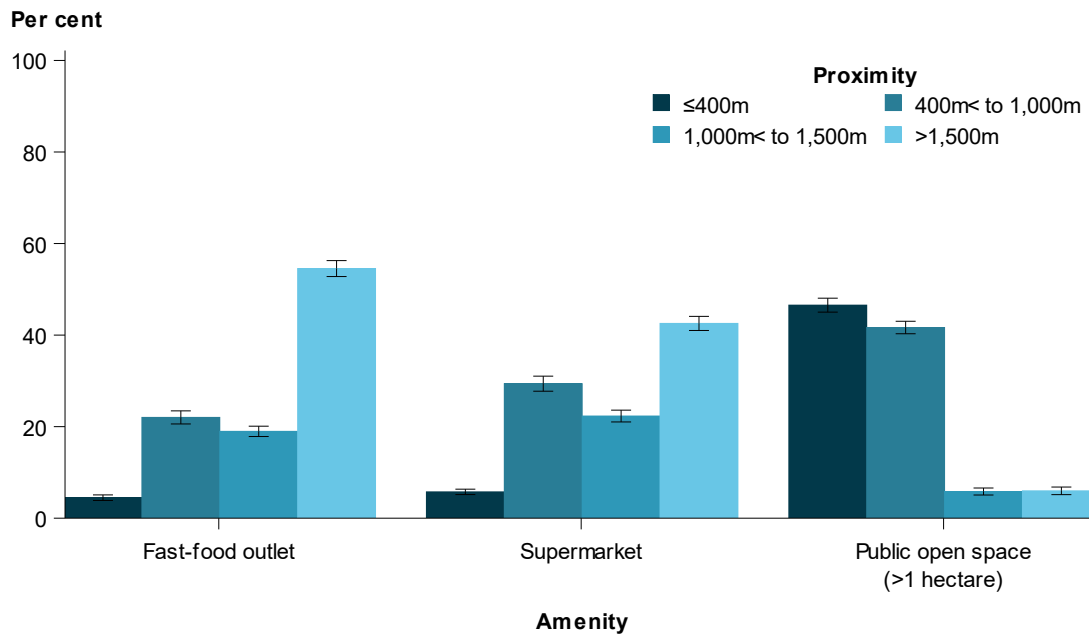
It should be noted that the measures used in this report do not necessarily capture the amenities people may use. For example, people could access a supermarket near their place of work, rather than near their place of residence. Also, the public open space measure used does not account for the quality of the space. Previous research has indicated that the quality of public open spaces tends to be poorer in lower socioeconomic areas and this might affect their use (Mears et al. 2019).

2.1 Distance from nearest amenity

The proximity to amenities varied by type of amenity and socioeconomic area:

- Few Australians lived within 400 m of a major fast-food outlet (4.5%) or supermarket (5.8%). Nearly 1 in 2 (47%) Australians had access to a public open space greater than 1 hectare within 400 m (Figure 2.1).
- More Australians in the lowest socioeconomic areas lived within 1,500 m of a major fast-food outlet (53%) or supermarket (67%) than those who lived in the highest socioeconomic areas (42% and 57% respectively) (Figure 2.2).

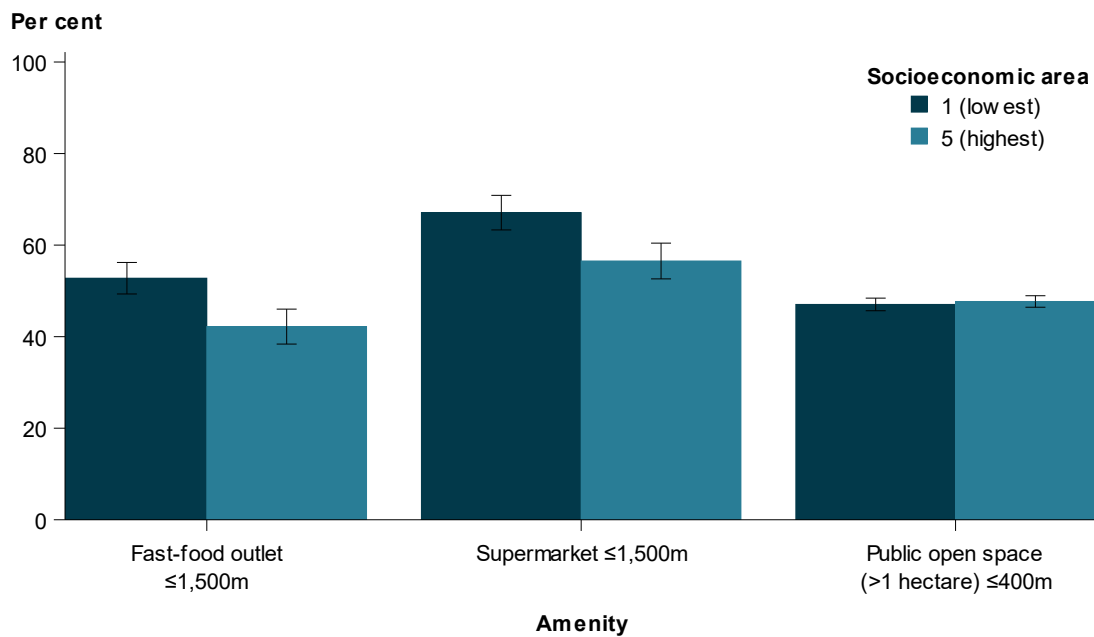
Figure 2.1: Proportion of adults with access to nearest amenity, by proximity, 2017–18



Note: Error bars on figures indicate 95% confidence intervals.

Source: AIHW analysis of ABS 2019a; Table S1 for data and footnotes.

Figure 2.2: Proportion of adults with access to nearest amenity, lowest and highest socioeconomic areas, 2017–18



Note: Error bars on figures indicate 95% confidence intervals.

Source: AIHW analysis of ABS 2019a; see Table S1 for data and footnotes.

Past research has suggested that access (measured through either proximity or density) to fast-food outlets tends to be higher for those in the least advantaged areas, while access to supermarkets tends to be higher for those in the most advantaged areas (Burns and Inglis 2007; Pearce et al. 2007; Trapp and Hooper 2020). It should be noted, however, that previous research has been largely restricted to small areas; for example, Burns and Inglis (2007) conducted their research only in Melbourne.

