Reducing the burden due to overweight (including obesity) and physical inactivity

Web report | Last updated: **28 Apr 2023** | Topic: Burden of disease

About

Improving the Australian population's exposure to lifestyle risk factors in physical inactivity and overweight (including obesity) reduces the risk of disease and the disease burden attributable to these risk factors. If exposure to overweight (including obesity) and physical inactivity is reduced, the loss of thousands of healthy years of life could be avoided in 2030.

This report presents results of various scenarios of reduced exposure to overweight (including obesity) and physical inactivity in terms of the disease burden avoided in 2030.

Cat. no: PHE 323

- Summary
- Data

Findings from this report:

- A 1-unit BMI reduction could reduce disease burden attributable to overweight (including obesity) by 11% in 2030
- An extra hour of weekly activity could reduce disease burden attributable to physical inactivity by 16% in 2030
- 13,400 deaths could be prevented if the obese population reduced their BMI to a healthy range
- 1,600 deaths could be prevented if everyone did an extra 15 minutes of exercise, 5 times a week

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Summary

Every year in Australia, millions of years of healthy life are lost because of injury, illness or premature deaths in the population. This loss is called the 'burden of disease'.

In 2018, more than one-third (38%) of disease burden could have been prevented by reducing exposure to risk factors such as tobacco use, overweight (including obesity), alcohol use and physical inactivity (AIHW 2021). These and other lifestyle-related risk factors are major contributors to chronic conditions such as coronary heart disease, dementia, type 2 diabetes and cancer.

This AIHW analysis looked at 2 risk factors for disease – overweight (including obesity) and physical inactivity – to see what could happen if Australians reduced their body mass index (BMI) or were more physically active between 2018 and 2030. In 2018, overweight (including obesity) and physical inactivity jointly accounted for 8.7% of the total burden in Australia – greater than tobacco smoking (8.6%), which was the leading risk factor for disease burden in Australia in 2018.

The year 2030 was chosen as it aligns with the National Preventive Health Strategy 2021–2030, which seeks to achieve improved health outcomes over the decade and is complemented by the National Obesity Strategy 2022–2032 (the Department 2021b, Commonwealth 2022).

Australia's status

In 2017–18, 2 in 3 (67%) adults and 1 in 4 (25%) children were overweight or obese (AIHW 2020a). From 1995 to 2017–18, trends over time have shown an overall increase in people living with overweight (including obesity). Among adults, the prevalence of those living with overweight (including obesity) increased from 57% in 1995 to 67% in 2017–18. The prevalence of obesity among adults similarly increased from 1 in 5 (19%) in 1995 to 1 in 3 (31%) in 2017–18 (AIHW 2020a).

The latest guidelines refer to 'insufficient activity' to describe minimum levels of activity required for health benefits (the Department 2021a). Trends in insufficient physical activity among adults have shown a slight decrease from 69% in 2007–08 to 65% in 2017–18 (AIHW 2020b).

Scenarios in 2030

The analyses examined the following scenarios:

- Stable scenario: in 2030 the prevalence of overweight (including obesity) and physical activity in the population stays at 2018 levels.
- Target scenarios: people at increased risk of disease associated with living with overweight (including obesity) and physical inactivity in 2018 reduce their BMI or increase their level of physical activity, respectively, and maintain this to 2030.
- Trend scenario: for overweight (including obesity), current trends in exposure were extended to 2030. However, limited data were available to inform the same trend for physical activity.

The modelling applied the methods used in the Australian Burden of Disease Study (ABDS) 2018 (AIHW 2021).

The analysis found that small improvements to people's weight and exercise levels could have a big effect on the disease burden attributable to the 2 risk factors:

- If people at risk reduced their BMI by one unit (that is, 1 kg/m^2) – which amounts to about 3 kg for Australians of average height – and maintained this to 2030, disease burden and deaths attributable to overweight (including obesity) could fall by 11% across the population, or 60,400 disability-adjusted life years (DALY), and 10% (2,300 deaths), respectively.
- If people at risk did the equivalent of an extra hour of moderate-intensity activity per week, such as taking a brisk walk, and maintained this to 2030, disease burden and deaths attributable to physical inactivity could fall by 16% (28,300 DALY) and 13% (1,500 deaths), respectively, across the population.

The analysis also found that the most effective interventions for achieving greater improvements in disease burden in 2030 would be those targeting higher levels of BMI (that is, the obese population) and those increasing activity among older people – these are the groups that experience larger disease burden overall.

References

AIHW (Australian Institute of Health and Welfare) (2020a) *Overweight and obesity: an interactive insight*, AIHW, accessed 3 February 2023.

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AIHW (Australian Institute of Health and Welfare) (2021) *Australian Burden of Disease Study: Impact and causes of illness and death in Australia 2018*, AIHW, accessed 29 August 2022, doi:10.25816/5ps1-j259.

Commonwealth (Commonwealth of Australia) (2022) National Obesity Strategy 2022–2032, Health Ministers Meeting, accessed 20 January 2023.

The Department (the Department of Health and Aged Care) (2021a) Physical activity and exercise guidelines for all Australians, the Department, accessed 17 October 2022.

The Department (the Department of Health and Aged Care) (2021b) National Preventive Health Strategy 2021–2030, the Department, accessed 17 October 2022.

Understanding lifestyle risk factors

In 2018, 38% of the burden of disease could have been prevented by reducing or avoiding exposure to 20 modifiable risk factors such as tobacco use, overweight (including obesity), and physical inactivity (AIHW 2021a). The risk factors are 'modifiable' because with lifestyle, environmental and metabolic changes, population risk exposure can be reduced. For example, a person could reduce their level of physical inactivity by taking a walk every day or reduce their BMI by losing weight.

Understanding the role that risk factors play in health and burden of disease is important for improving health outcomes and health service planning and delivery. Increased exposure increases the risk of developing diseases linked to the risk factor.

In 2018, 8.4% of the total disease burden was attributable to overweight (including obesity), making it the second leading risk factor contributing to disease burden after tobacco use (AIHW 2021a). Overweight (including obesity) was the leading risk factor contributing to non-fatal burden (living with disease), responsible for 7.4% of all non-fatal burden, and was the second-leading contributor to fatal burden (dying prematurely), contributing 16,400 deaths (10% of all deaths). It contributed to the burden of 30 diseases including 17 types of cancer, 4 cardiovascular diseases, 3 musculoskeletal conditions, type 2 diabetes, dementia, asthma and chronic kidney disease.

Overweight (including obesity) was responsible for more than 55% of type 2 diabetes disease burden, 51% of hypertensive heart disease burden, 42% of chronic kidney disease burden, 28% of coronary heart disease burden, and more than 28% of the burden from osteoarthritis (AIHW 2021a).

In 2018, physical inactivity accounted for 2.5% of the total disease burden in Australia and 8,300 deaths, making it the ninth leading risk factor contributing to disease burden (AIHW 2021a). It was also the 10th leading risk factor in terms of non-fatal burden and ninth for fatal burden. Physical inactivity is linked to an increased risk of type 2 diabetes, bowel cancer, dementia, coronary heart disease and stroke, as well as uterine and breast cancer in females.

In 2018, overweight (including obesity) and physical inactivity jointly accounted for 8.7% of the total burden in Australia – greater than tobacco smoking (8.6%), which was the leading risk factor for disease burden in Australia in 2018.

More results on the burden attributable to risk factors can be found in the *Australian Burden of Disease Study (ABDS) 2018: Interactive data on risk factor burden*.

The scenario modelling in this report includes depressive disorders as a linked disease for the first time, due to growing evidence of its association with physical inactivity (Pearce et al. 2022).

Increasing physical activity and reducing body mass index have several benefits for individuals and the broader health system including:

- reducing the risk of poor health outcomes
- reducing the number of years of healthy life lost
- reducing the cost of health care and aged care
- improving health service planning and delivery (AIHW 2021b).

Policies encouraging greater physical activity can also lead to more active transport (such as walking or cycling), reduced emissions and increased promotion of green space (AIHW 2022, WHO 2018).

References

AIHW (Australian Institute of Health and Welfare) (2021a) *Australian Burden of Disease Study: Impact and causes of illness and death in Australia 2018*, AIHW, accessed 29 August 2022, doi:10.25816/5ps1-j259.

AIHW (Australian Institute of Health and Welfare) (2021b) *Disease expenditure in Australia 2018–19*, AIHW, accessed 17 October 2022.

AIHW (Australian Institute of Health and Welfare) (2022) *Benefits of the environment to health. A literature review of health benefits derived from 3 ecosystem services: air filtration, local climate regulation, and recreation*, AIHW, accessed 17 October 2022.

Pearce M, Garcia L, Abbas A, Strain T, Barreto Schuch F, Golubic R, Kelly P, Khan S, Utukuri M, Laird Y, Mok A, Smith A, Tainio M, Brage S and Woodcock J (2022) 'Association between physical activity and risk of depression: a systematic review and meta-analysis', *Journal of the American Medical Association Psychiatry,* 79(6):550–559, doi:10.1001/jamapsychiatry.2022.0609.

WHO (World Health Organization) (2018) *Global action plan on physical activity 2018–2030: more active people for a healthier world*, WHO, accessed 17 October 2022.

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Understanding lifestyle risk factors

How did we measure overweight (including obesity)?

Body mass index (BMI) is an internationally recognised standard for classifying overweight and obesity in adults. It is calculated by dividing a person's weight in kilograms by the square of their height in metres. A BMI of 25 kg/m^2 or higher is considered overweight, while obesity is a higher-risk subcategory of being overweight (30 kg/m^2 or higher). A BMI of 25.0–29.9 kg/m^2 is classified as overweight (but not obese). Throughout the report, we refer to living with 'overweight (including obesity)' as the risk factor of being in either BMI category above 25 kg/m^2.

Overweight (including obesity) is a complex condition and is influenced by social, environmental and economic factors which can affect a person's ability to maintain a healthy weight. For further information, see the box below.

While BMI can be a useful measure for monitoring trends in the population, it does not necessarily reflect differing body composition, fat or muscle mass distribution between individuals. Particularly among older persons, other indicators of overweight (including obesity) may be more appropriate in determining health risk (Woo 2015). Further considerations for muscle mass and bone density may be needed before recommending intentional weight loss for older age groups.

Understanding BMI: Richard and Adrian's body mass index

Given that body mass index (BMI) incorporates measures of both height and weight, it is important to understand the relationship between the two that determines one's BMI.

