



Chronic condition multimorbidity

Web report | Last updated: 13 May 2021 | Topic: [Chronic disease](#)

About

Chronic conditions are an important global, national and individual health concern. They cause substantial ill health, disability, premature death, and disease burden. Many people with chronic conditions do not have a single condition, but rather they have **multimorbidity** - the presence of 2 or more chronic conditions at the same time. Using 10 major chronic conditions, this report, and the associated fact sheet, explore the characteristics and experiences of people with multimorbidity.

Cat. no: PHE 286

- [Fact sheet](#)
- [Data](#)

Findings from this report:

- [1 in 5 \(20%\) of Australians had multimorbidity—2 or more of 10 chronic conditions—in 2017-18, based on self-report](#)
- [Multimorbidity increases with age—it affects 12% of those aged 15-44 and half \(51%\) of those aged 65 and over](#)
- [Multimorbidity is more common among females \(23%\) than males \(18%\)](#)
- [Almost half \(45%\) of adults with multimorbidity live in the lowest 2 socioeconomic areas](#)



Chronic conditions and multimorbidity

Chronic conditions are an important global, national and individual health concern. Worldwide, they caused almost 3 in 4 (or 42 million) deaths in 2019 (Global Burden of Disease Collaborative Network 2020). This proportion has increased over time, from 67% of deaths worldwide in 2010 to 74% in 2019 (Global Burden of Disease Collaborative Network 2020). Although 2020 saw a large number of deaths from communicable disease due to the COVID-19 pandemic (WHO 2020), chronic conditions remain an ongoing cause of substantial ill health, disability and premature death.

Chronic conditions generally have long-lasting and persistent effects, and are also referred to as chronic diseases, long-term health conditions or non-communicable diseases. They include conditions such as arthritis, cancer and diabetes. In this report, a 'chronic condition' is defined as one of 10 major chronic condition groups: arthritis, asthma, back problems, cancer, selected cardiovascular diseases, chronic obstructive pulmonary disease, diabetes, chronic kidney disease, mental and behavioural conditions and osteoporosis.

The prevalence of these chronic conditions is increasing in Australia. Just under half (47%) of Australians had 1 or more chronic conditions in 2017-18, an increase from 42% of people in 2007-08 (ABS 2018). This is associated with a number of factors, including:

- Australia's ageing population
- improvements in the treatment and management of chronic conditions which extends life expectancy
- social and behavioural risk factors such as poor diet and physical inactivity (ABS 2018).

As the prevalence of chronic conditions increases, it is expected that multimorbidity - the presence of 2 or more chronic conditions in a person at the same time - will also become more common.

People living with multimorbidity can experience difficulties with everyday activities, poorer overall quality of life and more complex health needs (Fortin et al. 2007; Jackson et al. 2015; Makovski et al. 2019; Marengoni et al. 2011). These outcomes will vary, depending on the number and type of conditions a person has (Fortin et al. 2007; Jackson et al. 2015).

A challenge for health service providers managing multimorbidity is to focus on the person, and all of the conditions they experience, rather than on a single disease (Ording & Sørensen 2013; Starfield 2006).

Multimorbidity can make treatment more complex (Harrison & Siriwardena 2018) and requires ongoing management and coordination of specialised care across multiple parts of the health system (Department of Health 2020a). This places a heavy demand on Australia's health care system. A key focus of the Australian health system, therefore, is the prevention and better management of chronic conditions to improve health outcomes (Department of Health 2020b). A better understanding of multimorbidity, and of which chronic conditions commonly occur together, can help to inform guidelines for treatment and management.

This work provides baseline information on chronic condition multimorbidity in Australia, before the COVID-19 pandemic. The interaction between pre-existing chronic conditions and COVID-19 infection, as well as any indirect effects on chronic conditions from changes within the health system and wider society due to interventions to manage the spread and impact of COVID-19, may be explored in future work.

What chronic conditions do we look at?

Although the term 'chronic conditions' covers a diverse group of conditions, this analysis looks at 10 conditions (Table 1).

Table 1: Self-reported chronic conditions considered in this analysis

Chronic condition	Inclusions
Arthritis	<ul style="list-style-type: none"> • Osteoarthritis • Rheumatoid arthritis • Other and type unknown
Asthma	<ul style="list-style-type: none"> • Asthma
Back problems	<ul style="list-style-type: none"> • Sciatica • Disc disorders • Back pain/problems not elsewhere classified • Curvature of the spine
Cancer	<ul style="list-style-type: none"> • Malignant neoplasms

Selected cardiovascular diseases (heart, stroke and vascular disease)	<ul style="list-style-type: none"> • Angina • Heart attack • Other ischaemic heart diseases • Stroke • Other cerebrovascular diseases • Oedema • Heart failure • Diseases of the arteries, arterioles and capillaries
Chronic kidney disease	<ul style="list-style-type: none"> • Chronic kidney disease
COPD	<ul style="list-style-type: none"> • Bronchitis • Emphysema
Diabetes	<ul style="list-style-type: none"> • Type 1 diabetes • Type 2 diabetes • Type unknown
Mental and behavioural conditions	<ul style="list-style-type: none"> • Alcohol and drug problems • Mood (affective) disorders • Anxiety related problems • Organic mental problems (including dementia) • Problems of psychological development • Behavioural, cognitive & emotional problems with usual onset in childhood/adolescence • Other mental and behavioural problems • Other symptoms, signs involving cognition, perceptions, emotional state and behaviour
Osteoporosis	<ul style="list-style-type: none"> • Osteoporosis

These conditions were selected because they are common, pose significant health problems and have been the focus of ongoing national surveillance efforts (ABS 2019a). In many instances, action can be taken to prevent these conditions, making them an important focus for preventive health initiatives (Department of Health 2020b). Analysis of these conditions is based on self-reported data from the Australian Bureau of Statistics (ABS) 2017-18 National Health Survey (NHS). See [NHS chronic condition definitions](#) in the Technical notes for more detail on the collection and definitions of chronic conditions used in this analysis, and [Factors to consider when interpreting results](#).

How common are the chronic conditions?

Almost half of Australians (47%, or more than 11 million people) had 1 or more of the 10 self-reported chronic conditions in 2017-18 (ABS 2018).

Mental and behavioural conditions, back problems and arthritis were the most common of the 10 chronic conditions. It is estimated that about:

- 4.8 million (20%) people had a mental or behavioural condition, which was the most commonly reported chronic condition for both males and females (Figure 1.1; [Data table 1.1](#))
- 4 million (16%) had back problems, which includes sciatica, disc disorders, and curvature of the spine
- 3.6 million (15%) had arthritis, with females more likely than males (18% compared with 12%) to have arthritis.

In 2017-18, the most common condition(s) for people aged:

- 15-44 were mental and behavioural conditions (22%)
- 45-64 were back problems and arthritis (25% each)
- 65 and over was arthritis (49%) (ABS 2018).

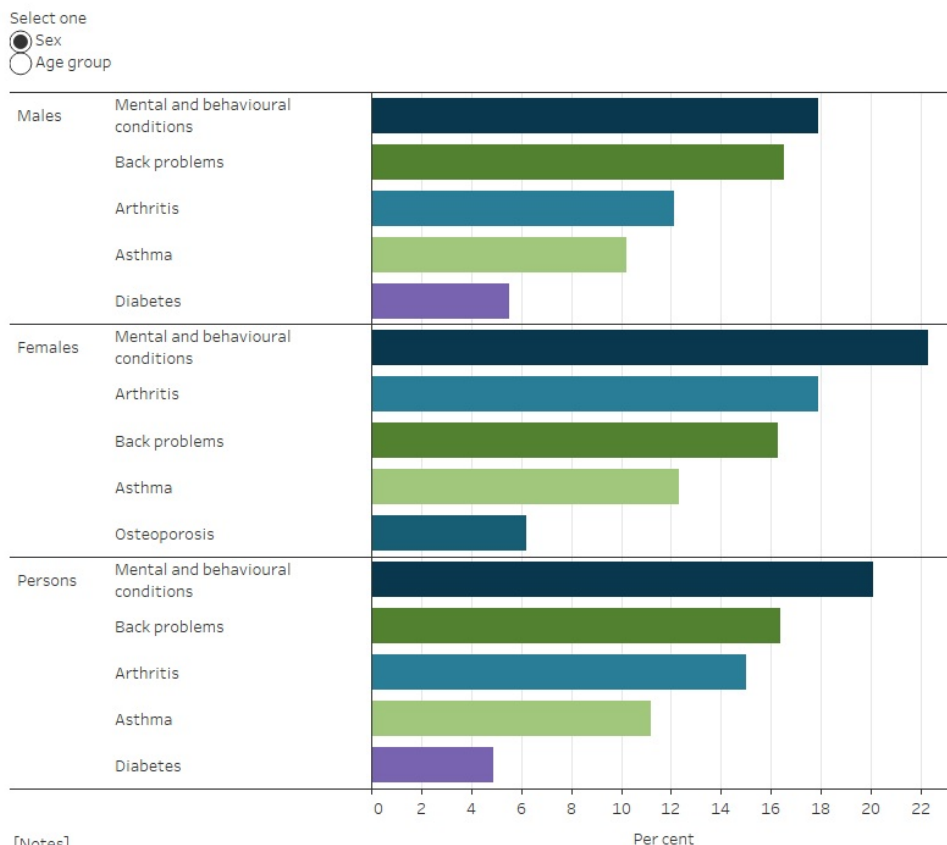
Four in 5 Australians aged 65 and over (80%) were estimated to have 1 or more of the selected chronic conditions in 2017-18 (ABS 2018).

For further detail on some of the most common conditions see [Chronic disease](#).

Figure 1.1: Top 5 self-reported chronic conditions by sex or age group, 2017-18

The figure shows the most common self-reported chronic conditions by either sex or age group in 2017-18. The most common chronic conditions for people of all ages were mental and behavioural conditions (20%), back problems (16%), arthritis (15%), asthma (11%) and diabetes (4.9%).

Figure 1.1: Top 5 self-reported chronic conditions by sex or age group, 2017-18



Nearly 3 in 4 (74%) people with 2 or more of the selected chronic conditions were aged 45 and over. Of those aged 45 and over, 38% had 2 or more chronic conditions and 2.9% had 5 or more (Figure 1.2; Data table 1.2). Females were less likely to have no chronic conditions (30%) than males (35%).

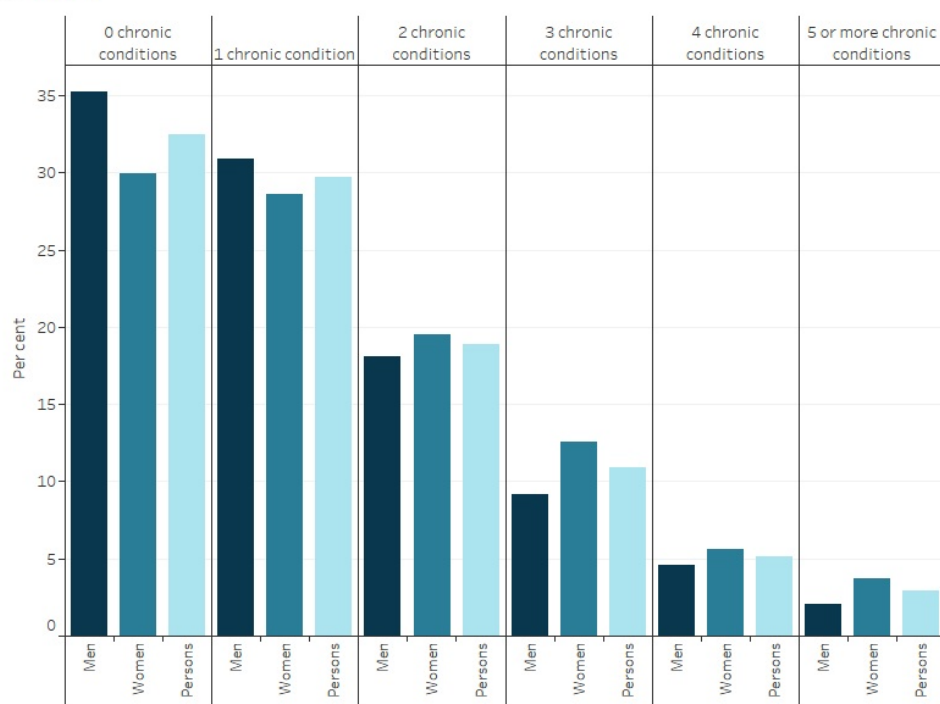
The proportion of people with no chronic conditions decreased with age. Just over half of those aged 45-49 (51%) had no chronic conditions compared with 17% of those aged 75 and over. In contrast, the proportion of people with 3, 4 and 5 or more chronic conditions generally increases with each 5-year age group from 45-49 years to 75 years and over.