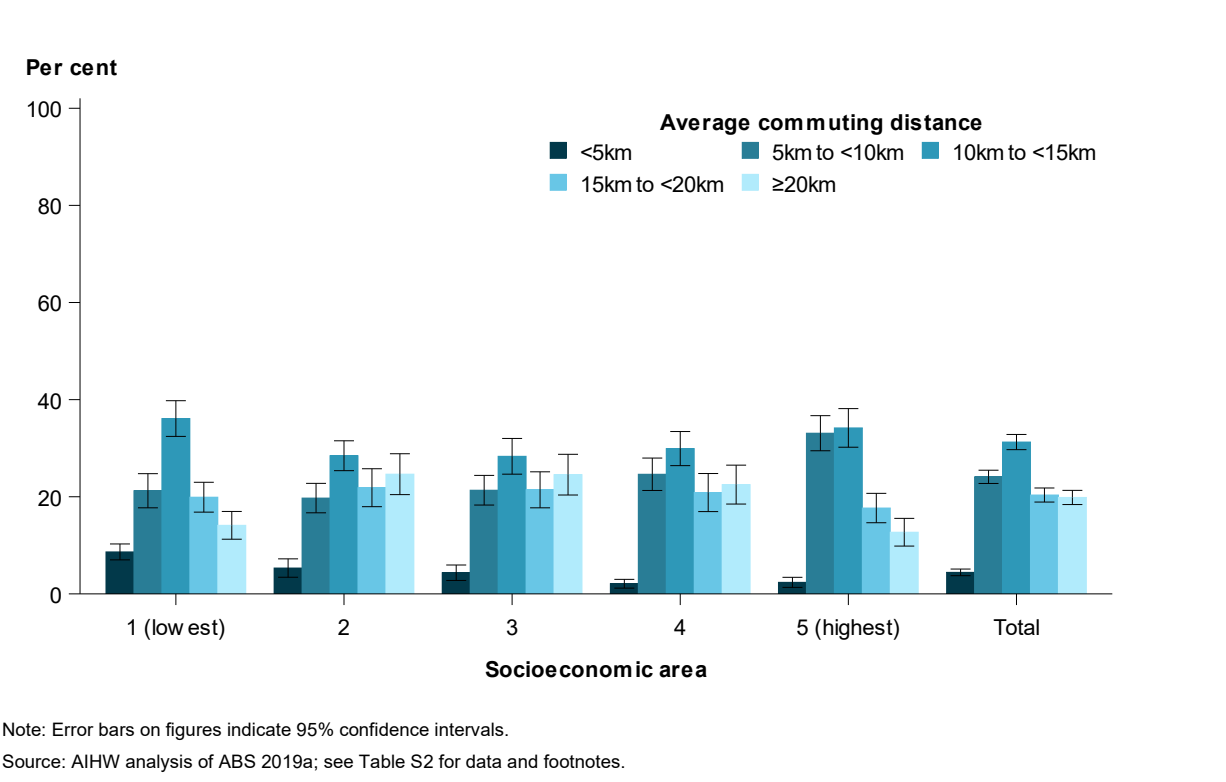
2.2 Average commuting distance

For adults aged 18 and over:

- The most common average commuting distance was 10 to less than 15 km.
- The distribution of average commuting distance differed by socioeconomic areas. More people living in the lowest socioeconomic areas had an average commuting distance of less than 5 km.
- People living in the lowest and highest socioeconomic areas were less likely to have an average commuting distance of at least 20 km (14% and 13%, respectively) than people living in all other socioeconomic areas (Figure 2.3).

Findings from the 2016 Census suggested that commuting distance was associated with the mode of transport used. People who travelled to work by train, truck or car tended to have longer average commuting distances than those who took active transport (such as walking or riding a bike to work) (ABS 2018a). Having closer commutes may promote increased physical activity, which is explored in Chapter 4 of this report.

Figure 2.3: Proportion of adults, by distribution of average commuting distance and socioeconomic area, 2017–18



3 Obesity

Overweight and obesity is a major public health issue in Australia, and is influenced by a complex interplay of individual, environmental and societal factors (Butland et al. 2007; Hruby and Hu 2015).

Overweight and obesity result from a sustained energy imbalance in the body – when energy intake from eating and drinking is greater than energy used through physical activity. Over time, an energy imbalance can lead to increases in excess body weight, which is commonly referred to as overweight and obesity (Romieu et al. 2017).

The environments that people interact with every day – in schools, workplaces, homes, neighbourhoods, shopping centres and communities – can affect health behaviours that affect overweight and obesity, including dietary patterns, physical activity levels and sleep patterns (Deacon-Crouch et al. 2020; Espinel and King 2009; Simonelli and Hale 2022).

Preliminary analysis from the ABS shows that in 2017–18, about 3 in 10 people living within 1,500 m of a fast-food outlet (29%) or supermarket (30%) were obese. In comparison, just over 1 in 3 (34%) people living further than 1,500 m from a fast-food outlet or supermarket were obese (ABS 2018d).

To further investigate the associations between the neighbourhood environment in Australia and obesity, the data in this chapter report on the age-standardised prevalence of obesity within socioeconomic areas by:

- population density
- proximity (within 1,500 m and further than 1,500 m) to a fast-food outlet or supermarket.
- proximity (within 400 m and further than 400 m) to a public open space greater than 1 hectare
- average commuting distance to work.

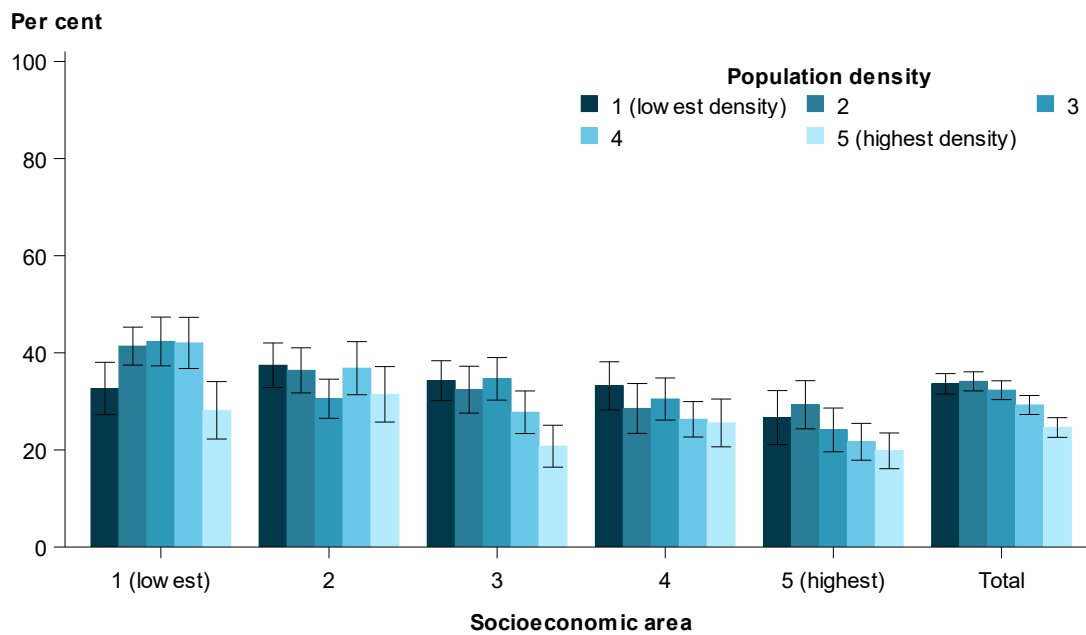
Data for these measures for the prevalence of overweight and obesity combined can be found in the online interactive visualisations and supplementary tables that accompany this report.

3.1 Population density and obesity

The age-standardised prevalence of obesity:

- generally decreased with increasing population density at a national level
- generally decreased with increasing population density across most socioeconomic areas – although this pattern was not shown for the lowest 2 socioeconomic areas (Figure 3.1).

Figure 3.1: Age-standardised prevalence of obesity among adults, by population density and socioeconomic area, 2017–18



Notes:

a) Data have been age-standardised to the 2001 Australian Standard Population.

b) Error bars on figures indicate 95% confidence intervals.

Source: AIHW analysis of ABS 2019a, see Table S3 for data and footnotes.

These findings are consistent with those reported internationally. For example, Buszkiewicz et al. (2021) found that people living in the most densely populated areas in Washington, USA had a lower prevalence of obesity than those living in the least densely populated areas.