Richard and Adrian are brothers. Richard weighs 90 kg and is 178 cm tall, giving him a BMI of 28 kg/m^2. Adrian weighs the same, though stands taller at 186 cm, giving him a BMI of 26 kg/m^2. While the two share the same weight, their BMI differs because of their different heights. To achieve the target scenario (described further below) of a 1-unit reduction in BMI (that is, 1 kg/m^2), Richard would have to reduce his weight by approximately 3.2 kg and Adrian by 3.5 kg.

While categories of BMI are described in this report, health risk develops gradually along a continuous BMI scale where individual risk differs even within the same BMI category. For example, while Adrian and Richard would be considered in the same category (that is, overweight but not obese), the additional risk of developing overweight-related diseases is greater for Richard due to his higher BMI.

Additionally, while being underweight (that is, having a very low BMI) also presents additional risk of disease, the risk factor presented in this report assesses only burden attributable to high BMI.

References

Woo J (2015) 'Obesity in older persons', *Current Opinion in Clinical Nutrition and Metabolic Care*, 18(1):5–10, doi:10.1097/MCO.0000000000000113.

Understanding lifestyle risk factors

How did we measure physical activity?

Physical activity is any bodily movement produced by skeletal muscles that requires energy expenditure (WHO 2018). Physical activity includes sport and leisure activities; everyday activities, such as doing household chores; and muscle-strengthening activities, such as lifting weights.

Being physically active improves mental and musculoskeletal health and reduces other risk factors such as overweight (including obesity), high blood pressure and high blood cholesterol (AIHW 2022).

Australia's Physical Activity and Sedentary Behaviour Guidelines (the guidelines) recommend minimum levels of activity for different age groups to promote good physical and mental health and wellbeing (the Department 2021). For example, it is recommended that people aged 18 to 64 do a minimum of 150 minutes of moderate- to vigorous-intensity activity (such as playing tennis or high-intensity interval training) a week.

The guidelines reflect acceptable activity levels after assessing the risks and benefits between population exposure and subsequent health impacts. However, the methods applied in this analysis are based on a theoretical exposure level that results in minimal risk of disease. This theoretical level differs from recommended guidelines because they are used for different purposes. See the Technical notes section for further details on the estimation of risk factor attributable burden.

Physical activity can be measured using the metabolic equivalent of tasks (METs), with 1 MET equivalent to 1 kcal/kg/hr, multiplied by the time spent active and the intensity of the activity to give MET-minutes.

Understanding METs: Julianne and Yolanda's activity levels

To calculate the amount of weekly physical activity using metabolic equivalent of tasks (METs), it is necessary to look at the amount of time spent being active and the intensity of each activity. This information is required for activity related to leisure, a person's activity at work, transport, and household chores (including gardening) to give the total amount of weekly activity in units of weekly MET-minutes (MET-mins).

Yolanda, aged 33, reports riding her bicycle to work each day, a 1-hour return commute (MET intensity score for moderate-intensity activity of 5). Her total MET score from travelling to work is 1,500 weekly MET-mins (60 minutes x 5 days a week x 5). At her job, she is on her feet doing physically intensive work for 2-hour shifts each day of the working week (MET intensity score for vigorous activity of 7.5). Her total MET-mins score from work is 4,500 MET-mins weekly (120 minutes x 5 days a week x 7.5). Based on time use survey results by age and sex, Yolanda's average weekly MET-mins from household chores amounts to 165 MET-mins. In an average week, Yolanda's activity measures 6,165 MET-mins in total.

In comparison, Julianne, aged 70, is retired and reports taking hour-long leisurely strolls once a week (MET intensity of 3.5). Based on time use survey results, Julianne's average weekly activity from household chores amounts to 237 MET-mins. Julianne's total activity in an average week amounts to 447 MET-mins in total.

Yolanda and Julianne's different levels of weekly activity mean they are exposed to different levels of additional risk attributable to inactivity. Yolanda's activity categorises her in the high activity level category (greater than 4,200 weekly MET-mins) while Julianne would be in the sedentary activity level category (below 600 weekly MET-mins). Yolanda would have minimal additional risk of developing diseases linked to inactivity. However, Julianne would be at additional risk of developing inactivity-related disease.

In assessing scenarios where additional MET-mins are used to explain improvements in activity, it is the total number of additional MET-mins over a week that is important in determining health risk benefits. For example, 15 minutes of moderate-intensity activity, 5 days a week, amounts to 75 minutes in total. These 75 minutes could be distributed over any number of days to achieve the same benefit.

References

AIHW (Australian Institute of Health and Welfare) (2022) *Insufficient physical activity*, AIHW, accessed 17 October 2022.

The Department (the Department of Health and Aged Care) (2021) Physical activity and exercise guidelines for all Australians, the Department, accessed 17 October 2022.

WHO (World Health Organization) (2018) *Global action plan on physical activity 2018-2030: more active people for a healthier world*, WHO, accessed 17 October 2022.

What scenarios did we examine?

Attributable burden is the amount by which disease burden could be reduced if exposure to the risk factor had been avoided or reduced to the lowest possible exposure. For example, the attributable burden for physical inactivity is the amount of illness and death that could be avoided if everyone was active enough to maintain a minimum risk of developing disease. This is quantified by using burden of disease measures, including the disability-adjusted life year (DALY). See the Technical notes section for a detailed description of data sources and methods used to calculate attributable burden.

What are disability-adjusted life years?

Disability-adjusted life years (or DALY) is a measure used in burden of disease analysis. It counts the combined years of healthy life lost through either premature death or living with disability due to illness or injury.

The modelling in this report explored the impact of hypothetical scenarios on disease burden in the year 2030 to align with national preventive health targets. See National health strategies for an overview of these targets.

This work builds on the latest methods used in the *Australian Burden of Disease Study (ABDS) 2018* to extend earlier scenario modelling that estimated burden attributable to overweight (including obesity) and physical inactivity (AIHW 2021). For both risk factors, the scenarios are:

- The stable scenario: estimated attributable burden in 2030 if the prevalence of living with overweight (including obesity) and levels of physical activity were to stay as they were in 2018.
- The target scenarios: estimated attributable burden in 2030 if the population at risk in 2017–18 improved their exposure to the risk factor. The analysis looked at 3 scenarios for overweight (including obesity) and 6 scenarios for physical inactivity (Table 1).
- A trend scenario: for overweight (including obesity), estimated attributable burden in 2030 if current trends in exposure were extended to 2030.

Trends in BMI were based on measured height and weight from successive health surveys of the Australian population by the Australian Bureau of Statistics. However, due to changes in the collection of self-reported data over time from successive surveys, a trend scenario for physical activity was not included. See the Technical notes section for more information.

Table 1a: Summary of target scenarios of improved BMI exposure

Overweight (including obesity)
Reduced BMI by 1 kg/m2
Reduced BMI by 2 kg/m2
Reduction in obese population’s BMI to overweight (but not obese) classification

Table 1b: Summary of target scenarios of improved physical activity exposure

Physical inactivity
Additional 15 mins of moderate-intensity activity per week
Additional 30 mins of moderate-intensity activity per week
Additional 60 mins of moderate-intensity activity per week
Additional 15 mins of moderate-intensity activity, 5 days a week
Additional 30 mins of moderate-intensity activity, 5 days a week

Additional 60 mins of moderate-intensity activity, 5 days a week

Note: Refer to the technical notes for more information on data sources and methods used to examine these scenarios.

References

AIHW (Australian Institute of Health and Welfare) (2021) *Australian Burden of Disease Study: Methods and supplementary material 2018*, AIHW, accessed 29 August 2022.

What scenarios did we examine?

The National Preventive Health Strategy 2021–2030 and the National Obesity Strategy 2022–2032

The National Preventive Health Strategy 2021–2030 provides a long-term approach to improving health outcomes through prevention in Australia (the Department 2021). The strategy outlines key health targets for Australia to achieve by 2030 to improve health outcomes. The National Obesity Strategy 2022–2032 similarly presents targets for obesity to provide a comprehensive guide for implementing preventive measures for the risk factor (Commonwealth 2022).

Four targets across these strategies aim to change the prevalence of obesity and physical inactivity by 2030:

1. Halt the rise and reverse the trend in the prevalence of obesity in adults.
2. Reduce overweight and obesity in children and adolescents aged 2–17 by at least 5%.
3. Reduce the prevalence of physical inactivity among children, adolescents and adults by at least 15%.
4. Reduce the prevalence of Australians (aged 15 and over) undertaking no physical activity by at least 15%.

While these targets do not directly align with the scenarios of this project, the analysis provides an assessment of the potential benefits to be gained by 2030 from reducing exposure to these risk factors.

References

Commonwealth (Commonwealth of Australia) (2022) National Obesity Strategy 2022–2032, Health Ministers Meeting, accessed 20 January 2023.

The Department (the Department of Health and Aged Care) (2021) National Preventive Health Strategy 2021–2030, the Department, accessed 17 October 2022.

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Overweight (including obesity)

Overweight (including obesity)

Overweight (including obesity) is a major risk factor for cardiovascular disease, type 2 diabetes, some musculoskeletal conditions and some cancers. As the level of BMI increases, so does the risk of developing these conditions.

The proportion of Australians estimated to be in each BMI category in 2030 under each scenario is shown in Figure 1. In 2017–18, 60% of Australians aged 5 and over were living with overweight (including obesity). Under the stable scenario, the proportions of the population in each physical activity category would be the same in 2030.

In 2017–18, a greater proportion of males (66%) than females (54%) were living with overweight (including obesity). Based on current trends, both males and females are expected to have greater prevalence (69% and 58%, respectively) of living with overweight (including obesity) in 2030.

If current trends continued (trend scenario), the population expected to be living with overweight (including obesity) in 2030 could increase to 64%.

If everyone in the population at risk of disease due to overweight (including obesity) in 2018 reduced their BMI by 1 kg/m^2, and these rates were maintained to 2030, 52% of the population could be expected to be living with overweight (including obesity) in 2030 (a 7.6 percentage-point reduction compared with the stable scenario). If BMI were reduced by 2 kg/m^2, this proportion could decrease further to 45%.

In the scenario where the population reduced their BMI by 1 kg/m^2, the proportion of males at risk in 2030 could decrease to 58% overweight (including obese) (an 8 percentage-point reduction). For females, this could decrease to 47% (a 7.1 percentage-point reduction). In the scenario where BMI reduced by 2 kg/m^2, male and female overweight (including obesity) prevalence could decrease further to 48% and 41%, respectively. In the scenario where the obese population reduced their BMI to overweight (but not obese) status, 66% of males and 54% of females could be overweight (but not obese).

