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Geographical variation in disease: diabetes, cardiovascular and chronic kidney disease

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AIHW

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1 Introduction

Objective

The *Geographical variation in disease* product suite provides information on the distribution of the impact of type 2 diabetes, cardiovascular disease (CVD) and chronic kidney disease (CKD) (including acute kidney injury (AKI) and dialysis) by small geography areas (state and territory, Primary Health Network and Population Health Area). This product provides comparable statistics across areas on the impact of 3 interrelated chronic diseases and their risk factors with easy access to comprehensive contextual information on the characteristics of the population living in these areas. It complements other available health digital atlases recently released such as the Australian Atlas of Healthcare Variation, the Social Health Atlases and Australian Heart Maps.

The product suite includes a series of 36 dynamic dashboards with 108 maps showing the impact of each disease; including how many people have the disease (prevalence rate), how many hospitalisations are related to the disease (hospitalisation rate) and how many people die from the disease (death rate) for each geography level.

The product suite aims to explore the following research questions:

- Where is the disease impact highest (i.e., prevalence rate, death rate, hospitalisation rate)? What is the variation in disease impact across Australia? How does the disease impact in each area compare with national and state and territory rates?
- Where is the relative difference (rate ratio) of the disease the highest? What is the variation of the relative difference? How does the relative difference in each area compare with national and state and territory rates?
- What is the health risk profile of an area of interest? How does it compare nationally and by state and territory? What is the relative difference of the health risk (rate ratio) of an area compared with the national rate?
- What are the population characteristics of an area of interest? How do they compare with the national and state and territory characteristics? What are the socioeconomic characteristics of areas with varying health outcomes and health risk profiles?

The product suite

The *Geographical variation in disease* product suite comprises 3 components:

1. Disease measures

The reported disease measures include:

- the proportion of people with the disease (prevalence) in 2017–18 and in 2011–12 (for CKD prevalence only)
- the death rate caused by or associated with the disease in 2013–2017
- the hospitalisation rate with a principal or additional diagnosis of the disease in 2015–16 to 2017–18.

These measures show the disease impact in an area in comparison to the national average using the ratio of the age-adjusted rate of the area and the national age-adjusted rate. Maps display variations across areas of Australia, showing the distribution of the actual rate of impacts (prevalence, death and hospitalisation rates) and the distribution of their relative difference (rate ratio) to the Australian average.

2. Health risk profile

A range of behavioural and biomedical factors may increase the risk of a person developing type 2 diabetes, CVD or CKD, some of which are preventable. As such, health risk profiles are included in the dashboards for each of the local populations with comparison to the national average.

The risk factors included in the product suite are:

- smoking
- physical activity
- obesity
- high blood pressure.

It is important to acknowledge the range of other complex factors that can contribute to variations in disease impact, they can be interrelated and influence individual health outcomes in different ways. Factors include individual biology (e.g., genetics, age and sex), behaviour, social determinants and environmental factors (AIHW 2020a).

Further, the presence of certain diseases themselves can act as risk factors and are therefore included in the health risk profile. For example, people with diabetes or CKD are at higher risk for other chronic diseases. Diabetes can increase the risk of CVD, CKD, cancer and dementia, and CKD is associated with the development of CVD conditions like coronary heart disease (CHD), stroke, peripheral vascular disease and dementia (AIHW 2016a).

As such, it is expected in area with high disease prevalence to be at increased risk of hospitalisation or death for the same disease. Health profile describing the prevalence of type 2 diabetes, heart, stroke and vascular disease and CKD is available as interactive graphs in all the hospitalisation and death dashboards.

3. Population characteristics

Certain population groups can experience greater disease impacts in terms of illness and death than the general population; including older Australians, Aboriginal and Torres Strait Islander people and those who are socioeconomically disadvantaged.

Age is a biological determinant of health with the risk of chronic disease and death increasing with age (Niccoli & Partridge 2012). The risk of CVD, diabetes and CKD is higher among older people. The age composition of a population can differ greatly across geographic regions of the states and territories.

Aboriginal and Torres Strait Islander people have poorer health and shorter life expectancy than non-Indigenous Australians (ABS 2018b; AIHW 2016b). Compared to other Australians, Indigenous Australians are at higher risk of CVD, diabetes and CKD (AIHW 2015b, 2020b). Their population distribution across geographic regions of the states and territories varies significantly, which influences the overall risk of CVD, diabetes and CKD of an area where a large proportion of its population is of Aboriginal or Torres Strait Islander origin.

Socioeconomic characteristics can influence disease in complex ways. They may potentially strengthen or undermine the health of individuals and local communities (AIHW 2020a). For example, recent analysis has shown that, in Australia in 2015, socioeconomic position accounted for 20% of the excess disease burden; that is, the burden that could be avoided if the lowest socioeconomic group experienced the same burden rates as the highest group (AIHW 2020a). Other findings have also shown the association between socioeconomic characteristics such as socioeconomic position, education, income and housing tenure and CVD, diabetes and CKD incidence, prevalence and death; showing worse outcomes among the most socioeconomically disadvantaged group (AIHW 2019b). The data sets for the socioeconomic characteristics included in the product suite are aligned where possible with data set year for the diseases in this report, varying between 2016 and 2018.

The population characteristics reported in the *Geographical variation in disease* dashboards are:

- people aged 65 and over
- people living permanently in aged care residence and aged 70+
- Aboriginal and Torres Strait Islander people
- educational attainment
- English proficiency
- socioeconomic disadvantage
- unemployment
- access to internet
- overcrowding.

Rationale

Cardiovascular disease (CVD), diabetes and chronic kidney disease (CKD) are together large contributors to the disease burden in Australia, accounting for 14%, 2.2% and 1.4% of the overall burden in 2015, respectively. Burden of disease analysis summarises the fatal and non-fatal impact of diseases, injury and risk factors on the population—measured in terms of premature death and people living with the disease (AIHW 2019a).

Geographically, the burden of these diseases on the Australian population is unevenly distributed. On average, in 2015, populations living in *Remote and very remote* areas were more impacted than populations in *Major cities*. In *Remote and very remote* areas the rate of CKD burden was 3.7 times as high as in the *Major cities,* while the burden rate for type 2 diabetes and CHD was twice as high (AIHW 2019a).

This product illustrates the geographical variation in the impact of diabetes, CVD and CKD (including acute kidney injury (AKI) and dialysis).

Box 1: What are cardiovascular disease, chronic kidney disease and diabetes?

Cardiovascular disease (CVD) is a broad term used to describe the many different conditions that affect the heart and blood vessels.

The most common and serious types of CVD in Australia include coronary heart disease (CHD), stroke and heart failure. The main underlying cause of CVD is atherosclerosis, where abnormal deposits of fat, cholesterol and other substances build up in the inner lining of the arteries to form plaque.

Chronic kidney disease (CKD) refers to all conditions of the kidney, lasting at least three months, affecting the filtration and removal of waste from the blood by the kidneys and/or leakage of protein or albumin in the urine.

Acute kidney injury (AKI) is a sudden reduction in kidney function (usually within a timeframe ranging from hours to days) manifesting clinically as a reversible acute increase of nitrogen waste products (serum urea and creatinine levels). In the past, AKI was referred to as acute renal/kidney failure. AKI is a common condition associated with hospitalisation and is especially common among critically ill patients (ISN 2019).

Diabetes is a chronic condition marked by high levels of glucose (sugar) in the blood. It is caused by the body being unable to produce insulin (a hormone made by the pancreas to control blood glucose levels) or to use insulin effectively, or both. The main types of diabetes are:

- type 1 diabetes—an autoimmune disease that usually occurs in childhood or early childhood
- type 2 diabetes—the most common form of diabetes, generally occurring in adulthood. It is largely preventable and is often associated with lifestyle factors such as physical inactivity, poor diet, obesity and tobacco smoking. Risk is also associated with genetic and family-related factors
- gestational diabetes—when higher than normal blood glucose is diagnosed for the first time during pregnancy
- other diabetes—a name for less-common forms of diabetes resulting from a range of different health conditions or circumstances. This includes diseases affecting the pancreas and endocrine system, viral infections, genetic syndromes and in some cases diabetes triggered from medications needed to manage or treat another health condition.

Note that, as the most common form of diabetes, this product focuses on type 2 diabetes.

2 Geographical structure, software and mapping

2.1 Geographical structure

The levels of geography reported in the dashboards include:

- state and territory
- Primary Health Network (PHN)
- Population Health Area (PHA)

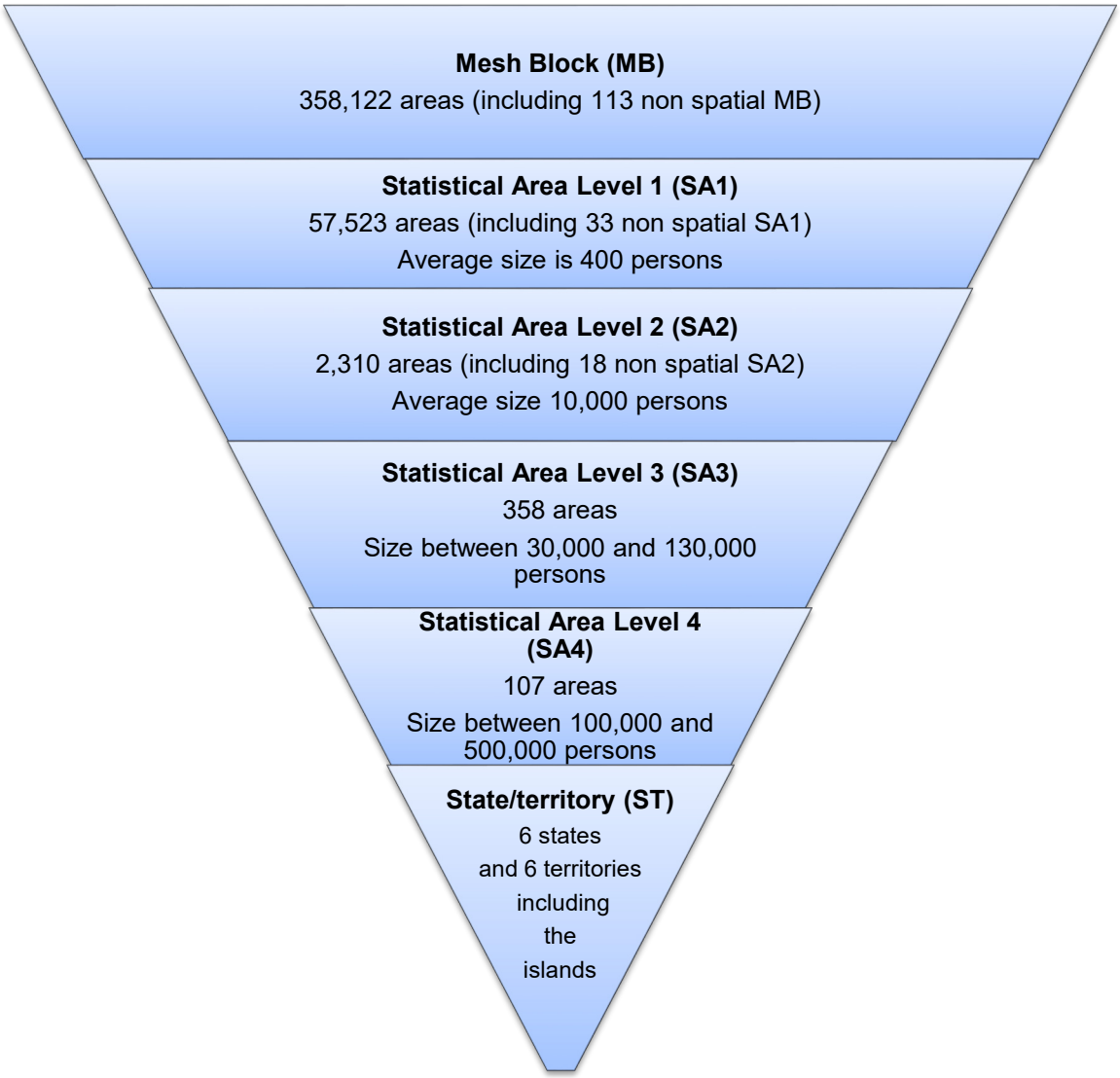
The Australian Statistical Geographical Standard