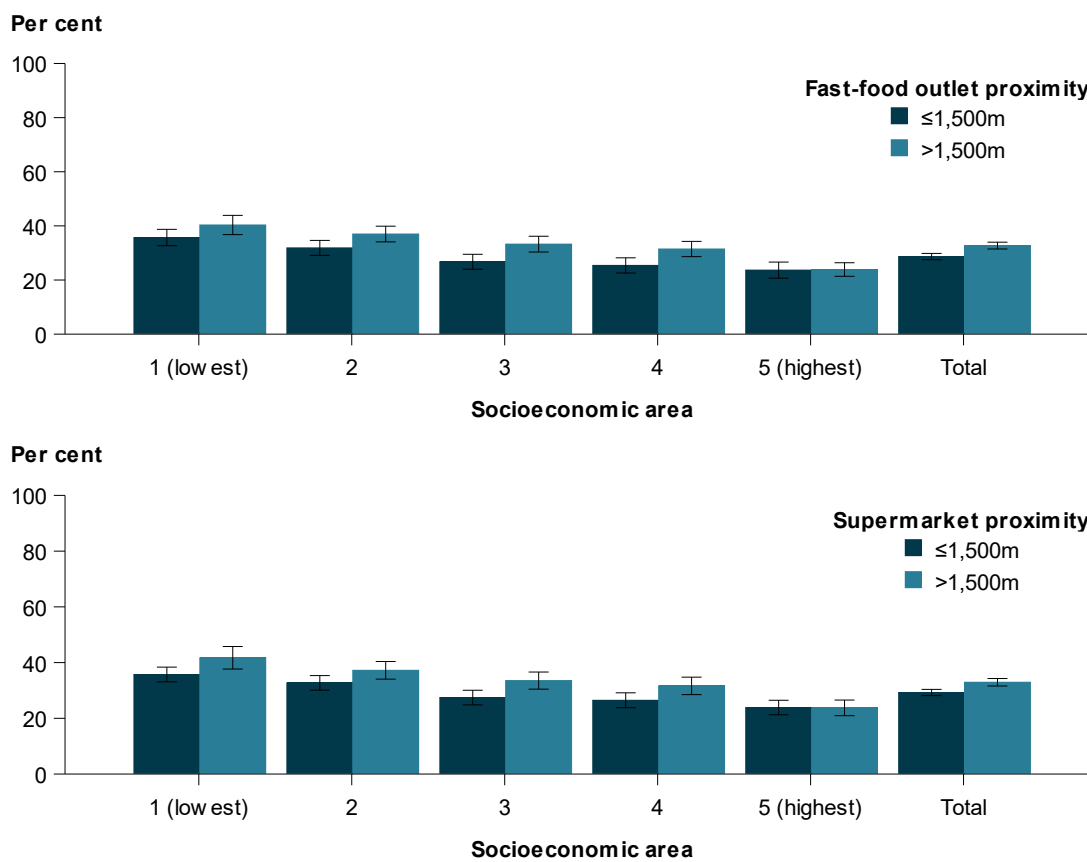
One possibility is that people living in the most densely populated areas have shorter commutes (less time spent traveling to work) and more time to spend on healthy behaviours such as physical activity (Parise 2020). The relationships between commuting distance and obesity or physical inactivity are explored later in this report.

3.2 Distance from nearest amenity and obesity

The age-standardised prevalence of obesity was:

- higher for those living further than 1,500 m from a fast-food outlet (33%) than for those living within 1,500 m of a fast-food outlet (29%). This finding was apparent in most socioeconomic areas except in the lowest and highest socioeconomic areas, where the prevalence of obesity was similar regardless of proximity (Figure 3.2).
- higher for those living further than 1,500 m from a supermarket (33%) than for those living within 1,500 m of a supermarket (29%). This pattern was consistent across most socioeconomic areas, except in the highest socioeconomic areas, where the prevalence of obesity was similar, regardless of proximity (Figure 3.2).
- similar for those living further than 400 m or within 400 m (both 31%) of a public open space >1 hectare. This pattern was consistent across socioeconomic areas (Figure 3.3).

Figure 3.2: Age-standardised prevalence of obesity among adults, by proximity to a fast-food outlet (top) or supermarket (bottom) and socioeconomic area, 2017–18



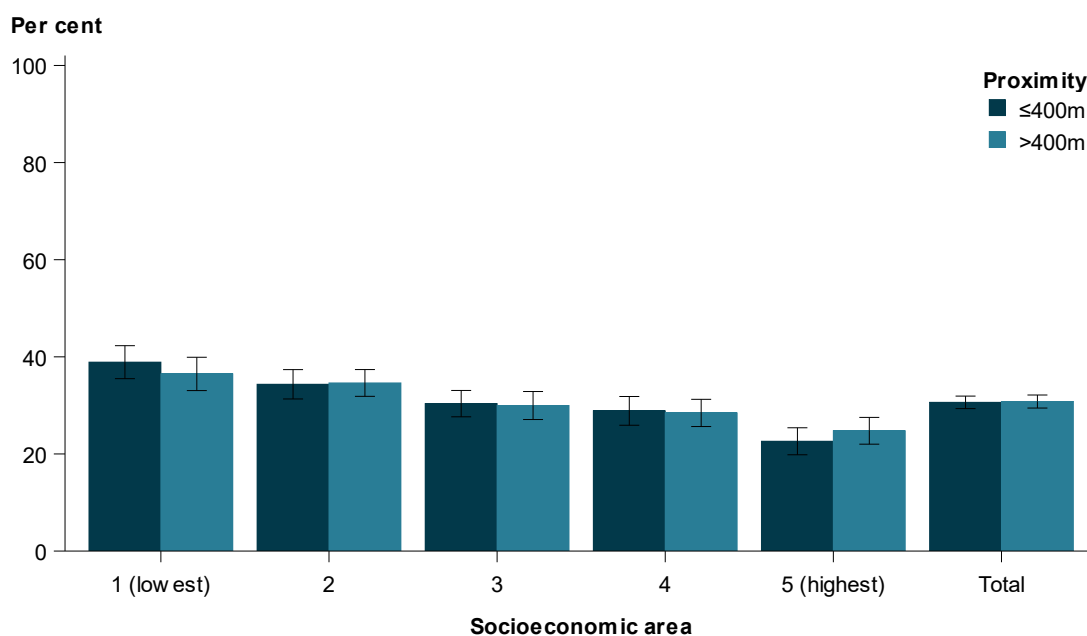
Notes:

a) Data have been age-standardised to the 2001 Australian Standard Population.

b) Error bars on figures indicate 95% confidence intervals.

Source: AIHW analysis of ABS 2019a; see tables S4 and S5 for data and footnotes.

Figure 3.3: Age-standardised prevalence of obesity among adults, by proximity to a public open space greater than 1 hectare and socioeconomic area, 2017–18



Notes:

a) Data have been age-standardised to the 2001 Australian Standard Population.

b) Error bars on figures indicate 95% confidence intervals.

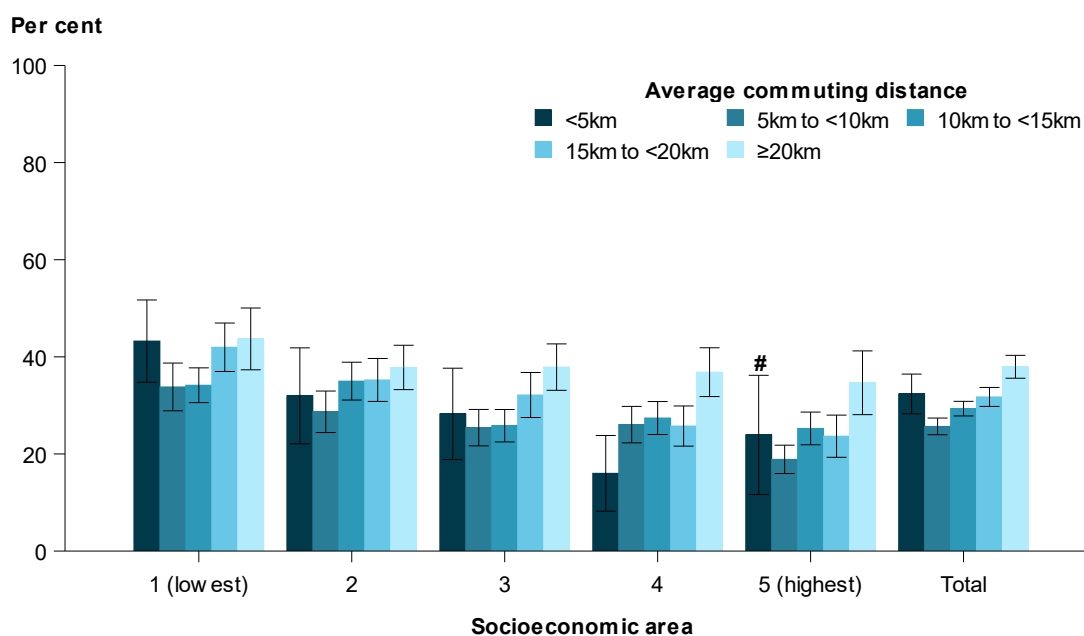
Source: AIHW analysis of ABS 2019a; see Table S7 for data and footnotes.

