Reporting on the health of culturally and linguistically diverse populations in Australia

An exploratory paper

AIHW

Reporting on the health of culturally and linguistically diverse populations in Australia: An exploratory paper

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Summary

Australia is an ethnically diverse nation. In 2020, an estimated 3 in 10 (30%, or 7.7 million) people living in Australia were born overseas (ABS 2021a). According to the 2016 Census of Population and Housing, almost half (49%) of Australians had been born overseas or had one or both parents born overseas (ABS 2017a).

People from some culturally and linguistically diverse (CALD) backgrounds can face greater challenges when navigating the health-care system than people who do not identify as CALD. These can include language and cultural barriers, such as not knowing where to seek help or how to access services. Understanding patterns of disease within CALD populations is important to being able to address the health needs of the CALD population in Australia.

What are the challenges in reporting on the CALD population

Reporting on the health needs of CALD populations in Australia is complex and challenging. The term CALD can have multiple definitions, and includes aspects such as a person's country of birth, their ancestry, where their parents were born, what language/s they speak and their religious affiliation. There can also be large differences within CALD groups; (for example, those born in the same country may not identify with the same culture or speak the same language). Many data collections do not collect any information on CALD, or collect information on one aspect only. This is inadequate for identifying all people from CALD backgrounds as often a range of information is required.

How can linked data be used to report on the health of the CALD population?

Using linked data can provide a solution to some of these challenges. By combining different sources of information, it is possible to tell a rich story of a person's demographic profile and interactions with various services. The Multi-Agency Data Integration Project (MADIP) combines information from data sets such as the Census, National Health Surveys (NHS), Medicare Benefits Schedule, prescription medicines (from the Pharmaceutical Benefits Scheme) and death registrations (ABS 2021c). Because the data are linked at the level of the individual, information from one data set (for example, country of birth from the Census), can be used to supplement information in data sets that do not collect this information.

What did the example analyses show?

This report uses linked Census, death registrations and NHS data to explore 3 commonly reported health outcomes in conjunction with the range of CALD information collected in these data. The CALD variables available were: country of birth of person, country of birth of parents, language spoken at home, proficiency in spoken English, religious affiliation, ancestry and year of arrival in Australia. Two of the health outcomes selected – self-reported health status and the proportion with a chronic condition – were from the NHS, and the third – all-cause mortality – from death registrations.

There was some evidence that the selected health outcomes were influenced by migration patterns. In general, newer migrants tend to be younger and from Asian countries such as China and India. In contrast, those from European countries such as Greece and Italy tend to be older and have arrived earlier. Additionally, new migrants are often subject to strict health screening requirements prior to entry.

Among the groups who could be considered as CALD:

- those who were born in Asian countries, who spoke Asian languages, and who identified with Asian ancestries generally had better health than the non-CALD Australian population, as measured by the likelihood of having a chronic condition and mortality rates
- those born in European countries, who spoke European languages and identified with European ancestries generally had the highest age-standardised proportions with a chronic condition and all-cause mortality rates
- even when adjusted for age, migrants who had been living in Australia for longer tended to have higher mortality rates than recent migrants.

Overall, variations in the selected health outcomes were observed for all of the CALD variables investigated in this report when data could be presented at the most granular level (such as for individual countries of birth or language). Where data were aggregated these differences were reduced, and when presented in binary CALD versus non-CALD form, the CALD population often had better outcomes. However, presenting results at the most granular level presents challenges, even for large data collections.

What are some key considerations when using linked data for CALD populations?

Both the linkage rate and linkage quality are important when using linked data, as both can introduce bias into reported outcomes. The linkage rate and linkage quality did vary by CALD group for the data collections used in this report. Where linkage rates are low for a particular group, the data may not be representative of this group and generalisability is reduced. Additionally, analysis based on linked data can underestimate the true prevalence or rate of a health outcome, particularly for CALD populations with low linkage rates.

However, linkage has an advantage in that, where variables are present in both data collections, missing data can be supplemented by the data in other collections.

Overall, linked data provides the opportunity to explore the health outcomes and service use using a range, or combination, of CALD variables. This allows the flexibility to tailor the definition of 'CALD' used to the health outcome of interest.

It is important to note, however, that the health of CALD populations is a product of many factors, including environmental, economic, genetic and socio-cultural factors in their home country and Australia, as well as their migration experience – many of which are unable to be captured consistently in data.

1   Introduction

Cultural and linguistic diversity (CALD) can encompass a range of aspects including a person's country of birth, their ancestry, where their parents were born, what language/s they speak, and their religious affiliation. Australia is one of the most culturally diverse countries in the world. Between 1990 and 2019, Australia had the ninth largest number of migrants in the world, but the largest proportion of its population overall (United Nations 2019). In 2020, it was estimated that 3 in 10 (30%) Australians were born overseas, equating to nearly 7.7 million migrants (ABS 2021a).

Although being born overseas is only one aspect of CALD, it is one for which the most information is collected and reported. The Australian Bureau of Statistics compiles and reports information on overseas migration annually using data sourced from the Department of Home Affairs. Other information on the CALD population is sourced from the 5-yearly Census of Population and Housing. The 2016 Census (the most recent for which detailed data are available) identified that:

- nearly half (49%) of Australians were born overseas or had parents who were born overseas
- around 1 in 5 (21%) Australians spoke a language other than English at home
- Australians identified with over 300 ancestries
- more than 300 languages were spoken in Australian homes (ABS 2017a).

Australia's migration patterns have been driven by historical and political context. More information on this is described in Box 1.1 'Migration history in Australia'. Currently, there are 2 distinct streams to settling in Australia permanently – the Migration Program, which includes skilled and family migrants, and the Humanitarian Program, for refugees and those in humanitarian need. In 2019–20, the vast majority of migrant places were for the Migration Program (140,366), with 13,171 visas granted under the Humanitarian Program. Over the 2 decades to 2020, between 7% and 15% of visas granted each year were for the Humanitarian Program, equating to 9% overall (Department of Home Affairs 2020a).

As at 30 June 2020, the overseas-born population had a median age of 44, compared with 34 for the Australian-born population (Table 1.2). This is influenced by the ageing of migrants who arrived under large-scale migration schemes following World War II. Due to the relatively recent increase in Asian migration, those born in Asia had a younger age profile, with a median age of 35. By contrast, people born in Europe had a median age of 59.

People from some CALD backgrounds face greater challenges when dealing with the health-care system and services (Henderson et al. 2011). Language barriers, lower health literacy, and difficulties navigating an unfamiliar system put them at greater risk of poorer quality health care and poorer health outcomes compared with other Australians (Bowden et al. 2020; Caperchione et al. 2013). Misinformation and a lack of health information in their language can also influence health-seeking behaviour and lead to lower utilisation of health services and health screening among CALD groups (Khatri and Assefa 2022).

Other barriers to appropriate care include the perceived or actual cost of care, unemployment, cultural difficulties, and a workforce unfamiliar with the health needs of refugees (Murray and Skull 2005). For those living in Australia temporarily, access to free or subsidised public health care is influenced by their visa type. Diverse health beliefs and

mistrust of government based on historical experiences can also affect attitudes to health, health care and expectations of the health system (Forrest 2018).

People from CALD backgrounds are considered priority populations for addressing inequalities across the health and welfare sectors. This includes a number of key Australian Government strategies:

- National Preventive Health Strategy
- National Obesity Strategy
- National Strategic Framework for Chronic Conditions
- National Women's Health Strategy
- National Men's Health Strategy
- Healthy, Safe and Thriving: National Strategic Framework for Child and Youth Health
- Australian National Breastfeeding Strategy.

It should be noted that while it could be read from parts of these strategies that the CALD population is considered as one group, it is acknowledged that there is vast heterogeneity among CALD populations. Identifying CALD populations in health research and administrative data sets and understanding patterns of disease and risk factors within these populations is imperative to informing improved, equitable service delivery.

The purpose of this report

The variables in many health-related data collections are inadequate for identifying all people from CALD backgrounds. While work is under way to improve the collection of CALD information in a number of collections, linked data provide an opportunity to explore the health status of the CALD population using variables that are seldom collected in administrative and service collections.

> **The purpose of this report is not to define 'cultural and linguistic diversity', but to explore the use of linked Multi-Agency Data Integration Project (MADIP) data to report on the health of CALD populations, including its benefits, challenges and limitations. It provides a comprehensive investigation of each of the available CALD variables individually.**
>
> **Three health outcomes have been chosen to explore differences between CALD groups within each CALD variable. These health outcomes were chosen for demonstration purposes only, and the purpose of this report is not to report fully on health status and outcomes for CALD populations.**

This report is part of a program of work that will use the Multi-Agency Data Integration Project (MADIP) to explore the health status of CALD populations in Australia. The MADIP is a linked data asset containing information on health, education, government payments, income and taxation, employment and population demographics over time (ABS 2021c). See 'Chapter 2 The Multi-Agency Data Integration Project' for more information on the MADIP.

The data sets of interest within MADIP for this report include the 2016 Census of Population and Housing (the Census), the 2014–15 and 2017–18 ABS National Health Surveys (NHSs), and death registrations. The Census contains the most comprehensive set of CALD variables, with the advantage of capturing all people who were usual residents of Australia on Census night. The use of linked data, which includes the Census, provides the

opportunity to explore CALD variables that are not collected in other data sets. This allows for a more comprehensive investigation of the dimensions of CALD than has previously been possible.

Box 1.1: Migration history in Australia

It is important to consider the migration history of Australia when reporting on the CALD population. Migration patterns have varied over time, in the number of migrants, the types of visas and the countries people have arrived from. This has influenced the age structure and the socioeconomic composition of Australia's contemporary CALD populations (Wilson et al. 2020).

The first migrants came to Australia involuntarily from British colonies, but the discovery of gold in 1851 led to rush of new immigrants with a variety of backgrounds (Department of Immigration and Border Protection 2017). By the time of Federation in 1901, the majority of migrants were still from the United Kingdom (58%) and Ireland (22%); however, there were also significant numbers from Germany (4.5%), China (3.5%) and New Zealand (3%) (Parliament of Australia 2010).

Following Federation, the Commonwealth began to oversee immigration, enacting legislation such as the *Immigration Restriction Act 1901,* the *Pacific Island Labourers Act 1901* and the *Naturalization Act 1903*. These laws became known as the White Australia Policy, with the aim of restricting immigration to those of British origin.

Following World War II, Australia's migration policy shifted focus to boost the population and the migration policy of accepting predominantly British migrants was relaxed to accommodate the many people displaced post-war from Europe (Parliament of Australia 2010). The *Migration Act 1958* replaced the *Immigration Restriction Act 1901*, expanding the Migration Program to actively encourage migration from non-British Europeans and eventually people from non-European backgrounds (Department of Immigration and Border Protection 2017).

As a result, the overseas-born population rapidly increased, from 9.8 per cent in 1947 to around 20 per cent in 1971. Moreover, there was a change in the composition of the overseas-born population, and during the late 1940s and 1950s, around two-thirds of migrants were from European countries other than Britain (Figure B1.1).

Figure B1.1 Overseas-born population in Australia, 1901−1971
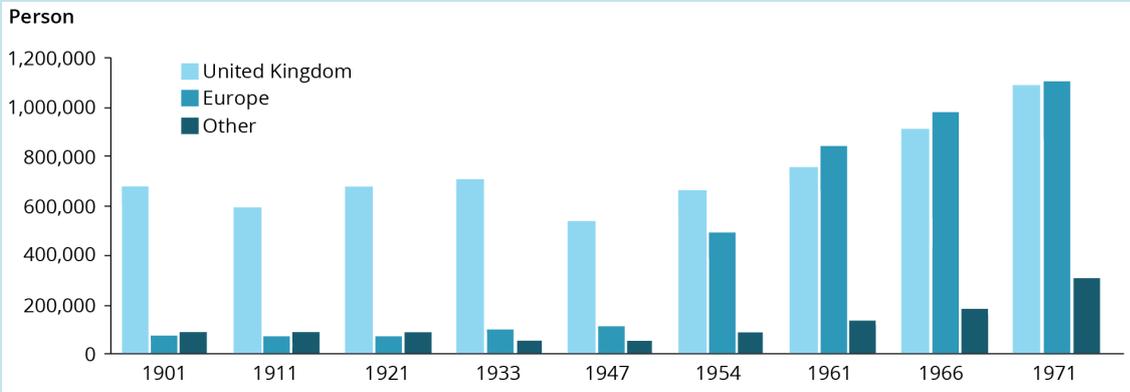
Source*:* Department of Immigration and Border Protection 2017

Dismantling of the administrative and policy framework around the White Australia Policy commenced in early 1966, and the migrant intake from Asia began to increase, continuing to grow over the next 4 decades (Hugo 2004). The number of migrants from the United Kingdom living in Australia was similar in 2020 to 1971 (around 1.2 million). However, the number of migrants from Asian countries had increased to more than 3.2 million (ABS 2021a). In the 1980s, Australia's Migration Program was reformed and divided into 3 distinct streams: family, skilled and humanitarian (Department of Immigration and Border Protection 2017). The country of origin of people on humanitarian visas has largely been reflective of countries that have experienced military and political unrest (Figure B1.2).

During the 21st century, the proportion of people who arrived Australia under the humanitarian program began to decrease, while the number of migrants under the skilled stream steadily increased (Parliament of Australia 2017). This can partially be explained by a shift in migration policy which aimed to enhance the economy by filling the gaps in the labour market with highly skilled people (Department of Home Affairs 2020b). For example, between 1984–1985 and 2015–16, the proportion of permanent migrants who arrived on a humanitarian visa declined from 21% to 8%, while the proportion of skilled migrants increased from 15% to 62% (Parliament of Australia 2017). During this period, there was a large intake of Asian migrants, as well as young people arriving on student visas before becoming permanent migrants, who could afford to study in Australia and met the rigorous health requirements of the selection process (Wilson et al. 2020).

Figure B1.2 Overview of major humanitarian groups in Australia

Post-World War II	• Eastern Europe (Romania, USSR, Ukraine) • Central Europe (Romania, Hungary, Slovakia) • The Balkans (Croatia, Bulgaria) • Baltic states (Lithuania)
1960s and 1970s	• Chile • Czech Republic • Lebanon
1980s and 1990s	• Indochina (Vietnam, Cambodia, Laos) • The former Yugoslavia • East Timor • El Salvador
Recent Arrivals	• Horn of Africa (Sudan, Eritrea, Somalia) • Central Africa • Middle East and Afghanistan • Burma • Sri Lanka

Source: Department of Immigration and Border Protection 2017.

Challenges in reporting on the CALD population

Collecting and measuring CALD

The term CALD is unique to Australia, and was intended to capture the ethno-cultural diversity of the Australian population (Rahim et al. 2020). The ABS developed the Standards for Statistics on Cultural and Language Diversity (the Standards) in 1999 as a way to standardise the collection and reporting of information on CALD (Table 1.1; ABS 1999). The Standards include aspects such as a person's country of birth, their ancestry, where their parents were born, what language/s they speak and their religious affiliation.

The Standards recommend that a Minimum Core Set of 4 variables is collected in all administrative and service provision settings where information on cultural and language diversity is required (ABS 1999). The use of a single variable from the Standards is generally inadequate to provide an accurate measure of cultural and language background and diversity, and a range of variables may be needed to measure different aspects of a person's cultural and language background and related advantage and disadvantage with regard to accessing government and other services (ABS 1999).

Table 1.1: Standard Set of Cultural and Language Indicators, 1999

Minimum Core Set	Country of birth of person
	Main language other than English spoken at home
	Proficiency in spoken English
	Indigenous status
Non-core variables	Ancestry
	Country of birth of father
	Country of birth of mother
	First language spoken
	Languages spoken at home
	Main language spoken at home
	Religious affiliation
	Year of arrival in Australia

Source: ABS 1999.

Most administrative and service data sets do not collect the Minimum Core Set of variables in full, and the non-core variables are even less frequently collected. Country of birth has been the most commonly collected and reported CALD variable, and is often used as the primary indicator of CALD status. Of the National Minimum Data Sets held by the AIHW, country of birth is collected in all but one, and is the primary indicator in 7 out of 10. In some administrative data collections, there is a tendency to collect information that supports service provision. An example of this is the collection of preferred language, which is not a variable in the ABS Standards, but can be useful to identify the language needs of their clients for service providers. It is important to note that even where data sets collect information on CALD, accuracy and completeness may vary.

Although the Standards are now more than 20 years old, there is no universally accepted or official operational definition of CALD, and approaches to identifying and reporting on the CALD population are inconsistent between organisations (Pham et al. 2021). The Standards themselves do not provide advice on how to use the data for each CALD variable, as this depends on the needs of the organisation collecting the information.

Although Aboriginal and Torres Strait Islander people are diverse in language and culture, their experiences and needs as First Australians are unique and are therefore considered distinct from the CALD population for the purposes of this report. For more on the health of Indigenous Australians, see <https://www.aihw.gov.au/reports-data/population-groups/indigenous-australians/overview>.

Reporting on CALD populations

Reporting on the CALD population in Australia has tended to take one of 2 approaches, each with its own strengths and limitations:

1. Aggregating the Australian population into CALD and non-CALD groups

Examples of how to define this group can include those who were born overseas or those who speak a language other than English. The non-CALD group would be the alternative; that is, those born in Australia, or those who speak mainly English.

Presenting data by CALD and non-CALD groups has the advantage of simplicity and the ability to be applied to a range of data sets. As results are aggregated, the size of the CALD population is usually adequate for reporting, and a CALD measure can also be included in standard reporting, similar to remoteness or indigenous status.

However, grouping Australians into CALD and non-CALD groups has limitations. As there is no universally agreed definition of CALD, the definition varies by organisation and/or CALD variable used.

A common definition of CALD when using country of birth only is to exclude those born in Australia and the United Kingdom (England, Scotland, Wales, Northern Ireland), Republic of Ireland, New Zealand, Canada, the United States of America, and South Africa. These countries were previously classified by the ABS as main English-speaking countries (MESC). The MESC classification was not an attempt to classify countries on the basis of their use of English, but a list of countries from which Australia received a significant number of migrants who were likely to speak English (ABS 2021b).

Using this approach, where one indicator of CALD is collected a person may be classified as non-CALD based on that one characteristic but would be considered CALD using a different indicator. For example, a person who was born in Australia or an MESC country would be classified as non-CALD if *Country of birth* of person was used as an indicator. However, if they spoke a language other than English at home, they would be classified as CALD using *Main language other than English spoken at home*.

Where country of birth and a language variable are collected, another common definition is to include people born in non-MESC countries and/or those who nominate speaking a language other than English at home.

However, as both of these approaches are limited in the characteristics they use to define CALD status, they fail to capture all people who identify as CALD.

Another key concern is the potential diversity within the identified CALD group, and the inclusion of many sub-groups with different experiences and needs. The larger groups within the CALD group will average out differences and disparities, and hide health and welfare issues experienced by smaller sub-groups (Sawrikar and Katz 2009). The vast majority of migrants arrived under the Skilled Migration stream (60%) and Family stream (39%) over the 20-year period between 2000–01 and 2019–20, each of which have strict eligibility and

screening requirements (Department of Home Affairs 2020b). This can often make the CALD group appear to have better health outcomes when presenting results in aggregated form, known as the 'healthy migrant effect' (see Box 1.2 for more information).

2. **Presenting results by the specific dimensions of cultural and linguistic diversity (for example, by country of birth)**

This approach involves presenting results for specific cultural and linguistic groups. When calculating mortality rates, the results are presented by each individual country or language – for example, the mortality rate for those born in Italy or who speak Italian at home.

The main benefit of this approach is that it is able to highlight differences and disparities relating to particular sub-groups that may be hidden if results are averaged out to a bigger group. For example, Indian-born and Greek-born Australians may both be considered CALD but their migration history and cultures can be very different. Presenting data at the most detailed level allows for a richer depiction of the outcome being explored.

This approach has its own challenges, one being that it is often impractical to present highly disaggregated results due to the small population in some CALD sub-groups, which can raise privacy and confidentially issues as well as statistical concerns.

Where only one variable of CALD is used, this approach will also fail to capture all people who may identify as CALD, and potentially some who don't.

Box 1.2: The healthy migrant effect

There is evidence to suggest that some migrant populations are less likely to report a chronic condition, have better self-assessed health status and lower mortality rates than the non-migrant population in several countries, including Australia (AIHW 2018; Jatrana et al. 2017; Kennedy et al. 2006; Kennedy et al. 2014). This pattern has been described as the 'healthy migrant effect'. A number of studies suggest that the healthy migrant effect can be explained by:

- health screening checks required by the host country before entry. In Australia, this is particularly evident for the skilled visa stream, which aims to ensure that the health of migrants does not pose a significant cost to the health system (Department of Home Affairs 2020c). Screening checks include things such as a full medical examination, chest X-rays and tests for infectious diseases prior to and on arrival to Australia (Department of Home Affairs 2020c)

- eligibility criteria that require a certain skill set favour higher educational attainment and younger age. For example, as the major component of Australia's migration program, the skilled stream aims to improve labour market productivity by selecting young migrants who are highly skilled and educated (Department of Home Affairs 2020b; Kennedy et al. 2014). Education is an important social determinant of health, which has a positive effect on health through a variety of mechanisms including better health literacy, healthier behaviours and increased preventive care (Raghupathi and Raghupathi 2020)

- immigrant self-selection, whereby the healthiest and wealthiest individuals are those most likely to have the financial resources (for example, the cost of migration) and to exhibit positive health behaviours (Kennedy et al. 2014). For example, a recent study found that some migrants reported fewer chronic conditions than Australian-born

people, and the healthy migrant effect seemed to remain even after controlling for education and age (Kennedy et al. 2014).

Some studies also suggest the healthy migrant effect can disappear after migrants have lived in a host country for a long time. For example, a study showed that some migrants living in Australia were significantly less likely to report a chronic condition than the Australian-born; however, after 20 years of residence, the health status of the migrant population became similar to that of those born in Australia (Jatrana et al. 2014).

Finally, studies have also shown that combining migrant populations into larger groups can mask important differences when trying to assess health outcomes. Acculturation can vary for different migrant populations depending on differences in education, income and language (Hamilton 2015; Jatrana et al. 2017; Lara et al. 2005). For example, someone who migrated from a mainly English-speaking country may find it easier to navigate the health-care system in Australia than a migrant from a non-English speaking country. Furthermore, analyses that are based on particular regions rather than specific countries of origin can mask important differences between migrant populations (Kennedy et al. 2014).

It is important to note that the healthy migrant effect does not apply to all populations, due to differences in the eligibility requirements for the different visa streams.

Report structure and methods

The purpose of this report is to explore the use of linked MADIP data to report on the health of CALD populations. It will provide a comprehensive investigation of each of the available CALD variables individually. The population used in this report is people who were usual residents of Australia on Census night 2016 (referred to as 'Australians').

CALD variables

All CALD variables are reported in accordance with their associated standard classification, using the groupings and names contained in the classification. Each classification follows a 3-tiered hierarchical structure, allowing users the flexibility to output statistics at a level best suited to their information or data needs. Where data could not be output at the most detailed levels of the classification, data have been aggregated and output at the higher levels. Further information on the classifications can be found in each chapter.