This study utilises area of usual residence data in regards to Statistical Area Level 2 (SA2) regions. These regions are sourced from the 2016 Australian Statistical Geography Standard (ASGS) produced by the Australian Bureau of Statistics (ABS). The main structure of the ASGS (as seen in Box 2) allows for statistical reporting, broadly based on the concept of functional areas at a variety of scales.

In this regard, SA2s are a general-purpose medium-sized area built from whole Statistical Area Level 1s (SA1s; Box 2) and represent a community with social and economic interaction within an average population of about 10,000 persons. There are currently 2,310 SA2s within Australia.

SA2s are the lowest-level ASGS structure for which estimated resident population (ERP), health and vitals, and other non-Census ABS data are generally available. SA2-level data can be aggregated up to the PHA and PHN levels using concordance files available from the ABS.

Box 2: Hierarchical construction of statistical area levels from the 2016 ASGS



Source: ABS 2016.

Primary Health Network

A PHN is an independent primary health care organisation established to commission health services to meet the identified and prioritised needs of people within a specific region. PHNs work collaboratively within their regions to integrate health services at the local level to create a better experience for patients, encourage better use of health resources, and eliminate service duplication.

Thirty-one PHNs were established at a regional level across Australia in 2015, replacing the previous 61 Medicare Locals. The boundaries of the PHNs align with Local Hospital Network boundaries (or equivalent), and take into account population size, alignment, state and territory borders and patient flow; as well as stakeholder input and administrative efficiencies (Department of Health 2018). For the *Geographical variation in disease* product, PHN refers to the geographic region bordered by these boundaries.

Not all PHN boundaries align directly with the ABS ASGS structure, for example, an SA2 boundary can be across 2 PHNs; making the direct comparison between PHN statistics and other geography standards, such as the ASGS, difficult. Correspondence files between the ASGS and the PHN regions, sourced from the ABS, were used to derive the PHN-based statistics presented in the product suite. Their large size in less-populated areas of Australia, particularly in jurisdictions with large Indigenous populations (such as the Northern Territory and Western Australia), may mask important intra-area variation, as shown in the PHN and PHA maps of this product. Table 2.1 shows the number of PHNs by jurisdiction.

Table 2.1: Number of Primary Health Networks (PHNs) by jurisdiction

State/territory	Number of PHNs
New South Wales	10
Victoria	6
Queensland	7
Western Australia	3
South Australia	2
Tasmania	1
Australian Capital Territory	1
Northern Territory	1
Australia	**31**

Note: Correspondence files from SA2 to PHN are available from ABS 2017. See http://www.abs.gov.au/ausstats/abs@.nsf/mf/1270.0.55.003.

For more information on PHNs, see http://www.health.gov.au/internet/main/publishing.nsf/Content/PHN-Home.

Population Health Areas

PHAs comprise a combination of whole SA2s and multiple aggregates of smaller SA2s. This level of geography maintains much of the value of the SA2 geography, while ensuring that by aggregating smaller-population SA2s relatively few areas need to have data suppressed.

The Public Health Information Development Unit (PHIDU) from Torrens University developed PHAs in collaboration with state and territory health agencies. PHA updates occur after each government Census, in line with changes to the ASGS.

In 2016, there were 1,165 PHAs in Australia derived from the 2016 ASGS. Table 2.2 summarises the number of SA2s within a PHA, with 39.7% of PHAs containing 1 SA2, 37.7% comprised of 2 SA2s and 15.8% comprised of 3 SA2s. PHA and PHN boundary do not align with cross over at some places but in most cases, PHA map show variation within a PHN.

For more information, see http://phidu.torrens.edu.au/help-and-information/about-our-data/geographical-structures/pha-overview.

Table 2.2: Number of Statistical Area Level 2s (SA2s) in Population Health Areas (PHAs)

No. of SA2s per PHA	Number of PHAs	Per cent of PHAs
1	463	39.7
2	439	37.7
3	184	15.8
4	43	3.7
5	17	1.5
6	8	0.7
7	3	0.3
8	3	0.3
9	5	0.4
Total	**1,165**	**100.0**

Note: Numbers may not sum to the total due to rounding.

Source: PHIDU 2016. See http://phidu.torrens.edu.au/help-and-information/about-our-data/geographical-structures/pha-overview.

2.2 Software and mapping

Geographical software

The *Geographical variation in disease* product suite uses geographical information software (GIS) developed by the Environmental System Research Institute (Esri). Products were constructed and published from ArcGIS Online, a cloud-based Esri environment. This platform provides a variety of web applications allowing users to explore, analyse, monitor and visualise geographical data. ArcGIS Online software updates occur periodically through the year unlike other Esri Enterprise products.

This product utilised ArcOnline to develop a number of maps and dashboards, accessible from the AIHW website under the disease topic page.

For more information on ArcGIS Online, see https://www.esri.com/en-us/arcgis/products/arcgis-online/overview.

Dashboard

Disease dashboards were constructed in *Operations Dashboard* (by Esri), a configurable web app that provides real-time operational views of people, services, assets and events data. Dashboards may contain multiple interactive elements such as maps, charts, imagery and dynamic text within a single interactive page. Dashboards offer a comprehensive and engaging view of the data to provide key insights for at-a-glance decision making.

For more information on Esri *Operations Dashboard*, see https://www.esri.com/en-us/arcgis/products/arcgis-dashboards/overview.

Disease impact maps

Maps form a component of the ArcGIS Online dashboard to represent the geographical variation of disease impact measures. These measures include prevalence, hospitalisation and death mapped to 3 geographic levels (state/territory, PHN and PHA) and include:

- crude rate
- age-standardised rate
- rate ratio

Choropleth maps represent the geographical variation of the disease impact. A sequential colour scheme represents high values (high impact) by darker colours and low values (low impact) by lighter colours. A diverging colour scheme was also used where 2 colour schemes represent the variation of values above or below a threshold (for example, rate ratio maps with a threshold value of 1).

The number of categories used for the variation depended on the data distribution; that is, the range between the minimum and maximum value of the measure. The categories represent area-based quantile ranges of between 3 and 10 groups depending on:

- the number of areas to be classified
- the value ranges of the quantiles
- the spread of the measures (as difference between maximum and minimum).

In most cases, state and territory map legends have 3 categories (tertiles) and PHN and PHA map legends have 5 categories (quintiles). The number of quantiles presented in the legend for the rate ratio map varies in some cases, to allow a better classification between areas with rates above the national average. For example, a quantile category with a range between 1 and 1.20 had to be broken down into smaller groups to allow a better classification of areas with similar rate ratios. This results in rate ratio map legends ranging from 5 to 10 categories. Conversely, for measures with a small spread of values, the number of categories used in the legend has been reduced (e.g., CVD prevalence) as there was not great variation in the measure by geography.

3 Data sources

ABS 2011–12 National Health Measures Survey

The ABS 2011–12 National Health Measures Survey (NHMS) is the biomedical survey component of the 2011–12 Australian Health Survey (AHS). Participants were drawn from the combined respondent sample of the National Health Survey (NHS) and the National Nutrition and Physical Activity Survey (NNPAS). The AHS collected information from a large sample of households about health-related issues, including health status, risk factors, health-related actions, socioeconomic circumstances, nutrition and physical activity, as well as self-reported long-term health conditions and biomedical information on chronic diseases and nutrient status.

The NHMS collected urinary and blood samples from over 11,000 voluntary respondents with children aged 5–11 years asked to provide a urine sample only.

The prevalence of chronic diseases, such as CKD and diabetes, are most accurately estimated using measured (or biomedical) data, in the form of markers found during blood and urine testing, rather than using self-reported data alone. For example, results from the AHS indicate that only 11% of the survey respondents who showed biomedical signs of CKD self-reported that they had the condition and for every 4 adults with diagnosed diabetes, there was 1 who was undiagnosed.

While the reliability of disease estimates is improved by using biomedical data, it should be noted that the AHS has limitations, which may result in the underestimation of the prevalence of these conditions:

- People living in non-private dwellings, including people living in institutional care facilities such as hospitals and aged care facilities, were not included in the survey.
- Those living in *Very remote* areas and in discrete Aboriginal and Torres Strait Islander communities were not included in the survey.
- For self-reported data items, some respondents may not have known, or were not able to accurately report, their health status.
- The response rate of the biomedical component of the survey was lower than the AHS. Overall participation in the NHMS was 37.1% among those aged 5 and over and 37.6% among those aged 12 and over with 34.7% providing a urine sample and 36.9% providing a blood sample (participants 12 years and over only) (ABS 2013).

Estimates for states and territories are direct survey estimates extracted from the 2011–12 NHMS. As unit record files in the NHMS do not include information at PHN or PHA level, the ABS produced modelled estimates for these smaller geographical areas (see Section 5.2 for more information).