These findings suggest that additional factors other than proximity to fast-food outlets and supermarkets may contribute to the higher prevalence of obesity seen in those living in the lowest socioeconomic areas.

3.3 Average commuting distance and obesity

The age-standardised prevalence of obesity was generally higher for people commuting further distances across all socioeconomic areas. About 1 in 4 people (26%) who commuted on average 5 km to less than 10 km to work were obese, compared with 38% of those commuting 20 km or more. However, the pattern of obesity across different commuting distances varied between socioeconomic areas (Figure 3.4).

Figure 3.4: Age-standardised prevalence of obesity among adults, by average commuting distance and socioeconomic area, 2017–18



Notes:

a) Data have been age-standardised to the 2001 Australian Standard Population.

b) Error bars on figures indicate 95% confidence intervals.

c) # denotes that the prevalence has a margin of error of greater than 10 percentage points, which should be considered when using this information.

Source: AIHW analysis of ABS 2019a; see Table S8 for data and footnotes.

These findings are generally consistent with those of Carroll et al. (2021), who found that longer average area round-trip commuting distances to work were associated with a greater body mass index (BMI) in most Australian cities.

Providing increased infrastructure and opportunity to use active transport could encourage people to reduce their reliance on cars for commuting and help reduce sedentary lifestyles (AIHW 2011).

4 Insufficient physical activity

Participating in regular physical activity and limiting the amount of sedentary time can have significant health benefits – it reduces the risk of chronic conditions and other disease risk factors such as overweight and obesity and improves social and emotional health and wellbeing (AIHW 2018).

In 2017–18, over 1 in 2 (55%) Australian adults did not participate in sufficient physical activity. Over 6 in 10 (63%) adults from the lowest socioeconomic areas were insufficiently active, compared with about 1 in 2 (48%) in the highest socioeconomic areas (AIHW 2020d) (see 'Appendix A: Technical notes' for the definition of insufficient physical activity used in this report).

Positive aspects of the neighbourhood environment such as easily accessible green spaces, walking tracks, and developed cycling infrastructure can help enable physical activity (Parise 2020). Additional factors such as residential density, perceived access to destinations and neighbourhood aesthetics can also help to promote regular walking (Sugiyama et al. 2015). Due to the nature of the data, these aspects could not be measured in the current report but would benefit from further investigation.

Investigating the associations between the neighbourhood environment, physical inactivity and socioeconomic disadvantage might help inform targeted policy and intervention strategies to improve overall participation in physical activity in the Australian population.

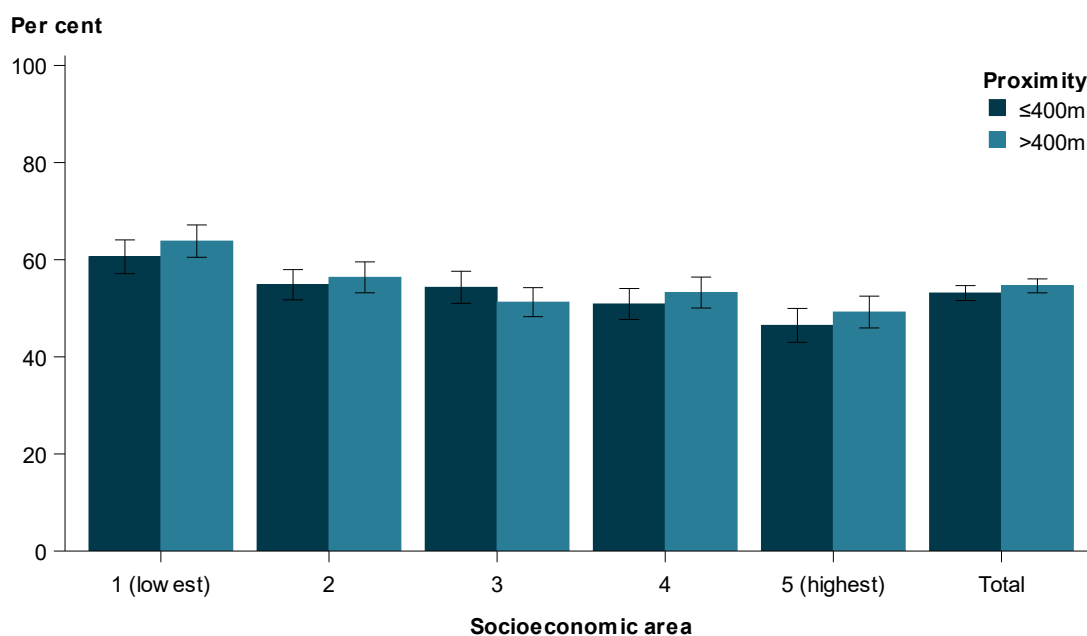
This chapter explores the age-standardised prevalence of insufficient physical activity (those who did not meet the guidelines) within socioeconomic areas by:

- proximity (within 400 m and further than 400 m) to nearest public open space greater than 1 hectare
- average commuting distance (distance travelled to work) (see 'Appendix A: Technical notes' for further details).

4.1 Distance from nearest public open space greater than 1 hectare and physical activity

The age-standardised prevalence of insufficient physical activity was similar for people who lived within 400 m of a public open space greater than 1 hectare (53%) and those who lived further than 400 m (55%) (Figure 4.1). This finding was consistent within socioeconomic areas.

Figure 4.1: Age-standardised prevalence of insufficient physical activity among adults, by proximity to public open space greater than 1 hectare and socioeconomic area, 2017–18



Notes:

a) Data have been age-standardised to the 2001 Australian Standard Population.

b) Error bars on figures indicate 95% confidence intervals.

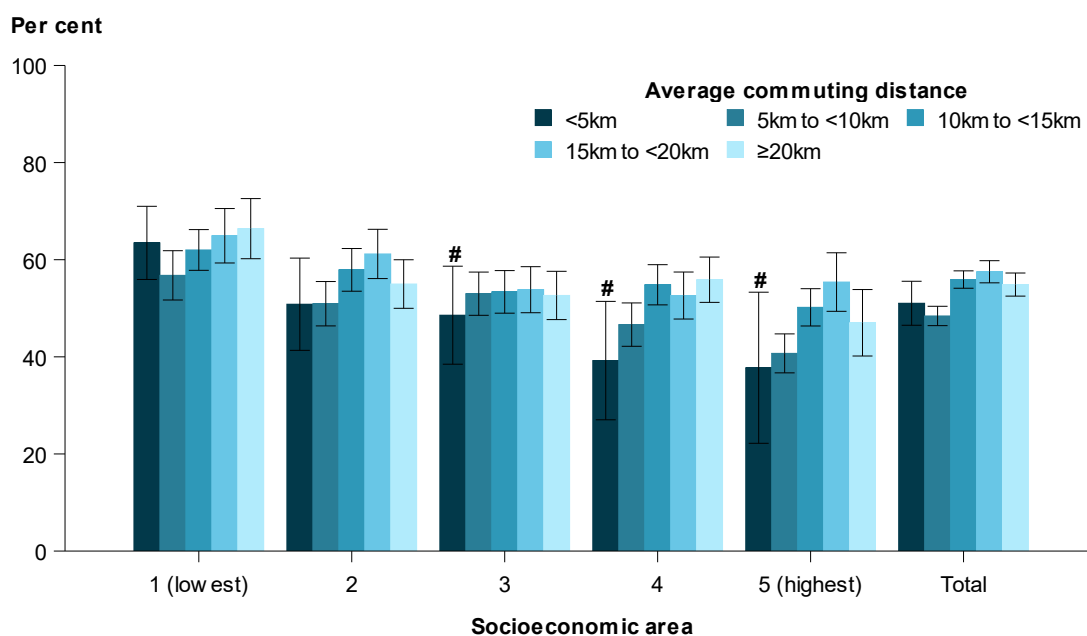
Source: AIHW analysis of ABS 2019a; see Table S11 for data and footnotes.