Figure 1.2: Number of self-reported chronic conditions among people aged 45 and over, by sex or age group, 2017-18

The figure shows the proportion of people aged 45 and over with 0, 1, 2, 3, 4 or 5 or more self-reported chronic conditions, by either sex or age group. Women were more likely to have 5 or more chronic conditions (3.7%) compared with men (2.0%). The proportion of people with 5 or more conditions increased with age; 5.5% of people aged 75 and over had 5 or more conditions.

Figure 1.2: Number of self-reported chronic conditions among people aged 45 and over, by sex or age group, 2017-18

Select one
 Sex
 Age group



[Notes]

Chart: AIHW. Source: AIHW analysis of ABS 2019b. (Data table 1.2)
<http://www.aihw.gov.au/>

What is the impact of chronic conditions?

Living with chronic conditions can substantially influence a person's health and their health service use. Analysis of the National Hospital Morbidity Database, National Mortality Database and Australian Burden of Disease Study 2015 data shows the 10 selected chronic conditions:

- were involved in 5 in 10 hospitalisations (51%) in 2017-18 where at least 1 of the selected conditions was recorded as either the **principal or additional diagnosis** in the hospitalisation ([Box 1](#)).
- contributed to nearly 9 in 10 deaths (89%) in 2018 where at least 1 of the selected conditions was recorded as either the **underlying or associated cause of death**. The result did not change when data was adjusted for Victorian additional death registrations for 2018 that were recorded in 2019 (ABS 2020).
- contributed to about two-thirds (66%) of the **total burden of disease (fatal and non-fatal)** in Australia in 2015 (excluding burden associated with osteoporosis which is not available within current burden of disease estimates) (AIHW 2019). See [Burden of disease](#) for more information on definitions and the burden of disease associated with these conditions.

Box 1: Key terms

additional diagnosis: The diagnosis of a condition or recording of a complaint - either coexisting with the principal diagnosis or arising during the episode of admitted patient care (hospitalisation), episode of residential care or attendance at a health care establishment - that requires the provision of care. Multiple diagnoses may be recorded.

associated cause(s) of death: A cause(s) listed on the Medical Certificate of Cause of Death, other than the underlying cause of death. They include the immediate cause, any intervening causes, and conditions that contributed to the death but were not related to the disease or condition causing death.

burden of disease (and injury): Term referring to the quantified impact of a disease or injury on a population, using the **disability-adjusted life years (DALY)** measure.

disability-adjusted life years (DALY): A measure of healthy life lost, either through premature death or living with disability due to illness or injury. Often used synonymously with health loss.

fatal burden: The burden from dying 'prematurely' as measured by years of life lost. Also referred to as 'life lost'.

non-fatal burden: The burden from living with ill-health as measured by years lived with disability.

principal diagnosis: The diagnosis established after study to be chiefly responsible for occasioning an episode of patient care (hospitalisation), an episode of residential care or an attendance at the health care establishment. Diagnoses are recorded using the relevant edition of the International statistical classification of diseases and related health problems, 10th revision, Australian modification (ICD-10-AM).

underlying cause of death: The disease or injury that initiated the train of events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury.

What data do we use?

Estimates of the number of Australians affected by 1 or more of the 10 selected chronic conditions come from the Australian Bureau of Statistics (ABS) 2017-18 National Health Survey (NHS). The 2017-18 NHS was completed by approximately 21,300 Australians from 16,400 private dwellings (ABS 2018).

Data on the presence and consequences of chronic conditions are based on self-reported data. This analysis is largely based on analysis of NHS data as these data enable us to look at the co-occurrence of the selected chronic conditions across the Australian population to produce estimates of multimorbidity.

Prevalence estimates are based on information 'as reported' by NHS respondents and may differ from those reported elsewhere due to differences in the data source used, including differences in the method of data collection (for example, self-report survey compared with diagnostic survey), as well as the specific chronic conditions included in analysis and how they are defined. In particular, estimates of people with self-reported mental or behavioural conditions in this analysis will differ from those obtained from a diagnostic tool such as that used in the 2007 National Survey of Mental Health and Wellbeing. The questions asked of NHS respondents are available in the [National Health Survey questionnaire, 2017-18](#).

The NHS does not include the experiences of older people in institutionalised dwellings (such as residential care facilities). This may mean the prevalence of chronic conditions and multimorbidity is underestimated.

Estimates of multimorbidity and complex multimorbidity types in this analysis represent multimorbidity associated with the 10 selected chronic conditions only, and may not reflect the prevalence of multimorbidity more broadly.

For further detail, see [Factors to consider when interpreting results](#) in the Technical notes.

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What is multimorbidity and how common is it?

Multimorbidity is the presence of 2 or more chronic conditions in a person at the same time. Multimorbidity is a slightly different concept from ‘comorbidity’, which refers to additional conditions (comorbidities) experienced by a person who has a specific condition of interest.

Multimorbidity considers all of the conditions experienced by a person, and places a much greater focus on the person as a whole, rather than their individual conditions (Harrison & Siriwardena 2018). Understanding multimorbidity can be particularly useful in the primary care setting (such as a general practice) where following disease-specific guidelines for the treatment and management of multiple conditions can lead to overprescribing and patient harm (Harrison & Siriwardena 2018).

In this section, multimorbidity estimates are for people of all ages, unless otherwise stated. Where comparisons are influenced by differences in the age structure between groups being compared, age-standardised estimates are provided for comparison. Both crude and age-standardised estimates are provided in the [Data tables](#).

1 in 5 (20%, or 4.9 million) Australians were estimated to have multimorbidity in 2017-18 (ABS 2019).

Multimorbidity becomes more common with age. In 2017-18, multimorbidity affected:

- 1 in 8 (12%) people aged 15-44
- nearly 1 in 3 (30%) people aged 45-64
- 1 in 2 (51%) people aged 65 and over (Figure 2.1; [Data table 2.1](#)).

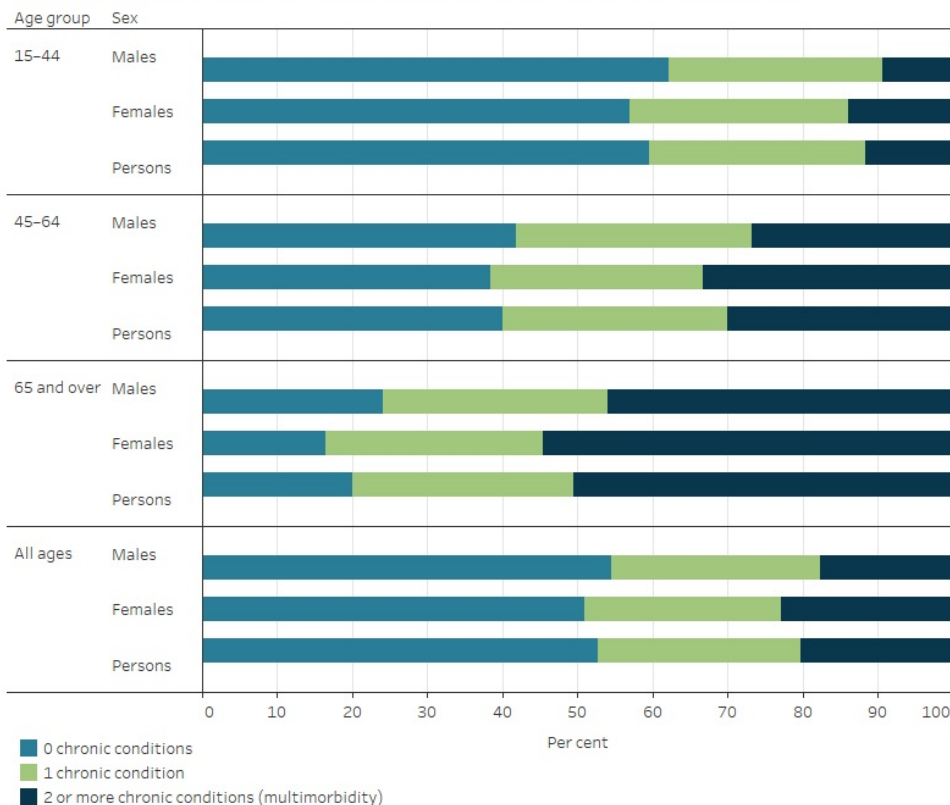
This increase is consistent with a decrease in the prevalence of having no self-reported chronic conditions as people get older. Among those aged 15-44, an estimated 60% had no chronic conditions compared with 40% of people aged 45-64 and 20% of people aged 65 and over. The proportion of people estimated to have only 1 condition was similar across age groups.

Multimorbidity was more common in females of all ages (23%) than males (18%). This difference can be seen across each of the age-specific groups examined, and remained after adjusting for differences in the age structure between males and females.

Figure 2.1: Number of self-reported chronic conditions, by age group and sex, 2017-18

The figure shows the proportion of people with no chronic conditions, 1 chronic condition, or multimorbidity by both sex and age group in 2017-18. Females and older people were more likely to have multimorbidity.

Figure 2.1: Number of self-reported chronic conditions by age group and sex, 2017-18



[Notes]

It is important to note that estimates of multimorbidity will differ depending on the definition and source of information used (Dobson et al. 2020; Harrison et al. 2014; Lujic et al. 2017). The number of conditions, the specific conditions included in analysis, and how they are defined will also affect estimates. For example, the chronic conditions selected for analysis may influence prevalence among males and females differently. See [Factors to consider when interpreting results](#) in the Technical notes for further detail.

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What is multimorbidity and how common is it?

Many health outcomes vary among population groups in Australia. The prevalence of multimorbidity differs by socioeconomic and remoteness areas.

Examining the prevalence of multimorbidity in different population groups can be useful for understanding which groups may be most affected by multimorbidity and therefore might benefit from policies for the prevention or management of multimorbidity.

The findings in this section adjust for differences in the age structure of the populations being compared.

How does multimorbidity vary by socioeconomic area?

The prevalence of multimorbidity was compared across 5 socioeconomic areas, based on the Index of Relative Socio-economic Disadvantage (IRSD). The IRSD reflects the overall, or average, level of disadvantage of the population of an area. It summarises attributes of the population such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations, allowing areas to be ranked and compared. See [Grouping data for analysis](#) in the Technical notes for more information.

The population living in the areas with the greatest overall level of disadvantage is described as living in the 'lowest socioeconomic areas'. Generally, people in lower socioeconomic areas are at greater risk of poor health, have higher rates of illness, disability and death, and live shorter lives than people from higher socioeconomic areas (AIHW 2020a; Mackenbach 2015).

In 2017-18, the prevalence of multimorbidity associated with the 10 self-reported chronic conditions increased with increasing socioeconomic disadvantage, ranging from:

- 1 in 7 (14%) in the highest socioeconomic areas; to
- nearly 1 in 4 (24%) in the lowest socioeconomic areas (Figure 2.2; [Data table 2.2](#)).

The proportion of people with 1 chronic condition was similar across socioeconomic areas.

How does multimorbidity vary by remoteness area?

Australians who live in rural and remote areas face unique challenges due to their geographic location (such as accessing health care or specialist services) and often have poorer health outcomes than people living in metropolitan areas. The prevalence of some chronic conditions varies by remoteness area. While people living outside *Major cities* had higher levels of arthritis, asthma and diabetes in 2017-18, the level of mental and behavioural conditions was higher in *Inner regional* areas than in *Outer regional and remote* areas and *Major cities*. However, the level of other conditions was similar across remoteness areas (AIHW 2020b).

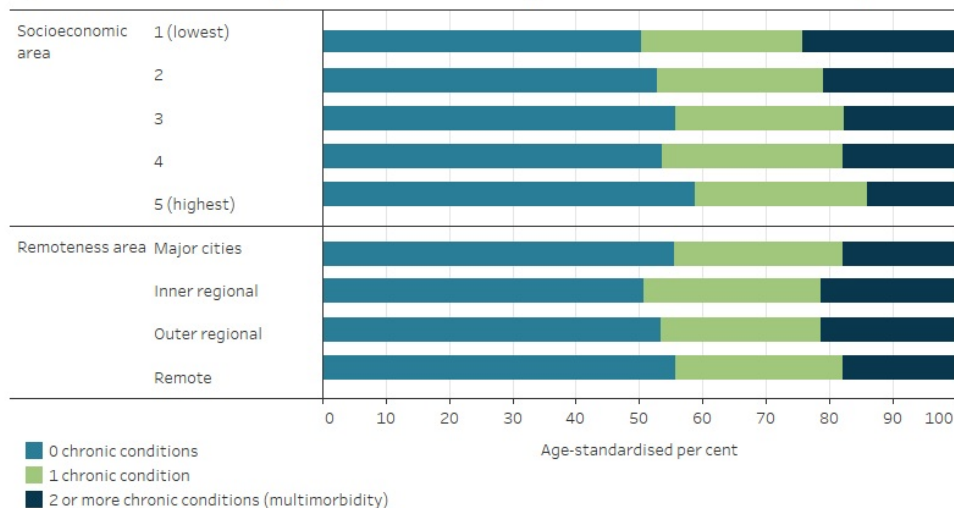
Those living in *Major cities* were less likely to have multimorbidity than those living in *Inner* and *Outer regional* areas. The prevalence of multimorbidity was:

- over 1 in 6 (18%) for people in *Major cities* and *Remote* areas
- over 1 in 5 (21%) for people in *Inner* and *Outer regional* areas (Figure 2.2; [Data table 2.2](#)).