For detailed information about modelled estimates and the methodology applied, please refer to the document: *Australian Health Survey 2011–12 modelled estimates for small areas – explanatory notes* in Technical notes.

For more information on the NHMS, see https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4364.0.55.005Main+Features12011-12?OpenDocument.

For more information on the AHS, see https://www.abs.gov.au/statistics/health/health-conditions-and-risks/national-health-survey-first-results/latest-release.

ABS 2017–18 National Health Survey

Conducted periodically—every 3 years between 1977 and 2021, the NHS provides information on the health status of the Australian population; including their use of health services and facilities, and health-related aspects of their lifestyle. The ABS NHS in 2017–18 is the latest survey at the time of this report. The NHS collects self-reported data on whether a respondent had 1 or more long-term health conditions; that is, conditions that lasted, or were expected to last, 6 months or more. A few exceptions have applied to health conditions not meeting the duration or currency criteria such as stroke, angina, heart attack, heart failure or epilepsy. These data are used in this report to estimate the prevalence of selected conditions. The survey had 20,700 respondents.

Consider the following limitations when interpreting data from the 2017–18 NHS:

- Much of the data is self-reported and therefore relies heavily on respondents knowing and providing accurate information.
- The survey is household-based and does not include information from people living in nursing homes or other institutions.
- The survey excludes residents of *Very remote* areas and discrete Aboriginal and Torres Strait Islander communities. This is unlikely to affect national estimates, but impacts prevalence estimates by small areas where a large proportion of the population live remotely (e.g., 20% of the population of the Northern Territory live in very remote areas).

For further information, see https://www.abs.gov.au/statistics/health/health-conditions-and-risks/national-health-survey-first-results/latest-release.

ABS 2017–18 Smoker status, Australia

In 2017–18, the NHS and the Survey of Income and Housing collected a number of items that were common to both. A pooled data set has been created from these 2 surveys and contains information on smoking behaviour from 44,904 individuals aged 15 and over. It allows derivation of more robust estimates of smoking status, particularly for smaller geographic areas.

When interpreting data from the pooled data set, the same limitations of the 2017–18 NHS apply.

For further information, see https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4324.0.55.004Quality%20Declaration02017-18?OpenDocument.

ABS 2016 Census of Population and Housing

The ABS 2016 Census of Population and Housing was Australia's 17th, 5-yearly national Census with more than 95% of Australians participating. In addition to key demographic characteristics, the Census collected information about housing tenure, education, labour force participation, occupations and industries, marital status and family size.

The Census provides information for the country as a whole, as well as for small geographic areas and small population groups.

Household, dwelling and population characteristics were extracted for inclusion in the socioeconomic profile, complementing the health risk profile of an area, which can be compared with state and territory and national profiles. Together, these provide a

comprehensive picture of disease health outcomes and behaviours within a social and economic context.

For the 2016 Census data quality statement, see https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2900.0~2016~Main%20Features~Understanding%20Census%20data%20quality~4.

For more information on the independent review of the data quality statement of the 2016 Census, see https://www.abs.gov.au/websitedbs/d3310114.nsf/home/Independent+Assurance+Panel/$File/CIAP+Report+on+the+quality+of+2016+Census+data.pdf.

AIHW National Aged Care Data Clearinghouse

Residential aged care data are available from the AIHW National Aged Care Data Clearinghouse (the Data Clearinghouse) and primarily sourced from the Department of Health.

The Data Clearinghouse is located at AIHW to provide aged care data to a range of stakeholders including policy makers, researchers, service providers and general consumers. The Data Clearinghouse includes a wide range of data on aged care providers, services, places, residents, care recipients and payments.

The majority of these data are derived from administrative data collections designed to support payment of subsidies to service providers, and include data on the numbers of clients, their age and Indigenous status. The residential aged care collection is used for this project.

Residential aged care provides care and support to senior Australians, who can no longer live at home and need ongoing help with everyday tasks or health care. Residential care is provided on a permanent or respite basis to any eligible person.

The services provided through residential care include:

- help with day-to-day tasks (such as cleaning, cooking, laundry)
- personal care (such as bathing, dressing, grooming, going to the toilet)
- clinical care (such as wound care and medication administration) under the supervision of a registered nurse
- other care services.

For people who need almost complete assistance with most activities of daily living, residential care can provide 24-hour care.

This project used June 2018 data on the permanent aged care residents aged 70 and over as additional information on the local population at risk living permanently in institutions.

At 30 June 2018, there were 2,695 residential aged care services, run by 886 operational residential aged care providers, an increase of 0.9% from the previous year.

For the data quality statement of the Data Clearinghouse, see https://meteor.aihw.gov.au/content/index.phtml/itemId/586498/.

AIHW National Mortality Database

The cause of death data used in this report are sourced from the Registrar of Births, Deaths and Marriages (RBDM) in each state and territory and the National Coronial Information System. The data were coded by the ABS using the 10th revision of the International

Classification of Diseases and Related Health Problems (ICD-10) in Australia. Note that the World Health Organization has already developed the 11th revision (ICD-11). Registration of deaths is the responsibility of the state and territory RBDM, with the Australian Coordinating Registry managing and coordinating the registry on their behalf. AIHW holds these records in the National Mortality Database (NMD).

A medical practitioner or a coroner is required to certify the cause of death and to report all medical conditions that directly contributed to the death and in some cases, the circumstances that led to the death:

- **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
- **associated causes of death**—all causes listed on the death certificate, 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 conditions causing the death.

In addition to information about causes of death, the NMD captures other characteristics of the person, such as sex, age at death, area of usual residence and Indigenous status.

Analysis of cause of death was based on:

- the year of registration of death over a 5-year period between 2013 and 2017
- area of usual residence.

Deaths registered in 2015 and earlier are based on the final version of cause of death data. Deaths registered in 2016 are based on the revised version. Deaths registered in 2017 are based on the preliminary version. Revised and preliminary versions are subject to further revision by the ABS.

Note: These data have not been adjusted for Victorian additional death registrations in 2019. For more detail please refer to Technical note: Victorian additional registrations and time series adjustments in Causes of death, Australia, 2019 (ABS Cat. no. 3303.0).

The data quality statements underpinning the AIHW NMD can be found in the following ABS publications:

ABS quality declaration summary for Deaths, Australia (ABS cat. no. 3302.0) https://www.abs.gov.au/methodologies/deaths-australia-methodology/2019#quality-declaration-summary.

ABS quality declaration summary for Causes of death, Australia (ABS cat. no. 3303.0) https://www.abs.gov.au/methodologies/causes-death-australia-methodology/2019#data-quality

For more information on the AIHW National Mortality Database, see https://www.aihw.gov.au/about-our-data/our-data-collections/national-mortality-database.

AIHW National Hospital Morbidity Database

The National Hospital Morbidity Database (NHMD) is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals.

The data are based on the Admitted Patient Care National Minimum Data Set (APC NMDS) and include demographic, administrative and length of stay data; as well as information on patient diagnoses, procedures and external causes of injury and poisoning.

The purpose of the APC NMDS is to collect information about care provided to admitted patients in Australian hospitals.

The scope of the APC NMDS is episodes of care for admitted patients in all public and private acute and psychiatric hospitals, freestanding day hospital facilities and alcohol and drug treatment centres in Australia. Hospitals operated by the Australian Defence Force, corrections authorities and in Australia's offshore territories are not in scope but some are included.

Reporting to the NHMD occurs at the end of a person's admitted episode of care (separation) using the clinical documentation for that episode. Separations—referred to in the map and data workbooks as hospitalisations—are reported to the NHMD in accordance with the requirements of the APC NMDS. A separation can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation). The NHMD does not include episodes of non-admitted patient care provided in outpatient clinics or emergency departments. Patients in these settings may be admitted subsequently, with the care provided to them as admitted patients being included in the NHMD.

The *Geographical variation in disease* product reports data both for a single year (2017–18) and as an aggregation of multiple years (2015–16 to 2017–18) in order to compare the smallest geographical areas (PHA). Both single and combined year data are reported at the national, state/territory and PHN levels.

The APC NMDS requires the principal diagnosis and any additional diagnoses to be reported according to the ninth and 10th revisions of the International Statistical Classification of Diseases and Related Health Problems, 10th Edition, Australian Modification (ICD-10-AM) and associated Australian Coding Standards.

Principal diagnosis is the diagnosis established after study and chiefly responsible for occasioning the patient's hospitalisation.

Additional diagnoses are conditions or complaints, 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 during a single episode of care.

Hospitalisations for CVD and where dialysis was undertaken are reported where they were recorded as the principal diagnosis. Diabetes, CKD and AKI hospitalisations are reported where they were recorded as any diagnosis (principal and/or additional diagnosis).

The comparability of the coded diagnosis data can be affected by variations in the quality of the coding, and can be influenced by state-specific coding standards. Further information on the quality and comparability of the coded data at the state and territory level can be found in the following AIHW publications:

- *Admitted patient care 2015–16: Australian hospital statistics* (AIHW Health services series no.75.Cat.no.HSE 185) https://www.aihw.gov.au/reports/hospitals/ahs-2015-16-admitted-patient-care/contents/table-of-contents
- *Admitted patient care 2016–17: Australian hospital statistics* (AIHW Health services series no.84. Cat.no. HSE 201) https://www.aihw.gov.au/reports/hospitals/ahs-2016-17-admitted-patient-care/contents/table-of-contents
- *Admitted patient care 2017–18: Australian hospital statistics* (AIHW Health services series no.90.Cat.no. HSE 225)

https://www.aihw.gov.au/reports/hospitals/admitted-patient-care-2017-18/contents/table-of-contents.

Data on geographical location are collected based on the area of usual residence of patients in the NHMD. These data are specified in the NMDS as state/territory of residence and SA2. Missing SA2 information explains why not all hospitalisation records could be assigned a PHN or PHA.

For the NHMD data quality statements for 2015–16, 2016–17 and 2017–18, see, respectively:

https://meteor.aihw.gov.au/content/index.phtml/itemId/723825

https://meteor.aihw.gov.au/content/index.phtml/itemId/724186

https://meteor.aihw.gov.au/content/index.phtml/itemId/724188.

For more information on the NHMD, see https://www.aihw.gov.au/about-our-data/our-data-collections/national-hospitals.

National Diabetes Services Scheme

Established in 1987, the National Diabetes Services Scheme (NDSS) is an initiative of the Australian Government, administered with the assistance of Diabetes Australia (DA). The NDSS subsidises the supply of diabetes-related services and products—such as pens and needles to administer insulin, blood glucose test strips and insulin pump consumables—to people registered with the scheme. A diagnosis of diabetes by a health professional is required in order to register with, and purchase products through, the NDSS. The NDSS registrant data provides demographic information as well as basic clinical details, such as diabetes type, while the sales data provides information on insulin use.