These findings would suggest that factors beyond simple proximity to public open space are responsible for the higher proportions of insufficient physical activity seen in those living in the lowest socioeconomic areas than in those living in the highest socioeconomic areas.

4.2 Average commuting distance and physical activity

The age-standardised prevalence of insufficient physical activity was higher for adults living in areas with an average commuting distance of greater than 10 km than for those with an average commuting distance of less than 10 km. This was generally consistent across socioeconomic areas (Figure 4.2).

Figure 4.2: Age-standardised prevalence of insufficient physical activity among adults, by average commuting distance and socioeconomic area, 2017–18



Notes:

a) Data have been age-standardised to the 2001 Australian Standard Population.

b) Error bars on figures indicate 95% confidence intervals.

c) # denotes that the prevalence has a margin of error of greater than 10 percentage points, which should be considered when using this information.

Source: AIHW analysis of ABS 2019a; see Table S12 for data and footnotes.

Increased commuting distances can take away time from participating in healthy behaviours. Previous research has suggested that longer commuting distances (that is, greater than 24 km) have been associated with a lower likelihood of meeting the recommendations for moderate-to-vigorous physical activity (Hoehner et al. 2012). Similarly, Raza et al. (2021) found that people who commuted between 3.1 and 20 km were more likely to be physically inactive than those who commuted the least distance (less than 3 km).

According to the 2016 Australian Census, the average commuting distance for people travelling from their usual place of residence was 16 km (ABS 2018a). Being able to reduce commuting times to work might therefore help people to engage in positive health behaviours, such as physical activity.

5 Dietary intake

The food and drinks we consume are important to our health and wellbeing. A healthy diet helps to prevent and manage health risk factors such as overweight and obesity, high blood pressure and high blood cholesterol, as well as associated chronic conditions, including type 2 diabetes, cardiovascular disease, and some forms of cancer (NHMRC 2013).

The Australian Dietary Guidelines outline the recommended daily intake for a healthy diet (NHMRC 2013). This includes eating a variety of nutritious foods, including recommended daily serves of fruit and vegetables, and limiting the intake of sugar sweetened drinks.

High or frequent intake of sugar sweetened drinks can lead to tooth decay and increased risk of excessive weight gain. As sugar sweetened drinks do not provide much nutritional value they are classified as discretionary choices and not an essential part of a healthy diet (NHMRC 2013).

In 2017–18, about 1 in 2 (49%) Australian adults did not eat the recommended 2 serves of fruit, over 9 in 10 (92%) did not eat the recommended 5–6 serves of vegetables, and 1 in 11 (9.1%) consumed sugar sweetened drinks daily (ABS 2018c).

People in the lowest socioeconomic areas were less likely to eat the recommended serves of fruit or vegetables, and more likely to drink sugar sweetened drinks daily, than those in the highest socioeconomic areas (AIHW 2020c).

Preliminary analysis from the ABS reported similar intakes of fruit, vegetables, and sugar sweetened drinks, by proximity to fast-food outlets and supermarkets (ABS 2018d).

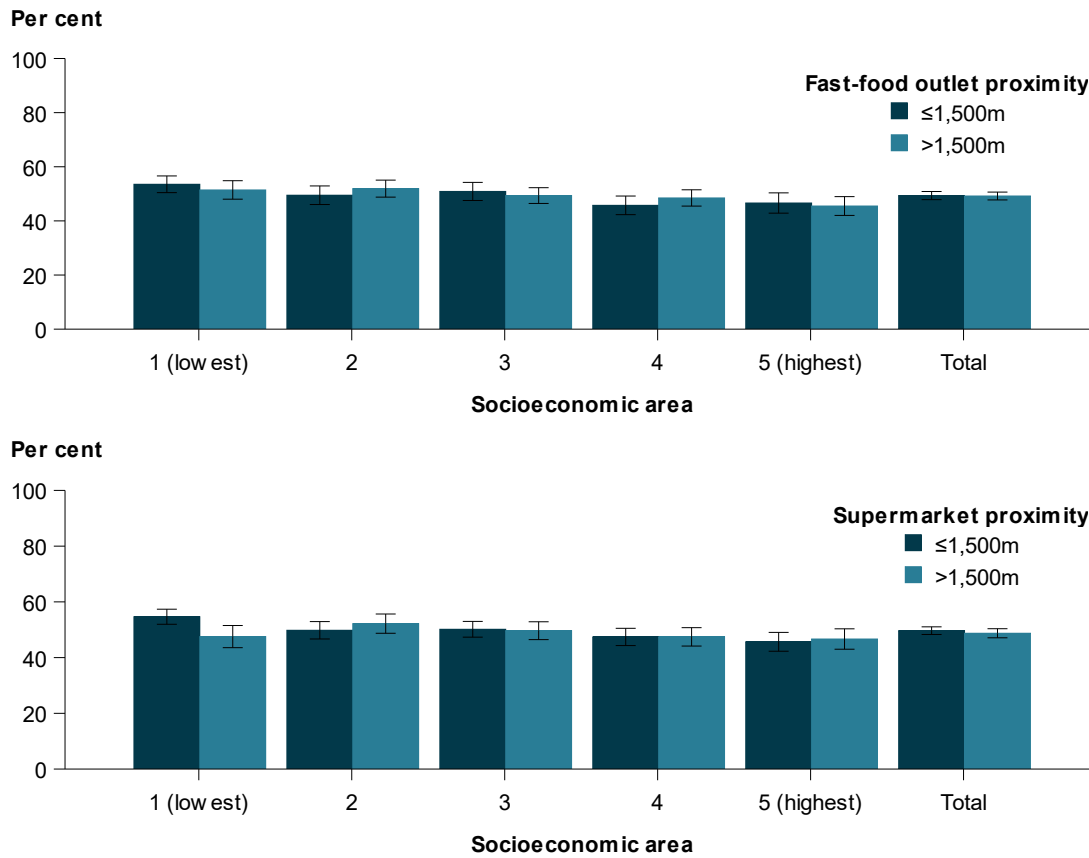
This report expands on the ABS analysis by investigating dietary intake and the neighbourhood environment within each socioeconomic area. If differences exist, this could help to inform targeted policy and intervention strategies to improve the overall diet of the Australian population.

This chapter explores the age-standardised prevalence of insufficient fruit and vegetable consumption (those who did not meet the guidelines) and daily sugar sweetened drink consumption within socioeconomic areas by proximity (within 1,500 m and further than 1,500 m) to the nearest fast-food outlet or supermarket.

5.1 Fruit and vegetable consumption and amenities

The age-standardised prevalence of not meeting the recommended fruit or vegetable guidelines was similar for those who lived within 1,500 m of a fast-food outlet or supermarket and those living further than 1,500 m. This pattern was generally consistent within socioeconomic areas (Figures 5.1 and 5.2).

Figure 5.1: Age-standardised prevalence of adults who did not meet the recommended fruit guidelines, by proximity to fast-food outlets (top) and supermarkets (bottom) and socioeconomic area, 2017–18