Figure 1: Prevalence of overweight (including obesity) in 2030, by body mass index categories and scenario

This figure presents stacked bar charts of the proportion of males, females and persons aged 5 years or older within each body mass index category (BMI), by scenario. There is also a filter that allows the user to select different age groups to present.

There are three categories of BMI used to categorise the population within each sex: normal or underweight (BMI less than 25), overweight but not obese (BMI between 25 and 30), and obese (BMI greater than or equal to 30).

In 2017–18, the stable scenario, 32% of persons were overweight but not obese, and 27% were obese. If current trends continued to 2030, 33% of persons could be expected to be overweight but not obese, and 31% could be expected to be obese. If the population at risk were to reduce their BMI by 1 unit, 29% would be overweight but not obese, and 23% would be obese.

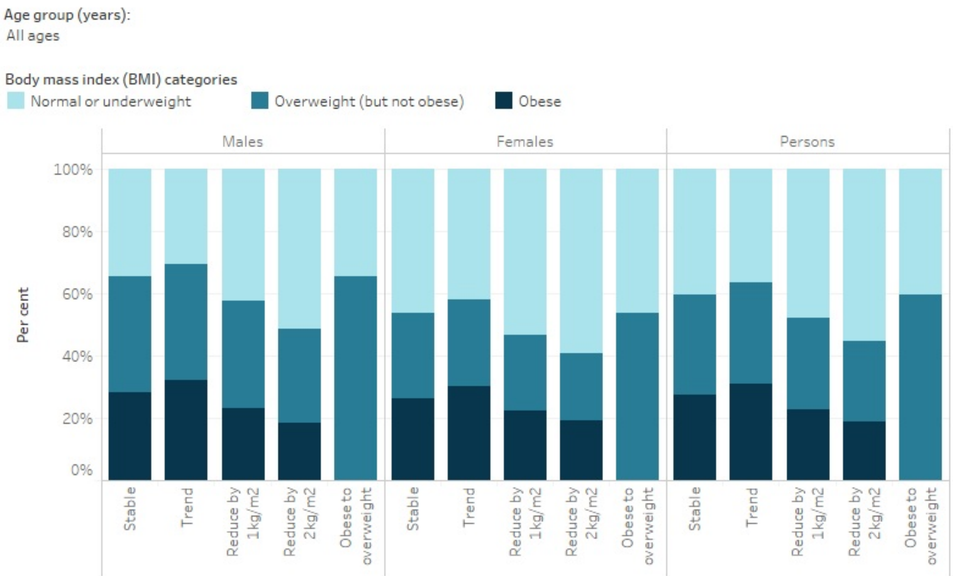

Figure 1: Prevalence of overweight (including obesity) in 2030, by body mass index categories and scenario
Notes: 'Normal or underweight' BMI refers to BMI < 25kg/m2, 'overweight (but not obese)' refers to BMI greater than 25 and less than 30kg/m2 and 'obese' refers to BMI greater than or equal to 30kg/m2. 'Obese to overweight' scenario refers to the scenario whereby the obese subpopulation were assigned a BMI of 29.99 kg/m2, into the 'overweight (but not obese)' category. Results include data for those aged 5 years and older.
Source: ABS National Health Surveys 2007-08, 2011-12, 2014-15 and 2017-18.
https://www.aihw.gov.au

How to navigate the interactive visualisation

- Use the drop-down lists at the top of the visualisation to filter the data by age group.

- Hover over the bars or coloured tiles on the charts for additional information.
- The toolbar at the bottom of the visualisation enables users to interact with the data in different ways:

- Undo = Undo the latest filter applied.
- Redo = Redo the latest filter applied.
- Revert = Clears all filters applied and reverts visualisation to default filters.
- Refresh = Connects to the underlying data source and updates the visualisation with any changes in the data *(not applicable to this visualisation)*.
- Pause = Stops the visualisation from updating each time a filter is changed, enabling multiple filters to be changed at once. Clicking ‘Resume’ will update the visualisation according to the selected filters.
- Share = Generates a link that can be shared (note that filters will not be applied when link is shared).
- Download = Allows a downloadable file as either an image (PNG), PDF or PowerPoint file. This is a useful way to save a snapshot of the visualisation to include in a document or presentation.
- Full screen = Displays the dashboard in full screen mode (press Esc to return to original view).

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Overweight (including obesity)

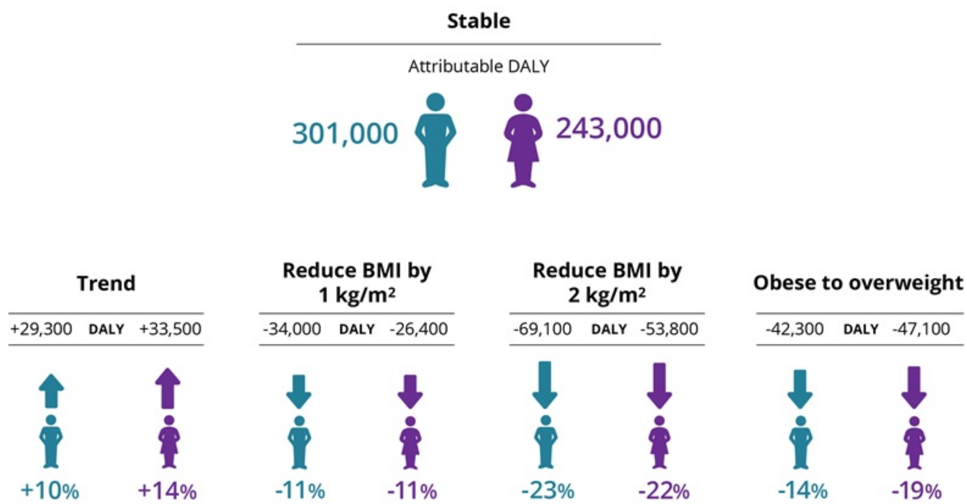
What is the burden attributable to overweight (including obesity) in 2030?

If current trends in the prevalence of overweight (including obesity) continued through to 2030 (trend scenario), 8.9% of total burden may be attributable to overweight (including obesity) compared with 8% in the stable scenario (an increase of 0.9 percentage points). This proportion decreases to 7.1% of total burden in the target scenario where BMI would be reduced by 1 kg/m^2 (a 0.9 percentage-point reduction compared with the stable scenario). If current trends continued, attributable disease burden and deaths could be 12% (62,900 DALY) and 16% (3,800 deaths) higher, respectively, compared with the stable scenario (Figure 2).

If everyone in the population at risk in 2017–2018 were to reduce their BMI by 1 kg/m^2, and these rates were maintained to 2030, disease burden and deaths attributable to overweight (including obesity) could fall by 11% (60,400 DALY) and 10% (2,300 deaths), respectively, compared with the stable scenario. This decreases further to 23% (123,000 DALY) and 22% (5,300 deaths) in the scenario where BMI is reduced by 2 kg/m^2.

If those in the obese population were to reduce their BMI only to overweight status (that is, if there was no obesity in the population), 16% (89,300 DALY) of future attributable burden and 14% (3,300 deaths) of attributable deaths could be avoided in 2030. Changes in attributable burden also differ between males and females.

Image: Changes in attributable burden, by sex and scenario



Older age groups experience greater overall burden attributable to overweight (including obesity) as many linked diseases are age-related. This means that older Australians also have the greatest potential gains under the target scenarios. For example, if the obese population were to reduce their BMI status to overweight (but not obese), with all else being equal, 29,100 DALY and 1,200 deaths could be prevented in 2030 (compared with the stable scenario) among those aged 70 to 79, compared with an estimated 5,100 DALY and 22 deaths that could be prevented in those aged under 40.

While younger age groups showed greater relative reductions of burden in the target scenarios, greater amounts of potential burden could be prevented among older age groups, who experience larger overall disease burden. However, there may be further improvements in longer-term health from addressing overweight (including obesity) among younger age groups, including impacts on other risk factors not measured here.

Among broad disease groups, cardiovascular diseases were estimated to have the greatest potential reduction in burden attributable to overweight (including obesity) with 20,100 DALY (11% fewer) and 1,000 deaths (10% fewer) avoided in 2030 in the scenario where the population at risk reduced their BMI by 1 kg/m^2 compared with the stable scenario.

Among specific causes, coronary heart disease had the greatest potential reduction, of 12,600 DALY and 660 deaths avoided in 2030 in the same scenario.

Across all target scenarios, endocrine disorders (which includes diabetes) were estimated to have the highest percentage-point reduction in the proportion of total burden attributable to overweight (including obesity).

Among specific causes, uterine cancer had the highest estimated percentage-point reduction of total burden attributable to overweight (including obesity) in all target scenarios.

Among older age groups, cardiovascular diseases as a group of diseases were estimated to have the greatest potential reduction in burden. For example, for the scenario where the population reduced their BMI by 1 kg/m^2, 3,200 DALY and almost 400 deaths could be avoided in those aged 80 and older. However, among specific causes, dementia had the greatest estimated potential reduction in burden in the same scenario for this age group (2,500 fewer DALY and 250 fewer deaths).

See the Technical notes section for a detailed description of data sources and methods used to calculate attributable burden for each scenario.

Figure 2: Burden attributable to overweight (including obesity) in 2030, by scenario

This figure represents two bar charts on the changes in burden attributable to overweight (including obesity) in 2030, by scenario, relative to the stable scenario.

The first bar chart presents these results for all ages. If current trends in the prevalence of overweight (including obesity) continued to 2030, attributable burden and deaths could be 12% (62,900 DALY) and 16% (3,800 deaths) higher, respectively, compared with the stable scenario. If everyone in the population at risk in 2017–18 were to reduce their BMI by 1 kg/m2, and these rates were maintained to 2030, disease burden and deaths attributable to overweight (including obesity) could fall by 11% (60,400 DALY) and 10% (2,300 deaths), respectively, compared with the stable scenario. This decreases further to 23% (123,000 DALY) and 22% (5,300 deaths) in the scenario where BMI were reduced by 2 kg/m2. If those in the obese population only were to reduce their BMI to overweight status (that is, if there was no obesity in the population), 16% (89,300 DALY) of future attributable burden and 14% (3,300 deaths) of attributable deaths could be avoided in 2030.