Throughout the report results are presented for each CALD variable in both binary and CALD and non-CALD groups and disaggregated by each dimension of CALD to demonstrate how results vary depending on how the data are presented. The non-CALD group includes those who nominate the most common response for Australians overall. For example, nominating that they were born in Australia, that they speak English at home, or that their ancestry is Australian. For these binary groupings, each of these characteristics is considered in isolation. However, the use of a combination of CALD variables to identify and report on the CALD population is explored further in 'Chapter 9 Combining CALD variables and defining CALD'.

Selected health outcomes

The 3 outcomes used in this report were chosen as they are commonly used in reporting on the health of Australians. They provide a range of information on health status and outcomes, while being common enough to have sufficient numbers for reporting across the range of CALD variables.

Two outcomes are based on self-reported data from the 2014–15 and 2017–18 NHSs. These were combined to provide a larger sample and enable reporting at more detailed levels. The third outcome is from death registrations.

1. Self-assessed health status: the proportion of individuals who consider their health to be excellent or very good.

2. The proportion of adults with 1 of 10 selected common chronic conditions (referred to throughout the report as the 'proportion with a chronic condition'):
    –   arthritis
    –   asthma
    –   back pain and problems
    –   cancer
    –   chronic obstructive pulmonary disease
    –   diabetes
    –   heart, stroke and vascular disease
    –   mental and behavioural conditions
    –   kidney disease
    –   osteoporosis.

3. Mortality rates: number of deaths per 100,000 people from all causes that occurred between August 2016 and November 2017.

Accounting for age effects

Table 1.2 shows the 10 countries with the largest number of migrants to Australia as at 30 June 2020, and their median age. Older migrants are most likely to have been born in European countries, while younger people are more likely to come from Asian countries or New Zealand.

The prevalence of many health conditions and risk of dying from any condition is strongly related to age. Additionally, the overseas-born population has a much smaller proportion in the younger age groups than the Australian population (ABS 2017a). The analyses in this report are therefore limited to adults.

Table 1.2 also shows the median age for the population used in this report (those aged 18 and over who were usual residents of Australia on Census night 2016). The exclusion of those aged under 18 has more effect on the Australian-born than the overseas-born population, reducing the difference in the median age from 10 years to 2.

Table 1.2: Australia's estimated resident population, by country of birth, 30 June 2020

Country of birth	Persons	Per cent	Median age	Median age for population used in this report (18 and over from 2016 Census)
England	980,360	3.8	58	57
India	721,050	2.8	35	34
China (excludes SARs and Taiwan)	650,640	2.5	38	35
New Zealand	564,840	2.2	44	45
Philippines	310,050	1.2	40	42
Vietnam	270,340	1.1	47	46
South Africa	200,240	0.8	44	45
Italy	177,840	0.7	72	70
Malaysia	177,460	0.7	41	42
Sri Lanka	146,950	0.6	41	43
All overseas-born	*7,653,990*	*29.8*	*44*	*47*
Australia-born	*18,043,310*	*70.2*	*34*	*45*
Total population	**25,697,300**	**100.0**		

Source: ABS 2021a; AIHW analysis of ABS 2020c.

Age-standardised rates are often presented to enable comparison of outcomes for populations with different age structures. As the purpose of this report is solely to compare health outcomes for different CALD populations, age-standardised results have been presented throughout. Unadjusted (crude) results reflect the actual outcome for the population of interest and are also presented throughout.

Age-standardised rates that are based on a small number of events are unreliable and can exhibit a large amount of random variation. Only estimates with sufficient numbers in the numerator and denominator have been age-standardised in this report.

The use of one summary measure only, however, can mask important differences between groups. For example, it is possible to have similar age-standardised rates but very different age-specific rates and distribution of events. The comparison of age-specific rates may be the most useful for many purposes but can be impractical when making a large number of comparisons. Age-specific rates have been presented for the CALD versus non-CALD comparisons of all-cause mortality to further demonstrate how a summary measure may mask underlying differences in health outcomes for CALD groups.

For more information on methods for age-standardisation, refer to 'Appendix B Methods'.

Accounting for the effect of sex

There may be differences in the health outcomes used in this report by sex, and the relative proportion of males to females who have migrated to Australia from some countries can vary substantially. However, as it can be difficult to achieve adequate samples sizes when presenting aspects of CALD at the most detailed level possible, no adjustment has been made for sex in these analyses.

Confidence intervals

For analyses based on survey data (that is, linked NHS and Census data), confidence intervals are presented in order to describe the uncertainty around an estimate. Each confidence interval is the range of values that is likely to include the true population value with a certain degree of confidence. Where the sample size is small, as is the case for some analyses in this report, the confidence interval may be wider. Confidence intervals are presented in figures and in the supplementary tables.

For more information on the methods used in this report, refer to 'Appendix B Methods'.

Supplementary data tables for the data presented throughout this report are available on the AIHW website at: <https://www.aihw.gov.au/reports-data/populationgroups/cald-australians/reports>.

2 The Multi-Agency Data Integration Project

The MADIP is a secure data asset combining information on health, education, government payments, income and taxation, employment and population demographics (including the Census) over time. It provides whole-of-life insights into various population groups in Australia, such as the interactions between their characteristics, use of services like health care and education, and outcomes like health and employment (ABS 2021c).

The ABS collects and combines the data in MADIP in partnership with the following agencies:

- Australian Taxation Office
- Department of Education, Skills and Employment
- Department of Health
- Department of Home Affairs
- Department of Social Services
- Services Australia.

The Person Linkage Spine (the Spine) is a separate piece of data infrastructure used to combine the data sets within the MADIP. It is made up of the population in 3 core data sets:

- Medicare Consumer Directory – Services Australia
- DOMINO Centrelink Administrative Data – Department of Social Services
- Personal Income Tax – Australian Taxation Office.

The Spine aims to cover all people who were resident in Australia at any point during a given reference period – currently January 2006 to November 2021. All other data sets in the MADIP are linked to the Spine once, and then combined as required using the Spine. The linkage information usually includes personal identifiers such as anonymised name and address, and may also include other socio-demographic information such as age, sex and country of birth (ABS 2021c; Frazer 2020). If a person does not appear in any of the core data sets in the reference period they will not have a record in the Spine and will not be able to be linked even where they have records in other data sets.

Data linkage is associated with errors due to false negatives (or missed matches, where records belonging to the same person across 2 or more data sources do not link) and false positives (or false matches, where records of 2 different people are mistakenly linked) (Bohensky et al. 2010; Harron et al. 2017). Errors in the linkage process are a potential source of bias in the results of studies using linked data and linkage errors do not always occur randomly. The probability of a missed match is associated with characteristics such as gender, age, ethnicity, deprivation and health status (Harron et al. 2017). In most cases, it is not possible to identify where errors have occurred, as a one-to-one match between data sets is not usually expected due to differences in scope.

It is possible to measure the linkage rate and linkage quality between data sets in the MADIP. When combining data sets in the MADIP, 2 linkages need to be considered – the relevant data sets to the Spine, and the relevant data sets to each other. The ABS also provides a measure of the linkage quality for the data sets in the MADIP to the Spine, via a

Linkage quality flag, which is based on how closely the linking variables match between the linked records.

The data linkage rates and data linkage quality for the data sets and population (adults aged 18 and over) used in this report are explored further below.

Data linkage rates

There are a number of reasons why people with a record in an integrated data set in MADIP will not link to the Spine, and a 100% linkage rate would not generally be expected. These include differences in the time period or scope of the data collections; the amount of missing or poor quality data; migration; and death. Where linkage rates are low for a particular population group, the data may not be representative of this group and generalisability is reduced. It is important to note, however, that the linkage rate alone does not provide information on the possible bias in results due to linkage error from missed matches or false matches.

The linkage rate for different populations to the Spine and between data sets can be easily assessed by firstly calculating the proportion with a Spine ID, and then the proportion who match with a record on the second data set using the Spine ID.

How did the overall linkage vary by data set?

Figure 2.1 shows the linkage rates between the Spine and the data sets used in these analyses:

- 87% of people in the 2016 Census linked to the Spine
- 97% of deaths that occurred between August 2016 and November 2017 linked to the Spine
- 94% of people in the pooled 2014–15 and 2017–18 NHSs linked to the Spine.

The proportion of people who linked to the Census from the combined NHSs and death registrations was lower:

- 79% of people in the NHSs linked to a Census record
- 81% of deaths linked to a Census record.

The lower linkage rate to the Census is expected, due to differences in the collection periods for these data. For example, a person participating in either NHS or who died in the reference period might not have been resident in Australia at the time of the Census. Likewise, a person who participated in the Census might have left Australia. For this reason, the linkage rate between the Census and other data collections will decrease as the time between collection periods increases.

Figure 2.1: Linkage rates between the MADIP Spine, 2016 Census, death registrations and combined NHSs

2014–15 and 2017–18 NHSs (n=40,572)

37,946 records (94%) linked to the Spine

2014–15 and 2017–18 NHSs linked to Census n=32,153 (79%)

Spine

Census (n=23,717,418)

20,712,394 records (87%) linked to the Spine

2016 Census

Deaths August 2016–November 2017 linked to Census n=175,395 (81%)

Death registrations August 2016–November 2017 (n=217,096)

209,574 records (97%) linked to the Spine
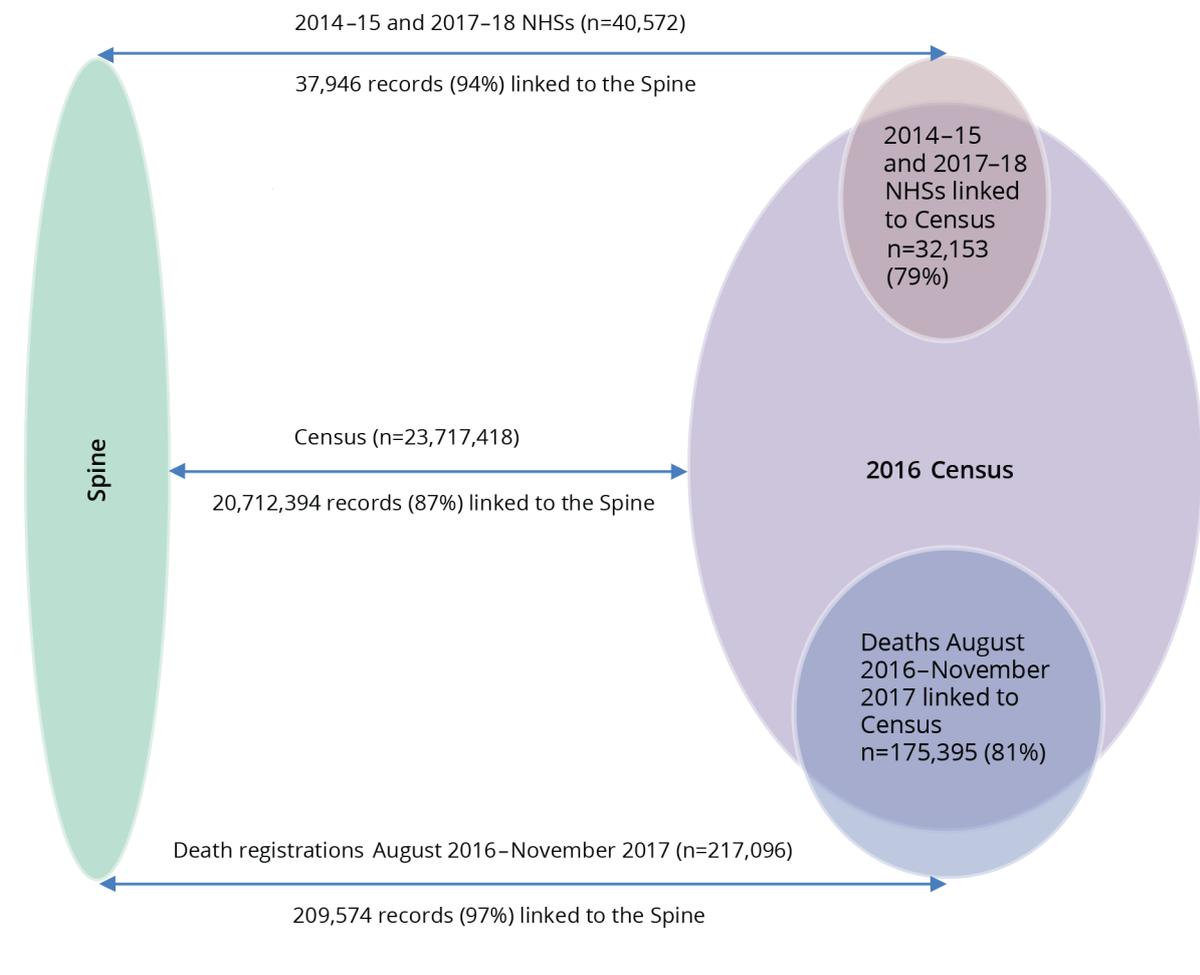
Source: AIHW analysis of 2020a.

How did the linkage rates vary by country of birth?

Differences in linkage rates for CALD populations were explored using country of birth, as this variable was present in all 3 data collections.

Further investigation is needed to understand the impact of data linkage on other characteristics, including age and sex. A recent study using linked Census and death registration data in MADIP found that linkage biased results for some age-sex groups, for example among women aged 25–44 from low socioeconomic areas (Welsh et al. 2021).

No adjustments have been made to the analyses in this report to account for differences in linkage rates between countries of birth.

Census and the Spine

Of the 66 countries of birth used in this report, the proportion of records that linked to the Spine from the Census ranged from 70% for those born in *China* to 97% for those born in *Northern Ireland*, *Wales* and *Scotland* (Table S2.1). For the majority of countries of birth (49

countries) the linkage rate was 90% or more, and only 2 countries had a linkage rate less than 80%. The linkage rate for people born in *Australia* was 95%.

Following linkage between the Census and NHSs, and the Census and death registrations, the overall linkage rates may differ and some countries may be more affected than others. This is discussed further in the following sections.

Death registrations and the Spine and Census

The proportion of death registrations that linked to the Spine ranged from 80% for people born in *Pakistan* to 100% for people born in *Argentina*, and was 97% for people born in *Australia* (Table S2.1). Only 7 of the countries of birth had a linkage rate less than 90%.

The proportion of death registrations that linked to the Census ranged from 55% for those born in *Tonga* to 84% for those born in *Finland*, *Italy* and *Malta*, and was 82% for people born in *Australia*. For almost two-thirds of the countries of birth (43 out of 66), linkage rates were less than 80%.

Comparing results for linked versus unlinked data can provide information on the extent to which results vary and the direction of any likely bias due to the exclusion of non-linked records. To demonstrate this, mortality rates by country of birth from death registrations alone were compared with mortality rates by country of birth using linked death registrations and Census data.

Mortality rates based on the linked Census and death registrations data set use people who died with a linkage to the Census as the numerator, and records from the Census (that is, people who died and did not die) with a linkage to the Spine as the denominator. In comparison, mortality rates based on unlinked data use people who died as the numerator, and people from the Census as the denominator. Comparisons between these analyses showed that the exclusion of people who died but did not link to the Spine or the Census, influenced mortality results by country of birth (Table S2.2).

The linkage rate was generally lower between death registrations and the Census than between the Census and the Spine, which results in a higher proportion of records being excluded from the numerator than from the denominator (Figure 2.1; Table S2.1). With the exception of *Ireland*, where rates were very similar, the mortality rates using linked data were lower. For example, the age-standardised all-cause mortality rate based on the linked data for *Tonga-born* adults, who had one of the lowest proportions of death registrations linked to the Census (55%), was almost half the mortality rate when using the unlinked data (1,084 and 2,082 deaths per 100,000). Overall, the age-adjusted mortality rates using linked data were 20% lower for those born in *Australia* and 21% lower for those born overseas when compared with the mortality rates using unlinked data.

The lower the linkage rates between death registrations and the Census for a country of birth, the greater the underestimate in mortality rates tended to be. This can influence the difference in mortality rates between CALD groups. For example, the linkage rate between the Census and the Spine for those born in *Germany* and *Turkey* was similar (93%), but there was greater difference in the linkage rate for these countries of birth between the death registrations and the Census (83% and 69%, respectively). As a result, the difference in age-standardised mortality rates for people born in *Germany* and *Turkey* using the linked data (899 and 745 per 100,000 respectively) reduced to almost none when using the unlinked data (1,127 and 1,119 per 100,000 respectively).

As mentioned above, linkage rates can vary for other characteristics also, which may influence mortality results further. For example, the absolute and relative difference between the linked and unlinked mortality rates tended to be similar for both the unadjusted (crude) and age-adjusted rates for most countries of birth. However, for some countries of birth, larger differences were seen in the absolute and relative differences between the unadjusted and adjusted rates. For these countries of birth there may be differences in the age structure of the linked versus unlinked populations.

NHSs and the Spine and Census

The range of specific countries of birth that could be presented from the NHSs was much lower than for death registrations and the Census due to the smaller number of participants. The proportion of people who linked to the Spine ranged from 82% for those born in *China* to 95% for those born in the *United Kingdom*, and was 94% for those born in *Australia* (Table S2.1).

The proportion of people who linked from the NHSs to the Census was smaller, ranging from 60% for those born in *China* to 84% for those born in *Italy*, and was 81% for those born in *Australia*.

The numerator and denominator for calculations of rates are from the same data source when using survey data such as the NHSs, so the loss of people who do not link does not necessarily have the same effect as for death registrations in underestimating rates. However, the loss of people with different characteristics may still influence results. For example, if the age distribution of the linked versus unlinked people is different, it may influence the results for self-assessed health status and having a selected chronic condition as both of these outcomes are influenced by age. However, it is not always possible to compare results for the linked and unlinked records, as was done in the mortality analysis, in order to determine the effect of excluding the unlinked records.

Data linkage quality

The most recent linkage of the 2016 Census, death registrations and 2017–18 NHS to the Spine uses deterministic linkage, which involves locating record pairs between the data sets and the Spine that match exactly or closely (according to pre-defined rules) on common variables. The matching rules and criteria are then gradually broadened using 4 stages, to tolerate greater differences in a variable or by expanding the geographic area in which a match can occur. For example, links formed in stage 1 match exactly on the variables used. An approximate link quality measure (Quality 1–4) is assigned to the links via a linkage quality flag which corresponds to the stage the link was formed in (Stage 1–4).

Quality 1 and 2 links are considered very good quality and can be included with confidence in most analyses. Quality 3 links are considered to be of good quality and can be used in aggregate analyses, though should be used with caution for small population groups. Quality 4 links are lower quality links and should be used with caution (ABS 2020b). The ABS does not further define small population groups, or aggregate analysis; however it is expected that many CALD populations would be considered small.

Analysts using the MADIP data can perform sensitivity tests to understand the impacts of excluding or including good and lower quality links for their specific analysis, including the direction of any potential bias. All records have been included in this report and no further sensitivity analyses were conducted.

The 2014–15 NHS to Spine linkage was completed using probabilistic linkage and did not include a link quality measure, so has not been included in this section (ABS 2020d).

The following sections of this report explore the quality of the linkage between records in the Census, 2017–18 NHS and death registrations and the Spine overall and by country of birth.

How did the linkage quality vary in each data collection?

Table 2.1 shows the linkage quality for each data set. Overall, death registrations had the highest proportion (88%) of very good quality links to the Spine which can be used with confidence in most analyses (Table S2.3). Some of the information used for linkage to the Spine in death registrations is based on formal documentation such as the registries of births, deaths, and marriages. This may have resulted in cleaner data and better agreement with the information contained in the Spine (which is based on Medicare, Personal Income Tax and Centrelink data and which also generally requires formal documentation to register), compared with self-reported data in the Census and the 2017–18 NHS.

The linkage quality was lowest for the 2017–18 NHS, with just over half (56%) of the links between the 2017–18 NHS and the Spine able to be used with confidence in most analyses, and a further 31% able to be used in aggregate analyses.

Table 2.1: Proportions of total links to MADIP Spine, by quality of linkage, 2016 Census, death registrations August 2016–November 2017, and 2017–18 NHS.

Linkage quality flag	Census	Death registrations	NHS
		Per cent	
Very good quality (Quality 1 and 2, include with confidence)	77	88	56
Good quality (Quality 3, can be used in aggregate analyses)	20	7	31
Lower quality (Quality 4, use with caution)	3	4	13

Source: AIHW analysis of ABS 2020c; Table S2.3.

How did the linkage quality vary by country of birth?

Table S2.3 presents the linkage quality results by country of birth for those used in this report.

Census

The proportion of linkages that were very good quality varied by country of birth, ranging from 55% for those born in *Slovakia* to 83% for those born in *Scotland*, and was 78% for those born in *Australia*. The proportion of lower quality links was quite low for all countries (range 2% to 8%), and those with lower proportions of very good quality links had higher proportions of good quality links. For analyses based on small populations, the good quality and lower quality links (between 45% and 17% of records that linked to the Spine) may need to be excluded following a sensitivity analysis. However, if good quality links can be kept in the analyses, more than 90% of people who link to the Spine could be included for all countries of birth.

Death registrations, August 2016 to November 2017

There was less variation in linkage quality results between the countries of birth for death registrations, and the proportion of very good quality links was higher than for the Census (Table S2.3). *Syria* had the highest proportion (93%), and *Ukraine* and *Lithuania* had the lowest (both 78%), and it was 89% for those born in *Australia*. The proportion of lower quality links was quite low for all countries (range 0% to 8%).

For aggregate analyses, where good quality links can be kept in the analyses, more than 95% of people who link to the Spine could be included for most countries of birth. However, the relatively smaller number of deaths for some countries of birth may result in fewer populations considered large enough to include the good quality links.

As highlighted above, mortality analyses based on the linked Census and death registrations data use the records that linked to the Spine in both the numerator and the denominator, which varied by country of birth. A further reduction of people due to the linkage quality in each data set may introduce additional bias into the results, as some populations may be more or less likely to have very good quality links than others.

2017–18 National Health Survey

The range of specific countries of birth that could be presented from the 2017–18 NHS data was much smaller than for the Census and death registrations (Table S2.3). The proportion of very good quality links ranged from 32% for those born in *Greece*, to 62% for those born in the *United Kingdom*, and was 57% for those born in *Australia*. The proportion of low quality links ranged from 11% to 29%.

The combination of small CALD populations in the NHS, even at the region level, and lower proportions of very good quality links may result in the exclusion of more than half of the linked records following a sensitivity analysis.

CALD variables in the MADIP

Table 2.2 shows the CALD variables used in this report from the Census, National Health Surveys and death registrations and their advantages and disadvantages for use in identifying and reporting on CALD populations. Almost all variables from the Standards are available, the exceptions being *First language spoken* and *Languages spoken at home*; however, these are in part covered by other language variables.

The choice of appropriate CALD variable/s for an analysis will depend on the research question, and often more than one variable will be required. Overall, *Country of birth* has the advantage of being the most commonly collected, is easy to define and does not change for a person over time, and population estimates are produced annually by the ABS. For most other variables, population estimates are available only for Census years, and the responses for an individual may change over time (for example, for *Main language spoken at home* and *Proficiency in spoken English*).