Not all people with diabetes register with the NDSS. However, given the incentives, it likely represents a high proportion of people with diagnosed diabetes in Australia.

As an administrative data set there are a number of data quality issues that should be noted in the context of this project:

- Prior to 2002–03 diabetes was classified as either insulin-dependent diabetes mellitus (IDDM) or non-insulin-dependent diabetes mellitus (NIDDM), with the IDDM records classified as type 1 diabetes and the NIDDM as type 2 diabetes. The changes in classification of diabetes type on the NDSS may underestimate the number of registrants with type 2 diabetes who also needed insulin to manage their diabetes.
- Diabetes type is classified by a health practitioner at the time of NDSS registration; however, the recorded type might not always be correct as the symptoms of type 1 and type 2 diabetes may be similar. To correct for the misdiagnosis of diabetes type (such as late onset type 1 diabetes), an algorithm proposed by Harding et al. (2014) was applied to reclassify registrants recorded as having type 2 diabetes to type 1 if they were:
  - less than 30 years of age at diagnosis; and
  - were using insulin; and
  - the time between date of diagnosis (or registration date if the date of diagnosis was missing); and
  - first insulin use was less than 1 year.

This may result in a small proportion of registrants with a true type 2 diagnosis being reclassified to type 1 diabetes and will result in discrepancies with published data from the NDSS.

- A large proportion of early NDSS registrations (prior to 2000) had a lower rate of completion for diagnosis date. However, the proportion of registrants with complete diagnosis date information has improved over time. Around 15% of new registrants had missing diagnosis date information in 2018 compared to 20% or over prior to 2014.
- There is limited coverage of the NDSS in remote areas. NDSS Access Points assist in delivering support services and products to people with diabetes in all states and territories. These Access Points may be limited in rural Australia and unavailable in remote communities, with other programs being available in these areas to assist with the purchase of diabetes-related products. As a result, the coverage of the NDSS may be lower in remote and very remote areas or across states and territories with large remote communities (AIHW 2017).
- The geographical information on NDSS registrants is based on the postcode of residence and is collected at the time of registration. To date, the extent to which the postcode information is updated over time is unknown, which might have an impact on the accuracy of the geographical distribution of type 2 diabetes in Australia.
- Interpretation of the results for type 2 diabetes for small geographic areas such as PHAs should be done with caution as a number of factors can affect the prevalence of type 2 diabetes at this level. These include the changes in postcode of residence information over time and the quality of the concordances for converting postcode data to PHA data for some PHAs. AIHW's internal assessment showed that over half of the postcodes (52%) poorly corresponded to the SA2 geography, leading to potential inaccuracy for 62% of the PHAs.

Despite these limitations, the NDSS is a valuable and unique national source of information about people diagnosed with diabetes.

NDSS-NDI linked data used for this project are based on the 2018 reference year.

For more details, see the 2018 quality statement of the National (insulin-treated) Diabetes Register which lists the NDSS limitations https://meteor.aihw.gov.au/content/index.phtml/itemId/727476.

National Death Index

The National Death Index (NDI), is a database housed at the AIHW, which contains records of all deaths occurring in Australia since 1980. The data are obtained from the RBDM in each state and territory. The NDI is linked to the NDSS to flag which registrants may be deceased and the date of their death to derive diabetes prevalence estimates at any point in time. The year of reference for this project was 2018.

For the data quality statement underpinning the NDI, see http://meteor.aihw.gov.au/content/index.phtml/itemId/480010.

Population data

Estimates available from the ABS for the ERP have been used to define the denominator and standard populations for all analyses in this product. ERP counts by SA2 from the 2016 ASGS were used to derive the population denominators for the PHN and PHA geographical levels. The following approach for specific data sets was used in this project:

- Denominators for the AHS were derived from the weighted population aged 18 and over. For more information about the denominators for direct estimates, see *Australian Health Survey: user's guide 2011–13* (ABS 2013a). For more information about the denominators for modelled estimates, see *Australian Health Survey 2011–12 modelled estimates for small areas – explanatory notes* in Technical notes.
- Denominators for the NHS were derived from the weighted population aged 18 and over. For more information about the denominators for direct estimates, see *National Health Survey: user's guide* (ABS 2019). For more information about the denominators for modelled estimates, see *National Health Survey, 2017–18 modelled estimates for small areas – explanatory notes release 2* in Technical notes.
- Denominators for the NHMD were derived from the ERP as at 30 June. For each financial year, December population counts were calculated, based on the averaged ERP at 30 June for each calendar year. Where the denominator for 3 financial years (2015–16, 2016–17 and 2017–18) was used, the sum of the December ERPs for each of the 3 years was divided by 3 to obtain the annual average population estimate for the denominator, and reported as annualised population. The rate calculation was based on the 3-year combined population denominator.
- Denominators for the NMD were derived from the ERP as at 30 June. Where the denominator for 5 calendar years (2013–2017) was used, the sum of the ERPs at June for each of the 5 years was divided by 5 to obtain the annual average population estimate for the denominator and reported as mean population per year. The rate calculation was based on the 5-year combined population denominator.
- Denominators used for the socioeconomic profile from 2016 Census data are summarised below with the corresponding characteristics:
  - occupied private dwellings (internet access and overcrowding)
  - usual resident population (socioeconomic quintile, educational attainment among people aged 25–74)
  - usual resident population speaking at home language other than English (self-assessed proficiency if spoken English)
  - usual resident in the labour force aged 15 to 64 (unemployment).

Estimates of the Aboriginal and Torres Strait Islander Australians in 2016 by small areas are based on the ABS Estimated Aboriginal and Torres Strait Islander Resident Population after adjusting for net census population undercount (ABS 2018d). Population estimates by Primary Health Network were derived using the correspondence files between SA2 area and Primary Health Network belong to a different geographical system than the ASGS.

For data quality statement of the ABS Estimated Aboriginal and Torres Strait Islander Resident Population see ABS Quality Declaration.

4 Definitions

4.1 Diseases and risk factors

Chronic kidney disease

CKD estimates were based on measures of estimated glomerular filtration rate (eGFR) and albumin/creatinine ratio (ACR) from biomedical blood and urine samples taken as part of the 2011–12 AHS:NHMS. These 2 measures are combined to identify signs of CKD staging (see 'CKD biomedical markers'). To confirm kidney disease, the reduction of kidney function marked by a low eGFR or signs of a damaged kidney detected by the presence of blood in the urine (haematuria) or the presence of albumin protein in the urine (albuminuria) should persist for at least 3 months (Kidney Health Australia 2019).

The AHS biomedical data provide prevalence estimates for signs of CKD. CKD is usually categorised into 5 stages according to the level of kidney function or the extent of damage in the kidney indicated by results of CKD biomarkers. The product suite does not report on the different stages of CKD but the overall prevalence of biomedical signs of CKD are referred to as the prevalence of CKD.

CKD biomedical markers

Estimated glomerular filtration rate (eGFR) is an estimation of the flow rate of filtered fluid through the kidney based on creatinine levels in the blood serum, using a formula accounting for age, sex and ethnicity. When the eGFR is less than 60 mL/min/1.73m^2, it indicates reduced kidney function.

Albuminuria is a key marker of kidney damage. The presence of albumin in the blood is measured using the albumin/creatinine ratio (ACR) based on results from urine tests. When the ACR is greater than or equal to 2.5 mg/mmol for males and greater than or equal to 3.5 mg/mmol for females, it indicates damage in the kidney.

The direct estimates of CKD prevalence were derived from ABS *DataLab* for state and territory and national levels, excluding survey population records where eGFR and ACR results were both missing (7% of the adult weighted biomedical sample).

CKD prevalence estimates for PHNs and PHAs were derived from modelling by the ABS using logistic regression. Note that remote and very remote SA2 areas and areas belonging to discrete Indigenous communities were excluded from the survey sample. CKD estimates for PHA including these areas have to be interpreted with caution.

For more details on the ABS method, please refer to *Australian Health Survey 2011–12 modelled estimates for small areas – explanatory notes* in Technical notes.

Type 2 diabetes

Diabetes is a chronic condition marked by high levels of glucose in the blood. Type 2 diabetes is the most common form of diabetes. People with type 2 diabetes produce insulin, but do not produce enough, and/or cannot use it effectively. Type 2 diabetes is largely preventable with lifestyle factors such as physical inactivity, poor nutrition, overweight or obesity and high blood pressure closely related to the occurrence of type 2 diabetes.

The prevalence of type 2 diabetes was derived from the NDSS administrative data set as the number of NDSS registrants with type 2 diabetes. NDSS registrants with type 2 diabetes recorded were reclassified as having type 1 if:

- they were less than 30 years of age at diagnosis; and
- were using insulin; and
- the time between date of diagnosis (or registration date if the date of diagnosis was missing) and first insulin use was less than 1 year.

This may result in a small proportion of registrants with a true type 2 diagnosis being reclassified to type 1 diabetes and will result in discrepancies with published data from the NDSS.

Heart, stroke and vascular disease

Heart, stroke and vascular disease (HSVD) is a subset of cardiovascular disease (CVD) including the most common and serious types of CVD: coronary heart diseases (CHD) (angina, heart attack and other heart diseases)—also known as ischaemic heart disease, cerebrovascular diseases (including stroke), oedema, heart failure and diseases of arteries, arterioles and capillaries.

HSVD is reported in the prevalence dashboards (aligning with ABS NHS publications and data). The broader definition (all CVD) is reported in the hospitalisation and deaths dashboards.

Direct estimates of HSVD prevalence were derived from *ABS DataLab* for state and territory and for the whole country using the ABS 2017–18 NHS.

HSVD prevalence estimates for PHNs and PHAs were modelled by the ABS using logistic regression. Note that for PHA estimates, SA2 areas were excluded where most of the private dwelling population was classified as *Very remote* or belonged to discrete Indigenous communities, resulting in an underestimation of HSVD estimates for PHAs covering these areas. For more details on the ABS method, please refer to *ABS NHS 2017–18 Modelled estimates for small areas: Explanatory notes* in Technical notes.

Uncontrolled high blood pressure

High blood pressure is a risk factor for stroke, ischaemic heart disease, heart failure and CKD. In 2015, high blood pressure was the fourth-leading risk factor contributing to disease burden (AIHW 2019a).