The second bar chart presents results for specific age groups. Older age groups experience greater overall burden attributable to overweight (including obesity). If the obese population were to reduce their BMI status to overweight (but not obese), with all else being equal, 29,100 DALY and 1,200 deaths could be prevented in 2030 (compared with the stable scenario) among those aged 70 to 79 years, compared with an estimated 5,100 DALY and 22 deaths that could be prevented in those aged under 40.

There are filters that allow the user to select these results for different burden of disease measures, disease groups and specific causes. Among broad disease groups, cardiovascular diseases were estimated to have the greatest potential reduction in burden attributable to overweight (including obesity) with 20,100 DALY (11% fewer) and 1,000 deaths (10% fewer) avoided in 2030 in the scenario where the population at risk reduced their BMI by 1 kg/m2 compared with the stable scenario. Among specific causes, coronary heart disease had the greatest potential reduction of 12,600 DALY and 700 deaths avoided in 2030 in the same scenario.

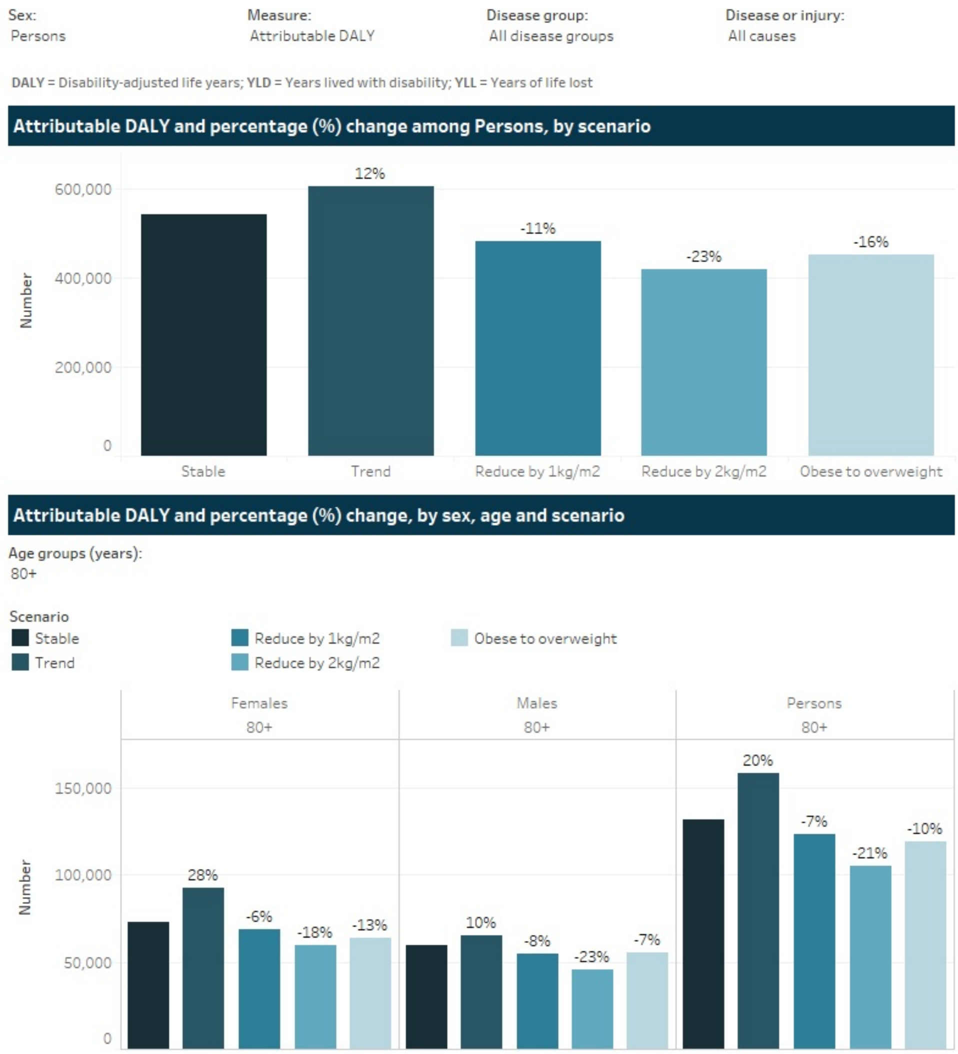


Figure 2: Burden attributable to overweight (including obesity) in 2030, by scenario
Notes: The stable scenario is the comparator for the change in attributable burden. 'Obese to overweight' scenario refers to the scenario whereby the obese subpopulation were assigned a BMI of 29.99 kg/m2, into the 'overweight (but not obese)' category. 'Overweight (but not obese)' refers to BMI greater than 25 and less than 30kg/m2 and 'obese' refers to BMI greater than or equal to 30kg/m2. Refer to the technical notes for more information on data sources and methods used in the study.
Source: AIHW analysis of Australian Burden of Disease database.
https://www.aihw.gov.au

How to navigate the interactive visualisation

- Use the drop-down lists at the top of the visualisation to filter the data by sex, measure of disease burden, disease group and disease/injury.

- Hover over the bars or coloured tiles on the charts for additional information.
- The toolbar at the bottom of the visualisation enables users to interact with the data in different ways:

- Undo = Undo the latest filter applied.
- Redo = Redo the latest filter applied.
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Overweight (including obesity)

Across all scenarios, burden attributable to obesity (BMI greater than or equal to 30 kg/m^2) was greater than the burden attributable to overweight (but not obese) BMI (BMI between 25 and 30 kg/m^2).

Using the stable scenario as the baseline, if the population living with obesity reduced their BMI by 1 kg/m^2, the burden attributable to obesity could be reduced from 324,000 to 272,000 DALY (52,100 fewer DALY) and from 13,400 to 11,500 deaths (1,900 fewer deaths) (Figure 3). This avoidable burden is more than 4 times that of the potential reduction in burden attributable to living with overweight (but not obese) BMI (8,300 fewer DALY and 400 fewer deaths in the same scenario).

Compared with the stable scenario, the trend scenario shows an increase in burden attributable to obesity of 22% (or 72,000 DALY). Conversely, the trend scenario shows a decrease in burden attributable to the overweight (but not obese) category (a decrease of 4.2%, or 9,200 DALY). If current trends continued, 5.8% of total burden may be attributable to obesity compared with 4.8% in the stable scenario. This reflects the trend towards increased obesity prevalence in 2030 with obesity contributing an increasing proportion of disease burden if trends continued. This proportion decreases to 4% of total burden in the target scenario where BMI is reduced by 1 kg/m^2.

The greater expected increase in 2030 for burden attributable to obesity compared with overweight (but not obese) BMI is seen across all age groups, and both males and females (trend scenario). However, the expected increase in obesity burden is greater among older age groups than younger age groups (40% increase in obesity burden for those aged 80 and over compared with 4% for those under 40).

Across all age groups and sexes, the target scenarios indicate that greater improvements in burden occur through reductions to obesity-related burden compared with overweight (but not obese) burden. While stabilising the rise in prevalence of living with overweight (including obesity) could lessen disease burden compared with current trends, these results indicate that the most effective interventions for reducing the loss of healthy years of life in 2030 would be those that target higher levels of BMI.

If the obese population were to reduce their BMI status to overweight (but not obese), an overall 89,300 DALY and 3,300 deaths could be prevented in 2030 compared with the stable scenario (Figure 2). While the burden attributable to living with overweight (but not obese) BMI increases in this scenario (107% increase as obesity burden is moved to the overweight but not obese category), there is an overall burden reduction across the population due to the burden attributable to obesity being reduced to zero.

If the obese population were to reduce their BMI status to a healthy level of BMI (that is, neither overweight nor obese), then 324,000 DALY and 13,400 deaths attributable to obese BMI could be prevented in 2030.

Among broad disease groups and in both target scenarios where BMI was reduced by 1 and 2 kg/m^2, cardiovascular diseases were estimated to have the greatest reduction in burden attributable specifically to obesity. Endocrine disorders were estimated to have the highest percentage-point reduction in the proportion of burden attributable to obesity (a 3.5 percentage-point reduction in the scenario reducing BMI by 1 kg/m^2).

Among specific causes, coronary heart disease was estimated to have the highest reduction in burden attributable specifically to obesity compared with the stable scenario (11,100 fewer obesity-related DALY in the target scenario reducing BMI by 1 kg/m^2). Uterine cancer was estimated to have the highest percentage-point reduction in the proportion of burden attributable to obesity (a 5.6 percentage-point reduction in the same scenario).

See the Technical notes section for a detailed description of data sources and methods used to calculate attributable burden for each scenario.

Figure 3: Attributable burden in 2030, by BMI category

This figure presents two tabs of results on the changes in burden attributable to overweight (including obesity) in 2030 for each specific category of overweight (including obesity), by scenario relative to the stable scenario.

The first tab presents results by sex with two columns of results for each BMI category of overweight but not obese, and obesity. The second tab presents results by age.

Using the stable scenario as the baseline, if the population at risk reduced their BMI by 1 kg/m2, the burden attributable to obesity could be reduced from 324,000 to 272,000 DALY (52,100 fewer DALY) and from 13,400 to 11,500 deaths (1,900 fewer deaths) (Figure 3). This avoidable burden more than four times that of the potential reduction in burden attributable to living with overweight (but not obese) BMI (8,300 fewer DALY and 400 fewer deaths in the same scenario).

Compared with the stable scenario, the trend scenario shows an increase in burden attributable to obesity of 22% (or 72,000 DALY). Conversely, the trend scenario shows a decrease in burden attributable to the overweight (but not obese) category (a decrease of 4.2%, or 9,200 DALY). If current trends continued, 5.8% of total burden may be attributable to obesity compared with 4.8% in the stable scenario. This proportion decreases to 4% of total burden in the target scenario where BMI were to be reduced by 1 kg/m2.

The greater expected increase in 2030 for burden attributable to obesity compared with overweight (but not obese) BMI is seen across all age groups, and both males and females (trend scenario). However, the expected increase in obesity burden is greater among older age groups compared with younger age groups (40% increase in obesity burden for those aged 80 years and older compared with 4% for those under 40 years).

Across all age groups and sexes, the target scenarios indicate that greater improvements in burden occur through reductions to obesity-related burden compared with overweight (but not obese) burden.