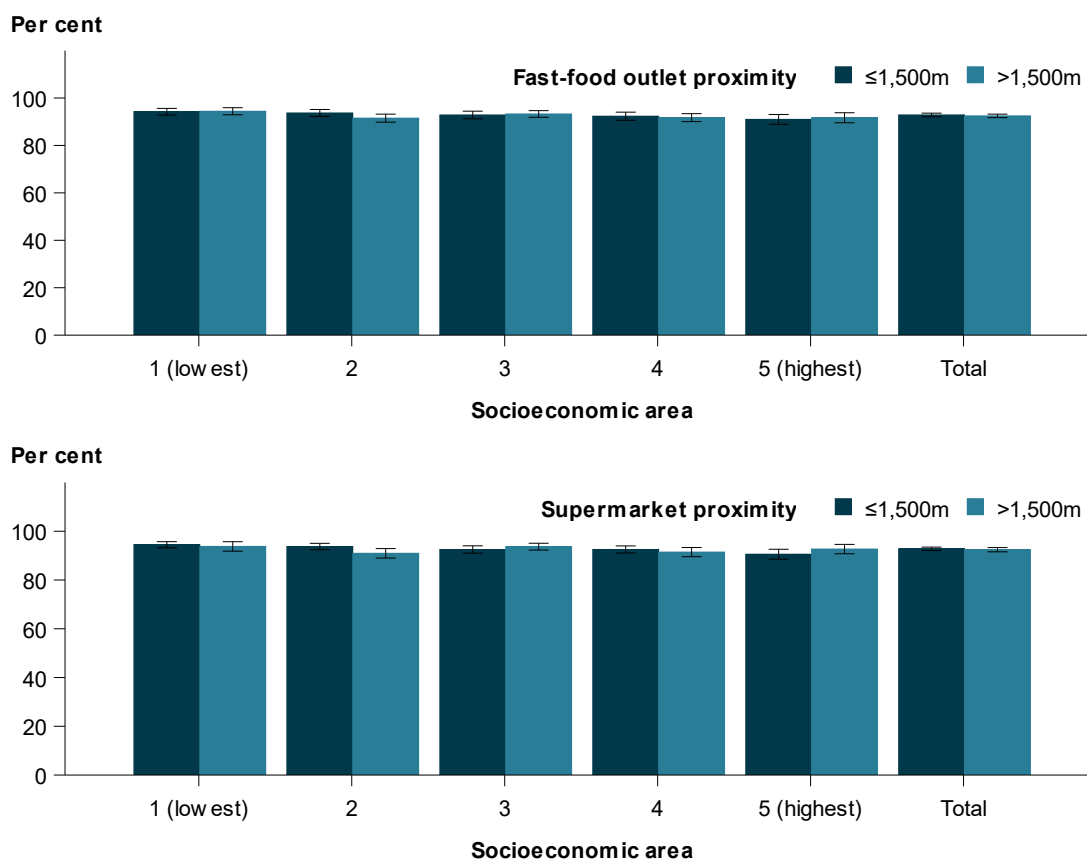
Notes:

a) Data have been age-standardised to the 2001 Australian Standard Population.

b) Error bars on figures indicate 95% confidence intervals.

Source: AIHW analysis of ABS 2019a; see tables S13 and S14 for data and footnotes.

Figure 5.2: Age-standardised prevalence of adults who did not meet the recommended vegetable guidelines, by proximity to fast-food outlets (top) and supermarkets (bottom) and socioeconomic area, 2017–18



Notes:

a) Data have been age-standardised to the 2001 Australian Standard Population.

b) Error bars on figures indicate 95% confidence intervals.

Source: AIHW analysis of ABS 2019a; see tables S13 and S14 for data and footnotes.

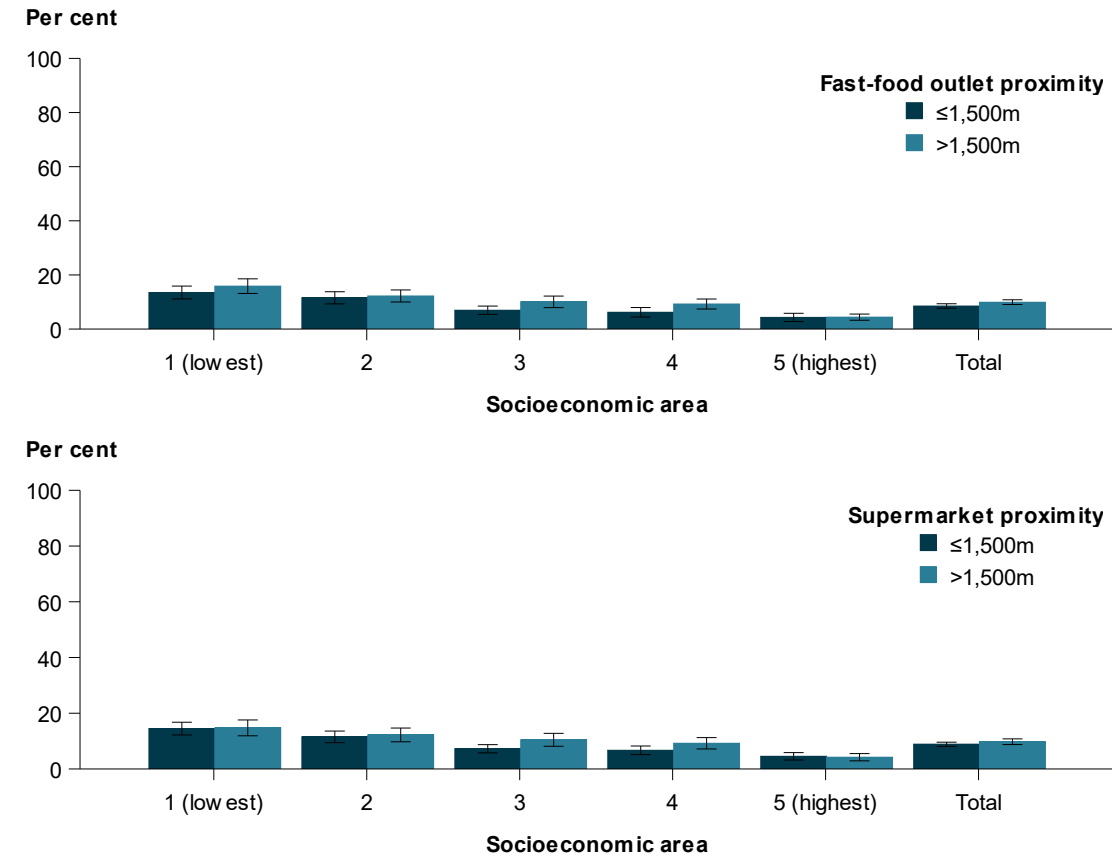
Given the findings in this report, future research could look at other components of the neighbourhood environment when examining the reasons why fruit and vegetable consumption tends to decrease in lower socioeconomic areas. For example, research has shown that people from lower socioeconomic groups (measured by household income) perceive price and perishability as barriers to consuming fruit and vegetables (Giskes et al. 2002; Lewis et al. 2021).

5.2 Sugar sweetened drinks and amenities

Based on AIHW analysis of the 2017–18 NHS, the age-standardised prevalence of daily sugar sweetened drink consumption:

- was generally higher for people living further than 1,500 m (9.9%) from their nearest fast-food outlet than for those who lived within 1,500 m (8.5%) at a national level, and this was mostly driven by differences for those in the middle (quintile 3) and second highest (quintile 4) socioeconomic areas
- generally did not differ by proximity to supermarkets across socioeconomic areas (Figure 5.3).

Figure 5.3: Age-standardised prevalence of adults who consumed sugar sweetened drinks daily, by proximity to fast-food outlets (top), supermarkets (bottom) and socioeconomic area, 2017–18



Notes:
 a) Data have been age-standardised to the 2001 Australian Standard Population.
 b) Error bars on figures indicate 95% confidence intervals.
 Source: AIHW analysis of ABS 2019a; see tables S15 and S16 for data and footnotes.

There is limited research on the association between socioeconomic status, proximity to fast-food outlets and consumption of sugar sweetened drinks. Where there has been research, findings have been mixed (McNaughton et al. 2020).

6 Future research and data limitations

The data presented in this report include characteristics of the neighbourhood environment, predominantly in relationship to where participants live, which have been collected nationally in the NHS. Data on other characteristics, including the workplace environment, which might have an impact on health risk factors were not collected in the NHS and therefore not reported. Given that many adults spend a large proportion of their day at work, data on the foods they buy and their access to open spaces during work hours would provide a more complete picture of the neighbourhood environment.

People are increasingly using online food delivery services to buy fast-food and groceries. In 2020, about 5.5 million people aged 14 and over used meal delivery services in Australia, which was 67% more people than in 2018 (Roy Morgan 2021). Research in Canada has shown that online food delivery services substantially increase geographic access to takeaway and fast-food, by up to 9 km and 472 restaurant choices (Brar and Minaker 2021). Similarly, Australian research has shown that nearly 90% of food delivery distances were more than 1,000 m away, with most from 1,100–5,000 m (Partridge et al. 2020). Future research could consider this aspect of food accessibility.