Uncontrolled high blood pressure is based on the measured blood pressure ranges from the survey, where people were classified as having uncontrolled high blood pressure if their systolic blood pressure was greater than or equal to 140 mmHg or their diastolic blood pressure was greater than or equal to 90 mmHg.

This measure excluded people who were taking blood-pressure-lowering medication and had their blood pressure under control with normal readings at the time of the survey.

In 2017–18, 31.6% of eligible survey respondents aged 18 years and over did not have their blood pressure measured. For these respondents, blood pressure was imputed. For more information, see Appendix 2: Physical measurements in the 2017–18 National Health Survey (ABS 2018c).

The state and territory direct estimates were based on measured and imputed blood pressure values while the PHA and PHN estimates were modelled. The modelled estimates used both measured and imputed values of blood pressure. For more details on the ABS method, please refer to *ABS NHS 2017–18 Modelled estimates for small areas: Explanatory notes* in Technical notes.

Overweight and obesity

Overweight and obesity refers to excess body weight. Excess weight, especially obesity, is a major risk factor for CVD, type 2 diabetes, high blood pressure and other chronic conditions. Overweight and obesity categories are based on the body mass index (BMI), values derived by dividing a person's weight in kilograms by the square of their height in metres (Table 4.1). In this product, BMI applies to the adult population (aged 18+) and was based on measured and imputed height and weight values of all survey respondents from the ABS 2017–18 NHS.

Table 4.1: Body mass index (BMI) classification for adults aged 18 and over

BMI (kg/m^2)	Classification
Less than 18.5	Underweight
18.5 to less than 25	Healthy weight range
25 to less than 30	Overweight
30 or more	Obese

Source: WHO 2000.

In 2017–18, 33.8% of respondents aged 18 and over did not have their height and or weight measured. For these respondents, height and weight was imputed. For more information, see Appendix 2: Physical measurements in the 2017–18 National Health Survey (ABS 2018c).

The state and territory direct estimates were based on measured and imputed BMI while the PHA and PHN estimates were modelled. The modelled estimates used both measured and imputed values for the BMI. For more details on the ABS method, please refer to *ABS NHS 2017–18 Modelled estimates for small areas: Explanatory notes* in Technical notes.

Insufficient physical activity

People who do not do sufficient physical activity have a greater risk of CVD, type 2 diabetes and osteoporosis. Being physically active improves mental and musculoskeletal health and reduces other risk factors such as overweight and obesity, high blood pressure and high blood cholesterol.

Australia's Physical Activity and Sedentary Behaviour Guidelines (the Guidelines) are a set of recommendations outlining the minimum levels of physical activity required for health benefits, as well as the maximum amount of time one should spend on sedentary behaviours to achieve optimal health outcomes (Department of Health 2019):

The Guidelines recommend:

- for people aged 18–64
  - be active on most, preferably all, days every week
  - accumulate 150 to 300 minutes (2 ½ to 5 hours) of moderate intensity physical activity or 75 to 150 minutes (1 ¼ to 2 ½ hours) of vigorous intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week

  - do muscle strengthening activities on at least 2 days each week
- for people aged 65 or more
  - be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility
  - accumulate at least 30 minutes of moderate intensity physical activity on most, preferably all, days.

For the purposes of this report, people were considered **insufficiently physically active** if they met the criteria below based on self-reported data on the duration, intensity of phsycial activity spread over a week from the 2017–18 NHS:

1. Adults aged 18–64 who undertook less than 150 minutes of moderate physical activity or equivalent per week and were active on fewer than 5 days per week
2. Adults aged 65 and over who were active for less than 30 minutes per day for fewer than 5 days per week.
3. Note that workplace activity was excluded from this measure. As such, the estimates differ from other published estimates including physical activity at work.

The state and territory direct estimates were based on results from the ABS 2017–18 NHS for those aged 18 and over who answered the relevant questions, excluding those with incomplete or missing information (less than 1% of adults weighted survey sample) while the PHA and PHN estimates were modelled. For more details on the ABS method, please refer to *ABS NHS 2017–18 Modelled estimates for small areas: Explanatory notes* in Technical notes.

Tobacco smoking

Tobacco smoking is one of the largest preventable causes of death and disease in Australia, responsible for 9.3% of the total burden of disease in Australia in 2015. Tobacco smoking is associated with an increased risk of heart disease, diabetes, stroke, kidney disease and other conditions such as cancer, eye disease and respiratory conditions.

Current tobacco smoking refers to a person who reported smoking manufactured (packet) cigarettes, roll-your-own cigarettes, cigars and pipes, daily or at least once a week but excluding chewing tobacco, electronic cigarettes (and similar) and smoking of non-tobacco products. Note that current tobacco smoking encompasses both people who smoke less frequently than daily and daily smokers—a larger group than for 'current daily smoking'. See details in the ABS National Health Survey: users' guide, 2017–18.

The same question items were asked in the 2 surveys and pooled into 1 data set—the ABS's 2017–18 Smoker status, Australia—to increase sample size and produce more robust estimates.

The state and territory direct estimates were based on results from the survey while the PHA and PHN estimates were modelled. For more details on the ABS method, please refer to *ABS NHS 2017–18 Modelled estimates for small areas: Explanatory notes* in Technical notes.

4.2 Population characteristics

Socioeconomic characteristics by small areas were analysed from the latest ABS 2016 Census of Population and Housing. Detailed descriptions of the selected socioeconomic characteristics can be found in the Census dictionary at: https://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/2901.0Main%20Features302016?opendocument&tabname=Summary&prodno=2901.0&issue=2016&num=&view=.

All characteristics described below, are reported for all geographical areas in the scope of this project, with the exception of socioeconomic group based on the Index of Relative Socio-economic Disadvantage (IRSD) which is available only for PHAs and state and territory.

Population aged 65 and over

The age composition of a population differs greatly across geographic regions of the states and territories and this has an influence on the size of the population at risk.

The measure reported is the proportion of people aged 65 and over by the geographical areas in scope in 2016.

Older people living in permanent aged care

Residential aged care data from the National Aged Care Data Clearinghouse contain informative statistics on the population living permanently in aged care residence.

The measure reported is the proportion of the population aged 70 and over living permanently in residential aged care as at June 2018 by all geographical areas in the scope of this project. Disease prevalence estimates sourced from NHSs reflect only the prevalence of the population usually living in private dwellings. The extent to which the prevalence estimates potentially underrepresent the actual local population is useful information for planning and public health interventions.

Aboriginal and Torres Strait Islander people

The measure reported is the overall proportion of the Indigenous population by geographical area in 2016 based on the ABS Estimated Resident Population (ABS 2018d)

Proficiency in spoken English

In the Census, each person who speaks a language other than English at home is asked how well they speak English (referred to as ENGP in the Census dictionary). The measure reported is the percentage of persons speaking a language other than English at home who reported their English proficiency level as ‘not well’ or ‘not at all’.

Educational attainment

Census information was collected on the level of highest educational attainment (referred to as HEAP in the Census dictionary). This is a single measure of a person’s overall level of educational attainment, whether it be a school or non-school qualification.

For the purposes of this project, the measure reported is the proportion of people aged 25–74 whose overall level of educational attainment falls in the lowest (secondary or lower education, certificates I, II, including people who did not attend school) and highest (bachelor degree or higher) categories for comparison. Not all education levels

(e.g., diploma, advanced diploma or certificates III and IV) are reported, hence the sum of the 2 proportions may not add up to 100.

Socioeconomic disadvantage

The IRSD is 1 of 4 area-based socioeconomic indexes developed by the ABS using information collected in the Census of Population and Housing. The IRSD represents the socioeconomic conditions of geographic areas by measuring aspects of relative disadvantage. The IRSD scores each area by summarising attributes of their population, such as low income, low educational attainment, high unemployment, and jobs in relatively unskilled occupations. A low score indicates relatively greater disadvantage while a high score indicates a relative lack of disadvantage. The IRSD reflects the overall or average socioeconomic position of the population of an area; it does not show how individuals living in the same area might differ from each other in their socioeconomic position nor does it show the relative disadvantage between individuals living in different areas (ABS 2018a).

Based on the IRSD, population-based quintile groups were used to report on the proportion of sub-populations of interest who live in each quintile. Five equal groups were formed based on the population of these areas, with quintile 1 being the most disadvantaged socioeconomic group through to quintile 5, the least disadvantaged.

At the national level each population quintile roughly represents one-fifth of the population. As such, 20% in each quintile group is used as a benchmark for comparison with socioeconomic group population distributions in smaller areas. The population in small areas is unevenly distributed across socioeconomic groups and may fluctuate between 0% and 100%, reflecting differences in socioeconomic disadvantage between areas. This measure is presented for state and territory and PHAs only. The highest and lowest categories (least and most disadvantage) are provided only for comparison in the Population characteristics graph, hence the sum of the 2 proportions may not add to 100.

For further information, see https://www.abs.gov.au/ausstats/abs@.nsf/mf/2033.0.55.001.

Unemployment

Unemployment is based on labour force status information collected during the Census (referred as LFSP in the Census dictionary). LFSP measures employment status among individuals aged 15 and over in the labour force.

The measure reported is the proportion of people who are unemployed and looking for full or part-time work aged 15–64.

Access to internet

The access to internet measure (referred as NEDD in the Census dictionary) collected in the Census is based on occupied private dwelling. The measure reported is the percentage of occupied private dwellings with no access to internet.

Overcrowding

Households were classified as overcrowded if they were estimated to require at least 1 bedroom or more than they have. It compares the number of bedrooms in a dwelling together with household demographics such as the number of usual residents, their relationships to one another, as well as their age and sex. The criteria used to assess the suitability of

dwelling utilisation, were based on the Canadian National Occupancy Standard and are as follows:

- There should be no more than two persons per bedroom.
- Children less than 5 years of age of different sexes may reasonably share a bedroom.
- Children less than 18 years of age and of the same sex may reasonably share a bedroom.
- Single household members aged 18 years and over should have a separate bedroom, as should parents or couples.
- A lone-person household may reasonably occupy a bed sitter.

4.3 Hospitalisations

Definitions

Hospitalisation counts are counts of admitted patient episodes of care and not individual patients. This can include multiple hospitalisations experienced by the same person if the individual had more than 1 hospitalisation for a vascular disease in the given time period.

For this report, hospitalisations referred to episodes of care where the selected condition was recorded as:

- the principal diagnosis and/or an additional diagnosis for type 2 diabetes, CKD and AKI
- the principal diagnosis for CVD and regular dialysis.