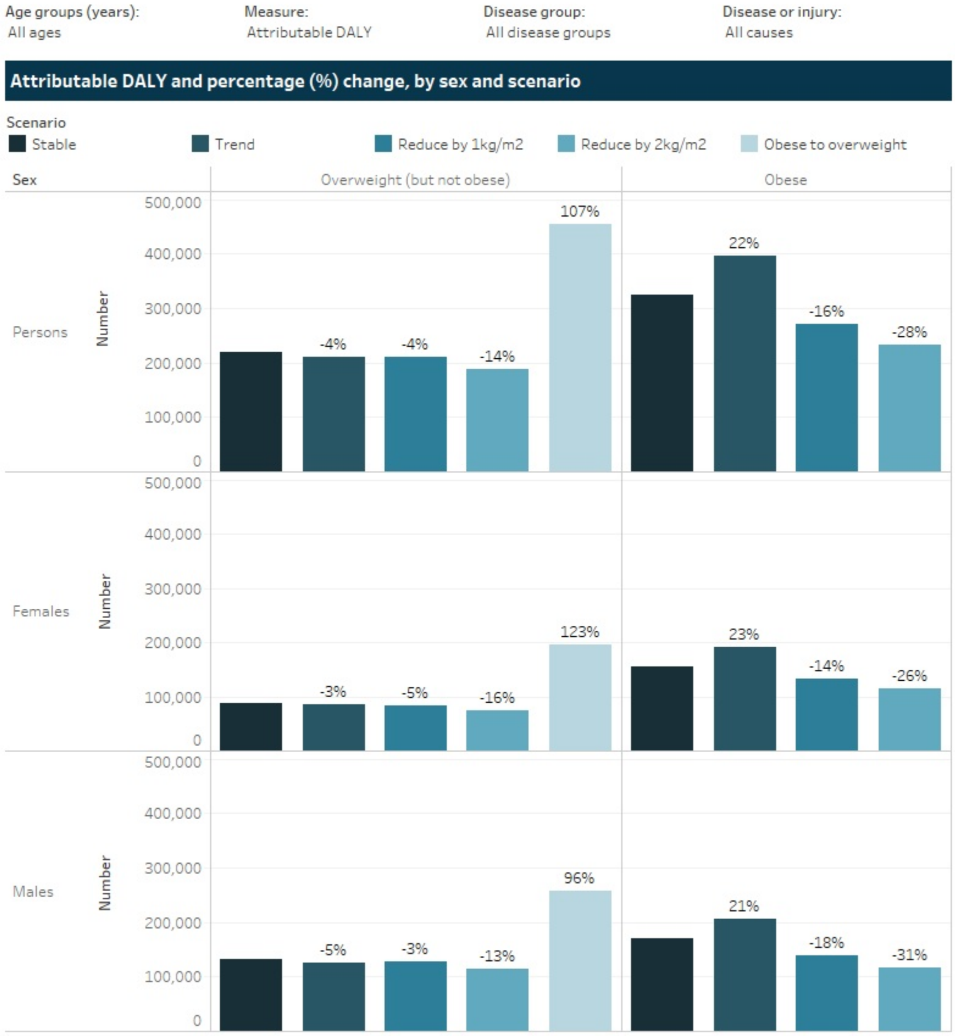

Figure 3: Attributable burden in 2030, by BMI category
Notes: The stable scenario is the comparator for the change in attributable burden. 'Obese to overweight' scenario refers to the scenario whereby the obese subpopulation were assigned a BMI of 29.99 kg/m2, into the 'overweight (but not obese)' category. Therefore, no burden due to obesity is recorded in this scenario. 'Overweight (but not obese)' refers to BMI greater than 25 and less than 30kg/m2 and 'obese' refers to BMI greater than or equal to 30kg/m2. Refer to the technical notes for more information on data sources and methods used in the study.
Source: AIHW analysis of Australian Burden of Disease database.
https://www.aihw.gov.au

How to navigate the interactive visualisation

- Use the drop-down lists at the top of the visualisation to filter the data by age group, measure of disease burden, disease group and disease/injury.

- Hover over the bars or coloured tiles on the charts for additional information.
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Physical inactivity

Physical inactivity

The proportion of Australians estimated to be in each physical activity category in 2030 under each scenario is shown in Figure 4. These categories are defined in weekly metabolic equivalent of tasks units (see Understanding METs box).

What are the physical activity MET categories?

The physical activity categories are defined in terms of weekly MET-mins as below:

- **Sedentary**: Less than 600 MET-mins per week
- **Low**: 600 – 2,399 MET-mins per week
- **Moderate**: 2,400 – 4,199 MET-mins per week
- **High**: Greater than 4,200 MET-mins per week

These categories were defined for this study to broadly indicate the level of risk associated with diseases linked to physical inactivity. For example, sedentary levels of activity put a person at greater risk of developing coronary heart disease than low levels of activity. However, like BMI, health risk develops gradually along a continuous scale of weekly activity where individual risk differs even within the same MET-mins category.

In 2017–18, 25% of Australians reported sedentary levels of weekly activity and 18% reported high levels of weekly activity. Under the stable scenario, the proportions of the population in each physical activity category would be the same in 2030.

If everyone in the population at increased risk of disease due to physical inactivity (those with sedentary, low and moderate physical activity levels) did the equivalent of an extra 15 minutes of moderate-intensity exercise (for example, cycling), 5 days a week, the proportion of the population expected to report sedentary levels of physical activity could reduce to 10%. Under this scenario, 21% of the population could be expected to report high levels of activity (2 percentage points more than the stable scenario).

If those at risk did the equivalent of an extra 30 minutes of moderate-intensity activity, 5 days a week, the proportion of Australians reporting high levels of physical activity could be expected to increase to 23% in 2030, with 0% sedentary.

When looking at physical activity among males and females separately, different patterns emerge. For males, the proportion of the population in the sedentary category in 2017–18 was 22%, with 25% in the high activity category. For females, 28% of the population reported sedentary levels of activity and 12% reported high activity.

Large differences are also seen across age groups. In 2017–18, 37% of Australians aged 65 and over reported sedentary levels of weekly activity, compared with 21% for those aged under 35. Only 8% of those over 65 reported high levels of weekly activity, compared with 24% for those aged under 35.

In the scenario where the population does the equivalent of an additional 15 minutes of moderate-intensity activity, 5 days a week, the proportion of those aged over 65 reporting sedentary levels of activity could reduce by 26 percentage points, compared with a 13 percentage-point reduction for those aged under 35.

Figure 4: Prevalence of physical activity in 2030, by activity categories and scenario

This figure presents stacked bar charts of the proportion of the population aged 20 years or older within each category of weekly activity levels, by scenario. There is also a filter that allows the user to select different age groups and sexes to present.

There are four categories of activity levels used to categorise the population in terms of MET-minutes: sedentary (fewer than 600 MET-minutes per week), low (between 600 and 2,400 MET-minutes per week), moderate (between 2,400 and 4,200 MET-minutes per week), and high (greater than or equal to 4,200 MET-minutes per week). See technical notes for further details regarding metabolic equivalent of tasks.

In 2017–18, the stable scenario, 25% of persons reported sedentary levels of weekly activity, and 18% reported high levels of weekly activity. If the population at risk were to increase their moderate-intensity levels of activity by an extra hour per week, 15% would be expected to report sedentary levels of activity, and 23% for high levels of activity.

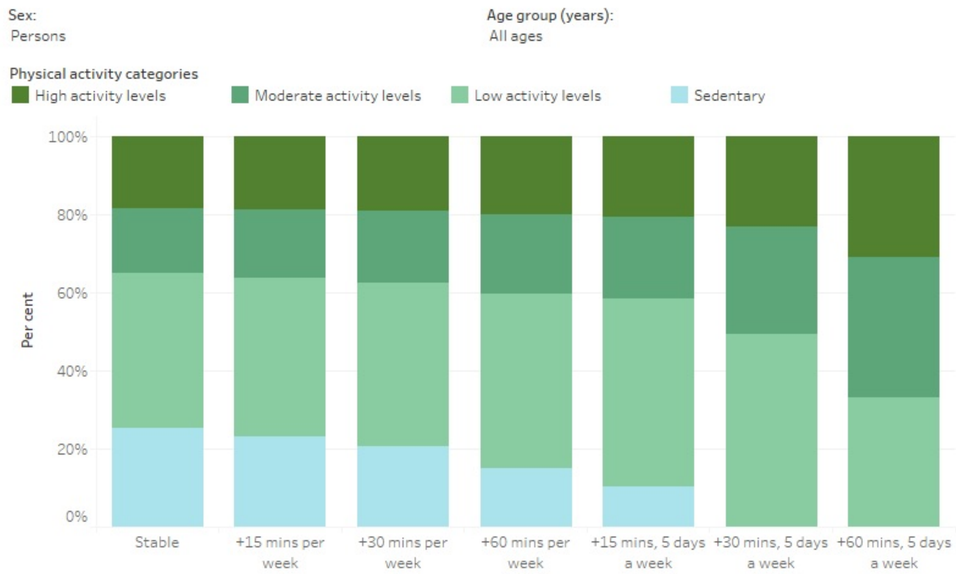

Figure 4: Prevalence of physical activity in 2030, by activity categories and scenario
Notes: In each scenario presented, it is the total number of additional minutes of physical activity over a week that is important. For example, 15 minutes, 5 days per week amounts to 75 minutes in total. This 75 minutes could be distributed over any number of days to achieve the same benefit. Additional activity also refers to moderate-intensity activity (MET intensity score of 5). The 'sedentary' category of physical activity refers to fewer than 600 MET-mins per week, 'low' is 600-2,399 MET-mins per week, 'moderate' is 2,400-4,199 MET-mins per week and 'high' is greater than or equal to 4,200 MET-mins per week. Refer to the technical notes for more information on how these categories relate to risk (including the theoretical minimum risk exposure), data sources and methods used in the study. Results include data for those aged 20 years and older.
Source: AIHW analysis of ABS National Health Surveys.
https://www.aihw.gov.au

How to navigate the interactive visualisation

- Use the drop-down lists at the top of the visualisation to filter the data by sex and age group.

- Hover over the bars or coloured tiles on the charts for additional information.
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Previous analyses by the AIHW indicate that the prevalence of insufficient physical activity in adults slightly decreased between 2007–08 and 2017–18 from 69% to 65% (AIHW 2020). These figures represent the proportion of Australians meeting the guidelines for physical activity (based on self-reported leisure activity), though rates have not changed significantly since 2011–12. However, if these trends were maintained to 2030, this may result in improvements to burden attributable to physical inactivity. Due to data limitations, a trend scenario in this study was not available to inform suitable comparisons with other scenarios. See the Technical notes section for further information.