Table 2.2: Advantages and disadvantages of the available CALD variables

Indicator	Description	Advantages	Disadvantages	Data collection in MADIP	AIHW collections
Country of birth of person	The country in which the person was born – primarily used to identify whether someone is a migrant to Australia or not	Easy to define and reliable – unlikely to change over time Objective and exhaustive when collected at country level Most collected indicator of CALD – often used in administrative data sets Can be combined with language or ancestry variables to identify migrant subgroups Denominator (estimated resident population by country of birth) data updated annually by ABS	Does not provide ethnocultural or linguistic information for those born overseas or in Australia Does not provide information on migration pathway Not always collected at country level (NHS 2014–15)	Census, National Health Surveys, death registrations	National Hospitals Morbidity Database, Alcohol and other drug treatment services, Community mental health care, Non-Admitted Patient Emergency Department Care Database, Public Dental Waiting Times, Residential Mental Health Care, Disability Services (2018-19), Specialised Homelessness Services (2019 onwards), Australian Cancer Database, National (insulin-treated) Diabetes Register, National Drug Strategy Household Survey, National Mortality Database, National Prisoner Health Data Collection, Residential aged care data
Country of birth of father	The country the respondent identifies as being the one in which the person's father was born.	Easy to define and reliable Objective and exhaustive when collected at country level Can provide a broader measure of cultural diversity by identifying second generation migrants Useful for determining retention of parent's culture, ethnicity and language	Does not provide ethnocultural or linguistic information for the father or respondent Population data only available for Census years	Census, National Health Surveys	

(continued)

Table 2.2 (continued): Advantages and disadvantages of the available CALD variables

Indicator	Description	Advantages	Disadvantages	Data collection in MADIP	AIHW collections
Country of birth of mother	The country the respondent identifies as being the one in which the person's mother was born.	Easy to define and reliable Objective and exhaustive when collected at country level Can provide a broader measure of cultural diversity by identifying second generation migrants Useful for determining retention of parent's culture, ethnicity and language	Does not provide ethnocultural or linguistic information for the mother or respondent Population data only available for Census years	Census, National Health Surveys	Perinatal
Main language other than English spoken at home	Main language, other than English, spoken by a person in his or her home on a regular basis to communicate with other residents of the home and regular visitors to the home.	Captures the use of another language where English may be the main language, maximising numbers of established migrants Originally identified as most useful general purpose language variable by ABS and best measure of identifying service needs and potential disadvantage when used with Proficiency in spoken English Only language variable collected in the Census	May not capture those who only speak a language other than English outside the home (e.g. within a person's ethnic group) May include those whose main and preferred language is English who have learnt another language which is spoken in the home Only identifies main language other than English most spoken at home at the current point in time, so may not necessarily be their first or preferred language or 1 most identified with The same language may be spoken by people from different countries and cultures Population data only available for Census years	Census	Child protection (2018 onwards), Specialised Homelessness Services (2019 onwards), Community Housing Data Set Specification, Cancer Screening Data (Breastscreen Australia, National Bowel Cancer Screening Program)

(continued)

Table 2.2 (continued): Advantages and disadvantages of the available CALD variables

Indicator	Description	Advantages	Disadvantages	Data collection in MADIP	AIHW collections
Main language spoken at home	The main language spoken by a person in his or her home, on a regular basis, to communicate with other residents of the home and regular visitors to the home.	Can be exhaustive if collected at language level Considered a good indicator of the language in which a person is likely to be most at ease Can help determine the need for language or interpreter services	Underestimates usage of other languages where English is mainly spoken at home The same language may be spoken by people from different countries and cultures Language information may reflect current living arrangements rather than cultural and language background Not considered the best filter for the Proficiency in spoken English question – potential to miss those who mainly speak English at home but are not fully proficient Used alone it does not capture information about proficiency in English No population data (not collected in Census)	National Health Surveys	National (insulin-treated) Diabetes Register, National Drug Strategy Household Survey (only 'Aboriginal and/or Torres Strait Islander languages' or 'language other than English'), National Prisoner Health Data Collection, Residential aged care data
Proficiency in spoken English	Defined as ability to speak English in everyday situations. Measured by asking those who speak a language other than English to self-assess their level of ability to speak English	Provides information on potential disadvantage when accessing services or programs	Subjective – different people may have different requirements for spoken English proficiency in everyday life that affect their response Relates to spoken English only and no other aspects of communication (reading, writing, listening) Population data only available for Census years	Census, National Health Surveys	Alcohol and other drug treatment services (preferred language), Specialised Homeless Services (2019 onwards), Residential Aged Care (preferred language)

(continued)

Table 2.2 (continued): Advantages and disadvantages of the available CALD variables

Indicator	Description	Advantages	Disadvantages	Data collection in MADIP	AIHW collection/s
Ancestry	Describes the ethnic or cultural groups to which a person's forebears are or were attached. In practice, it is the ethnic or cultural groups which the person identifies as being his or her ancestry.	Measures association with ethnic and cultural groups which do not equate directly to countries of birth or languages so may otherwise be missed. Flexible for the respondent	Can nominate up to 2 ancestries, no way of ranking so each ancestry is considered equal (can present challenges for analysis). Does not necessarily indicate current ethnic identity, other variables (country of birth, year of arrival, language variables) required to assess retention of cultural and language diversity. Subjective – people with the same ancestry or cultural background may identify differently and may change over time Population data only available for Census years	Census, National Health Survey 2014–15	Nil
Religious affiliation	The religious beliefs and practices to which a person adheres or the religious group to which a person belongs.	Subjective – individuals declare affiliation and no measure of strength of affiliation or adherence to religious practices Can provide information on specific ethnic or cultural groups not picked up in other variables Can be helpful in delivering culturally relevant services	People with the same religious affiliation can come from different countries, ancestries and ethnocultural backgrounds Population data only available for Census years	Census	Nil
Year of arrival in Australia	The year in which a person, born outside of Australia, first arrived in Australia from another country with the intention of living here for one year or more.	Can indicate how familiar migrants are likely to be with Australian society and practices	Will not equate to period of residence in Australia where there are significant periods of absence – additional question required Provides no information on cultural or social differences Population data only available for Census years Provides no information on migration pathway	Census, National Health Surveys, death registrations (as period of residence in Australia)	Specialised Homelessness Services (2019 onwards), National Mortality Database (as years resident)

Source: ABS 1999.

3 Country of birth of person

How is country of birth associated with health?

Every single country around the world was represented in Australia's population in 2019, although England remains the most common birthplace for overseas-born Australians (Table 1.2; ABS 2021a). *Country of birth* is the most used indicator of CALD, and the one for which the most information is collected and reported.

Country of birth can be an important determinant of the occurrence and outcomes of specific health conditions (Tran et al. 2012). For example, people born in some countries have a higher prevalence of type 2 diabetes and gestational diabetes, and are more likely to be hospitalised for chronic kidney disease (AIHW 2005, 2010, 2019). The incidence of, and mortality from, some cancers also vary by country of birth (AIHW 2012a, 2012b).

The health status of migrants can vary according to place of birth due to diverse social, economic, environmental, cultural and genetic influences. People born in the same country may identify with common cultural characteristics and sociodemographic backgrounds and share particular health risk factors related to diet or cultural practices that affect their health outcomes. They may also have similar ideas about health and illness, and show similar patterns of health-related behaviours and health service use (Tran et al. 2012). The process of migration has also been identified as a social determinant of health in and of itself (WHO 2018).

In some instances, collecting country of birth data has helped to identify a difference in disease burden among recently arrived migrants or refugees from certain countries (Quinn et al. 2014). This has allowed preventive health programs to be targeted to those migrating from these countries – for example, chronic hepatitis B in South Asian migrants (Quinn et al. 2014).

However, while country of birth can provide some health information about a population and the categorisation of countries is well established, it does not tell the whole story. It provides no information on how long a person has spent in Australia, nor their age at migration, both of which can influence acculturation (Jatrana et al. 2017). Country of birth does not account for social and cultural differences within a country and does not provide information about the ethnocultural group of Australian-born residents (Quinn et al. 2014). Some countries are very diverse and made up of very different ethnicities and cultural groups with very different implications for health outcomes. For example, a country such as Singapore has a diverse population which includes ethnic Chinese, ethnic Malays and ethnic Indians. For some countries, within-country disparities can be greater than between country disparities.

Country of birth and the selected health outcomes

The MADIP contains country of birth information in all 3 data sources used in this report: the Census, the NHSs, and death registrations.

Countries of birth are coded to the Standard Australian Classification of Countries, 2016 (SACC) (ABS 2016e). This classification follows a 3-level hierarchical structure – 9 major groups, 27 minor groups and 244 discrete countries. Minor groups lie wholly within the boundaries of a geographic continent, and contain neighbouring countries that are considered similar from a social, cultural, economic and political perspective (ABS 2016e). Major groups are formed by aggregating geographically close minor groups.

Self-assessed health status and country of birth

Based on self-reported data from the NHSs, more than half of *Australian-born* (56%) and overseas-born (54%) adults considered their health to be 'excellent' or 'very good' (Figure 3.1; Table S3.1). After adjusting for age, the corresponding proportions were the same for those who were born in *Australia* and those born overseas (56%).

After disaggregating into regions and countries of birth, as the data allowed, much greater variation was seen in self-assessed health (Figure 3.1; Table S3.1). The proportion who assessed their health as 'excellent' or 'very good' ranged from 22% for those born in *Greece* to 67% for those born in *Sub-Saharan Africa*.

After adjusting for age this variation was reduced, ranging from 49% for those born in *North Africa and the Middle East* to 67% for those born in *Sub-Saharan Africa*.

Figure 3.1: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by country and region of birth, 2014–15 and 2017–18
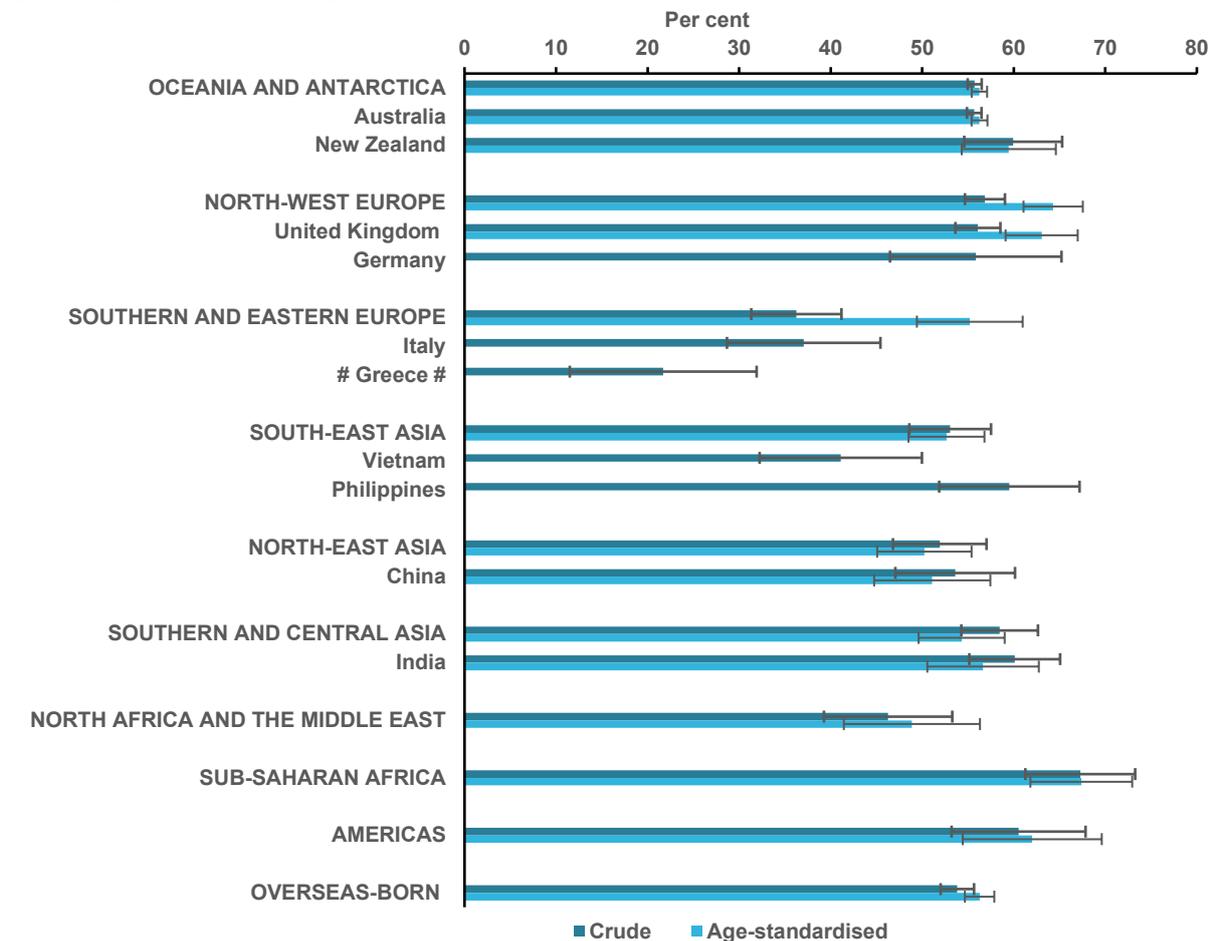
Notes:

1. Age-standardised proportions were calculated using the 2001 Australian Standard Population.

2. # Estimate has a high margin of errors (> 10 percentage points) and should be interpreted with caution.

3. Australia includes External Territories, and China excludes Special Administrative Regions and Taiwan.

Source: AIHW analysis of ABS 2020c; Table S3.1.

Chronic conditions and country of birth

Based on self-reported data from the 2014–15 and 2017–18 NHSs, a higher proportion of those born in *Australia* (58%) had a chronic condition than those who were born overseas (50%) (Figure 3.2; Table S3.1). After adjusting for age, 57% of *Australian-born* adults had a chronic condition, compared with 45% of those born overseas.

Much greater variation was seen when results were disaggregated by region and country of birth (Figure 3.2; Table S3.1). Around three-quarters of those born in *Italy* (78%) and *Greece* (75%) had a chronic condition, compared with less than one-third of those born in *China* (31%), *India* (34%) and *Vietnam* (36%). This is not surprising considering the differences in median age for these populations, and how strongly many of the selected chronic conditions are associated with increasing age.

After adjusting for age (where the data allowed), those born in *Australia* had the highest proportion with a chronic condition (57%), and those born in *China* the lowest (34%). Although it was not possible to age-standardise for *Italy* and *Greece* individually, at the region level (*Southern and Eastern Europe)* the proportion with a chronic condition decreased by more than 20 percentage points after adjusting for age, and was similar to the *Americas* and *Southern and Central Asia* regions.

Figure 3.2: Proportion of Australian adults with a chronic condition, by country and region of birth, 2014–15 and 2017–18
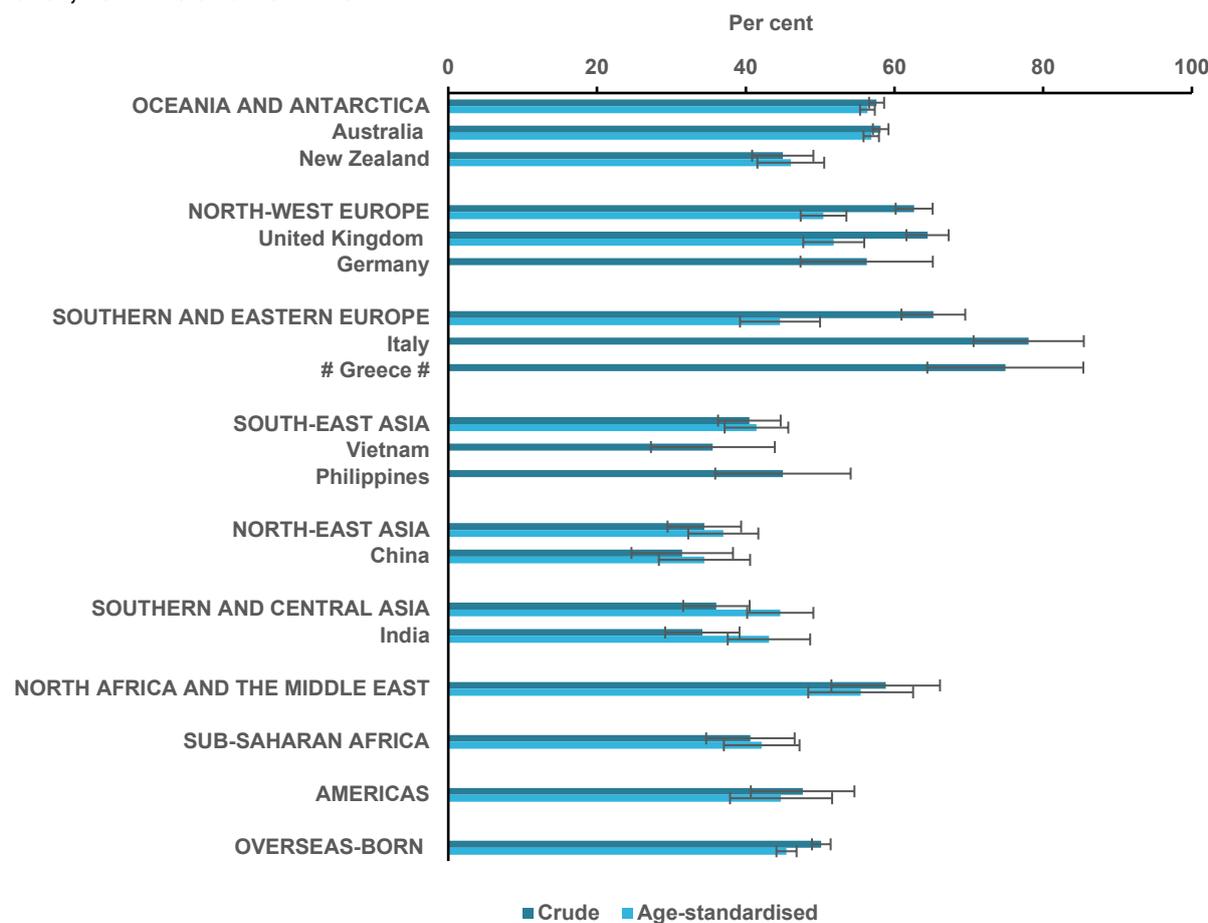
Notes:

1. Age-standardised proportions were calculated using the 2001 Australian Standard Population.

2. # Estimate has a high margin of errors (> 10 percentage points) and should be interpreted with caution.

3. Australia includes External Territories, and China excludes Special Administrative Regions and Taiwan.

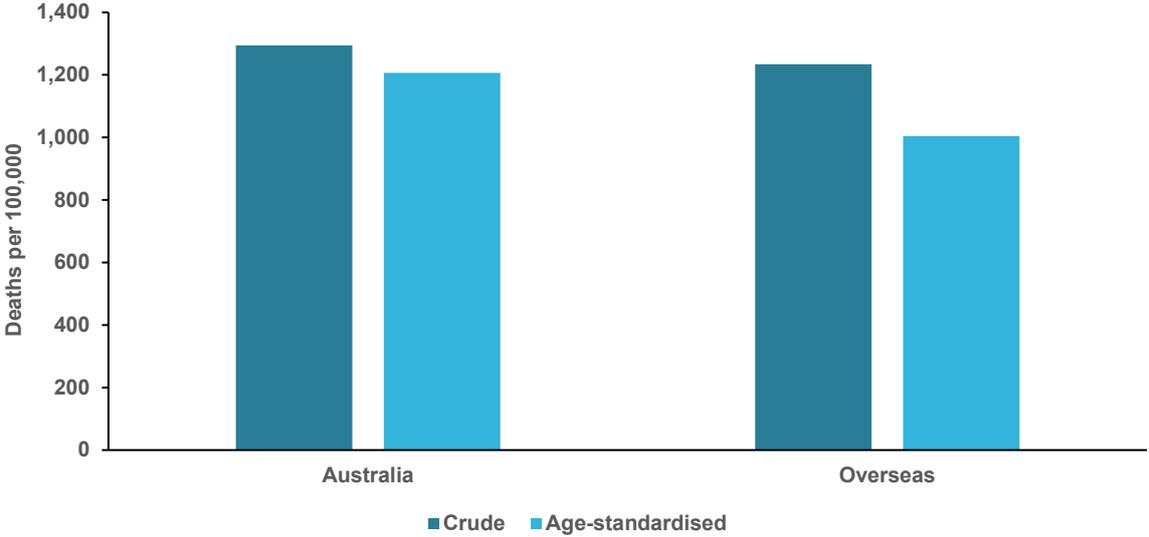Source: AIHW analysis of ABS 2020c; Table S3.1.

Mortality and country of birth

The use of linked data can underestimate mortality rates for some populations so mortality rates presented here were calculated using the complete death registration data set for the numerator (that is, number of adults who died between August 2016 and November 2017 by country of birth), and the complete Census file for the denominator (that is, total number of adults by country of birth including those who died). The use of data linkage to calculate mortality rates is discussed further in Chapter 2.

The mortality rate for *Australian-born* adults was slightly higher than for those born overseas (1,294 and 1,234 per 100,000 population, respectively) (Figure 3.3; Table S3.2a). After adjusting for age, *Australian-born* adults had a higher mortality rate than those born overseas (1,206 per 100,000, compared with 1,004 per 100,000 population).

The mortality rate was higher for the *Australian-born* population than overseas-born for all age groups, but the difference reduced with increasing age. The mortality rate for people born in *Australia* was 2.1 times as high as for those born overseas for those aged 44 and under, reducing to 1.1 times as high for *Australian-born* adults than overseas-born for those aged 65 and over (Table S3.2b).

Figure 3.3: Mortality rates for Australians adults, by country of birth, August 2016–November 2017

Notes

1. Age-standardised rates were calculated using the 2001 Australian Standard Population.

2. Australia includes External Territories.

Source: AIHW analysis of ABS 2020c; Table S3.2.

There was much greater variation in mortality rates between the discrete countries of birth.

Unadjusted (crude) mortality rates ranged from 195 per 100,000 population for adults born in *Pakistan* to 7,958 per 100,000 population for those born in *Latvia* (Table S3.2). Among overseas-born adults, the rates were generally highest in populations born in Europe, particularly in Eastern European countries, and lowest for Asian-born adults, particularly for those born in *North-East Asia* and *Southern Asia* (Table S3.2). This largely reflects migration patterns and that people born in Asia had a younger age structure, with a median age of 35, in 2016, compared with 59 for those born in Europe (ABS 2017a).

Adjusting for age reduced the extent of the variation, but the differences remained considerable. A number of countries of birth had higher age-standardised mortality rates than the *Australian-born* population, which would not have been identified if the data were presented only in binary form or at region level.

The rates remained generally lowest for those born in Asian countries (particularly for those born in countries in the *North-East Asia* and *South-East Asia* regions), and they were generally highest among European-born adults (particularly some countries in the *Southern and Eastern European* region) (Figure 3.4; Table S3.2).

Overall, the age-standardised mortality rates ranged from 560 per 100,000 for those born in *South Korea* to 2,526 per 100,000 for those born in *Czechia*.