Figure 2.2: Number of self-reported chronic conditions, by socioeconomic or remoteness area, 2017-18

The figure shows the proportion of people with no chronic conditions, 1 chronic condition, or multimorbidity by socioeconomic or remoteness area. The prevalence of multimorbidity increased with increasing socioeconomic disadvantage. The proportion of people in the *Major cities* with multimorbidity is lower than in *Inner* and *Outer regional* areas.

Figure 2.2: Number of self-reported chronic conditions by socioeconomic or remoteness area, 2017-18



[Notes]

Chart: AIHW. Source: AIHW analysis of ABS 2019. (Data table 2.2)

<http://www.aihw.gov.au/>

References

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What is multimorbidity and how common is it?

Analysis in this section highlights the personal experiences of people with multimorbidity. Based on self-reported data from the 2017-18 NHS, people with multimorbidity have different characteristics and experiences when compared with those with no self-reported chronic conditions. Comparisons in this section adjust for differences in the age structure of the populations being compared.

The information presented in the following sections relates to people aged 18 or over, due to the scope of the survey population for some of the questions asked. See [Box 2](#) for key considerations for interpreting these characteristics.

Figure 2.3: Selected self-reported characteristics and outcome information for people aged 18 and over, with and without multimorbidity, 2017-18

This figure shows the proportion of adults with no chronic conditions, 1 chronic condition, or multimorbidity by several self-reported characteristics (including sex, overweight/obesity, current tobacco smoker) and outcomes (including working, bodily pain, disability, restriction or limitation). Compared with people with no chronic conditions, people aged 18 and over with multimorbidity were more likely to be older, women, overweight or obese, not sufficiently active, renting, a current tobacco smoker, living alone or in a one-parent family with dependent children.

Figure 2.3: Compare selected self-reported characteristics and outcome information for people aged 18 and over, with and without multimorbidity, 2017-18

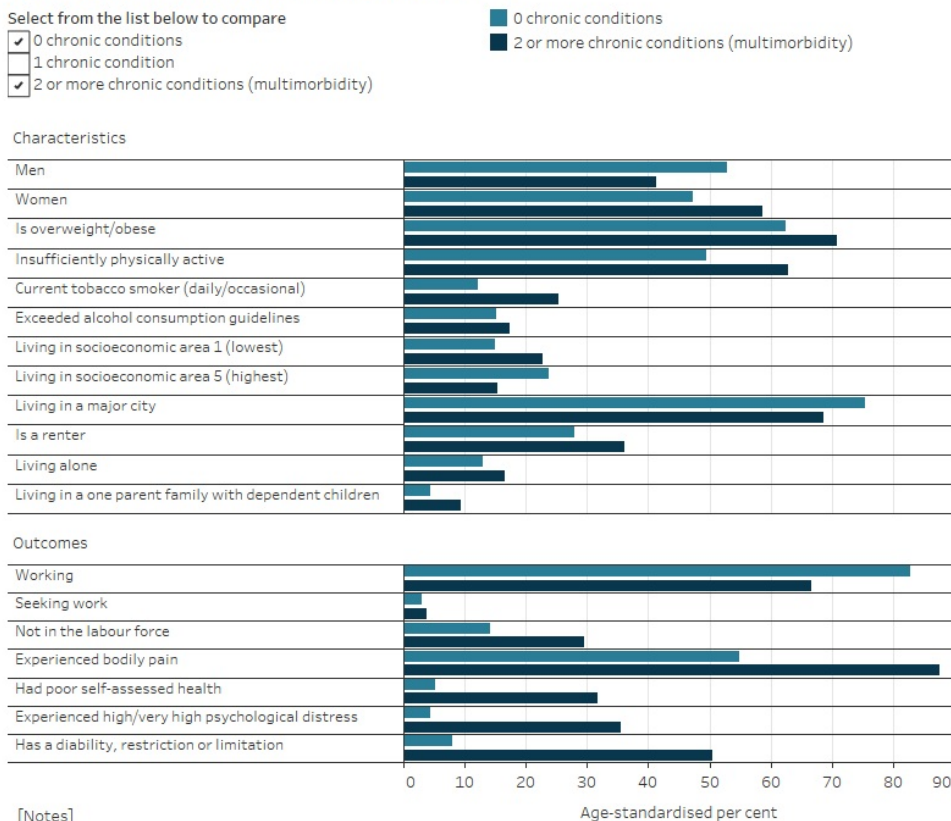


Chart: AIHW. Source: AIHW analysis of ABS 2019. (Data table 2.3)
<http://www.aihw.gov.au/>

Box 2: Key considerations for interpreting common characteristics

It is important to note that while some characteristics, such as age, sex or smoking status, may be more common in people with multimorbidity, it is not possible to say that multimorbidity is caused by these characteristics with the current data. Similarly, it is not possible to say that the characteristics examined are the result of having multimorbidity. For example, while being overweight or obese may be a risk factor for multimorbidity, it could also be the result of a person being limited in the physical activity they can participate in as a result of their multimorbidity. Longitudinal information on when a person developed multimorbidity, and when they became overweight or obese would be needed to understand this, but is not available within the NHS.

Characteristics of people with multimorbidity

Multimorbidity is more common in older age groups (see [What is multimorbidity and how common is it?](#)). As a result, the average age of adults with multimorbidity (58 years) is older than those with no chronic conditions (41 years) (ABS 2019).

When comparing people with multimorbidity and those without multimorbidity, it was less common for people with multimorbidity to live in a *Major city* (69%), compared with people with none of the chronic conditions examined (75% lived in a *Major city*) (Figure 2.3; [Data table 2.3](#)). However, compared with adults with no chronic conditions, those with multimorbidity are more likely to:

- be women (59% of adults with multimorbidity were women, compared with 47% of people with no chronic conditions of the same age)
- be overweight or obese (71% compared with 62%)
- be insufficiently active (63% compared with 50%)
- rent their homes (36% compared with 28%)
- live alone (17% compared with 13%) or in a one-parent family with dependent children (9.3% compared with 4.3%)
- currently smoke tobacco (25% compared with 12%)
- live in areas of highest socioeconomic disadvantage (23% compared with 15%).

The proportion of people who consumed alcohol at levels that put them at a lifetime risk of harm were similar among those with multimorbidity (17%) and those with no chronic conditions (15%).

The National Health and Medical Research Council guidelines for the consumption of alcohol are evidence-based recommendations that aim to reduce the health risks associated with alcohol consumption (NHMRC 2020). The guidelines were updated in 2020 however, estimates here are based on the 2009 guidelines which were current at the time of the survey. Based on the 2009 guidelines, consuming more than 2 standard drinks per day, on average, puts a person at lifetime risk of harm. Information collected from NHS respondents about their alcohol consumption in the week prior to interview is used to estimate the prevalence of lifetime risk of alcohol harm in this analysis. People that consumed alcohol at levels that put them at a lifetime risk of harm may or may not be considered to have an alcohol or drug problem (captured in the ‘mental and behavioural conditions’ group considered in this analysis). See [Grouping data for analysis](#) in the Technical notes for details of the definitions and groups used in this analysis.

Experiences of people with multimorbidity

Living with chronic conditions can affect a person’s quality of life and have social and economic effects for the individual (See Box 3). The impact may be even greater for people living with multimorbidity.

Box 3: Multimorbidity in their own words

Below are comments provided by women with multimorbidity in their responses as part of their participation in the [Australian Longitudinal Study on Women’s Health](#). They describe the impact multimorbidity has on multiple aspects of these women’s lives, including physical, emotional, social and financial consequences due to chronic conditions.

“I was forced to retire as a registered nurse because of my limitation. I have had to accept early retirement plus have to pace my activities to be able to control my pain and mobility.”

“I can never feel well enough to do all the things I would like, which can be frustrating and depressing.”

“The frustration of being disabled and not being able to do things that you once could do. Loss of independence and having to ask people for help - extremely difficult.”

“In the last 4 months my physical health has dropped. Where I now need a walker and can no longer do my own shopping.”

“I would normally work full-time but I have been on leave since June last year due to my weakness, tremor, poor eyesight, fatigue etc.”

(Dobson et al. 2020).

People with multimorbidity were less likely to be working than people with no chronic conditions. Two in 3 (67%) people aged 18-64 with multimorbidity were working, compared with 4 in 5 (83%) of people aged 18-64 with no chronic conditions. There was no difference in the proportion of people seeking work (Figure 2.3; [Data table 2.3](#)).

Adults with multimorbidity also reported poorer health experiences:

- 88% experienced bodily pain in the previous 4 weeks, compared with 55% of people with no chronic conditions
- 32% had poor self-assessed health, compared with 5.3% of people with no chronic conditions
- 50% had disability, restriction or limitation in everyday activities, compared with 7.9% of people of the same age with no chronic conditions
- 35% had high or very high psychological distress, compared with 4.3% of people with no chronic conditions.

In the 2017-18 NHS, survey participants were asked *“In general would you say that your health is excellent, very good, good, fair or poor?”* In this analysis, those who rated their health as ‘fair’ or ‘poor’ were grouped under the label *poor self-assessed health*. See [Grouping data for analysis](#) in the Technical notes for details of the definitions and groups used in this analysis.

References

ABS (Australian Bureau of Statistics) 2019. [Microdata: National Health Survey, 2017-18](#), DataLab. ABS cat. no. 4324.0.55.001. Canberra: ABS. Findings based on Detailed Microdata.

Dobson A, Forder P, Hockey R, Egan N, Cavenagh D, Waller M et al. 2020. The impact of multiple chronic conditions: Findings from the Australian Longitudinal Study on Women's Health. Report prepared for the Australian Government Department of Health, May 2020.

NHMRC (National Health and Medical Research Council) 2020. Australian guidelines to reduce health risks from drinking alcohol. Canberra: NHMRC.

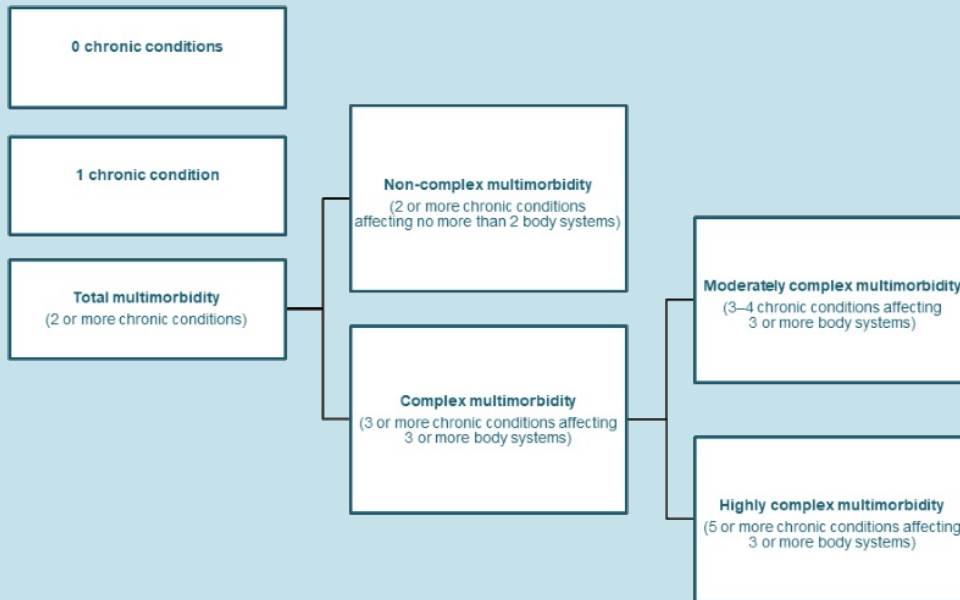
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What are the types of multimorbidity and how common are they?

Not all people with multimorbidity share the same characteristics and experiences. Characteristics common among people with different types of multimorbidity, and the different experiences they have, are compared in the following sections. The multimorbidity types investigated are shown in Box 4.

Box 4: Classification of multimorbidity types in this analysis



Complex multimorbidity is a subcategory of total multimorbidity and is described as the co-occurrence of 3 or more chronic conditions affecting 3 or more different body systems within a person at the same time (Harrison et al. 2014; [Box 5](#)). This is useful for identifying people with more complex health care needs as chronic conditions affecting different body systems may require co-ordination of multiple specialists—making treatment more complex, while the treatments of chronic conditions within the same body system may be more likely to be complementary (Harrison et al. 2014). Non-complex multimorbidity is described as the co-occurrence of 2 or more chronic conditions affecting no more than 2 body systems.

Box 5: Defining a body system

A body system is a group of organs and tissues that work together to perform specific functions.