References

AIHW (Australian Institute of Health and Welfare) (2020) *Insufficient physical activity*, AIHW, accessed 17 January 2023.

Physical inactivity

What is the burden attributable to physical inactivity by 2030?

If everyone in the population at risk did the equivalent of an extra hour of moderate-intensity activity per week, and this activity was maintained to 2030, 2.2% of total burden could be attributable to physical inactivity compared with 2.6% in the stable scenario (a decrease of 0.4 percentage points). If everyone in the population at risk did an extra hour of moderate-intensity activity (such as taking a brisk walk) per week, attributable burden and deaths could fall by 16% (28,300 DALY) and 13% (1,500 deaths), respectively, compared with the stable scenario.

Among males, with an additional hour of moderate-intensity exercise per week, 17% (15,500 DALY) of the burden and 14% (750 deaths) of deaths attributable to physical inactivity could potentially be avoided in 2030 compared with the stable scenario. For females, attributable burden and deaths could fall by 14% (12,800 DALY) and 12% (740 deaths) in the same scenario.

For those aged under 35, the equivalent of an additional hour of moderate activity per week, could reduce attributable burden in 2030 by 46% (3,000 DALY) compared with the stable scenario. This is due to the relatively small overall burden experienced in these age groups. In comparison, for those aged 80 and over, there was a 12% reduction in burden for the same scenario, though this amounts to a decrease of 8,500 attributable DALY.

While younger age groups showed greater relative reductions of burden in scenarios of additional exercise, greater absolute amounts of potential burden could be prevented among older age groups, who experience larger overall disease burden. However, there may be further improvements in longer-term health from addressing inactivity among younger age groups.

Among broad disease groups, cardiovascular diseases were estimated to have the greatest potential reduction in burden attributable to physical inactivity, with 15,600 DALY (21% fewer) and 1,300 deaths (21% fewer) avoided in 2030 if the population at risk did an extra hour of moderate activity per week compared with the stable scenario. The disease group of mental health conditions and substance use disorders had the next highest potential reduction in burden attributable to physical inactivity, with 8,800 DALY avoided (47% fewer).

Among specific causes, the largest amount of attributable burden that could be prevented was associated with coronary heart disease (11,700 DALY and 930 deaths in the scenario of an additional hour of activity per week). This was followed by depressive disorders with 8,800 DALY avoided in the same scenario.

Target scenarios with increased physical activity produce a larger reduction in attributable burden. If the population did the equivalent of an extra 15 minutes of activity, 5 days a week, 18% (32,100 DALY) of attributable burden and 15% (1,600 deaths) of attributable deaths in 2030 could be avoided compared with the stable scenario. If the amount of additional activity increased to 30 minutes, 5 days a week, 31% (55,700 DALY) of future attributable burden and 29% (3,300 deaths) of attributable deaths could be avoided. If the amount of additional activity increased further to 60 minutes, 5 days a week, 49% (87,600 DALY) of future attributable burden and 47% (5,300 deaths) of attributable deaths could be avoided.

See the Technical notes section for a detailed description of data sources and methods used to calculate attributable burden for each scenario.

Figure 5: Burden attributable to physical inactivity in 2030, by scenario

This figure represents two bar charts on the changes in burden attributable to physical inactivity in 2030, by scenario, relative to the stable scenario.

The first bar chart presents these results for all ages. If everyone in the population at risk did the equivalent of an extra 15 minutes of moderate-intensity activity, 5 days a week, and this activity was maintained to 2030, 2.2% of total burden could be attributable to physical inactivity compared with 2.6% in the stable scenario (a decrease of 0.5 percentage points). If everyone in the population at risk did an extra 15 minutes of moderate-intensity activity, 5 days a week, attributable burden and deaths could fall by 18% (32,100 DALY) and 15% (1,600 deaths), respectively, compared with the stable scenario.

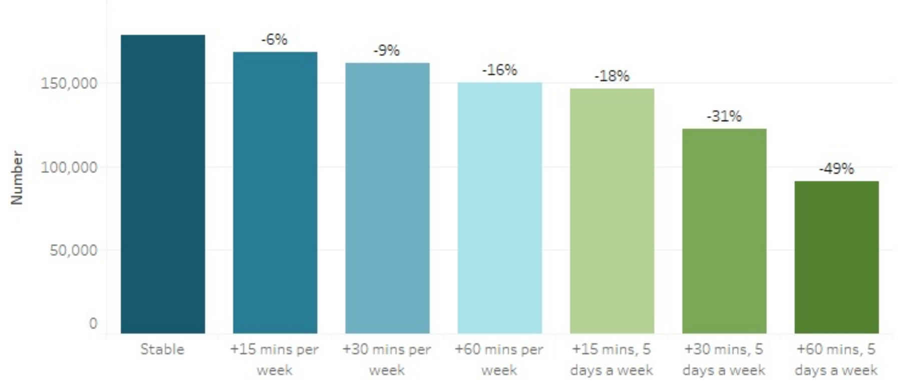
The second bar chart presents results for specific age groups. For those aged under 35 years, the equivalent of an additional 15 minutes of moderate activity, 5 days a week, could reduce attributable burden in 2030 by 50% (3,200 DALY) compared with the stable scenario. This is due to the relatively small overall burden experienced in these age groups. In comparison, for those aged 80 years and over, there was a 13% reduction in burden for the same scenario, though this amounts to a decrease of 9,300 attributable DALY.

There are filters that allow the user to select these results for different burden of disease measures, disease groups and specific causes. Among broad disease groups, cardiovascular diseases were estimated to have the greatest potential reduction in burden attributable to physical inactivity, with 17,700 DALY (24% fewer) and 1,400 deaths (23% fewer) avoided in 2030 if the population at risk did an extra 15 minutes of moderate activity, 5 days a week compared with the stable scenario. Among specific causes, the largest amount of attributable burden that could be prevented was associated with coronary heart disease (13,500 DALY and 1,000 deaths in the scenario of an additional 15 minutes, 5 days per week).

Sex: Persons | Measure: Attributable DALY | Disease group: All disease groups | Disease or injury: All causes

Attributable DALY and percentage (%) change among Persons, by scenario

DALY = Disability-adjusted life years; **YLD** = Years lived with disability; **YLL** = Years of life lost



Attributable DALY and percentage (%) change, by sex, age and scenario

Age group (years):
65-79

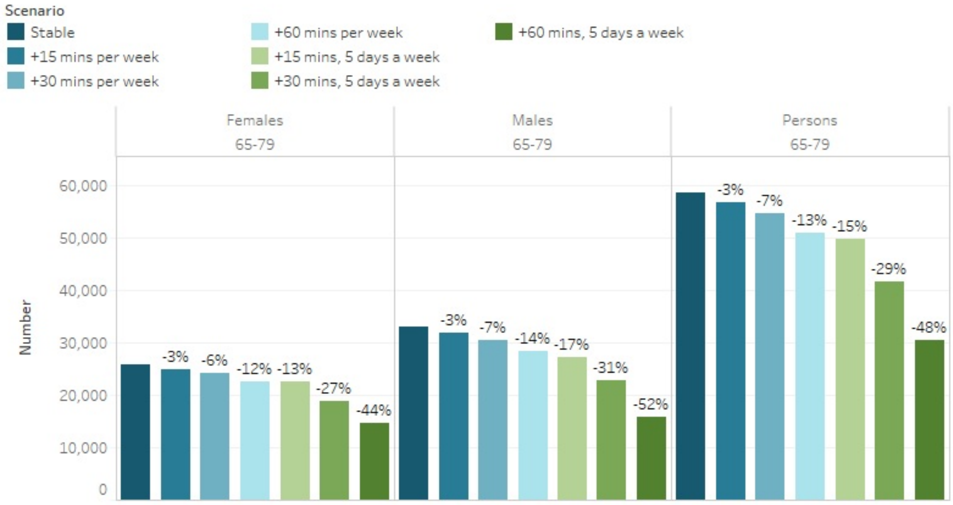
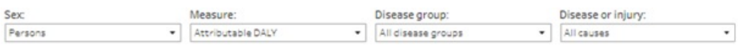


Figure 5: Burden attributable to physical inactivity in 2030, by scenario
Notes: The stable scenario is the comparator for the change in attributable burden. Note that in each scenario presented, it is the total number of additional minutes of physical activity over a week that is important. For example, 15 minutes, 5 days per week amounts to 75 minutes in total. This 75 minutes could be distributed over any number of days to achieve the same benefit. Additional activity also refers to moderate-intensity activity (MET intensity score of 5). Refer to the technical notes for more information on data sources and methods used in the study.
Source: AIHW analysis of Australian Burden of Disease database.
https://www.aihw.gov.au

How to navigate the interactive visualisation

- Use the drop-down lists at the top of the visualisation to filter the data by measure of disease burden, year, sex, disease group and disease/injury.



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How do these findings align with national targets?

The National Preventive Health Strategy and the National Obesity Strategy both include targets for reducing the prevalence of overweight (including obesity) in adults and children by 2030 (Commonwealth 2022, the Department 2021). These are similar to the stable and target scenarios in this study which showed large reductions in the attributable burden prevented in 2030.

Although the targets refer to both adults and children, further work is needed to determine the potential burden prevented among all linked diseases associated with children. Among children, only asthma is included in this study as a disease linked to overweight (including obesity) while physical inactivity attributable burden was assessed only for adults aged 20 and over.

The National Preventive Health Strategy's targets for physical activity relate to reducing the prevalence of physical inactivity (no physical activity) and insufficient activity (according to national recommendations) in the population by 2030.

All physical activity target scenarios in this study achieved the strategy's target for inactivity – there were reductions in future disease burden of between 6% and 49% compared with the stable scenario.

In terms of METs, the strategy's target for reducing insufficient activity (where insufficient activity is less than 150 minutes per week of moderate activity for all adults) is achieved in the target scenario where people do the equivalent of an extra 30 minutes of moderate-intensity activity, 5 days a week (that is, 750 MET-mins). In this scenario, attributable disease burden could reduce by 31% (55,700 DALY) in 2030.

This scenario modelling demonstrates the significance of the strategy's 2030 targets in reducing the risk of developing disease and the health loss attributable to being physically inactive or living with overweight (including obesity). Large improvements in attributable burden could be expected in 2030 through achieving these targets as a result of interventions that improve exposure to these risk factors.