Although differences were observed when aggregated to major groups and minor groups, it also demonstrated that there were wide differences between countries within the same minor group. For example, within the *South-Eastern Europe* region, the mortality rates for those born in *Serbia* (1,927 per 100,000) and *Bosnia* (1,589 per 100,000) were around twice as high as for those born in *Greece* (896 per 100,000). This suggests that there are differences in factors other than age between these populations influencing health outcomes, which would be identified only if data were disaggregated at the most detailed level possible.

Figure 3.4: Highest 10 and lowest 10 age-standardised mortality rates for Australian adults, by country of birth, August 2016–November 2017
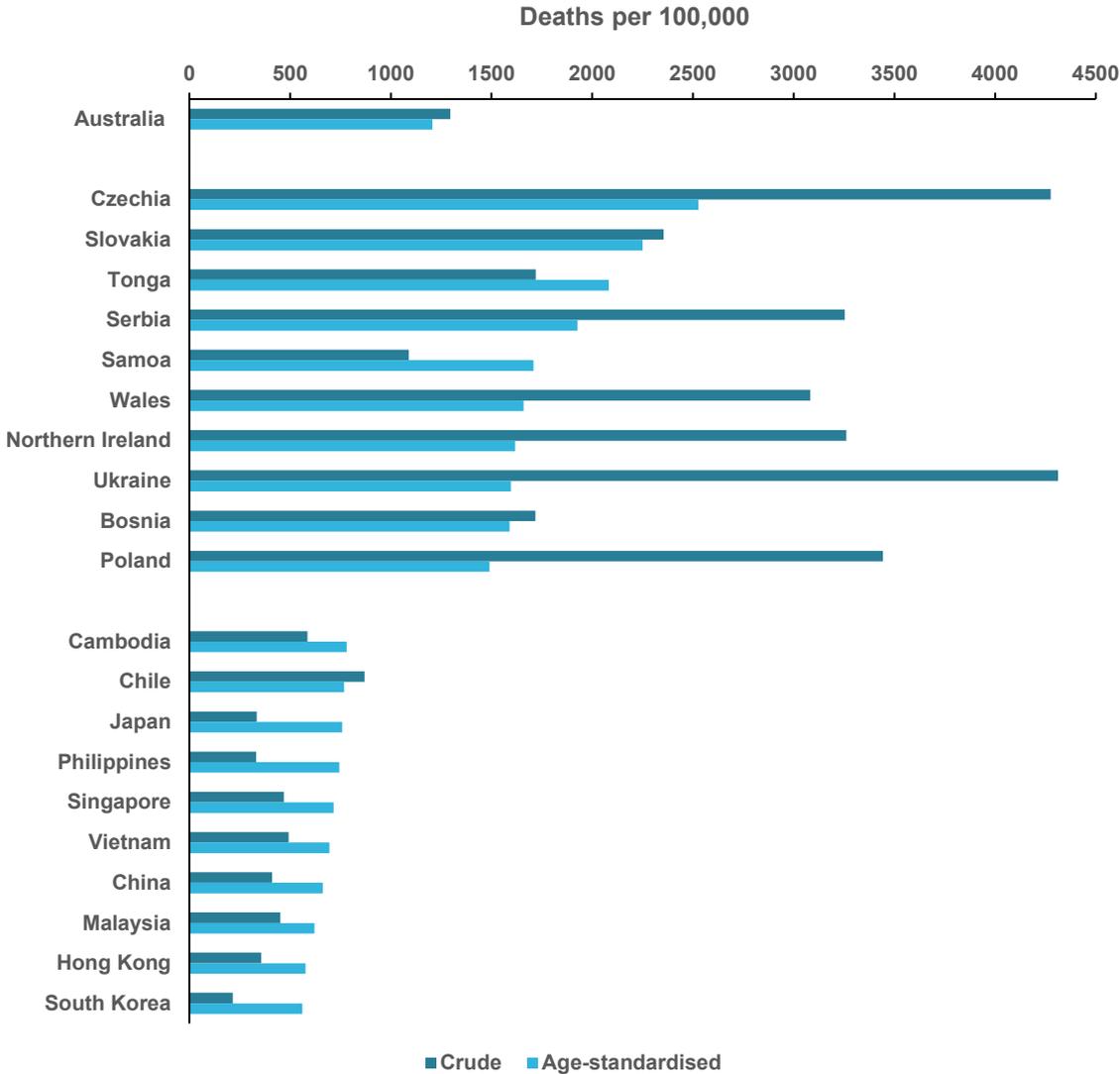
Notes:

1. Age-standardised rates were calculated using the 2001 Australian Estimated Resident Population.

2. Australia includes External Territories, and China excludes Special Administrative Regions and Taiwan.

Source: AIHW analysis of ABS 2020c; Table S3.2.

4   Country of birth of parents

In 2016, the 5 most commonly reported countries of birth for both mothers and fathers were the same as for the country of birth of person:

- Australia (54% of mothers, 52% of fathers)
- England (5.6% of mothers, 6.0% of fathers)
- China (3.0% of mothers, 3.0% of fathers)
- New Zealand (2.6% of mothers, 2.6% of fathers)
- India (2.6% of mothers, 2.6% of fathers).

Among people who had only one overseas-born parent, it was more likely to be their father than their mother (58%, compared with 42%) (ABS 2017a). The 2016 Census was the first time this information was collected, and respondents were asked specifically about the birthplace of their father and mother. However, Australian families are increasing in diversity – including a rise in the number of same-sex couple families (ABS 2017a). The 2021 Census provided participants with additional information for recording their parents' country of birth where they did not know their birth mother or father or had same-sex parents.

How is country of birth of parents associated with health?

The identification of the country of birth of parents can indicate a person's migrant background and provide some cultural context. Culture encompasses socially transmissible knowledge, beliefs and practices that affect the sociodemographic factors and health behaviours which stem from a person's unique cultural experience (Hernandez and Gibb 2020). Parents' socioeconomic status and health behaviours influence the circumstances experienced during childhood, which can have a lasting impact on health in adulthood. For example, a study found that a person's self-assessed health status at age 50 or over was associated with parental and childhood characteristics (Bricard et al. 2013).

Second-generation migrants

The Australian Bureau of Statistics defines second-generation Australians as people who are born and living in Australia, with at least one overseas-born parent. In 2016, around 1 in 5 Australians (21%) were second-generation Australians (ABS 2017a). There is mixed evidence on whether the health outcomes for second-generation Australians differ from people whose parents were born in Australia. When compared with their parents, second-generation migrants have grown up and been educated in Australia, and may find it easier to navigate the health-care system than their parents. However, second-generation migrants may experience conflict between their parents' culture and that of their host country, as well as discrimination from their host population, which can have a detrimental effect on their mental health (Lee 2019).

Country of birth of parents and the selected health outcomes

Country of birth of mother and father are included in 2 of the 3 data sources used in this report: the National Health Surveys (NHSs) and the Census. The Standard Australian Classification of Countries (SACC) 2016 is used to collect country of birth of mothers and fathers data (ABS 2016e). For more information on the SACC, refer to the 'Chapter 1 Country of birth and the selected health outcomes'.

Initial investigations found that there were no major differences in outcomes by country of birth of mother or country of birth of father, hence the data in this section have been aggregated to country of birth of parents. For each discrete country of birth and region of birth, a single variable was derived to identify people who had one or both parents born in that country or region. People who had at least one parent born overseas were also grouped using the same approach. As individuals may be included in 2 groups, the groups are not necessarily mutually exclusive. It is important to keep this in mind when comparing results between groups.

Highly aggregated results are also presented for people who had both parents born in Australia and those who had both parents born overseas. These 2 groups are mutually exclusive as the populations included in these groups do not overlap.
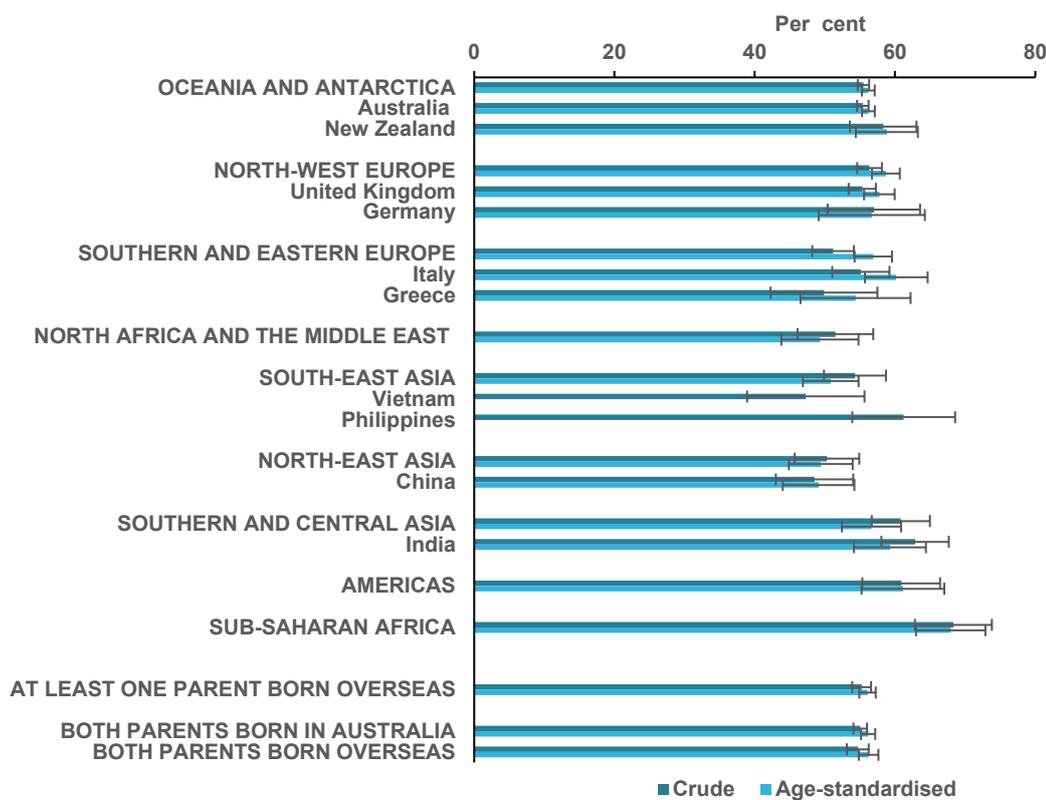
Self-assessed health status and country of birth of parents

Based on self-reported data from the 2014–15 and 2017–18 NHSs, more than half of adults with at least one parent born in *Australia* and those who had at least one parent born overseas assessed their health as 'excellent' or 'very good' (both 55%) (Figure 4.1; Table S4.1). After adjusting for age, there was also no difference in the proportions (both 56%). The age-standardised proportions for adults with both parents born in *Australia* and those who had both parents born overseas were also the same (both 56%). These 2 populations are mutually exclusive, meaning that the populations in these 2 groups do not overlap.

When the data were disaggregated into the specific countries of birth of parents, the proportion assessing their health as 'excellent' or 'very good' ranged from 47% for adults who had one or both parents born in *Vietnam* to 63% for those who had one or both parents born in *India*. After adjusting for age, where data allowed, adults who had at least one parent born in *Italy* (60%) had the highest proportion, while those who had at least one parent born in *China* (49%) had the lowest .

At the region level, those who had one or both parents born in *Sub-Saharan Africa* (68%) had the highest age-standardised proportion, while those with one or both parents born in *North Africa and the Middle East* (49%) had the lowest.

Figure 4.1: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by country and region of birth of parents, 2014–15 and 2017–18

Notes

1. Age-standardised proportions were calculated using the 2001 Australian Standard Population.

2. Australia includes External Territories, and China excludes Special Administrative Regions and Taiwan.

Source: AIHW analysis of ABS 2020c; Table S4.1.

Chronic conditions and country of birth of parents

Based on self-reported data from the 2014–15 and 2017–18 NHSs, adults who had at least one parent born in *Australia* were more likely to have a chronic condition than adults who had at least one parent born overseas (60% and 51%, respectively) (Figure 4.2; Table S4.1). This difference remained after adjusting for age (58% and 50%, respectively).

A similar picture was observed when comparing results for the mutually exclusive groups – 60% of adults who had both parents born in *Australia* had a chronic condition, compared with 50% of adults who had both parents born overseas. After adjusting for age, adults who had both parents born in *Australia* were still more likely to have a chronic condition than adults who had both parents born overseas (58% and 47%, respectively).

At the discrete country level, the proportions of adults with a chronic condition ranged from 34% for those with a parent born in *Vietnam* to 62% for those with a parent born in the *United Kingdom*. After adjusting for age, adults with at least one parent born in *Greece* were estimated to have the highest proportion, while those who had at least one parent born in *China* had the lowest (59% and 37%, respectively).

When Australians were grouped by the regions of birth of their parents, after adjusting for age, people who had at least one parent born in *Oceania and Antarctica* or *North Africa and*

the Middle East had the highest proportion with a chronic condition (both 57%), and those with at least one parent born in *North-East Asia* (37%) had the lowest.

Figure 4.2: Proportion of Australian adults with a chronic condition, by country and region of birth of parents, 2014–15 and 2017–18
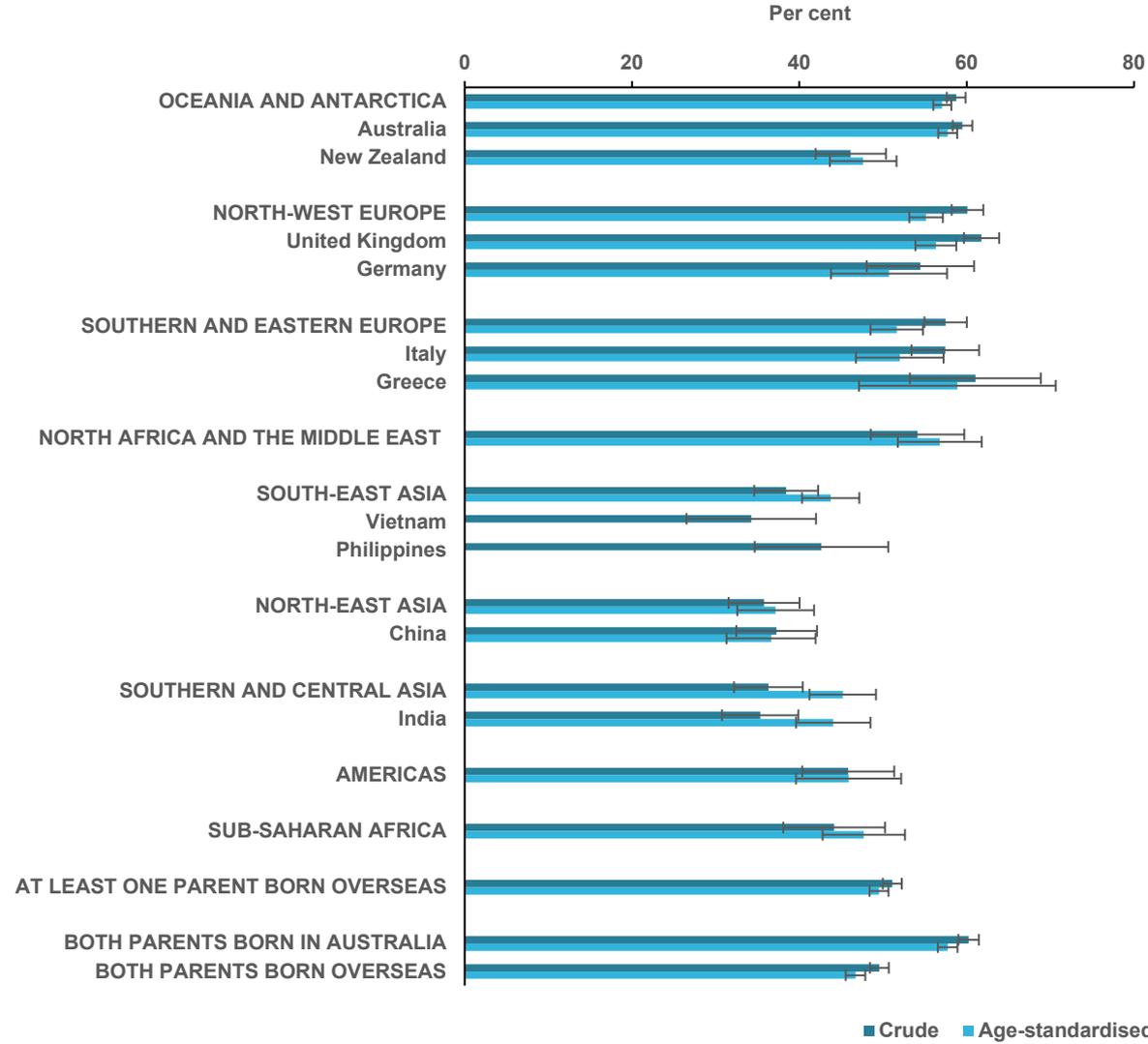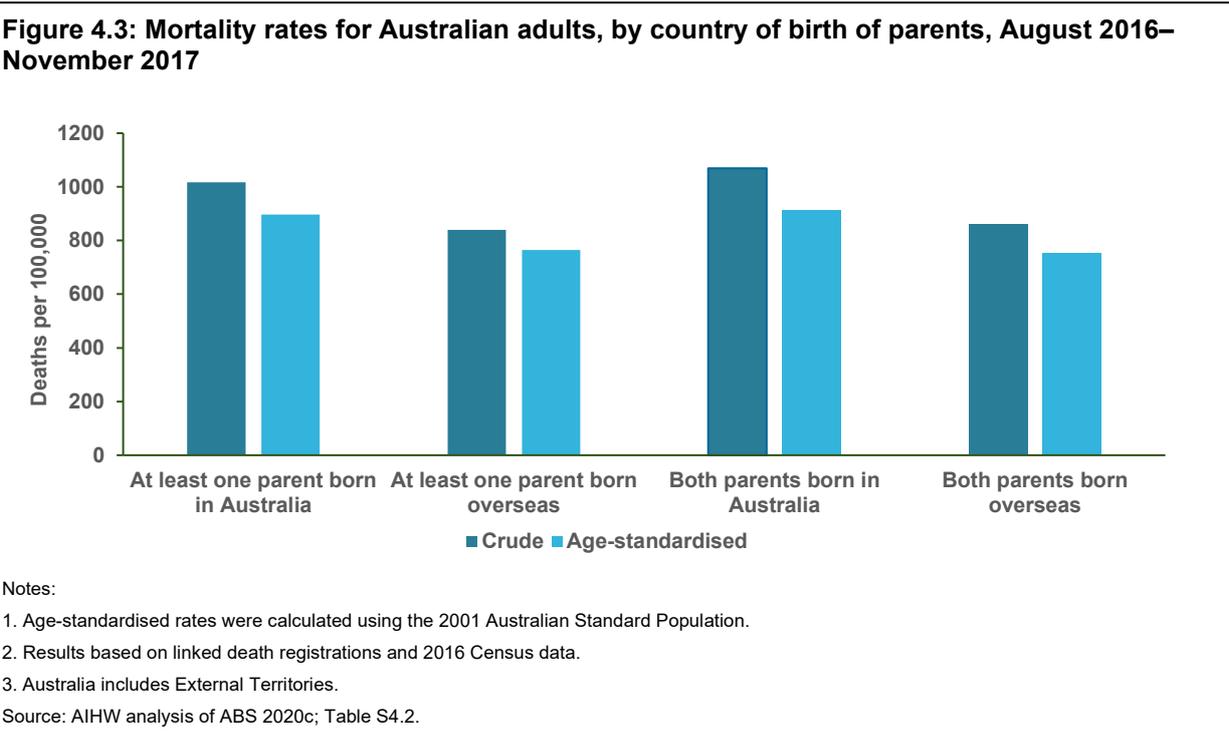

Notes:

1. Age-standardised proportions were calculated using the 2001 Australian Standard Population.

2. Australia includes External Territories, and China excludes Special Administrative Regions and Taiwan.

Source: AIHW analysis of ABS 2020c; Table S4.1.

Mortality and country of birth of parents

The all-cause mortality rate for adults who had at least one parent born in *Australia* was higher than for adults who had at least one parent born overseas (1,017 and 839 per 100,000 population, respectively) (Figure 4.3; Table S4.2a). After adjusting for age, this difference remained (896 and 764 per 100,000, respectively). Adults who had both parents

born in *Australia* also had a higher age-standardised mortality rate (912 per 100,000) than those who had both parents born overseas (753 per 100,000).

The mortality rate for adults with at least one parent born in *Australia* were higher for all age groups than those for adults with at least one overseas-born parent, with greater relative differences in younger age groups than older age groups (Table S4.2b). The same pattern was observed when comparing age-specific rates between adults who had both parents born in *Australia* and those who had both parents born overseas.

Figure 4.3: Mortality rates for Australian adults, by country of birth of parents, August 2016– November 2017

Notes:

1. Age-standardised rates were calculated using the 2001 Australian Standard Population.

2. Results based on linked death registrations and 2016 Census data.

3. Australia includes External Territories.

Source: AIHW analysis of ABS 2020c; Table S4.2.

Mortality rates ranged from 166 per 100,000 population for adults who had at least one parent born in *South Korea* to 2,037 per 100,000 for those who had at least one parent born in *Latvia* (Table S4.2). In general, those who had at least one parent born in a European country (particularly *Eastern European* countries) had higher mortality rates, while those with at least one parent born in an Asian country (for example, *South-East Asian* and *North-East Asian* countries) had lower mortality rates (Figure 4.4; Table S4.2). After adjusting for age, mortality rates ranged from 402 deaths per 100,000 for adults with at least one parent born in *South Korea* to 1,055 per 100,000 for those with at least one parent born in *Norway*. There were also differences between countries within the same minor region. For example, the age-standardised rate for adults who had at least one parent born in *Lebanon* was higher than for those with at least one parent born in *Iran* (817 and 580 per 100,000), both of which are within the *Middle East* region (Table S4.2).