Data limitations

Several data and methodological limitations should be considered when interpreting findings in this report.

For example, the data used to derive access to fast-food outlets was based on the locations of 18 major chains (see 'Appendix A: Technical notes' for more details). Smaller fast-food chains and independent outlets were not captured in the analysis. Similarly, the data used to derive access to supermarkets was based on the location of 10 major chains and did not capture smaller independent grocers, convenience stores or supermarkets.

Research has shown that small food stores and convenience stores when compared with supermarkets, are more likely to have produce of poorer quality, higher cost and could contribute to a higher BMI or overweight and obesity (Caspi et al. 2017; Dhakal and Khadka 2021; Lovasi et al. 2009; Morland et al. 2006). Therefore, the measures used in this report might underestimate accessibility in some areas.

The relationship between neighbourhood and food environments with dietary intake is complex. In addition to not capturing the complete neighbourhood food environment, the data presented do not capture what people are purchasing from fast-food outlets or supermarkets. Supermarkets sell a variety of food, including fresh produce, healthy foods, and unhealthy foods. Similarly, many major fast-food outlets offer healthy options in their menus. Other factors in food environments that are associated with dietary intake from supermarkets and/or fast-food outlets include, food:

- labelling
- composition (such as proportion of intake from unhealthy packaged food and drinks)
- promotion
- prices and affordability (Deakin University 2021).

As this report examined only proximity to fast-food outlets and supermarkets in the neighbourhood environment, and not consumption behaviours or food environments, the associations between these amenities and health risk factors such as obesity are likely to be incomplete.

While outside the scope of the current report, factors other than the neighbourhood environment, such as workplaces, or other lifestyle factors such as family structure or employment may be determinants of health risk factors (Richardson et al. 2011; Thornton et al. 2011). Additional factors also influence people's use of public open spaces, including quantity of the spaces and the quality and characteristics (for example, safety, maintenance, aesthetics) of the spaces (Rozek et al. 2017). Considering the interaction between these additional factors and the neighbourhood environment might provide a more complete picture of the determinants of health risk factors.

The area-level measures of the neighbourhood environment might not be representative of all areas in Australia. For example, *Remote* and *Very remote* areas were not captured in the measures of public open space. Also, the measurement of average commuting distance was captured at Statistical Area Level 1 as the average for people in that area. This doesn't reflect the individual commuting distance that a person had, which could be different from what was most common within their area.

Similarly, socioeconomic disadvantage was captured by the Index of Relative Socio-economic Disadvantage (IRSD). The IRSD is a general socio-economic index that summarises economic and social conditions of people and households within an area, to measure the overall relative disadvantage of an area. This doesn't necessarily reflect the individual economic and social circumstances that a person had, which could be different from what was most common within their area.

Appendix A: Technical notes

Data source

The analyses are based on data collected in the 2017–18 National Health Survey conducted by the Australian Bureau of Statistics (ABS). This survey is based on a nationally representative cross-sectional sample that included residents of private dwellings.

The survey excluded residents of non-private dwellings, such as hospitals, nursing homes, hotels, motels, boarding schools, and prisons as well as *Very remote* areas and discrete Aboriginal and Torres Strait Islander communities.

The survey sample size was 21,300 people. The survey collected information on measured height and weight as well as other risk factors, such as dietary intake and exercise.

For more information, refer to the [ABS National Health Survey: First Results methodology, 2017–18](#).

Data quality statement

The data quality statement for the National Health Survey 2017–18 is available on the ABS website: [4363.0 - National Health Survey: Users' Guide, 2017–18 \(abs.gov.au\)](#).

Measures

Socioeconomic areas

Information on socioeconomic areas in this report is based on Socio-Economic Indexes for Areas (SEIFA), a product developed by the ABS that ranks areas in Australia according to relative socioeconomic advantage and disadvantage. The indexes are based on information from the 5-yearly Census. Each index is a summary of a different subset of Census variables and focuses on a different aspect of socioeconomic advantage and disadvantage (ABS 2018b).

This report uses the Index of Relative Socio-economic Disadvantage (IRSD) from 2016, based on the Statistical Area Level 1 (SA1) that each household was within. Areas were ranked and put into 5 equally sized groups based on the IRSD score of these SA1s, and these groups form the socioeconomic areas used in this report. People within the 20% of areas with the greatest overall level of disadvantage are described as living in the lowest socioeconomic areas (areas of most disadvantage). People within the 20% of areas at the other end of the scale – those in areas with the least overall level of disadvantage – are described as living in the highest socioeconomic areas (areas of least disadvantage).

Fast-food outlet and supermarket classification

Counts of major fast-food chains and supermarkets within an area were calculated by road network. That is, the number of major fast-food chains and supermarkets based on the measured distance along the road network (distance along road(s) to amenity), to calculate more plausible travel routes. Independent supermarkets and fast-food providers were not included.

Eighteen fast-food chains were included:

- Crust Pizza
- Chicken Treat
- Domino's
- Donut King
- Eagle Boys Pizza
- KFC
- Hungry Jack's
- McCafe
- McDonald's
- Nando's
- Noodle Box
- Oporto
- Pizza Capers
- Pizza Haven
- Pizza Hut
- Red Rooster
- Subway
- Wendy's.

Ten supermarket chains were included:

- ALDI
- Coles
- Foodland
- Foodworks
- Franklins
- Fresh Market
- Friendly Grocer
- IGA
- Safeway
- Woolworths.

Public open space classification

In this report, public open spaces have been presented as public open spaces of any size and public open spaces greater than 1 hectare, which are accessible within the specified road network. Smaller public open spaces (for example, 'pocket parks') have been removed from these analyses as although these spaces may function as destinations to walk to, they may provide less opportunity for physical activity at the park itself. The data exclude *Remote* and *Very remote* areas of Australia.

Population density

The population density measures the population per square metre and was calculated by spatially intersecting the longitude/latitude associated with all household addresses in the NHS with the Australian Population Grid 2017. The grid represents population density at 1 km² cells across Australia. In this report, areas were ranked and put into 5 equally sized groups based on the population density scores that contained about 20% of the population, based on the person sampling weights.

Those living in the 20% of areas with the lowest overall population density are described as living in the least dense areas. Those living in areas with the highest overall population density – the 20% of areas at the other end of the scale – are described as living in the most dense areas.

Mean and median commuting distance to work

Commuting distance measures the distance travelled from where a person usually lives to where they usually work. Mean and median commuting distance was calculated based on where people lived for all Statistical Area Level 1 (SA1s) in the 2016 Australian Census. This data was then spatially intersected with all household addresses in the NHS. That is, not all SA1s in Australia are included in our analyses. Commuting distance calculations assumed that a person followed the shortest road or network path or, where this was not possible, a straight line distance, with no stops.

For more information on how commuting distances are calculated, see:

<https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2071.0.55.001~2016~Main%20Features~Commuting%20Distance%20for%20Australia~1>.

Obesity

In this report, obesity was based on measured height and weight, and classified according to the WHO (2000) guidelines:

- overweight or obese was classified as a BMI ≥ 25 kg/m²
- obesity was classified as a BMI of 30.0 kg/m² or more (WHO 2000).

The non-response rates for physical measurements used to derive body mass index (BMI) for adults in the National Health Survey was 34%. However, the ABS imputed BMI for people for whom BMI was not measured. In this method, participants with a missing response were given the response of similar participants who were matched on age group, sex, part of state, self-perceived body mass, level of exercise, and whether a participant had high cholesterol as a long-term health condition (ABS 2019b).

Insufficient physical activity

Insufficient physical activity was classified according to those who did not meet the Australian Physical Activity Guidelines (Department of Health 2021a).