References

Commonwealth (Commonwealth of Australia) (2022) National Obesity Strategy 2022–2032, Health Ministers Meeting, accessed 20 January 2023.

The Department (the Department of Health and Aged Care) (2021) National Preventive Health Strategy 2021–2030, the Department, accessed 17 October 2022.

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Technical notes

On this page:

Overarching methods

The aim of this project was to assess the impact of risk factor exposure to overweight (including obesity) and physical inactivity on attributable burden in the year 2030 under various scenarios. The year 2030 was chosen as it aligns with the National Preventive Health Strategy 2021–2030 which seeks to achieve improved health outcomes by 2030.

Risk factor attributable burden estimation is based on comparative risk assessment methodology developed as part of the Australian Burden of Disease Study (AIHW 2021a). Further details regarding methods for estimating burden attributable to physical inactivity and overweight (including obesity) can be found in *Australian Burden of Disease Study: Methods and supplementary material 2018* (AIHW 2021b).

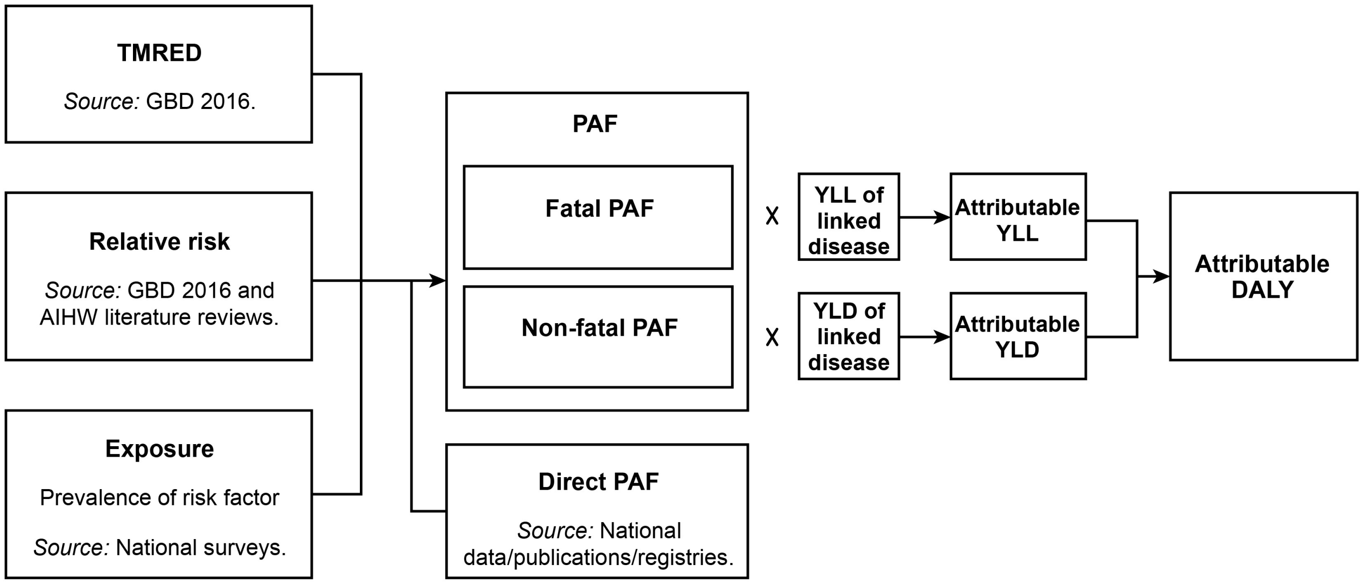
The basic steps in estimating risk factor attributable burden are:

1. Select risk factors.
2. Identify linked diseases based on convincing or probable evidence in the literature that the risk factor has a causal association with increased prevalence or mortality.
3. Define the exposure to the risk factor that is not associated with increased risk of disease (the theoretical minimum risk exposure distribution, or TMRED, or counterfactual).
4. Estimate the population attributable fractions (PAFs) by either a direct method or the comparative risk assessment method by age and sex:
    1. if PAFs appropriate to the disease and population in question are available from a comprehensive source (such as a disease register), they are estimated directly from this data source (named a 'direct PAF' in the ABDS) and do not require steps 5, 6 and 7, or
    2. if not, PAFs are created using the comparative risk assessment method, which involves steps 5, 6 and 7.
5. Define the amount of increased risk (relative risk) of morbidity or mortality for the linked disease due to exposure to the risk factor.
6. Estimate exposure to each risk factor in the population.
7. Use these inputs to calculate the PAF. The PAF has a value between 0 and 1, where 0 means there was no burden attributable to the risk factor and 1 means that all the burden for the linked disease was attributable to the risk factor.

The burden attributable to each risk factor is calculated by applying the PAFs by age and sex for each linked disease to the relevant YLL and YLD.

This process is shown in the figure below.

Figure 1: Inputs and processes to calculate attributable burden



The diseases whose burden is associated with physical inactivity are:

- bowel cancer
- breast cancer
- coronary heart disease
- dementia
- depressive disorders
- stroke
- type 2 diabetes mellitus
- uterine cancer

The diseases whose burden is associated with overweight (including obesity) are:

- Acute lymphoblastic leukaemia
- Acute myeloid leukaemia
- Asthma
- Atrial fibrillation and flutter
- Back pain and problems
- Bowel cancer
- Breast cancer
- Cataract and other lens disorders
- Chronic kidney disease
- Chronic lymphocytic leukaemia
- Chronic myeloid leukaemia
- Coronary heart disease
- Dementia
- Gallbladder and bile duct disease
- Gallbladder cancer
- Gout
- Hypertensive heart disease
- Kidney cancer
- Liver cancer
- Myeloma
- Non-Hodgkin lymphoma
- Oesophageal cancer
- Osteoarthritis
- Other leukaemias
- Ovarian cancer
- Pancreatic cancer
- Stroke
- Thyroid cancer
- Type 2 diabetes mellitus
- Uterine cancer

Estimating disease burden in 2030

To estimate disease burden in 2030, fatal and non-fatal burden rates for 2018 were applied to projected Australian population estimates in the year 2030 (AIHW 2021b). For all scenarios, it was assumed that 2018 rates of disease burden (crude YLL, YLD and DALY rates) were to remain the same in 2030. Population estimates for 2030 were sourced from population projections by the Centre for Population (2021). At the time of analysis, this was the only available source that accounted for the early impacts of the COVID–19 pandemic on Australia's population. The population under the 'central scenario' was used for this study, which assumed overseas migration to Australia was significantly affected by the COVID–19 pandemic.

Estimating attributable burden for each scenario in 2030

To examine the impact of different risk factor scenarios on attributable burden between the scenarios for each risk factor, exposure levels were adjusted to reflect the scenario of interest. These scenario-specific population exposures were then used to calculate scenario-specific PAFs which were then applied to the projected burden estimates to estimate attributable burden in 2030. This method involves determining the theoretical minimum risk exposure distribution (TMRED), which is the level of hypothetical exposure that would lead to the lowest conceivable disease burden. The TMREDs for each risk factor are:

- for overweight (including obesity): 20–25 kg/m^2
- for physical inactivity: 4,200+ MET-mins.

Further details on attributable burden estimation based on ABDS 2018 methods are described elsewhere (AIHW 2021b).

Two scenarios applied to both risk factors are explored in this project:

1. Stable scenario: estimates were based on the application of population attributable fractions for the reference year 2018 to the projected disease burden for 2030. This assumes that these remain the same for the year 2030.
2. Target scenarios: various scenarios that represent improved population exposure through to 2030 are compared with the stable scenario (in which 2018 exposure is maintained).
    1. For physical inactivity, various target scenarios that reflect additional minutes of moderate-intensity activity per week, such as going for a brisk walk, were included. These scenarios provide additional granularity on the marginal impacts of increasing activity to assess the burden prevented. As physical activity is measured in terms of METs, the appropriate level of MET-mins was added to respondents in the ABS National Health Survey 2017–18 to reflect changes in exposure. See Table 1 for a summary of the additional MET-mins assigned to respondents to estimate exposure in each scenario.
    2. For overweight (including obesity), 3 target scenarios were explored. The first 2 scenarios represent a reduction in BMI of 1 kg/m^2 and 2 kg/m^2 in the population at risk. In this case, a 1-unit and 2-unit reduction was made to the BMI of respondents in health survey data to re-estimate exposure. The third scenario represents the one where individuals of obese status reduced their BMIs to meet the minimal requirement to be classified as overweight (but not obese). In this case, respondents measuring greater than or equal to 30 kg/m^2 were assigned a BMI value of 29.99 kg/m^2, placing them in the overweight (but not obese) category, with zero population prevalence of obesity.

Table 1: MET-mins added by target scenario

Additional time of moderate-intensity activity in scenarios	Additional MET-mins per week based on moderate intensity
15 mins per week	75
30 mins per week	150
60 mins per week	300
15 mins, 5 days a week	375
30 mins, 5 days a week	750
60 mins, 5 days a week	1500

A trend scenario was also explored for overweight (including obesity) where current trends in exposure were extended to 2030. Exposure to risk within the trend scenario were based on log-linear regression of weighted median BMI using successive ABS National Health Survey data, by sex and 5-year age groups. Results were extrapolated to the year 2030 to determine relative change (that is, the percentage change) in BMI between 2030 and the latest survey year. These changes were then applied to 2017–18 survey data by each age and sex group to determine 2030 projected population exposure.

Limited data were available to inform sufficient projections for a trend scenario of physical activity to 2030. Physical activity in the ABDS is comprised of a number of components including leisure activity, walking for transport, occupational activity, gardening, chores, and strength and toning. The inconsistent availability and quality of some of these components across surveys resulted in unreliable comparisons over time, and therefore projections. Leisure activity and walking for transport are the only components with sufficient time series data to inform trends. However, time series data for other components are inconsistent, particularly occupational activity data which make up a large portion of overall activity (particularly among males). This means that 2030 projections of physical inactivity population exposure were not possible to estimate for this report.

Assumptions and limitations

The projection of disease burden in 2030 uses 2018 disease burden rates (using ABDS 2018 estimates) applied to projected population estimates in 2030. This method assumes that the impacts of changes in BMI and physical activity on YLL and YLD rates are offset by all other drivers of changes in rates of disease burden.