Figure 4.4: Lowest 10 and highest 10 age-standardised mortality rates for Australian adults, by country of birth of parents, August 2016–November 2017
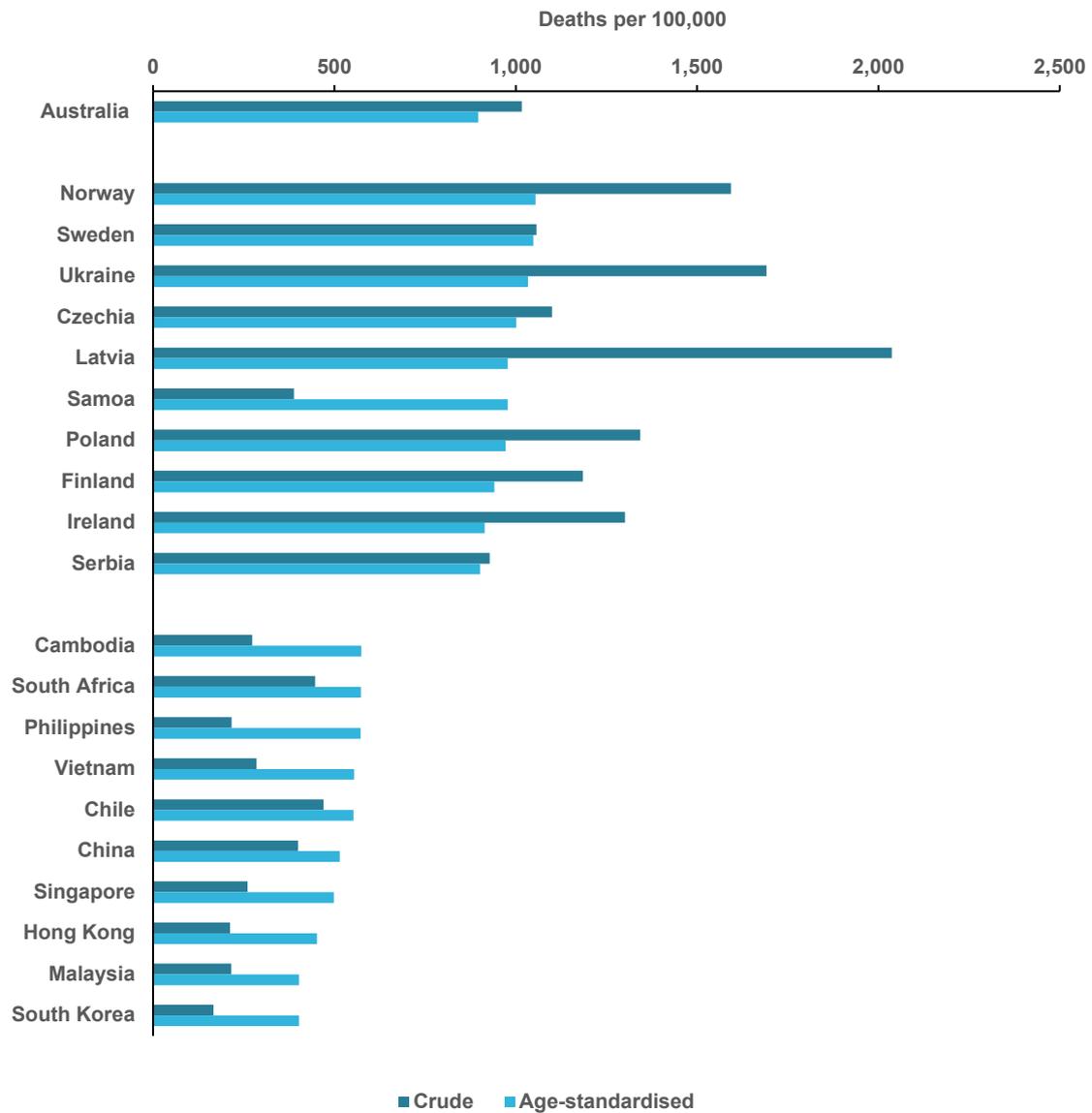
Notes:

1, Age-standardised rates were calculated using the 2001 Australian Standard Population.

2. Results based on linked death registrations and 2016 Census data.

3. Australia includes External Territories, and China excludes Special Administrative Regions and Taiwan.

Source: AIHW analysis of ABS 2020c; Table S4.2.

5 Language spoken at home and proficiency in spoken English

Australia is a land of many languages. According to the 2016 Census, more than 300 languages were separately identified as being spoken in homes across Australia, and one in 5 (21%) Australians spoke a language other than English at home. The languages most commonly spoken at home in 2016 were:

- Mandarin (2.5% of the population)
- Arabic (1.4%)
- Cantonese (1.2%)
- Vietnamese (1.2%)
- Italian (1.2%)
- Greek (1.0%)
- Hindi (0.7%)
- Spanish (0.6%)
- Punjabi (0.6%) (ABS 2017a).

How is language associated with health?

It is widely acknowledged and understood that the Australian health system does not adequately cater for people who do not have high proficiency in English (FECCA 2016). These language barriers in the health system have the potential to affect health negatively. A person's use of language, accent, dialect, repertoire and speech also plays a part in racism and institutional and interpersonal discrimination, and can lead to long-lasting psychological trauma and distress (Dovchin 2020).

Limited proficiency in English, also referred to as Limited English Proficiency (LEP), is the inability to read, write, speak or understand English very well. It is perhaps one of the more obvious, and more researched, language-related obstacles to health faced by people from diverse linguistic backgrounds. LEP is associated with decreased access to health care, worse health status, and worse health outcomes when compared with those without limited English proficiency (Fernandez et al. 2011; Mackay et al. 2017; Ou et al. 2010).

The difficulties related to English proficiency, or not speaking English as a first language, and the health-care system can apply across the care and prevention spectrum. For example, people with limited ability to read English may have difficulty sourcing, understanding and interpreting trusted health information.

Language barriers extend to interactions between clinicians and their patients, and LEP can affect a person's ability to understand and comply with health instructions (Kim et al. 2017; Wilson et al. 2005). Clinicians may lack cultural and linguistical responsiveness and may not be adequately trained, or working with interpreters, to be able to respond to the needs of people from non-English speaking backgrounds. Without adequate translation resources, or a doctor who speaks the same language as the patient, patients are at risk of adverse events and worse health outcomes from such things as:

- failing to understand medication instructions (Wilson et al. 2005)

- inability to read prescription labels (Masland et al. 2011)
- worse post-operative pain management (Jimenez et al. 2014)
- lower uptake of vaccines (Mendoza de la Garza et al 2021; Uwemedimo et al. 2012; Yi et al. 2013)
- the use of bilingual relatives or non-medical staff to translate medical information which can compromise quality of care and exacerbate health outcomes for migrant communities if the transfer of health information is lost in translation (Meuter et al. 2015).

Looking beyond Limited English Proficiency

People from different cultural backgrounds may describe pain or distress differently from the way their health-care practitioner understands it. For example, the use of metaphors or expressions used in one cultural context may not translate to another, even when English language proficiency is high (Meuter et al. 2015).

In another example, researchers found that being from a non-English-speaking background had a role in predicting lower health service utilisation, and that this was unconnected to the person's LEP (Ou et al. 2010). This finding indicates that social factors, cultural aspects, health beliefs and health-seeking behaviours associated with being from a non-English-speaking background may contribute to health behaviours independently of proficiency in English (Ou et al. 2010).

Similarly, speaking mainly a language other than English in the home has been associated with worse physical and oral health outcomes in adolescents, and with higher parental rates of dissatisfaction with health-care providers due to doctors not spending enough time with their child or not explaining things clearly (Lau et al. 2012). While LEP explains some of these findings, other drivers of dissatisfaction with doctors include not being included in the decision-making process, and a lack of cultural understanding (Harmsen et al. 2008; Moreno and Morales 2010).

An ageing migrant population

Understanding the broader language context of older people is also important. People with English as a non-primary language who were previously proficient in English may experience loss of ability in English and a reversion to their native language as they age (Schmid and Keijzer 2009), or as they develop certain types of dementia (Ellajosyula et al. 2020). Around 1 in 10 aged care users report speaking a language other than English, and the most commonly-spoken languages are Italian and Greek (AIHW 2021d). This is important for service planning for the aged care workforce, which is also commonly made up of people from non-English speaking backgrounds, but from backgrounds which are different from those most common among aged care users.

Language and its relationship with other CALD dimensions

It is important to note that language barriers intersect with a range of CALD dimensions, such as country of birth and year of arrival. For example, someone born in the United Kingdom may experience fewer language barriers than someone born in Vietnam when migrating to Australia. Moreover, as an individual spends more time in the host country, their proficiency in the language can improve. It is important to keep these factors in mind when interpreting the results in this section, as these have not been taken into account. Future analysis will investigate combining CALD variables to account for some of these related factors.

Language and the selected health outcomes

The ABS Standards for Statistics on Cultural and Linguistic Diversity 1999 contain 5 indicators relating to language (Box 5.1). Two of these indicators, *Main language other than English spoken at home* and *Proficiency in spoken English*, are considered core variables. While the remaining 3 indicators are not core indicators, they can help to provide additional information about potential needs and issues for people from linguistically diverse backgrounds.

The Australian Standard Classification of Languages, 2016 (ASCL) is used to collect data related to language usage (ABS 2016b). The ASCL has a 3-level hierarchical structure, the third and most detailed level being 435 individual languages. The second level is 51 narrow groups made up of similar individual languages, and the first level is 9 broad groups made up of geographically proximate narrow groups.

Box 5.1: Language-related CALD Indicators:

Main language other than English spoken at home*

Proficiency in spoken English*

First language spoken

Languages spoken at home

Main language spoken at home

* Part of the Minimum Core Set of Cultural and Linguistic Indicators

Source: ABS 1999.

Main language other than English spoken at home is the language variable asked of everyone in the Census, regardless of birthplace, via the question, 'Does the person speak a language other than English at home?'. Where more than one language other than English is spoken at home, people are asked to nominate the one spoken most often. For those who do nominate a language other than English, their proficiency in spoken English is assessed in the next question by asking, 'How well does the person speak English?'.

Main language spoken at home was collected in the NHSs by asking all respondents, 'Which language do you mainly speak at home?'. Those who answer a language other than English are then asked, 'Do you consider you speak English very well, well, or not well?' to assess their proficiency.

While these 2 language questions sound quite similar, there are some important conceptual differences. *Main language other than English spoken at home* deliberately captures a broader range of language diversity by allowing those who do speak English at home to nominate an additional language that is spoken at home, no matter how rarely. It is useful at picking up more established migrant communities whose main spoken language is now English, but who may regularly speak another language with family members or visitors in their home (ABS 1999).

In comparison, *Main language spoken at home* requires the person to nominate the language they speak most often at home. The use of *Main language spoken at home* may be preferable when the aim is to identify those who may experience disadvantage due to English not being their usual language.

Using the Census variable, *Main language other than English spoken at home,* 20% of people in the combined NHSs identified speaking a language other than English at home.

This compares with 12% of people who nominated mainly speaking a language other than English at home using the variable, *Main language spoken at home*, from the combined NHSs.

Proficiency in spoken English is collected only for those who nominate speaking a language other than English at home. This information is useful to identify those who may experience barriers in accessing services due to their lack of ability in spoken English (ABS 1999). It is worth noting that a person's assessment of their ability to speak English is subjective, as different people may have different requirements for spoken English proficiency in everyday life. Additionally, this question is related to spoken English only and no other aspects of communication such as listening, reading and writing, which may be particularly relevant to understanding health information (ABS 1999).

Self-assessed health status

Main language spoken at home

Based on self-reported data from the NHSs, an estimated 12% of adults spoke mainly a language other than *English* at home.

Adults who spoke mainly *English* at home were more likely to consider their health 'excellent' or 'very good' than those who spoke mainly other languages at home (56% and 49%, respectively), and this difference remained after adjusting for age (Figure 5.1; Table S5.1).

More variation was observed when data was disaggregated into broad language groups, ranging from 35% of people who spoke mainly *Eastern European languages* at home to 66% of people who spoke mainly *Northern European languages* (excluding *English*). Estimates could be age-standardised only for people who spoke *Southeast Asian* (44%) and *Eastern Asian languages* (48%), and both groups were less likely to view their health positively than those who spoke mainly *English* (57%).

Figure 5.1: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by main language spoken at home, 2014–15 and 2017–18
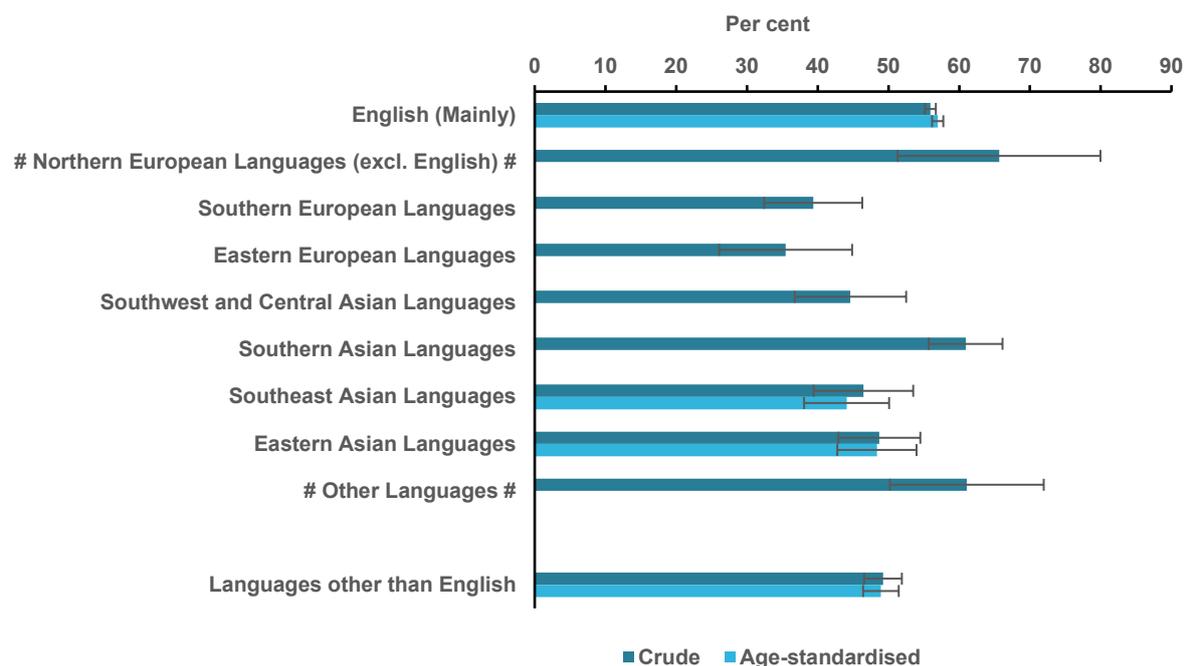
Notes:

1. Age-standardised proportions were calculated using the 2001 Australian Standard Population.

2. # Proportion has a high margin of error (>10 percentage points) and should be used with caution.

Source: AIHW analysis of ABS 2020c; Table S5.1.

Main language other than English spoken at home

Based on self-reported data from the Census, an estimated 20% of adults spoke a language other than English at home.

A higher proportion of adults who spoke only *English* at home considered their health to be 'excellent' or 'very good' than those who spoke a language other than *English* at home (56% and 52%, respectively) (Figure 5.2; Table S5.2). Adjusting the estimates for age increased the difference only slightly (57% and 51%, respectively). These results are very similar to those for *Main language spoken at home*.

Although self-assessed health status varied more when disaggregated into specific languages and narrow and broad language groups, the variation was not as great as for *Main language spoken at home*. At the region level, the proportion of people who assessed their health positively ranged from 42% for those who spoke *Eastern European languages* at home to 60% of those who spoke *Southern Asian languages*.

After adjusting the estimates for age (where data allowed), those who spoke *South-East Asian* (49%) and *Southwest and Central Asian* (44%) and *Chinese* languages (50%) were less likely to assess their health as 'excellent' or 'very good' than those who spoke only *English* at home. People who spoke *Italian* (65%) were most likely to consider their health positively, but this estimate did not differ significantly from those who spoke only *English* at home.

Figure 5.2: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by main language other than English spoken at home, 2014–15 and 2017–18
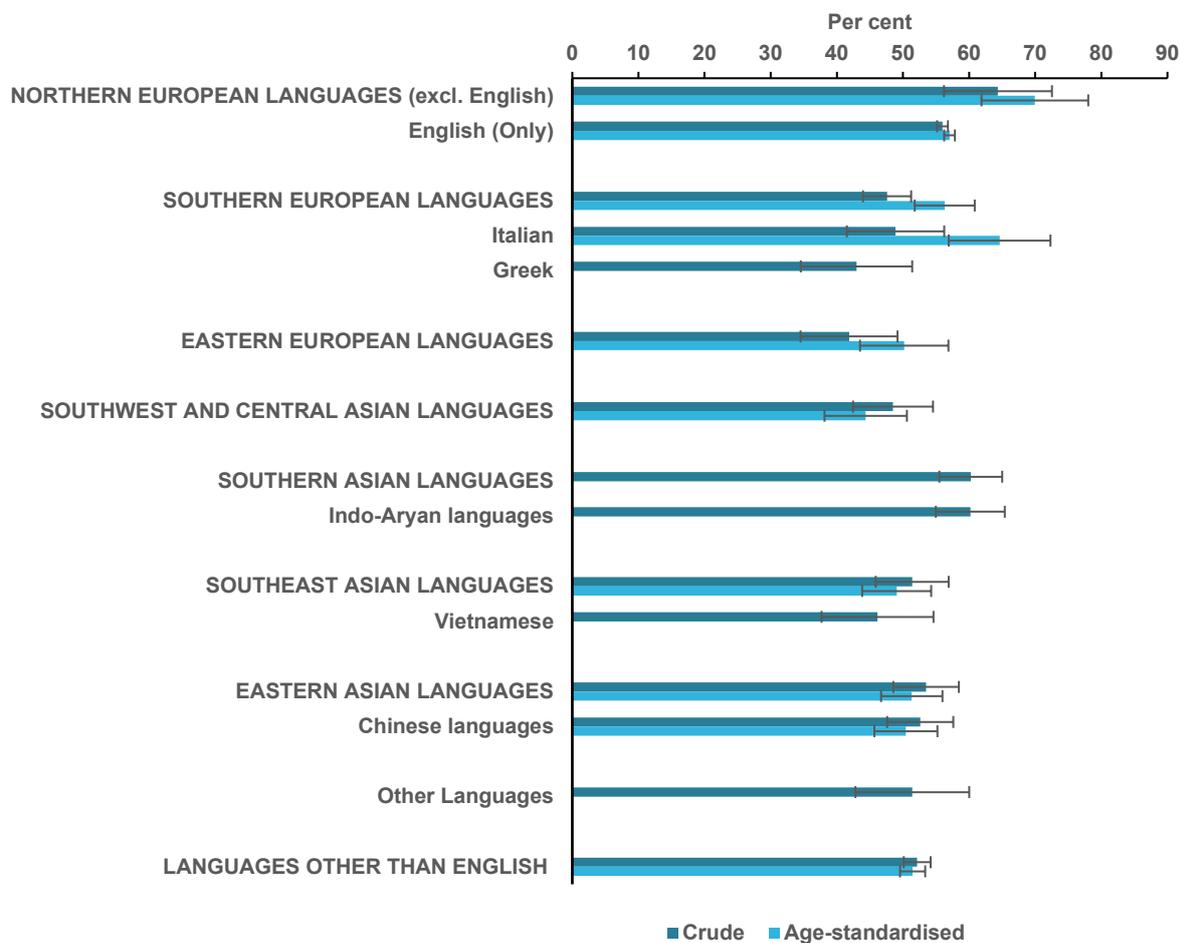
Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.
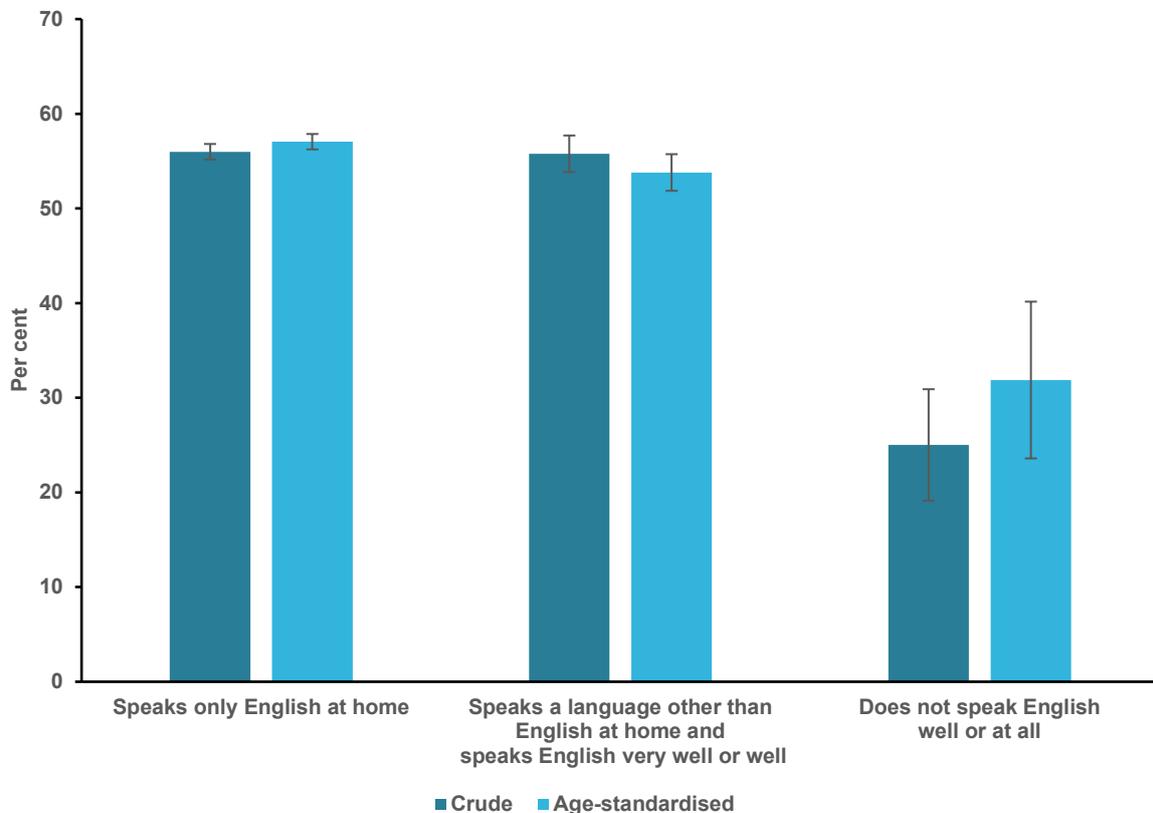
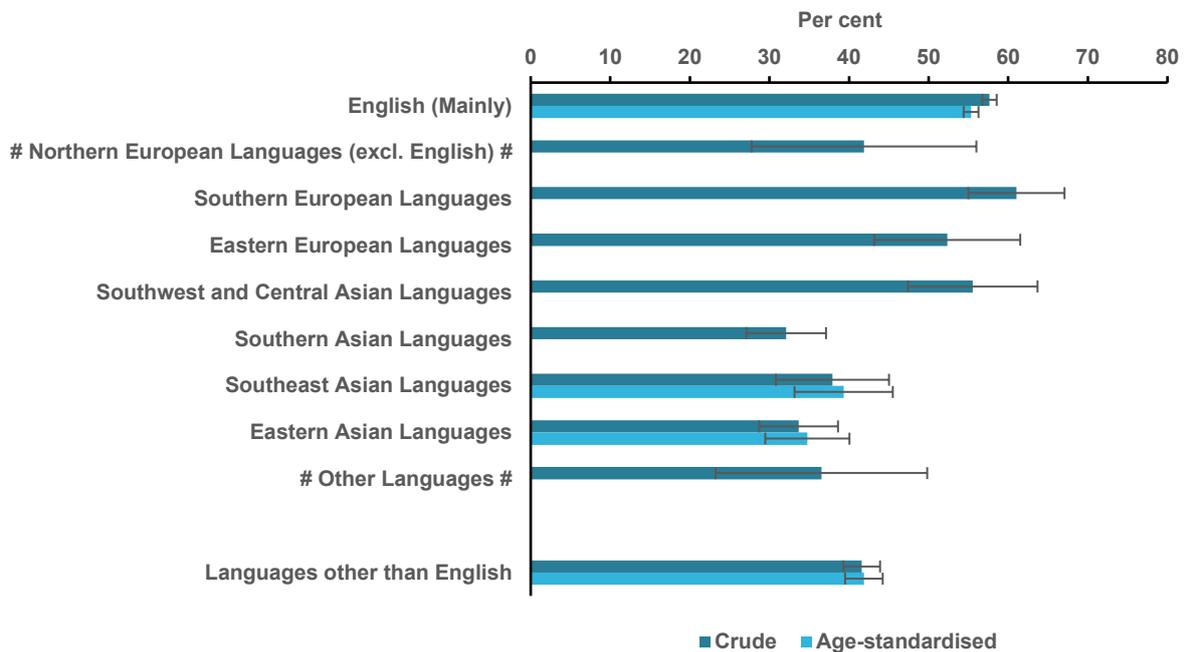Source: AIHW analysis of ABS 2020c; Table S5.2.