The ABS NHS condition classification is based on the International Classification of Diseases and Related Health Problems (10th revision; ICD-10) (ABS 2019a). Chapter axes within the ICD-10 include body systems, aetiology and 'others'. For consistency with the coding of NHS condition information, ICD chapters have been used as a proxy for body systems. The body systems and selected chronic conditions included in them for analysis are:

- Circulatory: selected cardiovascular diseases
- Endocrine, nutritional and metabolic: diabetes
- Genitourinary: chronic kidney disease
- Malignant neoplasms: cancer
- Musculoskeletal: arthritis, back problems, osteoporosis
- Psychological: mental and behavioural conditions
- Respiratory: asthma, COPD

See [Calculating the prevalence of multimorbidity and complex multimorbidity types](#) in the Methods section of the Technical notes for more information on how the 10 chronic conditions were grouped by ICD-10 chapter for the analysis of complex multimorbidity types.

Two types of complex multimorbidity are explored in this analysis: moderately complex multimorbidity (where 3-4 chronic conditions are present and affect 3 or more different body systems) and highly complex multimorbidity (where 5 or more chronic conditions are present and affect 3 or more different body systems).

In addition to considering how conditions across different body systems affect a person with multimorbidity, these groups allow us to explore differences when a large number of chronic conditions are present.

The majority of people with multimorbidity are aged 45 and over (74%); of those with either moderately or highly complex multimorbidity, 83% are aged 45 and over (ABS 2019b). For this reason, people aged 45 and over are the focus of analysis by type of multimorbidity. Analysis by age groups 45-64 and 65 and over is included in the [Data tables \(Box 6\)](#).

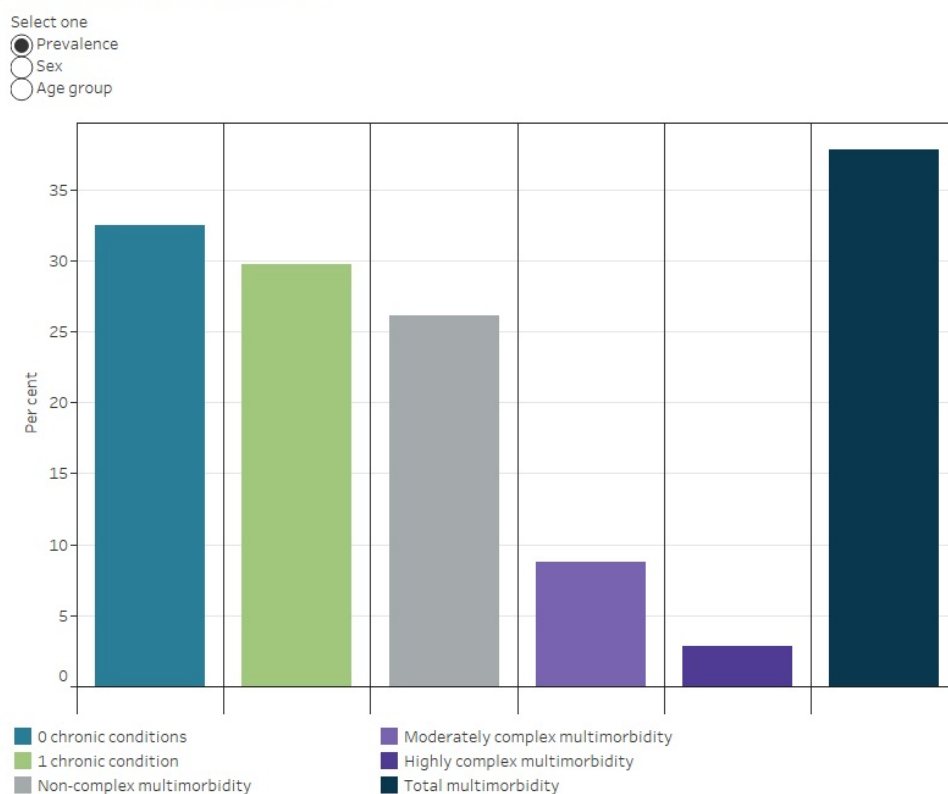
How common are different types of multimorbidity?

The prevalence of each multimorbidity type, by sex or age group is shown in Figure 3.1.

Figure 3.1: Prevalence of multimorbidity and complex multimorbidity types among people aged 45 and over, by sex or age group, 2017-18

This figure shows the proportion of people aged 45 and over with different multimorbidity types by sex or age group. Overall, women aged 45 and over were more likely to have multimorbidity (41%) compared with men (34%). Multimorbidity was more common in people aged 65 and over (51%) compared with people aged 45-64 (30%).

Table 3.1: Prevalence of multimorbidity and complex multimorbidity types among people aged 45 and over, by sex or age group, 2017-18



[Notes]

Chart: AIHW. Source: AIHW analysis of ABS 2019b. (Data table 3.1)
<http://www.aihw.gov.au/>

Consistent with the finding that multimorbidity becomes more common with age (see [What is multimorbidity and how common is it?](#)), the prevalence of complex multimorbidity increases with age:

- 6.3% of people aged 45-64 had moderately complex multimorbidity compared with 13% of people aged 65 and over
- 1.9% of people aged 45-64 had highly complex multimorbidity compared with 4.4% of people aged 65 and over (Figure 3.1; [Data table 3.1](#)).

Among people aged 45 and over, it was more common for women to have any type of multimorbidity (total multimorbidity) than men: about 41% of women and 34% of men aged 45 and over had multimorbidity.

The difference in the prevalence of total multimorbidity between men and women is primarily due to the larger proportion of women with non-complex multimorbidity. An estimated 29% of women and 23% of men had non-complex multimorbidity. Women were also more likely to have highly complex multimorbidity than men (3.7% compared with 2.0%).

Proportions of men and women aged 45 and over with moderately complex multimorbidity were similar. These findings remained after adjusting for differences in the age-structure of the populations being compared.

It is important to note that the number of conditions, the specific conditions included in analysis, and how they are grouped and defined will affect prevalence estimates for each of the multimorbidity types. See [Factors to consider when interpreting results](#) in the Technical notes for further detail.

Box 6: Accounting for age

Due to insufficient numbers of cases available for age-standardisation in many instances, only unadjusted (crude) estimates for people aged 45 and over are presented in this section, unless otherwise stated. Unadjusted estimates were compared with age-standardised estimates during analysis with few differences found, indicating unadjusted estimates provide sufficient information for comparison between groups. Age-specific estimates for people aged 45-64 and 65 and over are included in [Data tables 3.3b and 3.3c](#) and help to show how results may vary by age.

See the section [Crude, age-standardised and age-specific estimates](#) in the Methods section of the Technical notes for further information.

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What are the types of multimorbidity and how common are they?

The prevalence of total multimorbidity, and of the different multimorbidity types, vary among population groups. Consistent with findings for people of all ages (see [Does multimorbidity differ between population groups?](#)), the prevalence of total multimorbidity among people aged 45 and over increased with increasing socioeconomic disadvantage, ranging from:

- 27% in the highest socioeconomic areas; to
- 50% in the lowest socioeconomic areas (Figure 3.2; [Data table 3.2](#)).

This reflects similar patterns in the prevalence of non-complex multimorbidity, moderately complex multimorbidity and highly complex multimorbidity which were all highest in the lowest socioeconomic areas:

- 32% of people in the lowest socioeconomic areas experienced non-complex multimorbidity, compared with 20% of people in the highest socioeconomic areas.
- 13% of people in the lowest socioeconomic areas had moderately complex multimorbidity, compared with 5.7% of people in the highest socioeconomic areas.
- 5.2% of people in the lowest socioeconomic areas had highly complex multimorbidity, compared with 1.5% of people in the highest socioeconomic areas.

There was less variation in the prevalence of total multimorbidity among people aged 45 and over across each of the remoteness areas (*Major cities, Inner regional, Outer regional* and *Remote*): ranging from 35% in *Remote* areas to 42% in *Inner regional* areas.

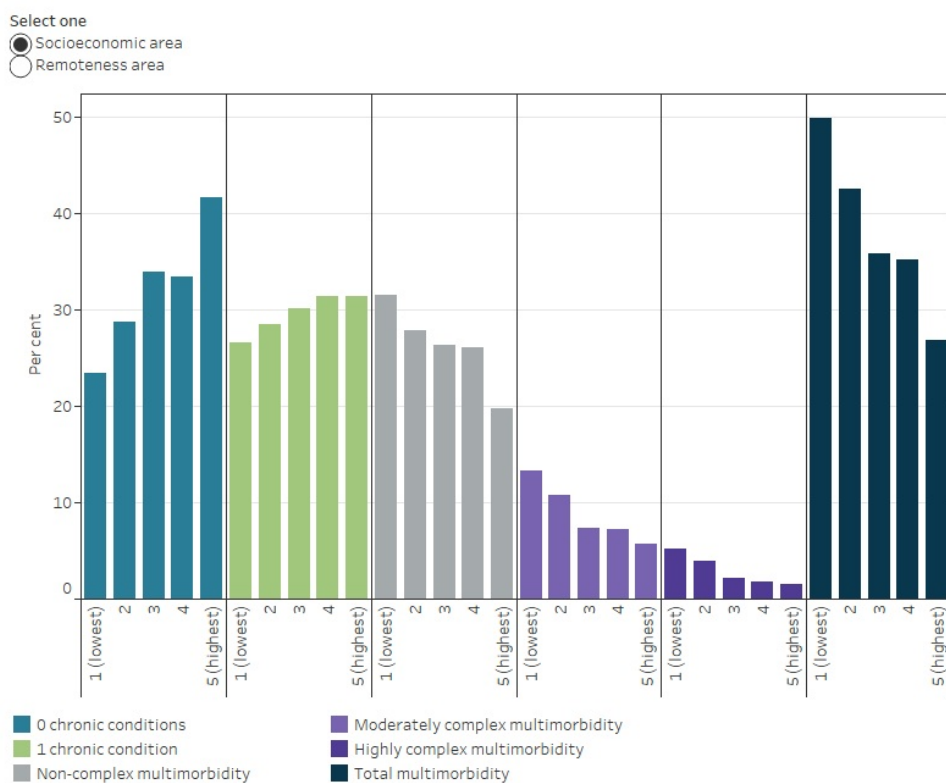
Prevalence of non-complex multimorbidity and total complex multimorbidity (including moderately and highly complex multimorbidity) across each of the remoteness areas was also similar. Based on the NHS 2017-18, it is estimated that among those aged 45 and over:

- non-complex multimorbidity affected 25-29% of people in each of the remoteness areas
- total complex multimorbidity (which includes moderately and highly complex multimorbidity) affected 10-14% of people in each of the remoteness areas.

Figure 3.2: Prevalence of multimorbidity and complex multimorbidity types among people aged 45 and over, by socioeconomic or remoteness area, 2017-18

The figure shows the proportion of people aged 45 and over with different multimorbidity types by socioeconomic or remoteness area. The prevalence of the different multimorbidity types among people aged 45 and over increased with increasing socioeconomic disadvantage. The proportion of people aged 45 and over with different multimorbidity types in each of the remoteness areas was similar.

Figure 3.2: Prevalence of multimorbidity and complex multimorbidity types among people aged 45 and over, by socioeconomic or remoteness area, 2017–18



[Notes]

Chart: AIHW. Source: AIHW analysis of ABS 2019. (Data table 3.2)
<http://www.aihw.gov.au/>

References

ABS (Australian Bureau of Statistics) 2019. Microdata: National Health Survey, 2017-18, DataLab. ABS cat. no. 4324.0.55.001. Canberra: ABS. Findings based on Detailed Microdata.



What are the types of multimorbidity and how common are they?

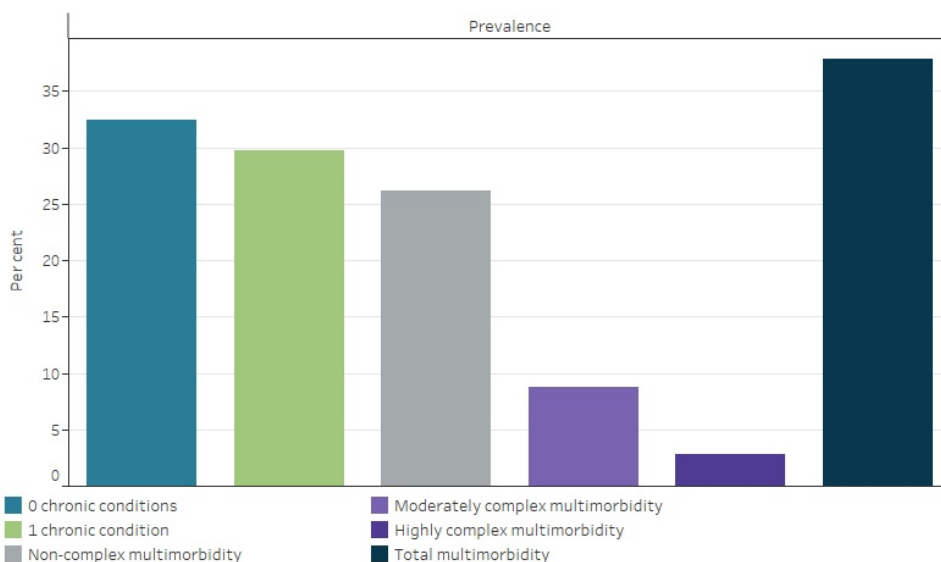
Based on self-reported information from the 2017-18 NHS, people aged 45 and over with different types of multimorbidity had different characteristics and experiences. Poorer health experiences were generally associated with moderately and highly complex multimorbidity. People living with multimorbidity can be limited by these experiences (Dobson et al. 2020). See [Box 7](#) for key considerations for interpreting these characteristics.