As mentioned in the report, it is important to note that these risk factors are inter-related and may sit on the same causal pathway for disease and other risk factors. Physical activity requires energy expenditure to produce bodily movements, which subsequently has impacts on a person's weight when this energy expenditure is taken from fat cells, resulting in reductions to BMI (WHO 2018). Similarly, the additional health risk of high levels of BMI can also be moderated by other factors including diet and genetics. The ABDS 2018 employs the use of mediation factors to account for inter-relatedness between risk factors when estimating attributable burden. Adjustments for associations between physical inactivity and high BMI, including considerations for energy balance or replacement, is not examined in this work. As such, the attributable burden estimates for each risk factor assess their direct short-term effects (that is, burden prevented in that year) on their linked diseases and independently of each other. Further improvements in longer-term health outcomes are therefore not captured in the analysis.

All scenarios assume homogeneity in the population for characteristics that may confound the association between these risk factors and linked diseases. However, as health experiences differ between population subgroups, assessment of attributable burden based on population-specific exposure to risk factors may show results different from those presented here. The results in this report refer to Australia's general population. Specific population groups may therefore experience different patterns of disease burden attributable to risk factors.

The projections used to develop the trend scenarios are based on extrapolations of the most recent health survey data on risk factor exposure. The methods thus assume that the relative risks of developing linked diseases attributable to risk factor exposure remain constant over time, without adjustment for other factors that may also influence risk of disease. This also includes potential developments in identifying additional linked diseases or developments in medical technology, for example, which may improve disease risk despite worsening exposure to risk factors. Similarly, this method to estimate trend scenario risk factor exposure assumes no impacts due to cohort effects in the population.

The target scenarios assume that the improvements in exposure are made and maintained from 2018 until 2030. It is therefore also assumed that any immediate or gradual (due to time lags) health benefits from improving population exposure to these risk factors would be realised by this point.

The target scenario of shifting the population from obese status to overweight (but not obese) represents a conservative scenario of reducing obesity exposure in the population. The BMI of 29.99 kg/m^2 assigned to those in the obese population is the highest level of overweight (but not obese) status that satisfies this scenario. Therefore, attributable burden prevented in this target scenario may represent an underestimate where the population minimally meets the target. In practice, individuals achieving this target may realistically decrease their BMI to below 29.99kg/m^2 and so may prevent additional attributable burden in 2030.

While measured BMI in the ABS National Health Surveys was used to estimate the prevalence of overweight (including obesity) in the population, physical activity is based on self-reported information by the participants. This relies on people accurately remembering their physical activity levels, which can introduce recall bias in reporting physical activity.

The use of METs as a measure for activity does not account for differences in benefits due to various types of activity. For example, on this scale, strengthening and toning is not distinguished from activity such as walking for transport, where specific health benefits may differ between these types of activities, outside of energy expenditure. Additionally, in using METs as a measure of exposure, it is the total number of additional MET-mins over a week that is important in determining improvements to health risk. For example, 15 minutes of moderate-intensity activity, 5 days a week, amounts to 75 minutes in total. These 75 minutes could be distributed over any number of days to achieve the same benefit. MET calculations are also based on self-reported activity which is prone to bias and recall error.

Among those aged under 20 years, only asthma is included in this study as a disease linked to overweight (including obesity) while physical inactivity attributable burden was only assessed for adults aged 20 years and older. Further work is needed to determine the potential burden prevented among all diseases linked to overweight (including obesity) and physical inactivity in children.

About the Australian Burden of Disease Study

The Australian Burden of Disease Study (ABDS) includes estimates of disease burden of more than 200 diseases and injuries in Australia. Burden of disease analysis is a way of measuring the impact of diseases and injuries on a population (in this report, the population of Australia). It is the difference between a population's actual health and its ideal health, where ideal health is living to old age in good health (without disease or disability).

Information and reports about burden of disease in Australia, including for Aboriginal and Torres Strait Islander people, are available on the AIHW website.

For further information or for customised data requests please contact the AIHW Burden of Disease team: burdenofdisease@aihw.gov.au

Key developments since the Australian Burden of Disease Study 2018

Evidence for the association between physical activity and mental health disorders, including depression, is prevalent in the literature, where activity is seen as an important preventive measure and management strategy for people who experience mental ill-health (Harris and Nichols 2019). A meta-analysis conducted by Pearce et al. (2022) has allowed for the quantification of this risk at varying levels of physical inactivity which have been incorporated into this project (Pearce et al. 2022). For the first time in ABDS risk factor attributable burden analysis, depressive disorders as a cause have been included as a disease linked to exposure to physical inactivity. As a result of this addition, attributable burden results due to physical inactivity cannot be compared with those found in previous iterations of the ABDS.

For the first time, national disease burden estimates were projected for the most recent year at the time of publication (2022), which includes estimates of disease burden due to COVID-19 (AIHW 2022). See the *Australian Burden of Disease Study 2022* for more information. Risk factor attributable burden was not estimated in ABDS 2022, therefore ABDS 2018 remains the most up-to-date data and methods available for use with this scenario modelling work.

About the ABS National Health Survey

This web report contains results and estimates based on extrapolation of data based on exposure trends from the Australian Bureau of Statistics (ABS) National Health surveys (NHS) 2007–08, 2011–12, 2014–15 and 2017–18.

The 2017–18 NHS is the most recent in a series of Australia-wide health surveys conducted by the ABS that was unaffected by the COVID-19 pandemic. It was designed to collect a range of information about the health of Australians, including:

- prevalence of long-term health conditions
- prevalence of health risk factors such as smoking, overweight and obesity, alcohol consumption and exercise
- use of health services such as consultations with health practitioners and actions people have recently taken for their health
- demographic and socioeconomic characteristics.

The 2017–18 NHS collected data on children and adults living in private dwellings but excluded persons living in non-private dwellings, very remote areas and discrete Aboriginal and Torres Strait Islander communities. For further information, refer to the ABS National Health Survey: First Results, 2017–18.

Due to the pandemic, physical measurements (including height, weight and waist circumference) were not taken at the time of the NHS 2020–21, the most recent NHS. Results from the NHS 2022–23 are yet to be released.

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Technical notes

Attributable burden: The disease burden attributed to a particular risk factor. It is the reduction in fatal and non-fatal burden that would have occurred if exposure to the risk factor had been avoided (or was reduced to its theoretical minimum).

Body mass index: An internationally recognised standard for classifying overweight and obesity in adults, calculated by dividing a person's weight in kilograms by the square of their height in metres.

Burden of disease (and injury): The quantified impact of a disease or injury on a population using the disability-adjusted life years (DALY) measure.

COVID-19 (Coronavirus disease 2019): An infectious disease caused by the SARS-CoV-2 virus.

Disability-adjusted life years (DALY): A year of healthy life lost, either through premature death or living with disability due to illness or injury.

Disease: A broad term that can be applied to any health problem, including symptoms, diseases, injuries and certain risk factors, such as high blood cholesterol and obesity. Often used synonymously with condition, disorder or problem.

Fatal burden: The burden from dying prematurely as measured by years of life lost (YLL). Often used synonymously with years of life lost, and also referred to as 'life lost'. See 'Years of life lost'.

Metabolic equivalent of tasks (METs): A measure of physical activity representing the rate of energy expenditure incorporating the duration and intensity of activity, with one MET equivalent to 1 kcal/kg/hr, which is about the energy expended in sitting, with 1 MET-minute equal to 1 minute of activity at an intensity of 1 kcal/kg/hr.

Non-fatal burden: The burden from living with ill health as measured by years lived with disability (YLD). Often used synonymously with years lived with disability, and also referred to as 'health loss'. See 'Years lived with disability'.

Obesity: Category used to describe the amount of body mass a person has above what is considered ideal. Defined as a body mass index equal to or greater than 30 kg/m2. See 'Body mass index'.

Overweight: Category used to describe the amount of body mass a person has above what is considered ideal. Defined as a body mass index equal to or greater than 25 kg/m2, but less than 30 kg/m2. See 'Body mass index'.

Prevalence: Refers to the existence of a disease or event in a population, whether or not it is newly occurring; the prevalence rate is the number of cases existing at a point in time (point prevalence) or over a specified time period (period prevalence) divided by the number of people in the population.

Rate: A burden (YLD, YLL or DALY) rate is one number (the numerator) divided by another number (the denominator). The numerator is commonly the number of years of healthy life lost in a specified time. The denominator is the population at risk of the event. Rates (crude, age-specific and age-standardised) are generally multiplied by a number such as 1,000 to create whole numbers.

Risk factor: Any factor that represents a greater risk of a health condition or health event. For example, smoking, alcohol use, high body mass.

Total (or overall) burden: The sum of fatal burden (YLL) and non-fatal burden (YLD), which totals disability-adjusted life years (DALY). See 'Burden of disease (and injury)'. See 'Disability-adjusted life years'.

Years lived with disability (YLD): Measures the years of what could have been a healthy life that were instead spent in states of less than full health. YLD represent non-fatal burden.

Years of life lost (YLL): Measures years of life lost due to premature death, defined as dying before the global ideal life span at the age of death. YLL represent fatal burden.

Technical notes

Table: Abbreviations and descriptions

Term	Description
ABDS	Australian Burden of Disease Study
ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
BMI	body mass index
COVID-19	coronavirus disease 2019
DALY	disability-adjusted life years
MET	metabolic equivalent of tasks
MET-mins	metabolic equivalent of task minutes
NHS	National Health Survey
PAF	population attributable fraction
TMRED	theoretical minimum risk exposure distribution
YLD	years lived with disability
YLL	years of life lost

Technical notes

The study was undertaken by members of the Burden of Disease and Mortality Unit of the Australian Institute of Health and Welfare (AIHW).

The study was undertaken by Vergil Dolar, under the guidance of Karen Bishop, Melanie Dunford, Frances Gibson, Michelle Gourley and Paula Laws.

Special thanks are extended to other members of the Burden of Disease and Mortality Unit, including Julianne Garcia, Yolanda Lovie-Toon, Nick Mann and Matilda Pulford who assisted in finalising the report.

Special thanks to Richard Juckes and Vanessa Prescott for reviewing the report.

Oscar Yang provided valuable advice on statistical methods for the Study.

The authors acknowledge the Australian Bureau of Statistics for providing risk factor exposure data.

Karen Hobson, Ingrid Mboya and Helen Tse assisted with publication and the presentation of information.

Analyses were conducted in consultation with the Burden of Disease Expert Advisory Group.

The Department of Health and Aged Care funded this Study and provided valuable input during the drafting process.

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