Proficiency in spoken English

In this section, proficiency in spoken English is from the Census and asked of those who nominated speaking a language other than English at home. Those who did not speak another language at home are included in the 'speaks English at home only' category.

Australians who did not speak English well or at all (25%) were least likely to consider their health to be 'excellent' or 'very good', compared with those who spoke English very well or well or those who spoke English only (both 56%).

After adjusting for age, Australians who did not speak English well or at all were still least likely to assess their health positively (32%). However, Australians who spoke a language other than English at home and spoke English very well or well were slightly less likely than those who spoke English only to assess their health as 'excellent' or 'very good' (54% and 57%, respectively) (Figure 5.3; Table S5.3).

Figure 5.3: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by proficiency in spoken English, 2014–15 and 2017–18

Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S5.3.

Chronic conditions and language spoken at home

Main language spoken at home

Based on self-reported data from the 2014–15 and 2017–18 NHSs, almost 3 in 5 (58%) Australians who spoke mainly *English* at home had a chronic condition, compared with around 2 in 5 (42%) of those who spoke mainly another language (Figure 5.4; Table S5.1). After adjusting for age, this difference remained (55% and 42%, respectively).

There was greater variation in results between the broad language groups, with the estimated proportion with a chronic condition ranging from 32% for those who spoke mainly *Southern Asian languages* to 61% for those who spoke mainly *Southern European languages*. The estimates could be age-standardised only for those who spoke mainly *Southeast Asian (*39%) and *Eastern Asian languages* (35%), which were considerably lower than for those who spoke mainly *English* at home.

Figure 5.4: Proportion of Australian adults with a chronic condition, by main language spoken at home, 2014–15 and 2017–18

Notes:

1. Age-standardised proportions were calculated using the 2001 Australian Standard Population.

2. # Proportion has a high margin of error (>10 percentage points) and should be used with caution.

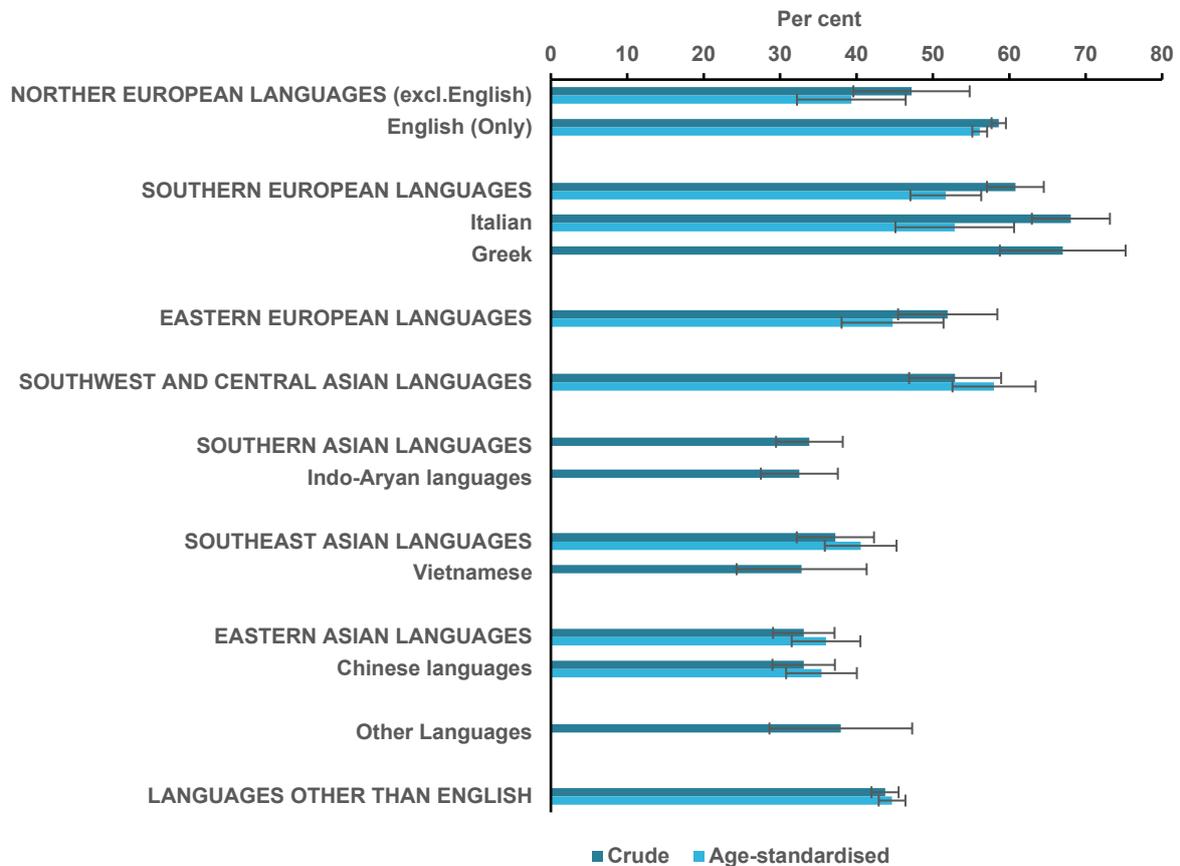Source: AIHW analysis of ABS 2020c; Table S5.1.

Main language other than English spoken at home

The proportion of people with a chronic condition was higher for adults who spoke only English at home than for those who spoke a language other than English at home (59% and 44%, respectively) (Figure 5.5; Table S5.2). After adjusting for age, this difference remained (56% and 45%, respectively), and was similar to the results for *Main language spoken at home*.

At the region level, the estimates were also similar to *Main language spoken at home*, but due to increased numbers more language groups could be age-standardised.

After adjusting for age, the proportion of people with a chronic condition who spoke *Southern European languages* at home (52%) was higher than for people who spoke *Southeast Asian* (41%), *Northern European (excluding English)* (39%) and *Eastern Asian* (36%) *languages*.

Figure 5.5: Proportion of Australian adults with a chronic condition, by main language other than English spoken at home, 2014–15 and 2017–18

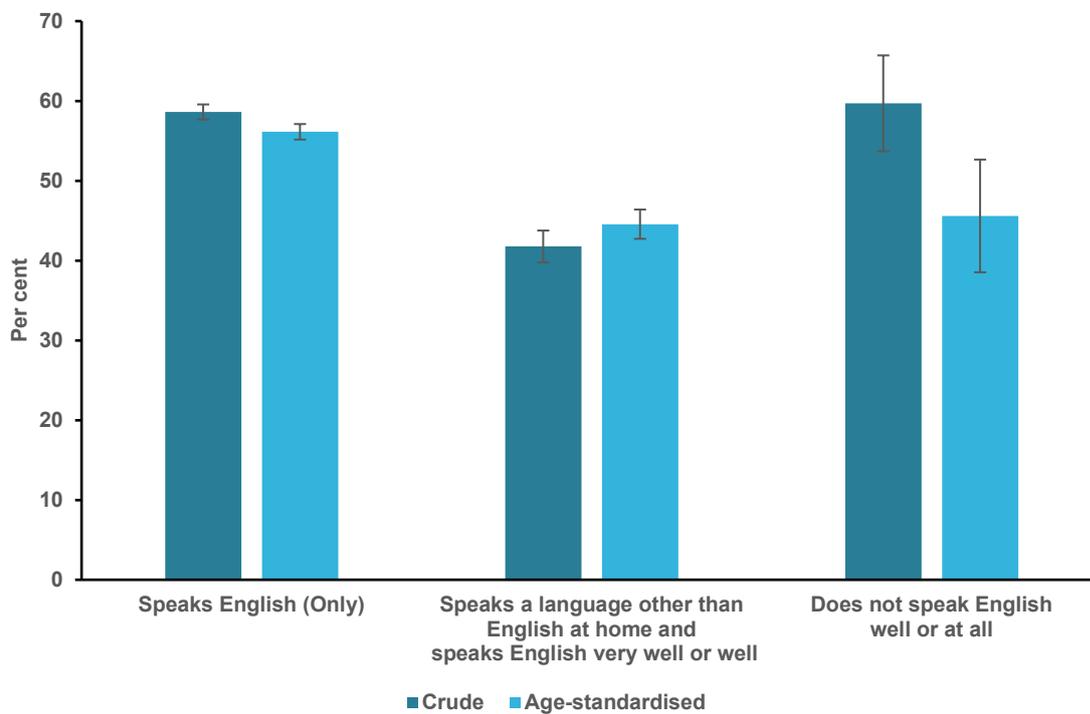Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of 2020b; Table S5.2.

Proficiency in spoken English

The proportion of people who did not speak English well or at all with a chronic condition (60%) was similar to people who spoke only English at home (59%), but significantly higher than for those who spoke a language other than English and spoke English very well or well (42%) (Figure 5.6; Table S5.3).

After adjusting for age, the proportion with a chronic condition was highest for those who spoke only English at home (56%), and similar for people who spoke English very well or well (45%) or did not speak English well or at all (46%).

Figure 5.6: Proportion of Australian adults with a chronic condition, by proficiency in spoken English, 2014–15 and 2017–18

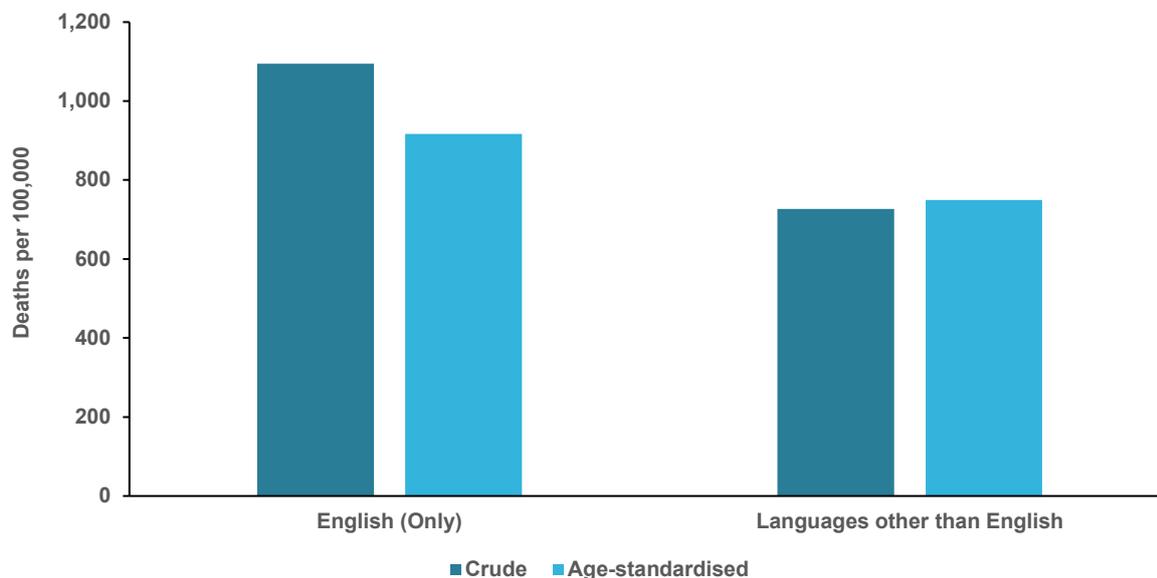Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S5.3.

Mortality and main language other than English spoken at home

The mortality rate for adults who spoke only *English* at home was considerably higher than for those who spoke a language other than English at home (1,094 and 726 per 100,000 population, respectively) (Figure 5.7; Table S5.4a). After adjusting for age, this difference was reduced, but the mortality rate was still higher for people who spoke only *English* at home (917 and 750 per 100,000 population, respectively).

This difference was driven by younger age groups. For those aged 44 and under, the mortality rate for people who spoke *English* only was twice as high as for people who spoke a language other than English at home, reducing to 1.1 times as high for those aged 75 and over (Table S5.4b).

Figure 5.7: Mortality rate for Australians adults, by main language other than English spoken at home, August 2016–November 2017

Notes: Age-standardised rates were calculated using the 2001 Australian Standard Population.
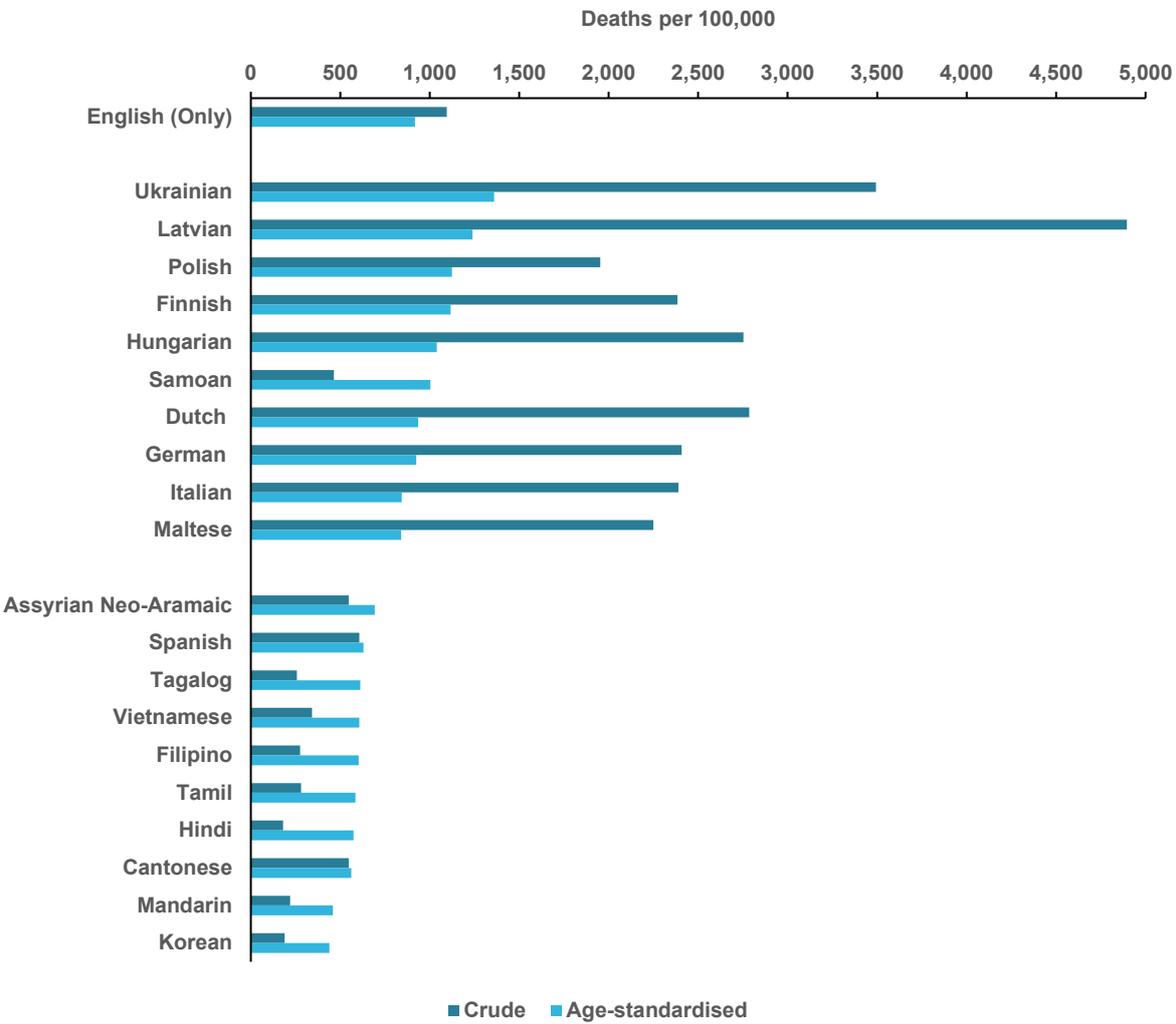
Source: AIHW analysis of ABS 2020c; Table S5.4.

When disaggregated into the main languages other than English spoken at home, the crude mortality rates ranged from 180 per 100,000 for adults who spoke *Hindi* to 4,895 per 100,000 for those who spoke *Latvian* (Figure 5.8; Table S5.4). In general, the European language groups (particularly *Eastern European languages*) had the highest mortality rates, while the Asian languages had the lowest rates.

Similar variations were seen when results were adjusted for age, with 9 out of 10 populations who had the highest age-standardised mortality rates being those who spoke a European language (chiefly *Eastern European languages*), and 8 out of 10 populations with the lowest mortality rates being those who spoke an Asian language.

Overall, the rates ranged from 439 per 100,000 for adults whose main language other than English spoken at home was *Korean*, to 1,360 per 100,000 for adults who spoke *Ukrainian* at home. As with other variables, there were large differences between languages within the same narrow language group. For example, within the *East Slavic* group, the mortality rate for people who spoke *Ukrainian* (1,360 per 100,000) was much higher than for people who spoke *Russian* (808 per 100,000) (Table S5.4). Such differences would not be identified if the data were aggregated.

Figure 5.8: Highest 10 and lowest 10 age-standardised mortality rates for Australian adults, by main language other than English spoken at home, August 2016–November 2017

Deaths per 100,000

Notes:

1. Age-standardised rates were calculated using the 2001 Australian Standard Population.

2. Results based on linked death registrations and 2016 Census data.
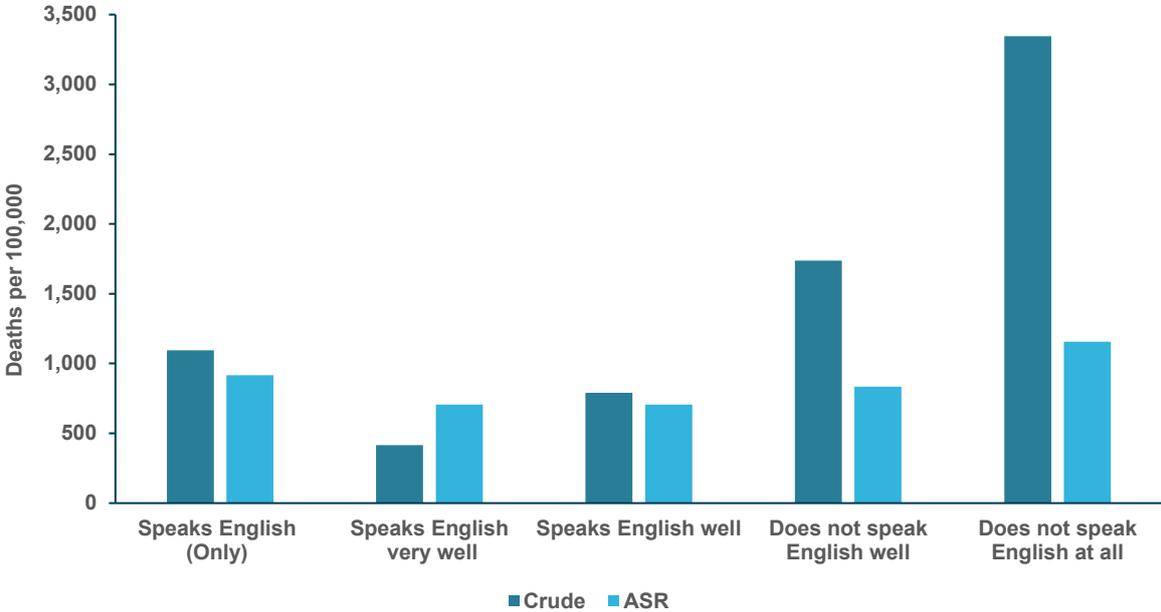
Source: AIHW analysis of ABS 2020c; Table S5.4.

Proficiency in spoken English

For adults who spoke a language other than English at home, mortality rates increased as the proficiency in spoken English decreased – ranging from 415 deaths per 100,000 for those who spoke English very well, to 3,346 deaths per 100,000 for those who did not speak English at all (Figure 5.9;Table S5.5). Those who did not speak English well (1,738 deaths per 100,000) or those who did not speak English at all had higher mortality rates than those who spoke only English at home (1,094 deaths per 100,000).

After adjusting for age, mortality rates still increased as proficiency in spoken English decreased, but to a lesser extent (Figure 5.9; Table S5.5). However, only adults who did not

speak English at all had a higher mortality rate than adults who spoke only English at home (1,157 and 917 per 100,000 respectively).

Figure 5.9: Mortality rates for Australian adults, by proficiency in spoken English, August 2016–November 2017

Notes: Age-standardised rates were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c: Table S5.5.

6   Religious affiliation

As a concept, religion can be difficult to define. According to the ABS (1999):

> …a religion is regarded as a set of beliefs and practices, usually involving acknowledgment of a divine or higher being or power, by which people order the conduct of their lives both practically and in a moral sense.

Religion and culture are considered inseparable, as the beliefs and practices of religion can be uniquely cultural, and religion can be a culture in itself (Croucher et al. 2017). Even where people may have other aspects of cultural and linguistic diversity in common – such as country of birth or language – the religious rituals associated with a religion may unite believers and separate non-believers. Similarly, people with a common ancestry or ethnic background often affiliate with the same religion.

Australia identifies as a secular society (meaning that Australia has no state or official religion) with a high degree of religious freedom and diversity. In the 2016 Census, Christianity remained the most common religious affiliation for the Australian population (52%). Almost half (47%) of the overseas-born people reported their religious affiliation as Christianity, compared with 58% among the Australian-born population (ABS 2017a). However, in keeping with migration patterns, more recent migrants to Australia were less likely to identify as Christian, and Hinduism, Islam, Sikhism and Buddhism are becoming more commonly reported religious affiliations. People who affiliated with a religion other than Christianity were also likely to be younger than Christians.

The proportion of Australians reporting no religious affiliation or secular and other spiritual beliefs is also increasing – from 22% in 2011 to 30% in 2016 (an additional 2.2 million people) (ABS 2017a).

How is religious affiliation associated with health?

Religion, medicine and health care have been interrelated since the beginning of history (Koenig 2012). Religious affiliation can both influence a way of life and be a way of life. Its impact on health, lifestyle and health-seeking behaviours varies depending on the extent of religious beliefs, denomination, practices and traditions.