The following hospitalisation records were excluded from the analysis:

- care types: 7.3 (newborn—unqualified days only), 9 (organ procurement—posthumous) and 10 (hospital boarder)
- separations from Western Australia which were coded as being an 'Inter-hospital contracted patient to private sector hospital' were excluded based on advice from Western Australia to avoid double counting these separations
- where age or sex were unknown or invalid for the calculation of age-standardised rates
- where place of usual residence of the patient was unknown, invalid, no fixed address, at sea or overseas and those residing in *Other territories*—Cocos (Keeling) Islands, Christmas Island— or in Jervis Bay Territory—Australian Capital Territory. These were included in the total for Australia only.

Hospital diagnosis data used ICD-10-AM (ninth and 10th editions). The ICD-10-AM diagnosis codes for vascular disease are included in Table 4.2.

Table 4.2: Selected disease classification codes in hospitalisation data

Condition	ICD-10-AM codes
CKD (excluding dialysis)	
Diabetic nephropathy	E10.2, E11.2, E13.2, E14.2
Hypertensive kidney disease	I12, I13, I15.0, I15.1
Glomerular diseases	N00–N08
Kidney tubule-interstitial diseases	N11, N12, N14, N15, N16
Chronic kidney failure	N18
Unspecified kidney failure	N19
Other disorders of kidney and ureter	N25–N28, N39.1,N39.2

Congenital malformations	Q60–Q63
Complications related to dialysis and kidney transplant	T82.4, T86.1
Preparatory care for dialysis	Z49.0
Kidney transplant and dialysis status	Z94.0, Z99.2
Dialysis	
Haemodialysis	Z49.1
Peritoneal dialysis	Z49.2
Acute kidney injury (AKI)	
Acute nephritis syndrome	N00
Acute tubule-interstitial nephritis	N10
Acute kidney failure	N17
Diabetes with other specified kidney complication including acute kidney failure/impairment and medullary (papillary) necrosis	E10.29,E11.29,E13.29,E14.29
Postpartum acute kidney failure and kidney failure after abortion and ectopic or molar pregnancy	O90.4,O08.4
Post procedural kidney failure	N99.0
All cardiovascular disease	I00–I99

Data suppression

Data have been suppressed if the:

- hospitalisation mean count per year was less than 5 or the annual average ERP was less than 100
- number of hospitalisations in the reference period was less than 20 for crude rates
- age-specific rates based on mean number of hospitalisations was less than 5 per year or 15 over the 3-year reference period and/or a mean population denominator was less than 100 per year or 300 over the 3-year reference period
- age-standardised rates were less than 20 hospitalisations in total in the reference period and/or an age-group population denominator was less than 30.

4.4 Deaths

Definitions

To fully capture the contribution of CKD, AKI, and type 2 diabetes to deaths from these conditions, death records were extracted for people who had these conditions listed on the death certificate as the underlying and/or associated cause of death:

- **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
- **associated causes of death**—all causes listed on the death certificate, 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 conditions causing the death.

Cardiovascular deaths were enumerated only when CVD was listed as the underlying cause of death.

Death records for which information on sex, age, or place of usual residence was missing, were excluded in the calculation of rates or statistics by geography but included in the totals for persons, all ages and all Australia. In addition, Australian death counts include deaths from *Other territories*, such as Christmas Island, Cocos (Keeling Island), Jervis Bay Territory and with unknown usual residence.

Cause of death is coded according to the rules set forward in the various versions of the ICD. The relevant codes for CKD, AKI, CVD and diabetes deaths using in this product are included in Table 4.3.

Table 4.3: Selected disease classification codes in death data

Condition	ICD-10 codes
Chronic kidney disease	
Diabetic nephropathy	E10.2, E11.2, E12.2, E13.2, E14.2
Hypertensive kidney disease	I12, I13, I15.0, I15.1
Glomerular diseases	N00–N07
Kidney tubule-interstitial diseases	N11, N12, N14, N15
Chronic kidney failure	N18
Unspecified kidney failure	N19
Other disorders of kidney and ureter	N25–N28, N39.1, N39.2, E85.1, D59.3, B52.0
Congenital malformations	Q60–Q63
Complications related to dialysis and kidney transplant	T82.4,T86.1
Acute kidney injury (AKI)	
Acute nephritis syndrome	N00
Acute tubule-interstitial nephritis	N10
Acute kidney failure	N17
Postpartum acute kidney failure and kidney failure after abortion and ectopic or molar pregnancy	O90.4,O08.4
Post procedural kidney failure	N99.0
Type 2 diabetes	E11,O24.1
Cardiovascular disease	I00–I99

Data suppression

Death rates are based on 5 years of combined mortality data from 2013 to 2017, due to the small number of diabetes and CKD deaths. At the PHN-area level, diabetes and CKD mortality rates are presented by broad age groups (under 55, 55–74 and 75 and over) and sex, while at the PHA level, data are available only for persons.

Data have been suppressed if the:

- death count per year was less than 3
- crude rates were based on a population denominator of less than 100
- age-specific rate based on the mean number of deaths was less than 5 per year or 25 over the 5-year reference period and/or the mean population denominator was less than 30 per year or 150 over the 5-year reference period
- age-standardised rates were less than 20 deaths in total in the reference period and/or an age-group population denominator was less than 30.

5. Statistical methods

The statistical methods presented below are also included in each data table with more detailed information on how these methods apply to the specific data source.

The following data tables can be accessed from Data:

- CKD prevalence
- CKD hospitalisation and dialysis
- CKD deaths
- AKI hospitalisation
- AKI deaths
- Type 2 diabetes prevalence
- Type 2 diabetes hospitalisation
- Type 2 diabetes deaths
- CVD and HSVD prevalence
- CVD hospitalisation
- CVD deaths
- Population characteristics.

5.1 Measures

Count

Count refers to the number of events (e.g., persons with disease, hospitalisations, deaths) occurring in the population or the number of the people residing in a specific geographic area. Please note that for hospitalisation and deaths data, counts were combined over a multiple-year period, due to the small number of counts at the SA2 level. Mean number of events per year was calculated by dividing the combined counts by the number of years included in the time period. Note that some disease and risk factor prevalence counts came from direct and modelled survey estimates. These counts include a level of error related to the sample size of the survey. For more details of the method to derive error and their related confidence, consult the following documents *ABS NHS 2017–18 Modelled estimates for small areas: Explanatory notes* in Technical notes.

Crude rate

A crude rate is the number of events in a given period divided by the size of the population at risk in the specific time period and approximated by the ERP for death and hospitalisation rates and the weighted survey population for prevalence. This period can be a year or multiple years. For example, CKD death rates were calculated based on the combined deaths and populations over the 5-year period.

Age-specific rate

An age-specific rate is a rate for a specific age group, where the numerator and denominator relate to the same age group. It measures the occurrence of an event within a specific age range in the population. In this product, 3 broad age groups were used for reporting: 0–54 or 18–54; 55–74; and 75 and over (survey prevalence estimates only).

Age-standardised rates

Age standardisation is a method of reducing the influence of age when comparing populations with different age structures. Directly age-standardised rates were computed as shown below to enable the comparison of rates between geographical areas.

Direct method

A directly age-standardised rate is derived by applying the age-specific rates in the study population to a single standard population—the June 2001 Australian ERP. Rates that have been directly age-standardised are comparable across geographic areas. Direct age-standardisation was applied to prevalence estimates at the state/territory level, and for all hospitalisation and deaths data.

The computational formula used to derive the directly age-standardised rate (ASR) is:

$$ASR = \sum_i Nipi \Big/ \sum_i Ni$$

with:

- N_i the standard population for each age group i
- p_i the event rates for each age group i.

95% confidence interval

The computational formulae used to derive the standard error (SE) and 95% confidence interval (CI) of the ASR are:

$$SE(ASR) = \sqrt{\sum_i \left(\frac{Ni^2 pi}{ni}\right) \Big/ \left(\sum_i Ni\right)^2}$$

$$\mathrm{CI(ASR)} = \mathrm{ASR} \pm (1.96 \times SE(ASR))$$

Note: Assumes Poisson distribution of the events and normal distribution of the ASRs.

Rate ratio

The rate ratio (RR) provides a measure of the relative gap in rates (crude and age-standardised) between 2 populations. Directly age-standardised RRs are the rates in the geographical areas (state/territory, PHN, PHA) divided by the national ASR.

The computational formula used to derive the RR between 2 ASRs (e.g., ASRa—local rate and ASRb—national rate) is:

$$RR = ASRa/ASRb$$

95% confidence interval

In order to assess whether the relative difference between the 2 rates is a true difference, the 95% CI for the RR (i.e., CI(RR)) was calculated using the formula below (Rothman et al. 2008):

Where:

$$CI(RR) = e^{[\ln(RR) \pm 1.96 \times SE(\ln(RR))]}$$

$$SE(\ln(RR)) = \sqrt{\frac{SE(ASRa)^2}{ASRa^2} + \frac{SE(ASRb)^2}{ASRb^2}}$$

With:

- e as exponential
- SE as standard error
- ln as natural logarithm.

Note: Assumes Poisson distribution of the events and normal distribution of the ASRs.

Percentile

Percentile is a measure derived by ranking the geographic areas (PHA) by the ASR and dividing it into 100 (percentile) equal parts. Percentile can also mean the cut-off points that make these divisions. In this report, percentile rankings are allocated for PHA hospitalisation and deaths data—the higher the ranking group number the higher the rate.

5.2 Survey estimates

ABS surveys are designed to obtain a sample that represents the characteristics of the national population on a smaller scale, and thus to reduce the cost and burden associated with data collection.

Direct survey estimates

Estimates for states and territories and the PHNs encompassing a whole state or territory—Tasmania, the Northern Territory and the Australian Capital Territory—were based on direct estimates. Modelled estimates were used for Tasmania, the Northern Territory and the Australian Capital Territory where their direct age-specific estimates were found unreliable.

The sampling designs for the 2011–12 AHS and the 2017–18 NHS were not intended to provide estimates by small areas (PHN and PHA). To overcome this limitation, the ABS undertook modelling to produce synthetic estimates for smaller geographical areas.

Modelled survey estimates

The modelled estimates were based on random effects logistic regression models fitted to data from the 2017–18 NHS, ERP as at 30 December 2017, 2016 Census of Population and Housing and administrative data, adjusted (where possible) to match the scope of the NHS 2017–18.

For both surveys (AHS and NHS), areas were excluded from the modelling process if:

- they were classified as *Very remote*
- they were classified as discrete Aboriginal and Torres Strait Islander communities
- they had zero residents.