Figure 3.3: Selected self-reported characteristics and outcome information for people aged 45 and over, by multimorbidity type, 2017-18

This figure shows the proportion of people aged 45 and over with different multimorbidity types by several self-reported characteristics (including sex, overweight/obesity, current tobacco smoker) and outcomes (including working, bodily pain, disability, restriction or limitation). Compared with people with no chronic conditions, people aged 45 and over with multimorbidity were more likely to be older, women, overweight or obese, not sufficiently active, a current tobacco smoker.

Figure 3.3: Compare selected self-reported characteristics and outcome information for people aged 45 and over, by multimorbidity type, 2017-18

Select one
 Prevalence
 Characteristics
 Outcomes



[Notes]

Chart: AIHW. Source: AIHW analysis of ABS 2019. (Data tables 3.3a and 3.3b)
<http://www.aihw.gov.au/>

Drnfile

Characteristics of people with multimorbidity and complex multimorbidity types

Multimorbidity is more common in older age groups (see [What is multimorbidity and how common is it?](#)). The characteristics of people aged 45 and over with different types of multimorbidity were compared with the characteristics of people with no chronic conditions in the same age group. Full details of each of the groups and characteristics examined is provided in the [Data tables 3.3a-c](#). Some findings of interest are included below.

Overweight and obesity

Overweight and obesity are common in Australia—67% of Australians aged 18 and over were overweight or obese in 2017-18 (AIHW 2020). Overweight and obesity are even more common among people with multimorbidity and complex multimorbidity (Figure 3.3; [Data table 3.3a](#)). Among people aged 45 and over, the proportion of people who were overweight or obese in 2017-18 was:

- 70% for people with no chronic conditions
- 76% for people with 1 chronic condition
- 76% for people with non-complex multimorbidity
- 82% for people with moderately complex multimorbidity
- 84% for people with highly complex multimorbidity.

The proportion of people who were overweight or obese within each group was similar by age group (45-64 and 65 and over) (see [Data tables 3.3b and 3.3c](#)).

Smoking status

The following groups were used in analysis of smoking status: current (occasional or daily) smokers, ex-smokers and never smoked. In this analysis, smoking refers to tobacco smoking. See the section 'Smoking status' in [Grouping data for analysis](#) for further detail.

In 2017-18, people aged 45 and over with any type of multimorbidity (total multimorbidity) were more likely to be current smokers or ex-smokers, and less likely to have never smoked, compared with people with no chronic conditions (Figure 3.3; [Data table 3.3a](#)). The proportion of people who were current smokers was:

- 12% among those with no chronic conditions
- 13% among those with 1 chronic condition
- 14% among those with non-complex multimorbidity
- 19% each among those with moderately complex and highly complex multimorbidity.

The proportion of people who were current smokers decreased with age (45-64 and 65 and over) across each of the groups compared. The proportion of people with no chronic conditions who were current smokers was 14% among those aged 45-64, compared with 5.9% among those aged 65 and over. The largest decreases were among people with moderately or highly complex multimorbidity. Of those aged 45-64, nearly 1 in 3 people with moderately complex or highly complex multimorbidity were current smokers (31% and 32%, respectively). Among those aged 65 and over, almost 1 in 10 (9%) people with moderately complex or highly complex multimorbidity were current smokers.

In contrast, the proportion of people who were ex-smokers tended to increase by age group (45-64 and 65 and over) across the multimorbidity groups compared. The largest increase by age group was among people with moderately complex multimorbidity. The proportion of people who had never smoked was similar across age groups for most groups compared (see [Data tables 3.3b and 3.3c](#)).

Alcohol consumption

It is estimated that among people aged 45 and over, the proportion who consumed alcohol at levels that put them at lifetime risk of harm was similar among those with no chronic conditions and those with any type of multimorbidity (total multimorbidity).

The National Health and Medical Research Council guidelines for the consumption of alcohol are evidence-based recommendations that aim to reduce the health risks associated with alcohol consumption (NHMRC, 2020). The guidelines were updated in 2020 however, estimates here are based on the 2009 guidelines which were current at the time of the survey. Based on the 2009 guidelines, consuming more than 2 standard drinks per day, on average, puts a person at lifetime risk of harm. Information collected from NHS respondents about their alcohol consumption in the week prior to interview is used to estimate the prevalence of lifetime risk of alcohol harm in this analysis. See [Grouping data for analysis](#) in the Technical notes for details of the definitions and groups used in this analysis.

People with highly complex multimorbidity were less likely to consume alcohol at these levels than those with no chronic conditions (Figure 3.3; [Data table 3.3a](#)). The proportion of people at risk of long-term harm from alcohol was:

- 17% among people with no chronic conditions
- 20% among people with 1 chronic condition
- 18% among people with non-complex multimorbidity
- 13% among people with moderately complex multimorbidity
- 11% among people with highly complex multimorbidity.

There was little difference in the proportion of people who exceeded alcohol consumption guidelines across age groups (45-64 and 65 and over, see [Data tables 3.3b and 3.3c](#)).

See [Grouping data for analysis](#) in the Technical notes for further detail on how lifetime risk of alcohol harm is estimated, and the groups used in this analysis.

Box 7: Key considerations for interpreting common characteristics

It is important to note that while some characteristics, including age, sex or smoking status, may be more common in people with multimorbidity, it is not possible to say that multimorbidity is caused by these characteristics with the current data. Similarly, it is not possible to say that the characteristics examined are the result of having multimorbidity. For example, while being overweight or obese may be a risk factor for multimorbidity, it could also be the result of a person being limited in the physical activity they can participate in as a result of their multimorbidity. Longitudinal information on when a person developed multimorbidity, and when they became overweight or obese would be needed to understand this, but is not available within the NHS.

Experiences of people living with multimorbidity and complex multimorbidity types

The experiences of people aged 45 and over with different types of multimorbidity were compared with the experiences of people with no chronic conditions in the same age group.

Full detail on each of the groups and outcomes examined is provided in the [Data tables 3.3a-c](#). Selected findings are presented below for people aged 45 and over in 2017-18.

Labour force participation

Consistent with findings for people aged 18-64 (see [Who has multimorbidity and what are their experiences?](#)), and after adjusting for age, people aged 45-64 with any type of multimorbidity (total multimorbidity) were less likely to be working than people with no chronic conditions in the same age group. The difference is greatest when comparing the proportion of people working among those with no chronic conditions and with any type of complex multimorbidity (including moderately and highly complex multimorbidity).

In 2017-18, age-adjusted proportions of those working among people aged 45-64 were:

- 82% among those with no chronic conditions
- 77% among those with 1 chronic condition
- 68% among those with non-complex multimorbidity
- 47% among those with any type of complex multimorbidity ([Data table 3.3b](#)).

Bodily pain

Most people with multimorbidity experienced bodily pain in the 4 weeks prior to the survey. This proportion increased with multimorbidity complexity (Figure 3.3; [Data table 3.3a](#)). Among those aged 45 and over, it is estimated that bodily pain was experienced by:

- 56% of those with no chronic conditions
- 75% of people with 1 chronic condition
- 87% of people with non-complex multimorbidity
- 93% of people with moderately complex multimorbidity
- 97% of people with highly complex multimorbidity.

The experience of bodily pain did not change with age; the prevalence of bodily pain was similar between those aged 45-64 and 65 years and over for all types of multimorbidity (see [Data tables 3.3b and 3.3c](#)).

Self-assessed health

In the 2017-18 NHS, survey participants were asked “*In general would you say that your health is excellent, very good, good, fair or poor?*” In this analysis, those who rated their health as ‘fair’ or ‘poor’ were grouped under the label *poor self-assessed health*.

Those with more complex types of multimorbidity were more likely to have poor self-assessed health compared with those with less complex multimorbidity (Figure 3.3; [Data table 3.3a](#)). Among people aged 45 and over, poor self-assessed health was experienced by:

- 5.4% of those with no chronic conditions
- 15% of those with 1 chronic condition
- 30% of those with non-complex multimorbidity
- 51% of those with moderately complex multimorbidity
- 74% of those with highly complex multimorbidity.

Self-assessed health status was similar across those aged 45-64 and 65 years and over among people in each of the groups examined (see [Data tables 3.3b and 3.3c](#)).

See [Grouping data for analysis](#) in the Technical notes for further detail on how self-assessed health is estimated, and the groups used in this analysis.

References

ABS (Australian Bureau of Statistics) 2019. [Microdata: National Health Survey, 2017-18](#), DataLab. ABS cat. no. 4324.0.55.001. Canberra: ABS. Findings based on Detailed Microdata.

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NHMRC (National Health and Medical Research Council) 2020. [Australian guidelines to reduce health risks from drinking alcohol](#). Canberra: NHMRC.

What are the patterns of multimorbidity?

In this section, patterns of multimorbidity are explored by identifying pairs of chronic conditions that commonly occur together among people aged 45 and over.

Identifying conditions that commonly co-occur can inform the development of treatment guidelines and pathways that consider these common patterns of multimorbidity.

Chronic conditions that are highly prevalent in a population may be expected to commonly occur together, as multimorbidities, among people in that population. Of the 10 chronic conditions examined in this analysis, the most common chronic conditions among people aged 45 and over in 2017-18 were:

- arthritis, 34% of people
- back problems, 26% of people
- mental and behavioural conditions, 22% of people (Figure 4.1; [Data table 4.1](#)).

The 3 most commonly co-occurring condition pairs among people aged 45 and over were:

- back problems with arthritis. These 2 conditions were estimated to occur together in nearly 1.2 million people aged 45 and over (12%)
- arthritis with mental and behavioural conditions, affecting just under 1 million people (10%)
- back problems with mental and behavioural conditions, affecting over 800,000 people (8.7%).

Figure 4.1 shows the individual and co-prevalence of each of the conditions examined in this analysis. The conditions are listed along the row and column headings. Each circle represents the prevalence of the conditions listed in the corresponding row and column headings. The size of the circle is proportional to the prevalence. Where the row and column headings are the same (for example where both are 'Arthritis' in the top left hand corner of the figure), the dark blue circle where they meet represents the prevalence of the individual chronic condition in the population (for example, 34.1% of people aged 45 and over had arthritis).

Where the row and column headings are different (for example, where the row heading is 'Asthma' and the column heading is 'Arthritis'), the light blue circle where they meet represents the prevalence of the co-occurrence of the 2 conditions (for example, 6.1% of people aged 45 and over had arthritis and asthma).

Figure 4.1: Prevalence of single and co-occurring self-reported chronic conditions among people aged 45 and over, 2017-18

This figure shows the prevalence of each of the conditions and their co-occurrence in people aged 45 and over.

Figure 4.1: Prevalence of single and co-occurring self-reported chronic conditions among people aged 45 and over, 2017–18



[Notes]

Chart: AIHW. Source: AIHW analysis of ABS 2019. (Data table 4.1)
<http://www.aihw.gov.au/>

In addition to identifying patterns of commonly co-occurring conditions, it is possible to explore other patterns among conditions that occur together by testing the strength of the association between them (Box 8). Stronger associations between conditions may be anticipated where the 2 conditions affect the same body system, share common risk factors, or where one condition may itself be a risk factor for another condition (see [What are the risk factors for multimorbidity?](#) for more detail).

Box 8: Testing for association between 2 chronic conditions

Any 2 conditions may occur together in the same person by chance. The expected prevalence of co-occurrence is the prevalence that we would expect if the 2 conditions occurred together purely by chance.

The ratio of the observed (actual) prevalence to the expected prevalence is a measure of how much more often the 2 conditions occurred together among individuals in the population, than would have been expected purely by chance. It can be considered a measure of the strength of association between 2 conditions (Norén et al. 2013). If the ratio is statistically significantly greater than 1, then the 2 conditions are estimated to co-occur more often than would be expected by chance alone (van den Akker et al. 2001). This may indicate an association between the 2 conditions. A higher ratio may indicate a stronger association between the 2 conditions.

See [Identifying patterns of multimorbidity](#) in the Technical notes for detail on how this analysis was performed.