Some religions can encourage what they consider to be healthy lifestyles and discourage unhealthy behaviours. For example, the Seventh-day Adventist religious group recommends that its followers do not use alcohol, tobacco and drugs and that they adopt a healthy lifestyle incorporating physical activity and a good diet (including vegetarianism) (Acosta Enriquez et al. 2019). On the other hand, religious beliefs – such as those held by Jehovah's Witnesses – have the potential to negatively affect health outcomes; for example, the refusal of a blood transfusion in an emergency or not vaccinating children on religious grounds (Koenig 2012). Depending on the extent of their religion (or religiosity), other people may have a fatalistic attitude towards their health – therefore whatever happens is God's will.

Some Australian studies have found an inverse relationship between risk-taking behaviours such as smoking, sexual behaviour, drug use and alcohol consumption among adolescents and higher religious involvements (Williams 2007). Religious belief is associated with improved mental health outcomes and has also been found to help people recover from traumatic events (Klocker et al. 2011). For some CALD sub-populations, such as refugees or

asylum seekers from war-torn countries, the protection and promotion of religious freedoms may be particularly important (Klocker et al. 2011).

Religious affiliation and the selected health outcomes

All participants of the Census are asked about their religion, but it is the only question considered optional (ABS 2017b). As the information is self-reported, it is subject to respondents' interpretation of the question and does not give an indication of the strength of their affiliation or the extent to which they practise their beliefs. This variable is considered most useful in providing additional data for identifying specific ethnic or cultural groups (ABS 1999).

The Australian Standard Classification of Religious Groups, 2016 was used to collect information on religious affiliation (ABS 2016c). The classification follows a 3-level hierarchical structure – 7 broad groups, 34 narrow groups and 131 religious groups. Narrow groups are formed by aggregating the discrete religious groups on the basis of similarity of religious beliefs and religious practices, and/or cultural heritage. Broad groups are formed using the same approach to aggregate similar narrow groups.

The scope of the classification is all religions and subsets of religions in the world. For practical reasons, and to make the classification more useful, it includes a broad group, *Secular beliefs and other spiritual beliefs and No religious affiliation* (ABS 2016c). This broad group could be considered outside the scope of the religion topic, but is needed to accommodate the whole range of responses to a question on religion.

In this section, the binary CALD and non-CALD comparison groups are *Christianity* (Australia's most commonly reported religion) and *Religions other than Christianity,* which includes all other religions, but excludes *Secular beliefs and other spiritual beliefs and No religious affiliation*.
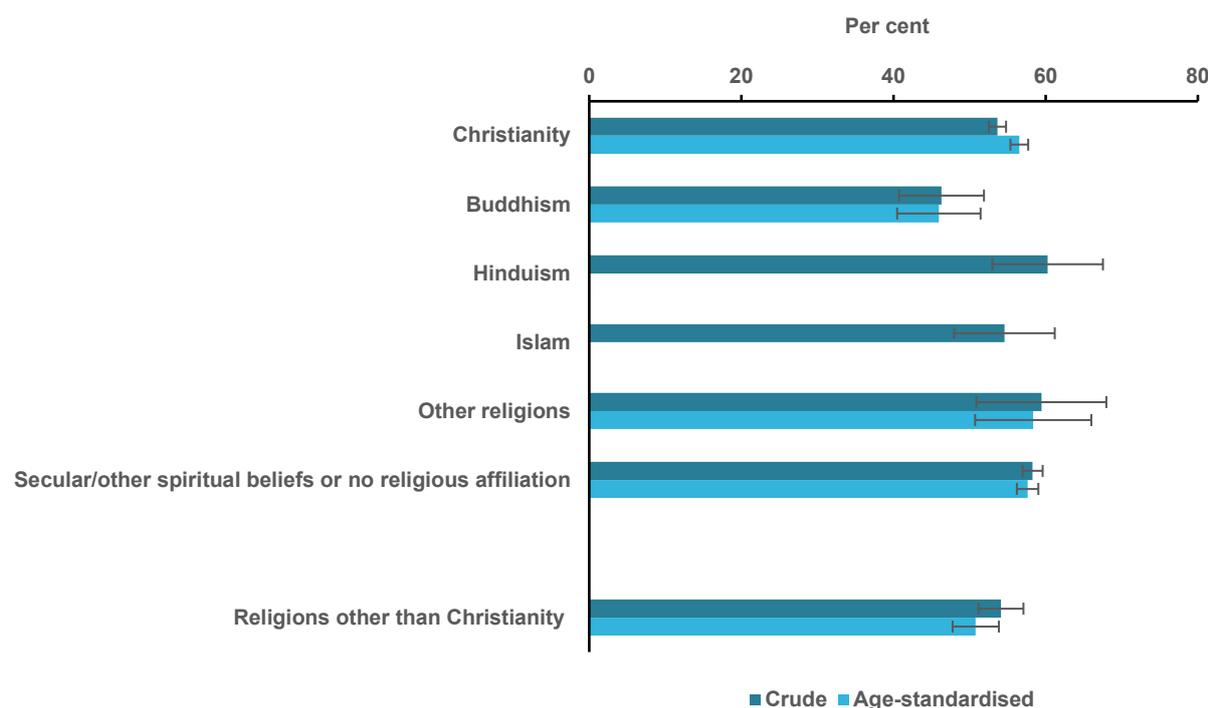
Self-assessed health status and religious affiliation

Based on self-reported data from the 2014–15 and 2017–18 NHSs, a similar proportion of adults who affiliated with *Christianity* and *Religions other than Christianity* considered their health to be 'excellent' or 'very good' (both 54%) (Figure 6.1;Table S6.1). However, after adjusting for age, people who affiliated with *Christianity* were more likely than those who affiliated with *Religions other than Christianity* to assess their health positively (57% and 51%, respectively). The age-standardised proportion for adults in the *Secular beliefs and other spiritual beliefs and No religious affiliation* group (58%) was similar to that for the *Christianity* group, but higher than for the *Religions other than Christianity* group.

For the other religious groups with sufficient numbers for reporting, the proportions ranged from 46% for adults who affiliated with *Buddhism*, to 60% for those who affiliated with *Hinduism* (Figure 6.1; Table S6.1).

Due to small populations sizes, the proportions for the *Islam* and the *Hinduism* religious groups could not be age-standardised. The age-standardised proportion of adults who considered their health to be 'excellent' or 'very good' who affiliated with *Buddhism* was 46% –much lower than that for those who affiliated with *Christianity*.

Figure 6.1: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by broad religious group, 2014–15 and 2017–18

Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.
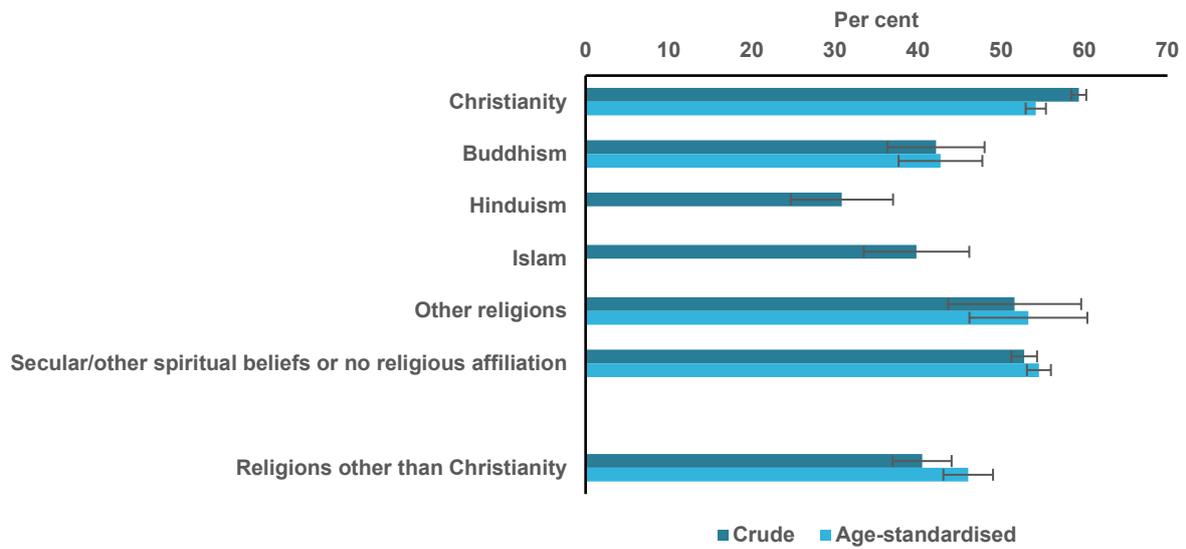
Source: AIHW analysis of ABS 2020c ; Table S6.1.

Chronic conditions and religious affiliation

Based on self-reported data from the 2014–15 and 2017–18 NHSs, around 3 in 5 adults who affiliated with *Christianity* (59%) had a chronic condition, compared with 2 in 5 (40%) who affiliated with *Religions other than Christianity* (Figure 6.2; Table S6.1). After adjusting for age, the difference was less marked, but still large (54% and 46%, respectively). After adjusting for age, the proportion of adults with a chronic condition in the *Secular beliefs and other spiritual beliefs and No religious affiliation* group (55%) was similar to the *Christianity* group, and higher than the *Religions other than Christianity* group*.*

Around 2 in 5 adults who affiliated with *Buddhism* (42%) and *Islam* (40%) had a chronic condition, compared with less than one-third (31%) of those who affiliated with *Hinduism* (Figure 6.2; Table S6.1).

Due to small population sizes, the estimates for *Islam* and *Hinduism* could not be age-standardised. The age-standardised proportion of adults with a chronic condition among the *Buddhism* group (43%) was much lower than for the *Christianity* group.

Figure 6.2: Proportion of Australian adults with a chronic condition, by broad religious group, 2014–15 and 2017–18

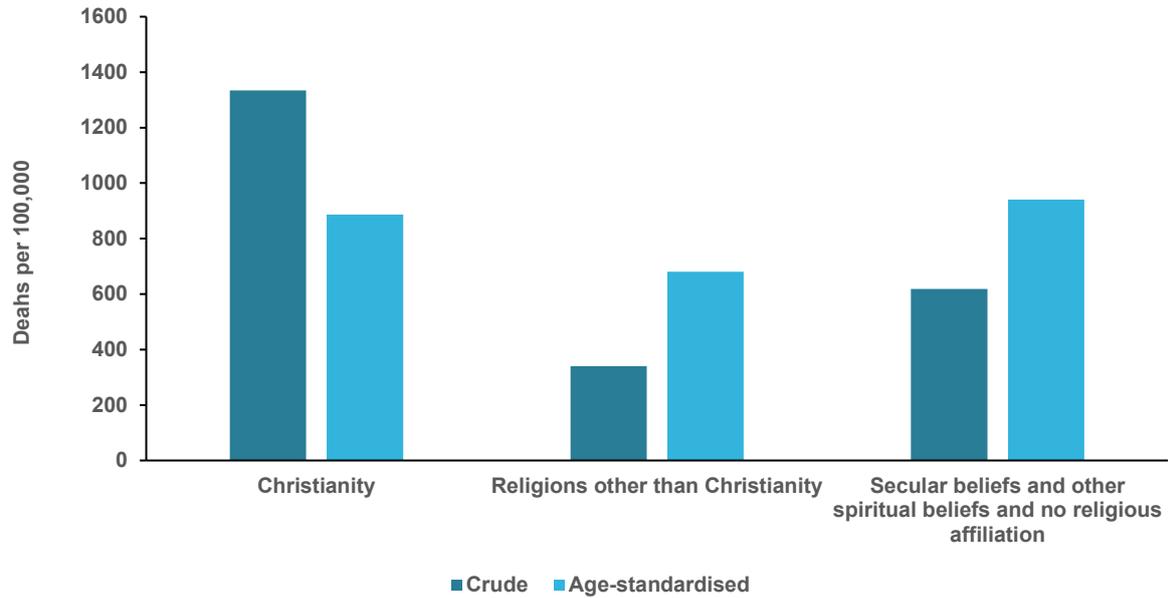Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c ; Table S6.1.

Mortality rates and religious affiliation

The mortality rate for adults who affiliated with *Christianity* was much higher than for those who affiliated with *Religions other than Christianity* (1,335 compared with 340 per 100,000 population) (Figure 6.3; Table S6.2a). After adjusting for age, the difference in rates between these 2 groups was much less pronounced (886 and 681 per 100,000 population, respectively). The age-standardised mortality rate for adults in the *Secular beliefs and other spiritual beliefs and No religious affiliation* group (941 per 100,000) was higher than for the *Christianity* group and the *Religions other than Christianity* group.

For all age groups, people who affiliated with *Christianity* had higher mortality rates than those who affiliated with *Religions other than Christianity*, but lower rates than the *Secular beliefs and other spiritual beliefs and No religious affiliation* group (Table S6.2b).

Figure 6.3: Mortality rates for Australian adults, by Christianity and Religions other than Christianity, August 2016–November 2017
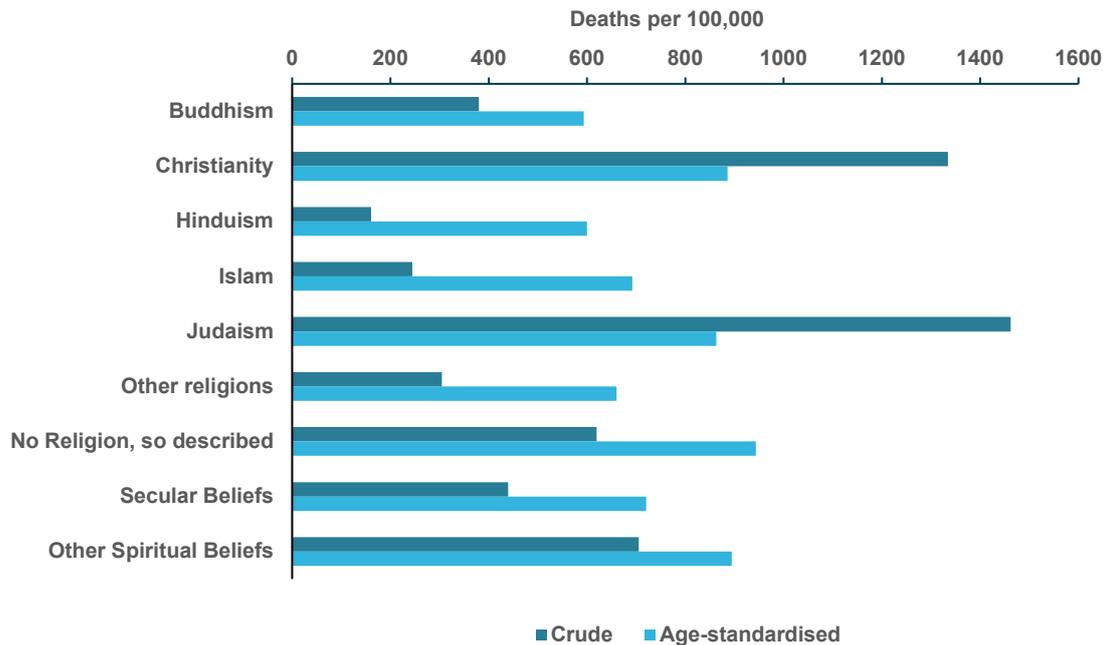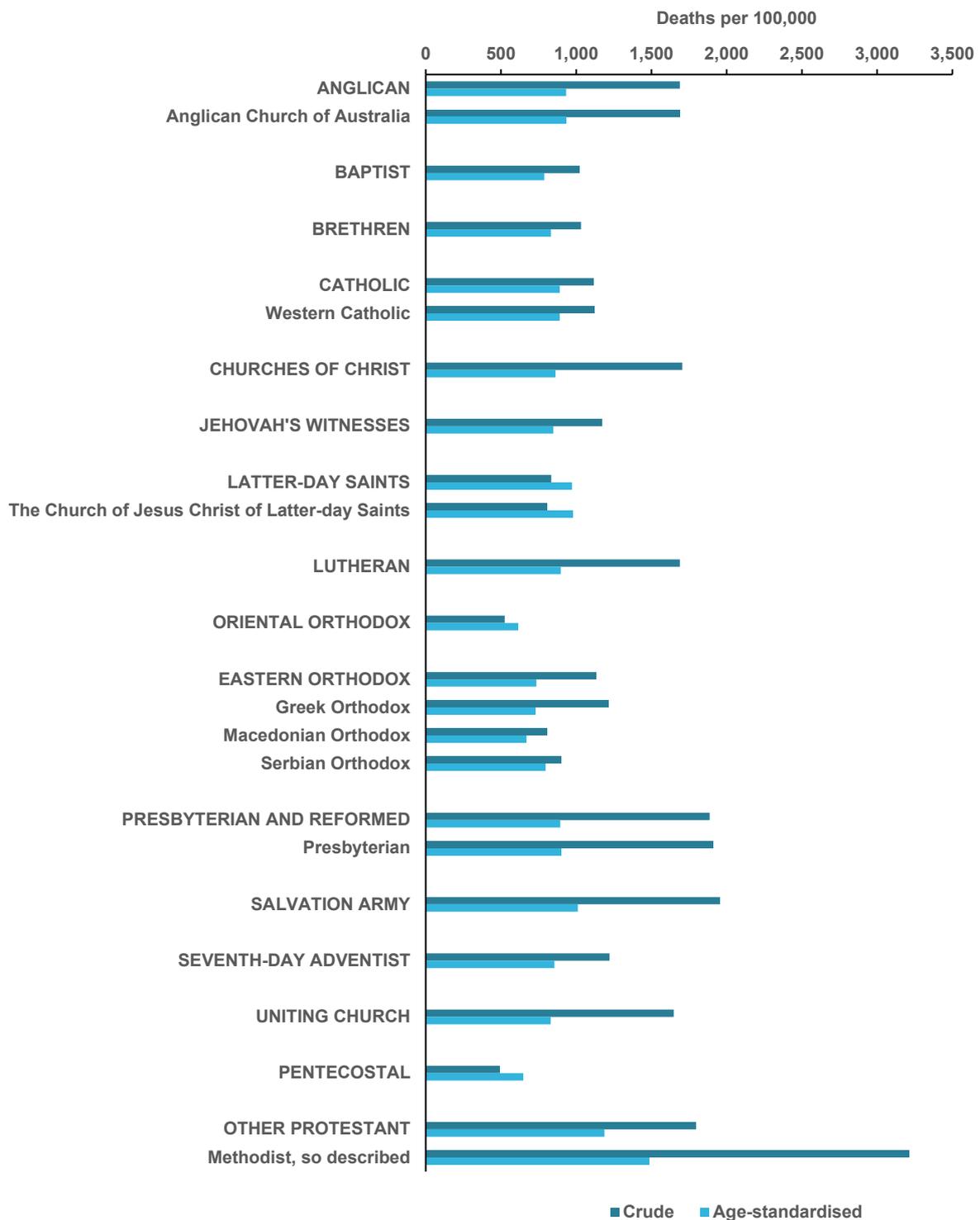

Note: Age-standardised rates were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S6.2.

There was great variation in the mortality rate for the 4 most common non-Christian religions, ranging from 161 per 100,000 population for adults who affiliated with *Hinduism*, to 1,462 per 10,000 population for those who affiliated with *Judaism* (Figure 6.4; Table S6.2a). After adjusting for age, the differences reduced, and ranged from 593 per 100,000 for *Buddhism* to 863 per 100,000 population for *Judaism*.

Figure 6.4: Mortality rates for Australian adults, by broad religious group, August 2016–November 2017

Note: Age-standardised rates were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S6.2.

There was great variation in mortality rates for the narrow and religious groups that sit under the broad *Christianity* group (Figure 6.5; Table S6.2a). Adults who affiliated with the *Methodist (so described)* religion had the highest mortality rate (3,215 deaths per 100,000), almost twice as high as for the *Other Protestant* narrow group that it forms part of. Adults who affiliated with a *Pentecostal* religion had the lowest mortality rate (494 per 100,000). After adjusting for age, the *Oriental Orthodox* narrow group had the lowest mortality rate (615 per 100,000), and the *Methodist (so described)* religion the highest (1,487 per 100,000).

Differences were observed in the mortality rate for religious groups within the *Eastern Orthodox* narrow group (Figure 6.5; Table S6.2a). The age-standardised mortality rates ranged from 669 per 100,000 for the *Macedonian Orthodox* religion to 794 per 100,000 for the *Serbian Orthodox* religion.

Figure 6.5: Mortality rates for Australian adults, by subsets of religions of Christianity, August 2016–November 2017

Note: Age-standardised rates were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S6.2.

7   Ancestry

More than 300 ancestries were identified in the 2016 Census (ABS 2017a). Ancestry (as it is collected in the Census) is the cultural or ethnic group with which the person most closely identifies. In 2016, the 10 most commonly reported ancestries were:

- English (36.1%)
- Australian (33.5%)
- Irish (11.0%)
- Scottish (9.3%)
- Chinese (5.6%)
- Italian (4.6%)
- German (4.5%)
- Indian (2.8%)
- Greek (1.8%)
- Dutch (1.6%).

Ancestry is a complex concept, the meaning of which varies depending on the context. While there is no universally agreed definition, it is generally used to indicate a general connection to people or things in the past.

The ABS describes ancestry as 'the ethnic origin or cultural group to which a person identifies and/or to which a person's forebears are or were attached' (ABS 2014a). According to the ABS, ethnicity is a multi-dimensional concept based on a number of distinguishing characteristics including shared history, cultural tradition, geographic origin, language, literature, religion, minority status and racial conspicuousness (ABS 2019a).

Some other countries, such as the United Kingdom, the United State of America, and Canada, collect information on race or ethnicity and use phenotype indicators such as 'white' and 'black' (Government of United Kingdom 2021; United States Census Bureau 2021; Statistics Canada 2021). In Canada, the term 'visible minority' is used to identify 'persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour' (Statistics Canada 2021). The use of such terms in reporting or data collections has received criticism, as it emphasises 'otherness', and can be considered as divisive and simplistic (FECCA 2020). However, there have been calls for national discussions in Australia on the usefulness and the feasibility of introducing a race/ethnicity variable in official data collections (FECCA 2020).

How is ancestry associated with health?

Ancestry as a social construct

Ancestry is important in health research because belonging to a particular ethnic or cultural group can affect a person's health through a number of mechanisms. These include social determinants of health, such as socioeconomic status and experiences of racism (Mays et al. 2007; Nazroo 2003; Paradies 2006), and cultural practices, lifestyle choices or access to health care (Pearce et al. 2004). It has been suggested that how a person identifies with a particular culture or ethnicity should not be overlooked, and that factors frequently associated

with belonging to an ethnic group, such as socioeconomic status, should not be considered as confounding factors, rather as explanatory variables in relation to health (Stronks et al. 2013). Not accounting for the contribution to health of these factors could lead to the misconception that unequal health is associated with genetics, rather than circumstance, thereby further disadvantaging a particular group (Blell and Hunter 2019; Ellison et al. 1997; Rata and Zubaran 2016).

Experience of racial discrimination can limit people's access to resources required for health such as employment, education and health services, and can negatively affect health-related behaviour (for example, the use of alcohol or other drugs) (Harrell et al. 2011). Exposure to racism can lead to anxiety and psychological distress, which can contribute to mental disorder. For example, a study (Ferdinand et al. 2015) used survey data on the self-reported lived experiences of interpersonal racism and reactions to these experiences, and found that poorer mental health was associated with the amount of racial discrimination among Australians who lived in areas in Victoria with high-level racial and ethnic diversity where racism was recognised as a concern.