Data for the Northern Territory, in particular, should be interpreted with caution as Aboriginal and Torres Strait Islander communities comprise around 28% of the resident population of the Northern Territory of which almost 8 in 10 Indigenous Australians live in *Remote* (21%) or *Very remote* (56%) areas (ABS 2017).

For detailed information about modelled estimates and the methodology applied, please refer to the following papers in Technical notes:

- National Health Survey, 2017–18 modelled estimates for small areas – explanatory notes release 2
- Australian Health Survey 2011–12 modelled estimates for small areas – explanatory notes

Abbreviations

ABS	Australian Bureau of Statistics
ACR	albumin/creatinine ratio
ACT	Australian Capital Territory
AHS	Australian Health Survey
AIHW	Australian Institute of Health and Welfare
AKI	acute kidney injury
APC NMDS	Admitted Patient Care National Minimum Data Set
ASR	age-standardised rate
ASGS	Australian Statistical Geography Standard
BMI	body mass index
CHD	coronary heart disease
CI	confidence interval
CKD	chronic kidney disease
CVD	cardiovascular disease
DA	Diabetes Australia
eGFR	estimated glomerular filtration rate
ERP	estimated resident population
Esri	Environmental System Research Institute
GIS	geographical information software
HbA1c	glycated haemoglobin
HSVD	heart, stroke and vascular disease
ICD-10	International Classification of Diseases and Related Health Problems, 10th revision
ICD-10-AM	International Classification of Diseases and Related Health Problems, 10th revision, Australian Modification
IDDM	insulin-dependent diabetes mellitus
IRSD	Index of Relative Socio-economic Disadvantage
LHN	Local Hospital Network
MB	Mesh Block (ASGS unit)
NDAC	National Aged Care Data Clearinghouse
NDI	National Death Index
NHMD	National Hospital Morbidity Database
NHMS	National Health Measures Survey

NHS	National Health Survey
NIDDM	non-insulin-dependent diabetes mellitus
NMD	National Mortality Database
NMDS	national minimum data set
NNPAS	National Nutrition and Physical Activity Survey
NSW	New South Wales
NT	Northern Territory
PHA	Population Health Area
PHIDU	Public Health Information Development Unit
PHN	Primary Health Network
Qld	Queensland
RBDM	Registrar of Births, Deaths and Marriages
RR	rate ratio
SA	South Australia
SA1	Statistical Area Level 1
SA2	Statistical Area Level 2
Tas	Tasmania
Vic	Victoria
WA	Western Australia

Symbols

—	nil or rounded to zero
. .	not applicable
n.a.	not available
n.p.	not publishable because of small numbers, confidentiality or other concerns about the quality of the data

Glossary

Aboriginal or Torres Strait Islander: a person of Aboriginal or Torres Strait Islander descent who identifies as an Aboriginal or Torres Strait Islander.

additional diagnosis: a condition or complaint that either coexists with the principal diagnosis or arises during the hospitalisation. An additional diagnosis is reported if the condition affects patient management.

age structure: The relative number of people in each age group in a population.

age-specific rate: A rate for a specific age group. The numerator and denominator relate to the same age group.

age standardisation: A way to remove the influence of age when comparing populations with different age structures. This is usually necessary because the rates of many diseases vary strongly and usually increase with age. The age structures of the different populations are converted to the same 'standard' structure, and then the disease rates that would have occurred with that structure are calculated and compared. Age-standardised rates are usually expressed per 100,000 population.

associated cause(s) of death: all causes listed on the death certificate 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 the death. See also cause of death.

biomedical data: biomedical or **measured data**—in the form of markers found during blood and urine testing—is the most accurate way to measure the prevalence of chronic diseases such as diabetes and chronic kidney disease. In the 2011–12 Australian Bureau of Statistics Australian Health Survey:

- 2 tests were undertaken to detect biomedical signs of diabetes: a measure of fasting plasma glucose (FPG) and a measure of glycated haemoglobin (HbA1c).
- 2 tests were undertaken to identify signs of chronic kidney disease by determining kidney function (estimated glomerular filtration rate (eGFR) and kidney damage (albumin creatinine ratio (ACR)).

blood pressure: The force exerted by the blood on the walls of the arteries as it is pumped around the body by the heart. It is written, for example, as 134/70 mmHg, where the upper number is the systolic pressure (the maximum force against the arteries as the heart muscle contracts to pump the blood out) and the lower number is the diastolic pressure (the minimum force against the arteries as the heart relaxes and fills again with blood). Levels of blood pressure can vary greatly from person to person and from moment to moment in the same person. See also **high blood pressure/hypertension**.

body mass index: The most commonly used method of assessing whether a person is within a healthy weight range, underweight, **overweight** or **obese**. It is calculated by dividing the person's weight (in kilograms) by their height (in metres) squared; BMI = weight (kg) / height $(m)^2$. For both men and women, underweight is a BMI below 18.5, a healthy weight range is from 18.5 to less than 25, overweight is from 25 to less than 30, and obese is 30 and over. Sometimes overweight and obese is combined, and is defined as a BMI of 25 and over.

burden of disease: The quantified impact of a disease, injury or risk factor on a population, using the **disability-adjusted life year (DALY)** measure. One DALY is one year of 'healthy

life' lost due to illness and/or death. The more DALY associated with a disease or injury, the greater the burden. The DALY is produced by combining the non-fatal and fatal burden together. People generally experience more burden as they age.

cardiovascular disease/condition: Any disease of the circulatory system, namely the heart (cardio) or blood vessels (vascular). Includes angina, heart attack, stroke and peripheral vascular disease. Also known as circulatory disease.

cause of death: the causes of death entered on the Medical Certificate of Cause of Death are all diseases, morbid conditions or injuries that either resulted in or contributed to death, and the circumstances of the accident or violence that produced any such injuries. Causes of death are commonly reported by the underlying cause of death. See also **associated cause(s) of death**.

choropleth map: thematic map used to represent statistical data through various shading patterns or symbols on predetermined geographic areas (i.e. countries). For this product the maps represent the geographical variation of disease impact using a sequential colour scheme; darker colours represent high values (high impact) while lighter colours represent low values (low impact).

chronic kidney disease (CKD): Refers to all conditions of the kidney, lasting at least 3 months, where a person has had evidence of kidney damage and/or reduced kidney function, regardless of the specific cause.

confidence interval (CI): a statistical term describing a range (interval) of values within which we can be 'confident' that the true value lies, usually because it has a 95% or higher chance of doing so.

coronary heart disease: is the most common form of CVD. There are 2 major clinical forms—heart attack and angina. Heart attack is a life-threatening event that occurs when a blood vessel supplying the heart itself is suddenly blocked, causing damage to the heart muscle and its functions. Angina is a chronic condition in which short episodes of chest pain can occur periodically when the heart has a temporary deficiency in its blood supply.

current smoker: Reported smoking daily, weekly or less than weekly at the time of the survey.

diabetes (diabetes mellitus): a chronic condition where the body cannot properly use its main energy source—the sugar glucose. This is due to a relative or absolute deficiency in insulin, a hormone produced by the pancreas that helps glucose enter the body's cells from the bloodstream and be processed by them. Diabetes is marked by an abnormal build-up of glucose in the blood; it can have serious short- and long-term effects. For the three main types of diabetes, see **type 2 diabetes.**

dialysis: a medical procedure that artificially cleans the blood to remove waste products that build up (a function that kidneys would normally perform). It is most often required due to kidney failure.

education–lowest: Educational attainment is a single measure of a person's overall level educational attainment whether it be a school or non-school qualification. The proportion of people aged 25–74 who had a secondary or lower education (including no school qualification).

education–highest: Educational attainment is a single measure of a person's overall level educational attainment whether it be a school or non-school qualification. The proportion of people aged 25–74 who had bachelor degree or higher educational level.

episode of care: The period of admitted patient care between a formal or statistical admission and a formal or statistical separation, characterised by only one care type (see care type and **separation**).

estimated resident population (ERP): The official ABS estimate of the Australian population. The ERP is derived from the 5-yearly Census counts and is updated quarterly between each Census. It is based on the usual residence of the person. Rates are calculated per 1,000 or 100,000 mid-year (30 June) ERP.

fatal burden: The burden from dying prematurely as measured by years of life lost. Often used synonymously with **years of life lost**, and also referred to as 'life lost'.

heart failure: occurs when the heart functions less effectively in its role of pumping blood around the body. Although it can occur suddenly, it usually develops over many years, as the heart gradually becomes weaker and works less effectively.

heart, stroke and vascular diseases: is a subset of CVD including only the most common and serious types of CVD: coronary heart diseases (CHD) (angina, heart attack and other ischaemic heart diseases)—also known as ischaemic heart disease— cerebrovascular disease (including stroke), oedema, heart failure and diseases of the arteries, arterioles and capillaries.

high blood pressure/hypertension: The definition of high blood pressure (also known as hypertension) can vary but a well-accepted one is from the World Health Organization: a systolic blood pressure of 140 mmHg or more or a diastolic blood pressure of 90 mmHg or more, or the person is receiving medication for high blood pressure.

hospitalisation: refers to an episode of care for an *admitted patient*, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation). The same person may have multiple hospitalisations and it is currently not possible to link records of multiple hospitalisations in the AIHW National Hospital Morbidity Database to individuals and therefore to count the number of individuals being hospitalised, and their patterns of hospitalisations. There are 2 distinct types of diagnoses recorded in the database, principal diagnosis and additional diagnosis.

incidence: refers to the number of new cases of an illness, disease, or event occurring during a given period.

Index of Relative Socioeconomic Disadvantage (IRSD): One of the set of **Socio-Economic Indexes for Areas (SEIFA)** for ranking the average socioeconomic conditions of a population in a geographic area. The IRSD was developed by the ABS for use at Statistical Area Level 2 and summarises attributes of the population that indicate disadvantage, such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations.

Indigenous: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also **Aboriginal or Torres Strait Islander**.

International Statistical Classification of Diseases and Related Health Problems (ICD): The World Health Organization's internationally accepted classification of death and disease. The 10th Revision (ICD-10) is currently in use. The ICD-10-AM is the Australian Modification of the ICD-10; it is used for diagnoses and procedures recorded for patients admitted to hospitals.

no internet: Access to internet is a measure based on occupied private dwellings. The measure reported is the percentage of occupied private dwellings with no access to internet connection.

no or low English: Proficiency in spoken English is a measure based on self-assessed proficiency level of spoken English by people who speaks other language than English at home. The percentage of people with no or limited proficiency in English is reported.