After adjusting for age, a statistically significant association was found in over half of the condition pairs tested, that is, they were estimated to occur together in individuals more often than would be expected by chance alone (Figure 4.2; [Data table 4.2](#)). The 3 most strongly associated combinations of 2 chronic conditions among people aged 45 and over were:

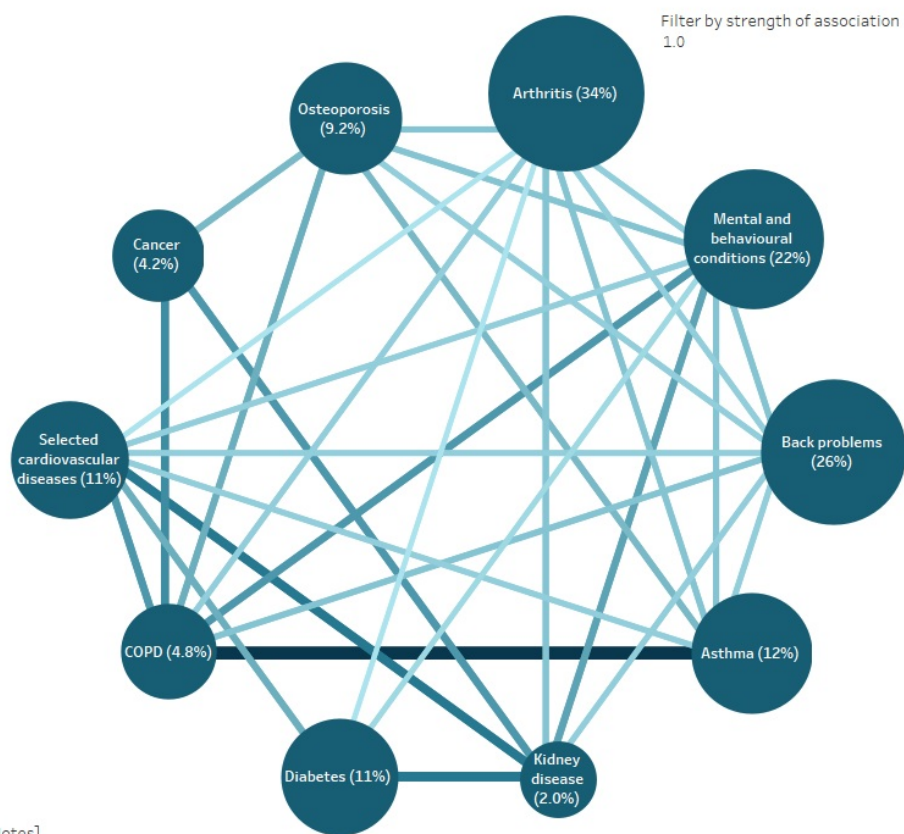
- Asthma with COPD. While asthma and COPD are estimated to occur together in only 2.1% of people aged 45 and over (Figure 4.2), this was 3.5 times as high as the expected prevalence. It is known that longstanding asthma is a risk factor for developing COPD later in life, and that both asthma and COPD can occur together (National Asthma Council Australia 2019).
- Diabetes with chronic kidney disease. Nearly 0.7% of people aged 45 and over are estimated to have both diabetes and chronic kidney disease, based on self-reported information. This was 2.5 times as high as expected. Diabetes is a common cause of chronic kidney disease with about 1 in 3 people with diabetes developing chronic kidney disease (Kidney Health Australia 2019).
- Selected cardiovascular diseases with chronic kidney disease. Cardiovascular disease occurred with chronic kidney disease in an estimated 0.7% of people aged 45 and over, this was 2.3 times as high as expected. A complex interplay between the effects of chronic kidney disease and cardiovascular disease means that each condition is a risk factor for the other (Kidney Health Australia 2019).

A network of the co-occurrence of the conditions is shown in Figure 4.2. The size of the circles is proportional to the estimated prevalence of the condition shown. The width of the line connecting 2 circles represents the strength of association between the 2 conditions at each end of the line. Use the filter bar to show only conditions that are more strongly associated.

Figure 4.2: Prevalence of self-reported chronic conditions, their co-occurrence and strength of association, among people aged 45 and over, 2017-18

This figure shows the prevalence of each of the conditions in people aged 45 and over, and the strength of association between significantly associated pairs of conditions.

Figure 4.2: Prevalence of self-reported chronic conditions, their co-occurrence and strength of association, among people aged 45 and over, 2017-18



[Notes]

Chart: AIHW. Source: AIHW analysis of ABS 2019. (Data table 4.2)
<http://www.aihw.gov.au/>

As with estimates of the prevalence of individual chronic conditions and of multimorbidity, it is important to note that estimates of the co-occurrence of the conditions, and of the strength of the association between them, will be influenced by the self-reported nature of the data. For more information see [Factors to consider when interpreting results](#) in the Technical notes.

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What are the risk factors for multimorbidity?

While the number of chronic conditions a person has tends to increase with age, more often than not, conditions occur together because there is some association between them. A number of chronic conditions share common risk factors, or one disease may be a risk factor in itself for another (AIHW 2016a). Diabetes is a well-known risk factor for cardiovascular disease, possibly due to diabetes increasing atherosclerosis (thickening of blood vessel walls with plaque deposits), which is the underlying cause of most cardiovascular disease in Australia (Woo et al. 2008).

At the individual level, a number of biomedical and behavioural risk factors can affect the likelihood of developing chronic conditions (AIHW 2016b). Biomedical characteristics that contribute to the development of chronic conditions include overweight and obesity, high blood pressure, dyslipidaemia (high blood cholesterol) and a person's genetic make-up. Biomedical risk factors are often influenced by behavioural risk factors. Behavioural risk factors include physical inactivity, poor nutrition, smoking tobacco and risky alcohol consumption. As with chronic conditions, many of these behavioural risk factors tend to be more prevalent in the lowest socioeconomic areas and in regional and remote areas (AIHW 2020a, AIHW 2020b).

The relationship between behavioural risk factors and multimorbidity is complex. Research based on data collected at a single point in time has found that the more chronic conditions a person reports, the more risk factors they are likely to have (AIHW 2012). However, without information on exposure to risk factors over time and the timing of chronic condition onset, the presence of chronic conditions cannot be attributed to the number of risk factors a person has. This is because the onset of some chronic conditions may motivate a person to change their behaviour for the better. For example, a diagnosis of COPD may motivate a person to quit smoking. In contrast, the onset of a chronic condition may result in an individual being less able to participate in physical activity.

Longitudinal research can help to understand the interacting complexities of risk factors and multimorbidity. A study of multimorbidity in Australian women has shown overweight and obesity, physical inactivity and social inequality to be risk factors common to a number of patterns of multimorbidity (Jackson et al. 2016).

At the societal level, the availability of health services, vaccination programs and a clean and healthy environment can promote good health and reduce the risk of developing, or exacerbating existing, chronic conditions. Aspects of the natural and built environment, including the availability of healthy food, building design, access to green space, exposure to advertising, portion sizes of prepared food and the convenience of pre-packaged, calorie dense food also contribute to overweight and obesity (AIHW 2017), which are risk factors for the development of chronic conditions.

Many of the individual and societal risk factors for chronic conditions are largely modifiable or treatable (AIHW 2016). Changes in behaviour, together with timely and effective medical treatments, can reduce the risk of developing chronic conditions, and multimorbidity, resulting in large population health gains.

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How is multimorbidity treated and managed?

Trends associated with a number of risk factors for chronic conditions among the Australian population continue to put a large number of people at risk of developing chronic conditions: among people aged 18 and over levels of inadequate physical inactivity and fruit or vegetable consumption have remained high since 2007-08, while levels of overweight and obesity have increased (ABS 2018). If left unchecked, trends in chronic condition risk factors, combined with a growing and ageing population and better treatment and management of chronic conditions, will lead to increasing numbers of people living with multiple chronic conditions.

In contrast, smoking rates have consistently declined in Australia over the past two decades, with 11% of Australians aged 14 and over smoking daily in 2019 compared with 24% in 1991 (AIHW 2020). Helping people to make good lifestyle choices and actively self-manage existing chronic conditions, including by accessing available treatments and services and adhering to long-term therapies, can help to keep people in good health and prevent illness. Having an accessible and integrated health care system is also important.

Most care for chronic conditions is provided in the primary health care setting by general practitioners (GPs) and allied health practitioners, with the number of GP visits increasing with increasing number of chronic conditions (Dobson et al. 2020). Mental and behavioural conditions (including anxiety, depression and mood disorders), musculoskeletal (including arthritis), respiratory (including asthma) and endocrine and metabolic conditions (including diabetes) were the most common health concerns managed by GPs in 2019 (RACGP 2019). Effective primary health care can help prevent unnecessary hospitalisations and improve health outcomes (AMA 2017; OECD 2017).

Multiple medications and therapies are often needed to manage multiple conditions, which requires extra attention from clinicians to reduce the risk of overprescribing and treatment conflicts such as dangerous drug interactions (AIHW 2014; Harrison & Siriwardena 2018; Starfield 2006). For example, the presence of coronary heart disease in people with COPD requires more careful management of certain medications such as beta-blockers (Albouaini et al. 2007). And, detailed clinical guidelines advise clinicians on the treatment of asthma when co-existing with COPD, due to the impact of treatment on the individual conditions (National Asthma Council of Australia 2019). More detailed information on the treatment and management of specific chronic conditions can be found on the [Chronic disease](#) web pages.

People with chronic conditions can also be more vulnerable to the effects of certain communicable diseases, including Influenza and Coronavirus disease (COVID-19). While most people will only experience relatively mild/moderate symptoms after contracting these diseases, people with chronic conditions including cardiovascular disease, diabetes, chronic respiratory disease and cancer can develop more serious illness (NSW Health 2018; WHO 2020). Vaccination against Influenza (having a 'flu' shot) is strongly recommended each year for people with these conditions to reduce the risk associated with contracting Influenza (NSW Health 2018). Likewise, vaccination against COVID-19 is recommended for all Australians but those with an underlying medical condition, including a disability, have been prioritised in Australia's COVID-19 Vaccine and Treatment Strategy (Department of Health, 2021). To reduce the risk of transmitting or contracting Influenza or COVID-19, hand washing/sanitising, practising appropriate cough/sneeze etiquette, physical distancing and self-isolating (if necessary) is recommended (Department of Health 2020a; NSW Health 2018; WHO 2020).

Within Australia, it is recognised that multimorbidity increases the complexity of patient care (Harrison & Siriwardena 2018), yet it is accepted that, historically, there has been a lack of coordination and communication between different parts of the Australian health care system (Department of Health 2020b).

The Australian Government has implemented a number of approaches with the aim of improving coordination and care for people with chronic conditions, including:

- access to care plans and assessments through the Medicare Benefits Schedule for the planning and management of chronic conditions
- subsidies through the Pharmaceutical Benefits Scheme for a range of medicines used in the treatment of chronic conditions
- trialling Health Care Homes where patients are enrolled with a specific general practice or Aboriginal Community Controlled Health Service to coordinate their care and to facilitate services by a care team. The care team can include a range of health professionals (for example, general practitioner, specialists, allied health professionals, practice nurses) (Department of Health 2020b).

In 2017, all Australian health ministers endorsed the [National Strategic Framework for Chronic Conditions](#) (the Framework; AHMAC 2017). The Framework provides guidance for the development and implementation of policies, strategies, actions and services to tackle chronic conditions. It moves away from a disease-specific approach and better caters for shared health determinants, risk factors and multimorbidities across a broad range of chronic conditions.

The Framework outlines 3 objectives that focus on: preventing chronic conditions, and thus minimising multimorbidities; providing efficient, effective and appropriate care to manage them; and targeting priority populations (AHMAC 2017). The Framework will be complemented by the development of a 10-year National Preventive Health Strategy announced by the Minister for Health in June 2019 (Department of Health 2020c).

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Technical notes



Technical notes

ABS National Health Survey

This web report contains results from the Australian Bureau of Statistics (ABS) National Health Survey (NHS) 2017-18, collected between July 2017 and June 2018.

The 2017-18 NHS is the most recent in a series of national health surveys conducted by the ABS. It was designed to collect a range of information about the health of Australians, including:

- prevalence of long-term health conditions
- health risk factors such as tobacco smoking, overweight and obesity, alcohol consumption and exercise
- demographic and socioeconomic characteristics.

When interpreting data from the 2017-18 NHS, some limitations need to be considered:

- Much of the data is self-reported and therefore relies on respondents knowing and providing accurate information.
- The survey is community-based and does not include information from people living in nursing homes or otherwise institutionalised.

Residents of *Very remote* areas and discrete Aboriginal and Torres Strait Islander communities are out of scope for the survey. While this is unlikely to affect national estimates, data on chronic condition multimorbidity in Aboriginal and Torres Strait Islander people is out of scope for this report. For further information, refer to the section 'Scope of the survey' in the ABS [National Health Survey: First Results methodology, 2017-18](#).

Technical notes

On this page:

- [NHS chronic condition definitions](#)
- [Grouping data for analysis](#)
- [Calculating the prevalence of multimorbidity and complex multimorbidity](#)
- [Crude, age-standardised and age-specific estimates](#)
- [Identifying patterns of multimorbidity](#)

NHS chronic condition definitions

The 10 chronic conditions included in this analysis are arthritis, asthma, back problems, cancer, selected cardiovascular diseases, chronic obstructive pulmonary disease (COPD), chronic kidney disease, diabetes, mental and behavioural conditions, and osteoporosis.