Australia's Physical Activity and Sedentary Behaviour Guidelines recommend that Australian adults:

- aged 18–64 be active on most, preferably all days (that is, 5 or more) with at least 150 minutes of moderate or 75 minutes of vigorous intensity each week (or equivalent combination of both), and include muscle-strengthening activities on at least 2 days each week
- aged 65 and over be active on most, preferably all days (that is, 5 or more) with at least 30 minutes of moderate activity per day
- of all ages should aim to limit long periods of time spent sitting and break these up by standing or going on short walks where possible (Department of Health 2021a).

Based on the guidelines, in this report insufficient physical activity was defined as:

- adults aged 18–64 who did not complete 150 minutes of moderate to vigorous physical activity across 5 or more days in the last week
- adults aged 65 and over who did not complete at least 30 minutes of physical activity per day on 5 or more days in the last week.

Statistical analyses

Crude prevalence estimates

Crude prevalence estimates are presented as percentages in this report. Crude prevalence, as a percentage, is defined as the number of people with a particular characteristic, divided by the number of people in the population of interest, multiplied by 100.

In calculating crude prevalence estimates, where the information of interest (for example, BMI) was not available, these people were excluded from the denominator.

All crude prevalence estimates in this report are based on population weighted estimates allocated to each survey participant by the ABS to allow for national representativeness.

Age-standardised prevalence estimates

Age-standardised prevalence estimates are presented to remove the influence of age when comparing populations with different age structures. This is necessary because rates of certain risk factors, such as obesity, vary (usually increasing) with age.

The age-standardised proportions in this report have been directly age-standardised to the 2001 Australian Standard Population.

Standard error, relative standard error, margin of error and confidence intervals

For all survey data, the jack-knife weight replication method was used to derive the standard errors for each number estimate, using replicate weights provided by the ABS.

The standard error for the estimates was derived as follows:

$$SE (estimate) = \frac{RSE (estimate) \times (estimate)}{100}$$

where $RSE (estimate)$ is calculated as shown below.

The relative standard error (RSE) of an estimate is a measure of the error likely to have occurred due to sampling. The RSEs of the estimates were calculated using the standard errors (SEs):

$$RSE(estimate) = \frac{SE(estimate)}{estimate} \times 100$$

The margin of error (MoE) at the 95% confidence level for each estimate was calculated using 1.96 as the critical value:

$$MoE = 1.96 \times SE(estimate)$$

The MoE was then used to calculate the 95% confidence interval (CI) around each estimate:

$$95\% CI = estimate \pm MoE(estimate)$$

Confidence intervals are used to describe the uncertainty around point estimates. There is a 95% chance that the calculated 95% CI contains the true population quantity being estimated.

Estimates with a margin of error of 10 percentage points or greater have been allocated a hash (#) and should be considered with caution.

Significance testing

Variation or difference in observed values or rates may be due to a number of causes including, among other things, actual differences in the study's populations and sampling error. A statistical test of significance indicates how incompatible the observed data are with a specified hypothesis.

z-score

A difference between prevalence estimates was considered statistically significant if the 95% CIs around the estimates did not overlap. Where there was a small overlap between 95% CIs, a z-score for the difference in observed proportions was calculated using the following formula:

$$z = \frac{(estimate 1 - estimate 2)}{\sqrt{(SE(estimate 1))^2 + SE(estimate 2)^2}}$$

If the absolute value of the z-score was greater than or equal to 1.96, then the difference was reported as statistically significant at the 95% confidence level.

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Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
BMI	body mass index
CI	confidence interval
IRSD	Index of Relative Socio-economic Disadvantage
MoE	margin of error
NHMRC	National Health and Medical Research Council
NHS	National Health Survey
RSE	relative standard error
SA1	Statistical Area level 1
SE	standard error
SEIFA	Socio-Economic Indexes for Areas
WHO	World Health Organization

Symbols

%	per cent
<	less than
>	greater than
≤	less than or equal to
≥	greater than or equal to
kg	kilograms
kg/m ²	kilograms per metre squared
km	kilometres
m	metres

Glossary

active transport: The process of being physically active to make a journey. Common forms of active transport are walking and cycling.

age-standardisation: A way to remove the influence of age when comparing populations with different age structures. This is usually necessary because the rates of many diseases vary strongly (usually increasing) with age. The age structures of the different populations are converted to the same 'standard' structure, and then the disease rates that would have occurred with that structure are calculated and compared.

amenities: include things such as sports facilities, supermarkets, fast-food outlets, and restaurants that provide comfort, convenience and/or enjoyment.

body mass index (BMI): The most commonly used method of assessing whether a person is normal weight, underweight, overweight or obese (see **obesity**). It is calculated by dividing the person's weight (in kilograms) by their height (in metres) squared – that is, $\text{kg} \div \text{m}^2$. For both men and women, underweight is a BMI below 18.5, normal weight is from 18.5 to less than 25, overweight but not obese is from 25 to less than 30, and obese is 30 and over. Sometimes overweight and obese are combined – defined as a BMI of 25 and over (see **overweight**).

built environment: The built environment refers to the human-made surroundings where people live, work and recreate. It includes buildings and parks as well as supporting infrastructure such as transport, water and energy networks (Coleman 2017).

density: The number of units (for example, people, dwellings, employees) per unit of land area (Giles-Corti et al. 2012).

disease burden: The quantified impact of a disease or injury on an individual or population, using the disability-adjusted life year (DALY) measure.

health risk factors: Any factor that causes or increases the likelihood of a health disorder or other unwanted condition or event.

moderate intensity exercise: Physical activity at a level that causes the heart to beat faster, accompanied by some shortness of breath, but during which a person can still talk comfortably.

obesity: Marked degree of overweight, defined for population studies as a **body mass index** of 30 or over. See also **overweight**.

overweight: Defined for the purpose of population studies as a **body mass index** of 25 or over. See also **obesity**.

proximity: A measure of closeness to something such as a supermarket or fast-food outlet.

quintile: A group derived by ranking the population or area according to specified criteria and dividing it into 5 equal parts. The term can also mean the cut-points that make these divisions – that is, the 20th, 40th, 60th and 80th percentiles – but the first use is the more common one. Commonly used to describe socioeconomic areas based on socioeconomic position.

socioeconomic areas: Based on the Index of Relative Socio-Economic Disadvantage, part of the Socio-Economic Indexes for Areas (SEIFA) created from Census data, which aims to represent the socioeconomic position of Australian communities and reflect the overall or average level of disadvantage of the population in an area.

vigorous intensity exercise: Physical activity at a level that causes the heart to beat a lot faster and shortness of breath that makes talking difficult between deep breaths.

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Related publications

The following AIHW reports might be of interest:

- AIHW (2020) [A framework for monitoring overweight and obesity in Australia](#), AIHW, Australian Government, accessed 25 November 2021.
- AIHW (2020) [Built environment and health](#), AIHW, Australian Government, accessed 9 December 2021.
- AIHW (2020) [Insufficient physical activity](#), AIHW, Australian Government, accessed 25 November 2021.
- AIHW (2020) [Novel sources of data for monitoring food and nutrition](#), AIHW, Australian Government, accessed 25 November 2021.
- AIHW (2020) [Overweight and obesity: an interactive insight](#), AIHW, Australian Government, accessed 25 November 2021.
- AIHW (2020) [Overweight and obesity in Australia: an updated birth cohort analysis](#), AIHW, Australian Government, accessed 25 November 2021.
- AIHW (2019) [Data sources for monitoring overweight and obesity in Australia](#), AIHW, Australian Government, accessed 25 November 2021.
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- AIHW (2018) [Nutrition across the life stages](#), AIHW, Australian Government, accessed 25 November 2021.
- AIHW (2018) [Physical activity across the life stages](#), AIHW, Australian Government, accessed 25 November 2021.
- AIHW (2017) [A picture of overweight and obesity in Australia](#), AIHW, Australian Government, accessed 25 November 2021.



Our neighbourhood environment influences our health by supporting or hindering our opportunities to engage in physical activity, access nutritious foods and commute to work. This report explores whether the selected factors in our neighbourhood environment are associated with socioeconomic disadvantage and obesity, physical inactivity, insufficient fruit and vegetable consumption and the daily consumption of sugar sweetened drinks.

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