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

obesity: marked degree of overweight, defined for population studies as a body mass index of 30 or over.

overcrowding is based on the information collected about the number of bedroom and in a dwelling and the composition of the household. The measure reported in the percentage of household living in a dwelling that requires at least one extra room to meet the minimum housing standard as per the Canadian National Occupancy Standard.

permanent residential aged care: an Australian Government-funded aged care program which provides round-the-clock personal care and nursing services to people living long-term in a **residential aged care facility**.

prevalence: is the number or proportion of cases or instances of a disease or illness present in a population at a given time. The prevalence of disease is related to both the incidence of the disease and how long people live after developing it (survival).

Primary Health Network (PHN): Primary Health Networks were established by the Australian Government Department of Health on 1 July 2015. These networks are intended to play a critical role in connecting health services across local communities so that patients, particularly those needing coordinated care, have the best access to a range of health care providers, including practitioners, community health services and hospitals. Primary Health Networks work directly with general practitioners, other primary care providers, secondary care providers and hospitals.There are 31 PHNs that cover the whole of Australia.

principal diagnosis: the diagnosis established after study to be chiefly responsible for occasioning the patients hospitalisation.

procedure: a clinical intervention that is surgical in nature, carries a procedural risk, carries an anaesthetic risk, requires specialised training and/or requires special facilities or equipment available only in an acute-care setting.

quintile: A group derived by ranking the population or area according to specified criteria and dividing it into five equal parts. Commonly used to describe socioeconomic areas.

rate: A rate is one number (the numerator) divided by another number (the denominator). The numerator is commonly the number of events in a specified time. The denominator is the population ‘at risk’ of the event. Rates (crude, age-specific and age-standardised) are generally multiplied by a number such as 100,000 to create whole numbers.

remoteness: a system which classifies geographical locations into groups (*Major cities, Inner regional, Outer regional, Remote, Very remote*) according to distance from major population centres and services. In these analysis, remoteness is based on Accessibility/Remoteness Index of Australia (ARIA) and defined as Remoteness Areas by the Australian Statistical Geographical Standard (ASGS) (in each Census year). Remoteness is a geographic concept and does not take account of accessibility which is influenced by factors such as the socioeconomic status or mobility of a population.

residential aged care facility: these are facilities that provide Australian Government-funded residential aged care either on a permanent or short-term (respite) basis to people. The service must meet specified standards in the quality of the built environment, care, and staffing levels in accordance with the Aged Care Act 1997. Some people refer to these services as 'nursing homes.'

residential care: A program that provides personal and/or nursing care to people in a residential aged care facility. As part of the service, people are also provided with meals and accommodation, including cleaning services, furniture and equipment.

risk factor: Any factor that represents a greater risk of a health condition or health event.

self-reported: self-reported data rely on survey participants being aware of, and accurately reporting, their health status and health conditions, which is not as accurate as data based on clinical records or measured data. As some people may not be aware that they have the condition estimates based on self-reported data, especially for conditions such as diabetes and chronic kidney disease, may underestimate the prevalence of these diseases. People also underestimate their weight yet overestimate their height, which are used to calculate body mass index for the assessment of overweight and obesity. Measured data are, therefore, more reliable in such instances.

separation (from hospital): An episode of care for an admitted patient, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation). Separation also means the process by which an admitted patient completes an episode of care either by being discharged, dying, transferring to another hospital or changing type of care.

Socio-Economic Indexes for Areas (**SEIFA**): A set of indexes, created from Census data, that aim to represent the **socioeconomic position** of Australian communities and identify areas of advantage and disadvantage. The index value 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 group. This product presents groups based onthe **Index of Relative Socio-Economic Disadvantage**.

Socio-Economic Indexes for Areas (SEIFA) quintiles: Population-based quintiles are calculated by dividing SEIFA areas into 5 equal groups in such a way that the population in each group is approximately equal. As SEIFA measures the characteristics of an area rather than individuals; the population in the most disadvantaged population-based quintile ('1—Lowest') is 20% of the national population residing in the most disadvantaged areas, rather than the most disadvantaged 20% of the population.

socioeconomic status: The social and economic position of an individual or group within the larger society. In this product, socioeconomic status is reported using one of the Socio-Economic Indexes for Areas—Index of Relative Socio-Economic Disadvantage, typically for 5 groups (quintiles), from the most disadvantaged (lowest socioeconomic status areas) to the least disadvantaged (highest socioeconomic status areas).

statistical areas: A geographical classification defined by the ABS. They encompass four levels, with increasing size and population: Statistical Areas Level 1 (SA1s); Statistical Areas Level 2 (SA2s); Statistical Areas Level 3 (SA3s); and Statistical Areas Level 4 (SA4s).

statistical significance: A statistical measure indicating how likely the observed difference or association is due to chance alone. Rate differences are deemed to be statistically significant when their **confidence intervals** do not overlap, since their difference is greater than what could be explained by chance.

stroke: occurs when an artery supplying blood to the brain either suddenly becomes blocked or begins to bleed. Stroke often causes paralysis of parts of the body normally controlled by the area affected by the stroke, or speech problems and other symptoms, and is often fatal.

type 2 diabetes: The most common form of diabetes, occurring mostly in people aged 40 and over, and marked by reduced or less effective insulin. See **diabetes (diabetes mellitus)**.

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

unemployment is based on the labour status information collected during the census. The measure reported is the proportion of people who are unemployed and looking for full- or part-time work aged 15–64.

usual residence: The area of the address at which the deceased lived or intended to live, for 6 months or more prior to death.

References

ABS (Australian Bureau of Statistics) 2013. Australian Health Survey: Biomedical results for chronic diseases methodology.Canberra: ABS. Viewed 7 April 2021, https://www.abs.gov.au/methodologies/australian-health-survey-biomedical-results-chronic-diseases-methodology/2011-12

ABS 2013a. Australia Health Survey: Users' Guide, 2011–13. ABS cat. no. 4363.0.55.001. Canberra: ABS.

ABS 2016. Australian Statistical Geography Standard (ASGS): volume 1—main structure and greater capital city statistical areas. ABS cat. no. 1270.0.55.001. Canberra: ABS.

ABS 2017. Census of Population and Housing—counts of Aboriginal and Torres Strait Islander Australians. ABS cat. no. 2050. Latest release. Canberra: ABS.

ABS 2018a. Socio-Economic Indexes for Areas (SEIFA): technical paper. ABS cat. no. 2033.0.55.001. Canberra: ABS.

ABS 2018b. Life tables for Aboriginal and Torres Strait Islander Australians, 2015–17. ABS cat. no. 3302.0.55.003. Canberra: ABS.

ABS 2018c. National Health Survey: first results, 2017–18. ABS cat. 4364.0.55.001. Canberra: ABS.

ABS 2018d. Estimates of Aboriginal and Torres Strait Islander Australians, June 2016. ABS cat no. 3238.0.55.001. Canberra: ABS.

ABS 2019. National Health Survey: users' guide, 2017–18. ABS cat. no. 4363.0. Canberra: ABS.

AIHW (Australian Institute of Health and Welfare) 2015a. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: risk factors. Cardiovascular, diabetes and chronic kidney disease series no. 4 Cat. no. CDK 4. Canberra: AIHW.

AIHW 2015b. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: Aboriginal and Torres Strait Islander people. Cardiovascular, diabetes and chronic kidney disease series no. 5. Cat. no. CDK 5. Canberra: AIHW.

AIHW 2016a. Diabetes and chronic kidney disease as risks for other diseases. Australian Burden of Disease Study series no. 19. Cat. no. BOD 9. Canberra: AIHW.

AIHW 2016b. Australian Burden of Disease Study: impact and causes of illness and death in Aboriginal and Torres Strait Islander people 2011. Australian Burden of Disease Study series no. 6. Cat. no. BOD 7. Canberra: AIHW.

AIHW 2017. Deaths among people with diabetes. Cat. no. CVD 79. Canberra: AIHW.

AIHW 2019a. Australian Burden of Disease Study: impact and causes of illness and death in Australia 2015. Australian Burden of Disease Study series no. 19. Cat. no. BOD 22. Canberra: AIHW.

AIHW 2019b. Indicators of socioeconomic inequalities in cardiovascular disease, diabetes and chronic kidney disease. CDK no 12. Canberra: AIHW.

AIHW 2020a. Chapter 3: Social determinants of health in Australia. In: Australia's health 2020: data insights. Australia's health series no. 17 Cat. no. AUS 231. Canberra: AIHW.

AIHW 2020b. Profiles of Aboriginal and Torres Strait Islander people with kidney disease. Cat. no. IHW 229. Canberra: AIHW.

Department of Health 2018. Department of Health: PHN Background. Canberra: Department of Health. Viewed 6 April 2021, https://www1.health.gov.au/internet/main/publishing.nsf/Content/PHN-Background

Department of Health 2019. Australia's Physical Activity and Sedentary Behaviour Guidelines and the Australian 24-Hour Movement Guidelines. Canberra: Department of Health. https://www1.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines#npa05

Harding JL, Shaw JE, Peeters A, Guiver T, Davidson S & Magliano DJ. 2014. Mortality trends among people with type 1 and type 2 diabetes in Australia: 1997–2010. Diabetes Care 37.

ISN (International Society of Nephrology) 2019. Global kidney health atlas: a report by the International Society of Nephrology on the global burden of end-stage kidney disease and capacity for kidney replacement therapy and conservative care across world countries and regions. Brussels: ISN.

Kidney Health Australia 2019. National Strategic Action Plan for Kidney Disease. Available from https://kidney.org.au/get-involved/advocacy/national-strategic-action-plan-for-kidney-disease.

Niccoli T & Partridge L 2012. Ageing as a risk factor for disease. Current Biology 22(17):R741–R752. doi: 10.1016/j.cub.2012.07.024. Viewed 19 August 2020, https://www.sciencedirect.com/science/article/pii/S0960982212008159.

PHIDU (Public Health Information Development Unit) 2016. Population Health Areas: overview. Adelaide: Torrens University. Viewed 1 April 2020, http://phidu.torrens.edu.au/help-and-information/about-our-data/geographical-structures/pha-overview.

Rothman KJ, Greenland S & Lash TL 2008. Modern epidemiology. 3rd edition. Philadelphia: Lippincott William and Wilkins.

WHO (World Health Organization) 2000. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. WHO technical report series 894. Geneva: WHO.

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These technical notes provide a detailed overview of the geographical analysis, map software, data sources, statistical methods and definitions used in Geographical variation in disease: diabetes, cardiovascular and chronic kidney disease to assist in the interpretation of the maps and charts in the dashboards, as well as highlight limitations in the underlying data.

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