The NHS uses 3 factors to determine whether or not a person is counted as having a particular condition: whether the condition is current, whether it is long term and whether it was medically diagnosed. The combination of these factors required for a person to count as having the condition varies according to the nature of the condition ([Table 2](#)). For example, some conditions, such as diabetes and cardiovascular disease, once diagnosed, are seen to be lifelong. Even if a person no longer reports symptoms, they still count as having the condition. While other conditions, such as depression, asthma, cancer or back problems, can be lifelong, episodic or in complete remission.

Most conditions do not need the respondent to have been diagnosed by a doctor or nurse. The respondent is counted if they said they have the condition - that is, if they have self-reported the condition. However, in cases where the respondent said they had diabetes or cardiovascular disease and that the condition was not current, they need to have received a diagnosis to be counted. See the [National Health Survey questionnaire, 2017-18](#) and the [National Health Survey: Users' Guide, 2017-18](#) for more information.

Table 2: Definitions used for chronic conditions

Condition	Current	Long term	Has the condition been diagnosed by a doctor or nurse?
Arthritis	current	long term	no diagnosis required
Asthma	current	long term	no diagnosis required
Back problems	current	long term	no diagnosis required
Cancer	current	long term	no diagnosis required
Selected cardiovascular diseases (heart, stroke and vascular disease) (2 combinations)	current	long term	no diagnosis required
	ever had	not long term	diagnosis required
Chronic kidney disease	current	long term	no diagnosis required
COPD	current	long term	no diagnosis required
Diabetes (2 combinations)	current	long term	no diagnosis required
	ever had	not long term	diagnosis required
Mental and behavioural conditions	current	long term	no diagnosis required
Osteoporosis	current	long term	no diagnosis required

Grouping data for analysis

Remoteness area

Remoteness is classified according to the Australian Statistical Geography Standard (ASGS) 2016 Remoteness Areas structure based on area of residence. Remoteness Areas divide Australia into 5 classes of remoteness on the basis of a measure of relative access to services. The 5 remoteness areas are *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote*. Refer to the ABS [Remoteness structure](#) for more information.

Very remote areas are not included in this analysis, as these areas are outside of the scope of the NHS 2017-18. For more information see the section 'Scope of the survey' in the ABS [National Health Survey: First results methodology](#), 2017-18.

Socioeconomic area

Socioeconomic areas are classified according to the Socio-Economic Indexes for Areas (SEIFA), specifically the Index of Relative Socio-Economic Disadvantage (IRSD).

The IRSD classifies individuals according to the socioeconomic characteristics of the area in which they live. It scores each area by summarising attributes of the population, such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations. Areas can then be ranked according to their score. In this analysis, the population living in the 20% of areas with the greatest overall level of disadvantage is described as the 'lowest socioeconomic areas'. The 20% of areas with the lowest level of disadvantage - the top fifth - is described as the 'highest socioeconomic areas'.

Note that the IRSD reflects the overall or average level of disadvantage of the population of an area; it does not show how individuals living in the same area differ from each other in their socioeconomic position. Refer to the ABS [Socio-economic indexes for areas \(SEIFA\) 2016](#) for more information.

Family composition of household

Family composition of the household describes the members of the household to which the respondent belongs to. The following categories were used in this analysis:

- Couple family with dependent children
- Couple only
- Lone person
- One parent family with dependent children
- Other: includes other one family households, multiple family households and group households.

Analysis excludes cases where the family composition of the household could not be determined.

Tenure type of household

Participants were asked about the dwelling in which they were surveyed. In most cases this was their usual place of residence. Only those who indicated that they were in a dwelling that was owned (including partly owned or being paid off with a mortgage/secured loan) or being rented are included in analysis.

People who indicated the dwelling they were in was being purchased under a shared equity scheme, occupied under a life tenure scheme, occupied rent free or not stated were excluded due to small numbers for analysis.

Smoking status

Refers to the frequency of smoking tobacco, including manufactured (packet) cigarettes, roll-your-own cigarettes, cigars and pipes, but excluding chewing tobacco, electronic cigarettes (and similar) and smoking of non-tobacco products. Smoking status is categorised as:

- Current smoker: includes daily smokers (regularly smoked one or more cigarettes, cigars or pipes per day) and occasional smokers (smoked cigarettes, cigars or pipes, less frequently than daily).
- Ex-smoker: a respondent who reported that they did not currently smoke, but had regularly smoked daily, or had smoked at least 100 cigarettes, or smoked pipes, cigars, etc. at least 20 times in their lifetime.
- Never smoked: a respondent who reported they had never regularly smoked daily, had smoked less than 100 cigarettes in their lifetime and had smoked pipes, cigars, etc. less than 20 times.

Alcohol consumption

This report has classified alcohol consumption based on the 2009 National Health and Medical Research Council guidelines for the consumption of alcohol which were current at the time of survey. Only the 2009 lifetime risk guideline is used in this analysis, which considers average daily consumption of alcohol. A number of factors are included in the calculation of average daily consumption of alcohol:

- the type, brand, number and serving sizes of alcoholic beverages consumed
- the amount consumed on 3 most recent days of the week prior to interview (on which the respondent consumed alcohol), and
- the total number of days alcohol was consumed in the week prior to interview.

Respondents were classified as exceeding guidelines if more than 2 standard drinks were consumed per day on average. Respondents were classified as not exceeding guidelines if less than 2 standard drinks were consumed per day on average, or if they had not consumed alcohol in the last week. People that consumed alcohol at levels that put them at a lifetime risk of harm may or may not be considered to have an alcohol or drug problem (captured in the 'mental and behavioural conditions' group considered in this analysis).

Those for which the time since they last consumed alcohol was not known were excluded from analysis.

The 2009 guidelines were replaced in 2020, and the new guidelines recommend that healthy men and women should drink no more than 10 standard drinks a week and no more than 4 standard drinks in any one day (NHMRC 2020). Data on the new guidelines was not available for this report.

Physical activity

In this analysis physical activity includes walking for transport, walking for fitness, sport or recreation, moderate exercise and vigorous exercise, and workplace physical activity (moderate and vigorous) undertaken in the last week. Based on the current Australia's Physical Activity and Sedentary Behaviour Guidelines (Department of Health 2019), insufficient physical activity is defined in this analysis as:

- adults aged 18-64 who did not complete 150 minutes of moderate intensity physical activity or 75 minutes of vigorous intensity physical activity, or an equivalent combination of both, across 5 or more days in the last week and did not do muscle strengthening activities on at least 2 days each week
- adults aged 65 and over who did not do some form of physical activity every day, and did not complete at least 30 minutes of moderate intensity physical activity per day on 5 or more days in the last week.

People for whom this measure was not stated are not included in analysis.

Body Mass Index

Body Mass Index (BMI) is commonly used to classify underweight, normal weight, overweight and obesity. It is calculated from height and weight information, using the formula weight (kg) divided by the square of height (m). The NHS uses measured height and weight to calculate the BMI of survey respondents. In 2017-18, 34% of respondents aged 18 and over did not agree to have their height and weight measured. For these respondents, height and weight was imputed and used to calculate a BMI. For more information see 'Appendix 2: Physical measurements' in the [2017-18 National Health Survey methodology](#).

In this analysis people were classified as 'underweight/normal' (based on a BMI of less than 25) or 'overweight/obese' (based on a BMI of 25 or greater).

Self-assessed health

Self-assessed health status reflects a person's subjective perception of his or her own health at the time of interview. In the 2017-18 NHS, survey participants were asked "*In general would you say that your health is excellent, very good, good, fair or poor?*" Those who rated their health as 'fair' or 'poor' were grouped in analysis under the label *poor self-assessed health*, and those who rated their health as 'excellent', 'very good' or 'good' formed another group labelled *good self-assessed health*.

Bodily pain

Bodily pain refers to any bodily pain experienced (from any and all causes) in the 4 weeks prior to interview, based on a 6-point scale ranging from 'none' to 'very severe'. Participants were classified as experiencing pain if they indicated any bodily pain (ranging from 'very mild' to 'very severe').

Analysis does not include people for whom this measure was not applicable or not stated.

Psychological distress

Psychological distress refers to unpleasant feelings or emotions that affect a person's level of functioning and interfere with the activities of daily living. This distress can result in having negative views of the environment, others and oneself, and manifest as symptoms of mental illness, including anxiety and depression.

Psychological distress is measured using the Kessler Psychological Distress Scale (K10), which involves 10 questions about negative emotional states experienced in the previous 4 weeks. The scores are grouped into Low/Moderate: K10 score 10-21 and High/Very high: 22-50.

Analysis does not include people for whom this measure was not applicable, not asked, or unable to be determined.

Disability

Disability or a restrictive long-term health condition exists if a limitation, restriction, impairment, disease or disorder has lasted, or is expected to last, for six months or more, which restricts everyday activities. In the current report, a person was classified as having disability, restriction or limitation if any limitation or restriction was indicated. This included those with either profound, severe, moderate or mild limitation in core activities (mobility, self-care and communication) or restriction in schooling or employment.

Those who indicated that they had no difficulties with school, study or work and had not identified any chronic conditions were identified as having 'no disability, limitation or restriction'.

Labour force participation

People were classified as either in the labour force or not in the labour force based the following criteria:

- In the labour force includes two groups:
 1. those working: employed people who reported that in the preceding week they had worked in a job, business or farm, or who had a job but were absent during that week
 2. those seeking work: people who were not employed but actively looking for work in the four weeks prior to the survey, and were available to start work in the week prior to the survey.
- Not in the labour force: those who were not employed or seeking work, including those who were retired, no longer working, do not intend to work in the future, are permanently unable to work, or have never worked and never intend to work.

Labour force participation was not examined in people aged 65 and over.

Calculating the prevalence of multimorbidity and complex multimorbidity types

Prevalence refers to the number or proportion of cases of a particular characteristic (e.g. a specific chronic condition), that are present in a population at one point in time. This differs from incidence, which refers to the number of new cases of a particular characteristic occurring within a certain period.

Prevalence estimates are provided for people of all ages with:

- no chronic conditions
- 1 chronic condition
- multimorbidity (2 or more chronic conditions).

Prevalence estimates are also provided for people aged 45 and over with:

- no chronic conditions
- 1 chronic condition
- multimorbidity (2 or more chronic conditions).

Multimorbidity is then split into 2 groups of people aged 45 and over with:

- non-complex multimorbidity (defined as 2 or more chronic conditions affecting no more than 2 body systems)
- complex multimorbidity (3 or more conditions affecting 3 or more body systems).

Complex multimorbidity is then further split into 2 groups:

- people with moderately complex multimorbidity (3-4 chronic conditions affecting 3 or more body systems)
- people with highly complex multimorbidity (5 or more chronic conditions affecting 3 or more body systems).

Multimorbidity

The first step in calculating the prevalence of total multimorbidity is to count the number of chronic conditions each person in the population has.

Once the number of chronic conditions have been counted, the number of people with 2 or more chronic conditions (multimorbidity) is divided by the number of people in the whole population of interest to calculate the prevalence of total multimorbidity in that population.

When calculating the prevalence of total multimorbidity, the body systems affected by the 10 conditions are not considered in the calculation. As a result, a person with arthritis and osteoporosis is assessed as having 2 individual conditions and therefore as having multimorbidity, even though arthritis and osteoporosis are both musculoskeletal conditions.

Complex multimorbidity

Multimorbidity is split into 2 groups; complex and non-complex multimorbidity. The prevalence of complex multimorbidity is based on counting the number of body systems affected, as well as the number of chronic conditions. Complex multimorbidity is defined as the co-occurrence of 3 or more chronic conditions affecting 3 or more different body systems (Harrison et al. 2014).

In contrast, non-complex multimorbidity exists where 2 or more chronic conditions occur together and affect no more than 2 body systems.

The ABS NHS condition classification is based on the International Classification of Disease (10th revision; ICD-10) (ABS 2019). Chapter axes within the ICD-10 include body systems, aetiology and 'others'. For consistency with the coding of NHS condition information, ICD chapters have been used in this work as a proxy for body system, while acknowledging that all conditions in some groups cannot be attributed to the same body system, for example 'all cancers'. See [Table 3](#) for the grouping of chronic conditions by body systems based on ICD-10 chapters.

Complex multimorbidity types

In this analysis, complex multimorbidity is further divided into 2 groups: moderately complex multimorbidity and highly complex multimorbidity.

People with moderately complex multimorbidity are defined as having 3-4 chronic conditions affecting 3 or more body systems. Those with highly complex multimorbidity have 5 or more chronic conditions, affecting 3 or more body systems.

In addition to considering how conditions across different body systems affect a person with multimorbidity, these groups allow us to explore differences when a large number of chronic conditions are present.

Table 3: Classification of the selected chronic conditions based on ICD-10 chapter

ICD-10 chapter	Chronic condition	Inclusions
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Circulatory	Selected cardiovascular diseases (heart, stroke and vascular disease)	<ul style="list-style-type: none"> • Angina • Heart attack • Other ischaemic heart diseases • Stroke • Other cerebrovascular diseases • Oedema • Heart failure • Diseases of the arteries, arterioles and capillaries
Endocrine, nutritional and metabolic	Diabetes	<ul style="list-style-type: none"> • Type 1 diabetes • Type 2 diabetes • Type unknown
Genitourinary	Chronic kidney disease	<ul style="list-style-type: none"> • Chronic kidney disease
Malignant neoplasms	Cancer	<ul style="list-style-type: none"> • Malignant neoplasms
Musculoskeletal	Arthritis	<ul style="list-style-type: none"> • Osteoarthritis • Rheumatoid arthritis • Other and type unknown
	Back problems	<ul style="list-style-type: none"> • Sciatica • Disc disorders • Back pain/problems not elsewhere classified • Curvature of the spine
	Osteoporosis	<ul style="list-style-type: none"> • Osteoporosis
Psychological	Mental and behavioural conditions	<ul style="list-style-type: none"> • Alcohol and drug problems • Mood (affective) disorders • Anxiety related problems • Organic mental problems (including dementia) • Problems of psychological development • Behavioural, cognitive & emotional problems with usual onset in childhood/adolescence • Other mental and behavioural problems • Other symptoms, signs involving cognition, perceptions, emotional state and behaviour
Respiratory	Asthma	<ul style="list-style-type: none"> • Asthma
	COPD	<ul style="list-style-type: none"> • Current and long-term bronchitis • Current and long-term emphysema

Crude, age-standardised and age-specific estimates

Unadjusted (crude) weighted prevalence estimates provide important information on the actual level of multimorbidity in the population under study. However, unadjusted estimates do not account for differences in the age structure between populations and it is known that the risk of having a chronic disease varies with age. This may make comparisons across sub-populations (such as between males and females, or between people with no chronic conditions and those with multimorbidity) misleading if they have different age structures.

Variations in age structure between populations can be adjusted for by a statistical procedure called age-standardisation. This procedure applies the age-specific prevalence estimates observed in the study population to a single standard population. The overall rates that would then occur if the study population had the same age structure as the standard population can then be calculated and compared. This allows for different sub-populations to be compared on an equal age basis.

Age-standardised estimates have been reported in the section 'Who has multimorbidity and what are their experiences', where all people aged 18 and over are included in analysis. Age-standardised estimates are directly age-standardised to the Australian population as at 30 June 2001 using the age groups: 0-17, 18-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75+.

In the section '[What are the types of multimorbidity and how common are they](#)', crude estimates for people aged 45 and over are presented unless otherwise stated. Due to insufficient numbers of cases available to ensure the results of standardisation are robust for each group/measure compared, age-standardised results are not published. Age-standardised estimates were produced as part of this analysis however, and compared with crude estimates. In most cases, little difference was found between age-standardised and crude estimates. This suggests that age is not confounding the comparison of crude estimates in these instances and that crude prevalence estimates provide sufficient information for comparison.

Age-specific estimates for people aged 45-64 and 65 and over are included in [Data tables 3.3b and 3.3c](#). Age-specific estimates can be used, in comparison with total crude estimates, to help understand how results may vary by age.

Identifying patterns of multimorbidity

Two approaches were used to identify different patterns of multimorbidity:

1. identifying pairs of chronic conditions occurring together with high prevalence
2. identifying pairs of chronic conditions occurring together at a higher prevalence than expected.

All analysis was performed using SAS Enterprise Guide version 7.1. SAS PROC SURVEYFREQ was used to produce weighted estimates for each combination of 2 of the 10 selected chronic conditions (45 combinations in total). Sample weights were included in the procedure to account for survey sample design in the calculation of estimates, and replicate weights included to adjust for design effects in the calculation of variance and errors. Analysis included all people surveyed aged 45 and over.

Detail on the analysis performed to identify these patterns is outlined in the following sections.

1. Identifying pairs of chronic conditions occurring together with high prevalence

SAS PROC SURVEYFREQ was used to produce observed weighted prevalence estimates for each combination of 2 of the selected chronic conditions. 95% confidence intervals for the observed prevalence estimate were calculated using the PROC SURVEYFREQ procedure.

2. Identifying pairs of chronic conditions occurring together at a higher prevalence than expected

Identifying pairs of conditions that co-occur in individuals at a higher than expected prevalence involves comparison of observed and expected prevalence estimates.

The observed prevalence of 2 conditions co-occurring is the actual prevalence calculated from the number of cases of the 2 conditions occurring together among individuals in the population. In this analysis, the observed prevalence of co-occurrence is estimated based on self-reported condition information collected through the NHS.

Any 2 conditions may occur in the same person by chance. The expected prevalence of 2 conditions co-occurring is the prevalence that we would expect to see if the 2 conditions occurred together purely by chance. When two conditions occur together by chance, their expected co-prevalence is the product of their individual prevalence estimates (prevalence of condition A * prevalence of condition B) under the assumption that the 2 conditions are independent of each other (van den Akker et al. 2001).

The ratio of observed to expected prevalence can be used to study multimorbidity (van den Akker et al. 2001). It is a measure of how much the observed prevalence differs from the expected prevalence. If the ratio is greater than 1, then there are more cases of the 2 conditions co-occurring than would be expected by chance alone. This ratio can be used to describe the strength of the association between co-occurring conditions (Norén et al. 2013), and is described this way in the current report.

The weighted number of expected events can be computed by the PROC SURVEYFREQ procedure under the null hypothesis that the row and column variables (the 2 conditions) are independent (SAS 2019). As the prevalence of many chronic conditions increases with age, age-adjusted estimates of expected condition co-occurrence were produced in order to account for differences in condition prevalence by age group. This was performed using SAS PROC SURVEYFREQ to produce weighted numbers of observed and expected events for each combination of 2 chronic conditions, by age group: 45-54, 55-64, 65-74 and 75 and over. Counts were then summarised across age groups to calculate the weighted age-adjusted expected number of events (E), along with the weighted observed number of events (O). These counts were used to calculate the age-adjusted ratio of observed to expected prevalence of the 2 conditions co-occurring where N is the number of people in the total population of interest:

$$\frac{O/N}{E/N} = \frac{O}{E}$$

To identify pairs of conditions that co-occurred at a higher than expected prevalence, the age-adjusted ratio of observed to expected prevalence was assessed using a 95% confidence interval. If the lower limit of the 95% confidence interval is greater than 1, then the ratio is statistically significantly greater than 1. In such cases we can conclude that the number of cases of co-occurrence is greater than could be explained purely by chance and that there is a statistically significant association between the conditions.

The standard error (SE) of the estimated observed number of events is included in the output of the PROC SURVEYFREQ procedure. In order to take account of the variability arising from the sampling process and the survey design the SE is used to calculate the lower and upper limits of the 95% confidence interval around the observed number of events using the formulas:

$$\text{Lower limit (O}_L\text{)} = O - 1.96 * SE$$

$$\text{Upper limit (O}_U\text{)} = O + 1.96 * SE$$

The upper and lower limit are then substituted into the ratio, so the 95% confidence interval of the ratio of observed to expected prevalence is:

$$\left[\frac{O_L}{E}, \frac{O_U}{E} \right]$$

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Technical notes

Estimates presented here may differ from those reported elsewhere due to differences in the data source, including differences in the method of data collection, as well as the specific chronic conditions included in analysis and how they are defined.

On this page

- [Influence of self-report](#)
- [Influence of conditions included in analysis](#)
- [Study population](#)
- [Note on causality](#)

Influence of self-report

The conditions data used in this analysis are 'as reported' by respondents and may not necessarily represent conditions as medically diagnosed, or all conditions that a respondent may have. Similarly, estimates of the proportion of people who are sufficiently active are based on self-reported information which may affect interpretation.

Prevalence estimates based on self-reported conditions may differ from those reported based on diagnostic surveys or biomedical testing. In particular, estimates of people with self-reported mental or behavioural conditions presented from analysis of the NHS will differ from those obtained from a diagnostic tool such as that used in the 2007 National Survey of Mental Health and Wellbeing. The questions asked of NHS respondents are available in the [National Health Survey questionnaire, 2017-18](#).

The degree to which reported conditions have been medically diagnosed is likely to differ across age groups and condition types. Where a condition has been reported, but is not medically diagnosed, overestimation of disease prevalence can occur.

The tendency to self-report a chronic condition can differ between individuals, based on characteristics of the individual such as age, cohort or language spoken at home, and may be influenced by characteristics of the condition such as whether it is episodic or persistent in nature (Dobson et al. 2020; Lujic et al. 2017).

In contrast, a person may have a condition and either not be aware of it, or be reluctant to report it due to personal preference or the personal or sensitive nature of the condition. Where a diagnosed condition is not self-reported, or multiple diagnosed conditions are selectively self-reported, disease prevalence may be underestimated. For example, it is known that self-reported data for chronic kidney disease substantially underestimate its prevalence compared with biomedical testing: 1.0% versus 10% respectively (AIHW 2014).

The implications of this for estimating multimorbidity, the co-prevalence of chronic conditions and the strength of the association between them are even more complex. As the tendency to self-report a chronic condition can differ between individuals, some people may be more likely to report a chronic condition than others, and if a person is more likely to report one condition, they may be more likely to report another (with or without a medical diagnosis). This may lead to the overestimation of multimorbidity, co-prevalence and of the strength of association between the conditions reported by the individual who is more likely to self-report a chronic condition.

Alternatively, where an individual may selectively report some diagnosed chronic conditions, but not others, or does not report any of the conditions they have been diagnosed with, multimorbidity, co-prevalence and the strength of the association between conditions may be underestimated.

Influence of conditions included in analysis

The conditions included in this analysis were chosen for the substantial impact they have on people's health, as well as data availability. As a result, this report can only estimate the prevalence of multimorbidity due to the 10 selected conditions and may underestimate the prevalence of multimorbidity that would be calculated if all chronic conditions could be included in the analysis.

When measuring the prevalence and impact of chronic conditions collectively, the inclusion (or exclusion) of specific conditions has the potential to affect results.

For example, hypertension is a highly prevalent, major risk factor for chronic conditions including stroke, heart failure and chronic kidney disease (AIHW 2019). If chronic hypertension was included in the analysis for selected cardiovascular diseases, this may have increased prevalence estimates for cardiovascular disease, and potentially estimates of multimorbidity prevalence. The inclusion of conditions more common in either females or males could influence findings about whether multimorbidity is more common in females or males.

The way that each chronic condition has been defined within this analysis may also influence estimates of multimorbidity. For example, cardiovascular disease has a large number of inclusions, such as stroke and heart attack, but a person who reports having had both a stroke and a heart attack are only counted as having 1 condition (selected cardiovascular diseases) when counting morbidities and are not counted as having multimorbidity. In contrast, osteoporosis is the only inclusion within that condition.

Research has shown that when multimorbidity is defined as having 2 or more ‘disease entities’, there is no substantial difference in prevalence estimates, regardless of whether a disease entity represents an individual chronic condition (such as osteoporosis) or has multiple inclusions (such as cardiovascular disease) when using International Classification of Primary Care (V.2; ICPC-2) chapter, International Classification of Disease (10th revision; ICD-10) chapter or Cumulative Illness Rating Scale (CIRS) domain (Harrison et al. 2014).

This suggests that the estimates of total multimorbidity presented here are likely to be less affected by the selected conditions and their inclusions than estimates of the prevalence of the number of chronic conditions experienced, and of complex multimorbidity types where classification is partly based on the number of conditions experienced.

How conditions are allocated to body systems will also influence estimates of complex multimorbidity types as the number of body systems affected defines, in part, whether someone will be categorised as having complex multimorbidity or not. ICD-10 chapters are used as a proxy for body system in this analysis (see Table 1 ‘Definitions used for chronic conditions’ in the section [NHS chronic condition definitions](#) for details). However, using a different classification, or a different method (such as expert advice) to allocate conditions to body systems could produce different results.

Study population

Chronic conditions are more common among older people. As a result, the likelihood of having multiple chronic conditions—multimorbidity—is also expected to be higher among older Australians. However, as the NHS samples from the non-institutionalised Australian population (ABS 2018), these results potentially underestimate the true prevalence and level of multimorbidity in the entire population, given that older people in institutionalised dwellings (such as residential care facilities) are not included.

Note on causality

It is important to note that while this analysis has found characteristics that may be more common in people with multimorbidity, it is not possible to definitively say that multimorbidity is caused by these characteristics with the current data. Similarly, it is not possible to say that the characteristics examined are the result of having multimorbidity. For example, while being overweight or obese may be a risk factor for multimorbidity, it could also be the result of a person being limited in the physical activity they can participate in as a result of their multimorbidity. Longitudinal information on when a person developed multimorbidity, and when they became overweight or obese would be needed to understand this, but is not available within the NHS.

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