Genetic ancestry

In recent times, the introduction of genetic sequencing has given rise to the concept of genetic ancestry, or the inheritance of genetic material over a number of generations (Mathieson and Scally 2020). This method assigns people to historical continental locations based on differing genetic makeup (for example, European, African, Asian continents). Investigations have shown some differences by genetic ancestry for conditions such as type 2 diabetes (Cheng et al. 2012; Qi et al. 2012) and various cancers (Batai et al. 2020) which are associated with increased risk of these diseases. This genetic variation is thought to explain, at least in part, the disproportionate burden of disease in some populations (Batai et al. 2020).

Several studies have found that self-reported ancestry is less reliable than genetic ancestry, which has implications when it comes to screening for diseases and genetic disorders (Kaseniit et al. 2020; Louwers et al. 2014; Shraga et al. 2017).

However, the pattern of ill health according to self-identified ethnicity perhaps gives greater insight into health disparities than the prevalence of a particular disease by genetic ancestry. Some specific diseases do occur more commonly in people with certain genetic ancestries, but when a particular (minority) group suffers worse health across the board on a range of risk factors and diseases it is unlikely that genetics is solely responsible for the disease burden, and more likely that environmental and social factors are key drivers of health disparities (Cooper 2004).

Ancestry and the selected health outcomes

Of the data sources used in this report, the Census and the 2014–15 NHS collected information on ancestry. Participants were asked, 'What is your/the person's ancestry?', with the option to provide up to 2 ancestries. The online 2016 Census form further prompted participants to consider as far back as their parents and grandparents. There is no ranking of responses, so if a respondent reports 2 ancestries both have equal standing (ABS 2017b).

The Australian Standard Classification of Cultural and Ethnic Groups, 2016 (ASCCEG 2016) is used for collecting and disseminating data on ancestry for the 2016 Census (ABS 2016a). The classification criteria used in the ASCCEG are 'geographic proximity of cultural and

ethnic groups' and 'similar social and cultural characteristics'. These are used to form a 3-level hierarchical structure – 9 broad groups, 37 narrow groups and 322 cultural and ethnic groups in the ASCCEG 2016 (ABS 2016a). Narrow groups are formed by aggregating geographically proximate cultural and ethnic groups with similar cultural and social characteristics. Major groups are formed by aggregating narrow groups that are also geographically proximate with similar cultural and social characteristics.

Ancestry as an indicator is useful to identify distinct cultural groups living in Australia that are spread across countries (for example, Kurds or Indians), who would not be captured using country of birth data (ABS 2017b). When used in conjunction with other measures of ethnic diversity, such as country of birth or a language variable, it can add useful contextual information about a person's socio-cultural identity, which is thought to affect health experiences (ABS 1999).

As ancestry is a multi-response question, people who provide 2 ancestries will be counted in both ancestry groups, and the number of responses will add to more than the total population. It is important to keep this in mind when comparing results between groups. Self-reported ancestry is subjective in nature, and depends on a person's self-evaluated attachment to a particular nation, country or ethnicity. It can also can change over time and with subsequent generations (ABS 1999).

In this section the cultural and ethnic groups for Australia and New Zealand have been aggregated to the narrow group level of *Australian peoples* and *New Zealand peoples* due to the small numbers of some cultural and ethnic groups within these narrow groupings. The *Australian peoples* narrow group includes the following cultural and ethnic groups:

- *Australian*
- *Australian Aboriginal*
- *Australian South Sea Islander*
- *Torres Strait Islander*.

The *New Zealand peoples* group includes the cultural and ethnic groups of *Māori* and *New Zealander.*

Self-assessed health status and ancestry

Based on self-reported data from the NHSs, similar proportions of adults who identified with an *Australian peoples* ancestry (54%) or other ancestries (56%) considered their health to be 'excellent' or 'very good' (Figure 7.1; Table S7.1). After adjusting for age, the proportions remained similar (55% and 57%, respectively).

When Australians were grouped into the specific cultural and ethnic groups, 3 in 5 adults who identified with *Filipino* (63%), *Indian* (63%) and *Italian* (60%) ancestries considered their health 'excellent' or 'very good', as did around half of adults with *Greek* (52%), *Chinese* (50%) and *Vietnamese* (47%) ancestries. After adjusting for age (where data allowed), estimates ranged from 48% for adults with *Chinese* ancestry to 61% for those with *Italian* ancestry.

Figure 7.1: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by cultural and ethnic group, 2014–15 and 2017–18
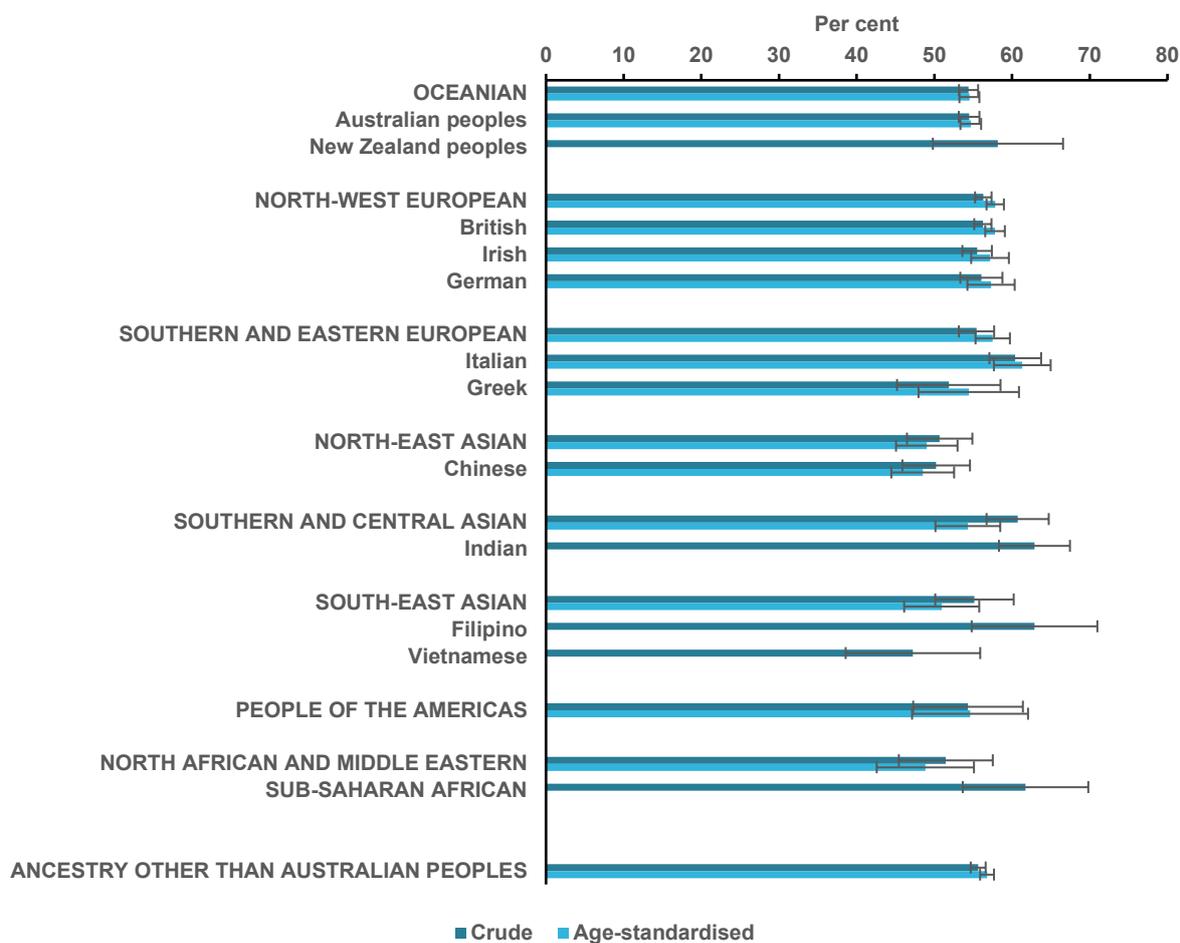
Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.
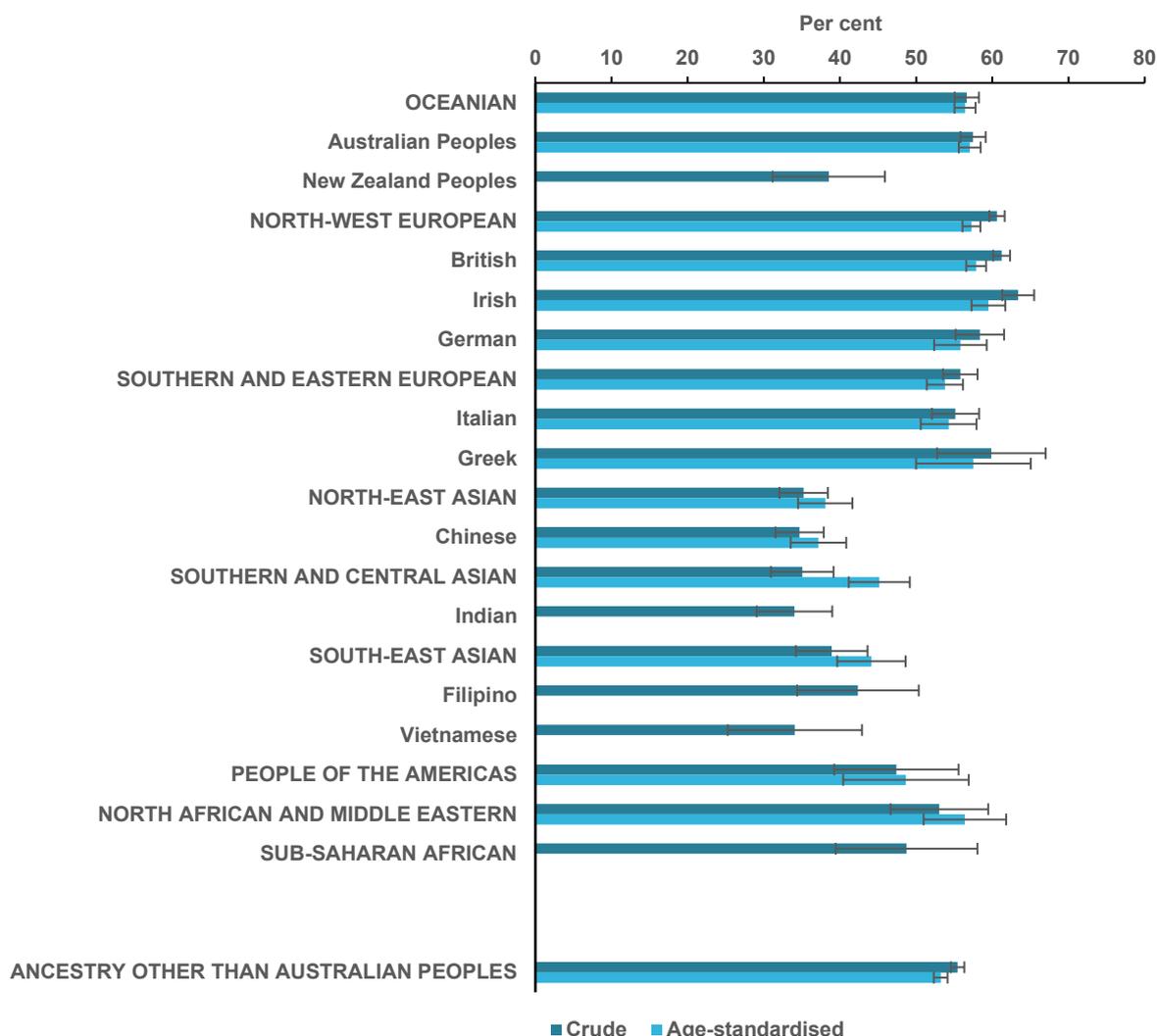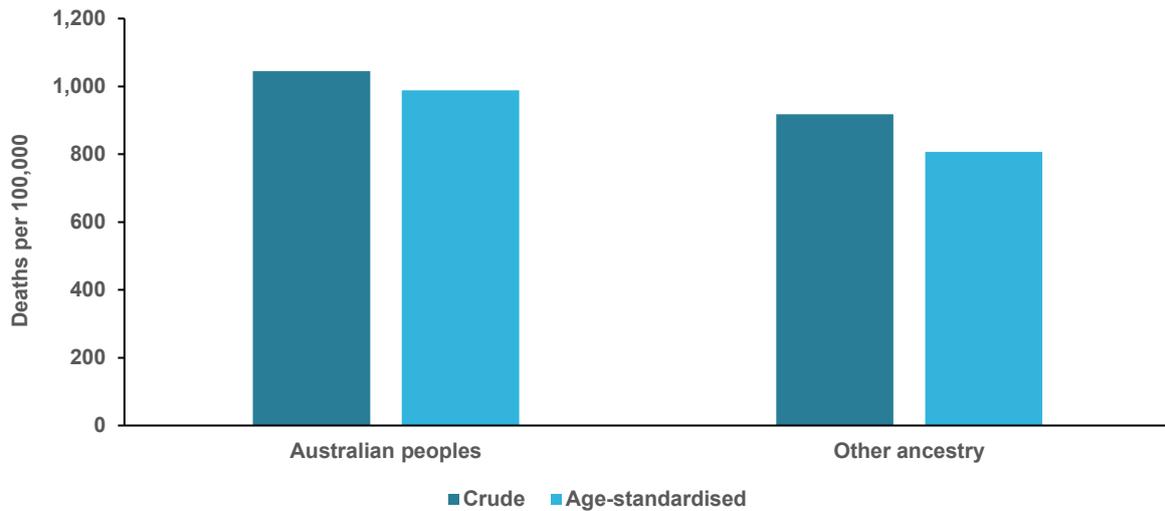
Source: AIHW analysis of ABS 2020c; Table S7.1.

Chronic conditions and ancestry

The proportion of adults with a chronic condition among those who identified with an *Australian peoples* ancestry (57%) was similar with that for people who identified with other ancestries (55%) (Figure 7.2; Table S7.1). After adjusting for age, the difference increased slightly (57% and 53%, respectively).

Larger differences were seen by cultural and ethnic group. More than 3 in 5 adults with *Irish* ancestry (63%) had a chronic condition, compared with 1 in 3 with *Indian* (34%) and *Vietnamese* (34%) ancestries. After adjusting for age (where data allowed), the proportion with a chronic condition ranged from 37% for adults with *Chinese* ancestry, to 59% for those with *Irish* ancestry.

Figure 7.2: Proportion of Australian adults with a chronic condition, by cultural and ethnic group, 2014–15 and 2017–18

Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S7.1.

Mortality rates and ancestry

The mortality rate for adults who identified with an *Australian peoples* ancestry was much higher than for those who identified with other ancestries (1,045 deaths per 100,000 compared with 918 per 100,000) (Figure 7.3; Table S7.2a). After adjusting for age, the difference between the rates was reduced (989 and 806 per 100,000, respectively).

For all age groups, the mortality rate for adults who identified with an *Australian peoples* ancestry was higher than for those who identified with other ancestries, with greater relative differences in younger age groups than older age groups (Table S7.2b).

Figure 7.3: All-cause mortality rates for Australian adults, by cultural and ethnic group, August 2016–November 2017
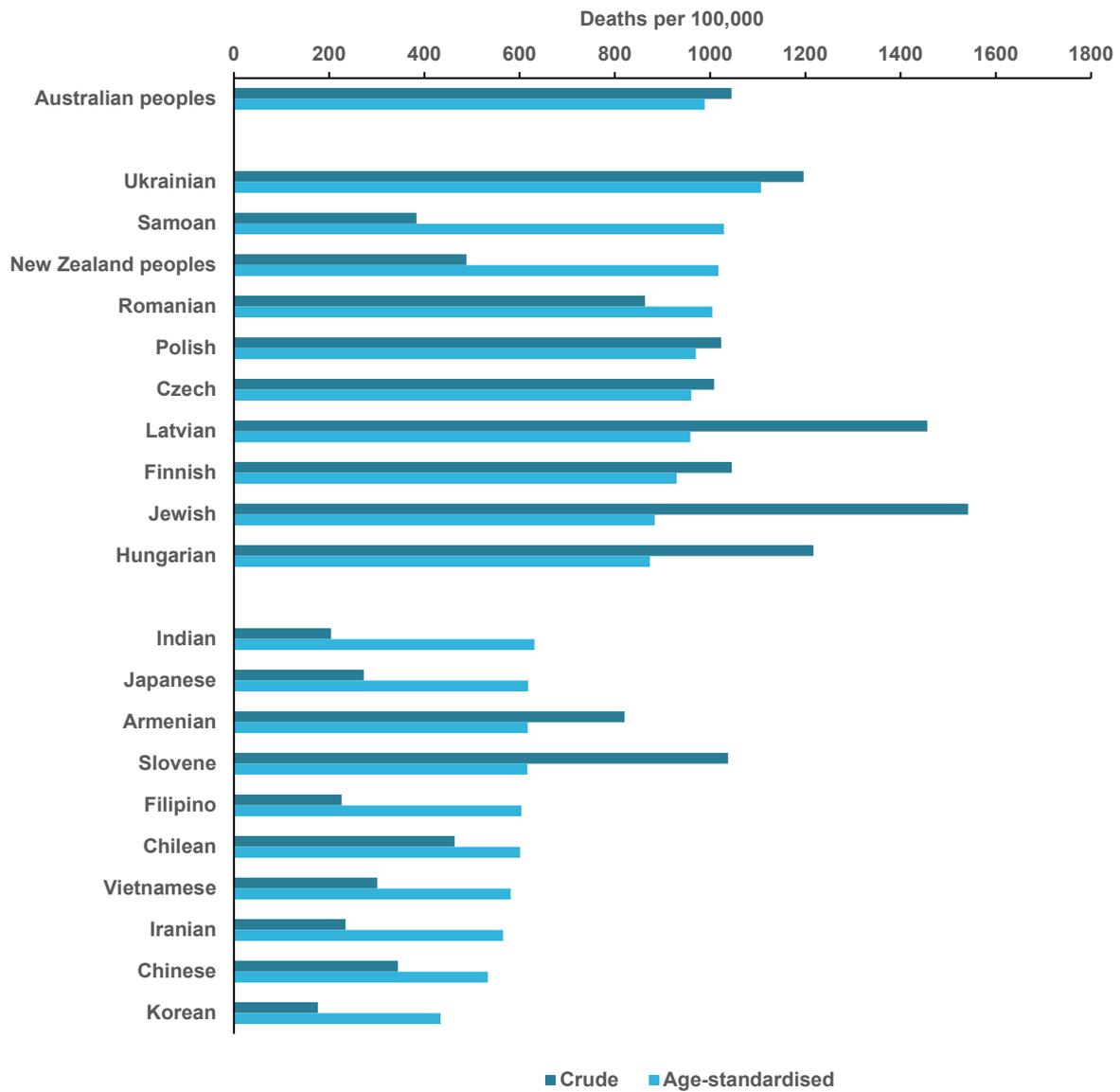

Note: Age-standardised rates were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S7.2.

Figure 7.4 shows the highest 10 and lowest 10 age-standardised mortality rates by cultural and ethnic group. The rate for the *Australian peoples* ancestry group is also shown for comparison purposes. The mortality rate for specific cultural and ethnic groups ranged from 176 deaths per 100,000 population for adults with *Korean* ancestry to 1,542 deaths per 100,000 population for those with *Jewish* ancestry (Table S7.2a). In general, those with European ancestries had the higher mortality rates, while those with Asian ancestries had lower rates.

In some cases there was substantial variation between cultural and ethnic groups within the same narrow grouping. For example, within the *South Eastern European* narrow group, the age-standardised mortality rate ranged 661 per 100,000 for adults with *Slovene* ancestry to 1,005 for those with *Romanian* ancestry (Table S7.2a).

Figure 7.4: Highest 10 and lowest 10 age-standardised mortality rates for Australian adults, by cultural and ethnic group, August 2016–November 2017

Note: Age-standardised rates were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S7.2.

8   Year of arrival in Australia

Migration patterns to Australia have varied over time, in both the number of migrants and the country where people have previously lived (see Box 1.1 in Chapter 1). According to the 2016 Census, among people who were born overseas:

- 39% arrived between 2006 and 2016
- 17% arrived between 1996 and 2005
- 13% arrived between 1986 and 1995
- 31% arrived before 1986.

How is year of arrival in Australia associated with health?

Research has extensively explored whether migrant health changes positively or negatively with time spent in the migrant's host country. The literature describes what is known as the 'healthy migrant effect', whereby the health of new immigrants is often better than that of the host country's population (see Box 1.2). Past studies have found that this initial health benefit appears to diminish with length of residence in the host country. Studies on the health of migrants with respect to various health conditions (such as diabetes, asthma and cardiovascular disease) and health risk factors (such as obesity), have demonstrated an alignment towards the health of people born in the host country in the 10 to 20 years after arrival (Antecol and Bedard 2006; Biddle et al. 2007; Menigoz et al. 2016; Oza-Frank et al. 2009).

Past studies have suggested a deterioration in health with time spent in the host country may be explained by:

- acculturation and assimilation – taking on characteristics of the host country (in particular nutritional acculturation and, in some cases, changes in physical activity) (Antecol and Bedard 2006; Unger et al. 2004)
- access barriers – lack of culturally appropriate services and language barriers (da Silva and Dawson 2004; Maneze et al. 2015)
- socioeconomic factors once in the host country – affordability of health care (Kennedy et al. 2006) and inability to find jobs at the same level as in the home country (Lasseter and Callister 2009)
- stress – resulting from racial and ethnic discrimination, poor socioeconomic standing (physically demanding jobs, overcrowded dwellings, living in poor neighbourhoods) (Borrell et al. 2007; Finch et al. 2000) and isolation from social networks (da Silva and Dawson 2004).

However, in other cases, the length of time from migration has been shown to have a positive impact on health. For example, studies have found that in some contexts physical activity levels increase with increased acculturation (Gerber et al. 2012; Wolin et al. 2006). Another study showed a lower risk of vitamin D deficiency in more acculturated North-East Asian immigrants in Australia (Guo et al. 2014).

Year of arrival and the selected health outcomes

Year of arrival describes the year in which a person, born in another country, first arrived in Australia to live for one year or more (ABS 1999). It is included in some form in all 3 of the data sets used in this report. The Census and the NHSs collect year of arrival, while death registrations collect the period of residence in Australia for the deceased.

The length of time migrants have been in Australia can give an indication of how familiar they are with Australian society and health practices (ABS 1999). It is also useful to explore how the health characteristics of migrants change with length of time spent in Australia (ABS 1999). The results in this section have been presented by time spent in Australia, which was calculated as the difference between the year of arrival and the year in which the data were collected (ABS 2014b).

When interpreting the results, it is important to note that migration to Australia has varied over time, both in the comparative proportion of humanitarian to skilled migrants and the countries and regions of origin (see Box 1.1). Therefore, the comparisons of estimates between recent and early arrivals and with those born in Australia reflect not only the effect of length of time spent in Australia, but also other factors such as their initial health status and the socio-demographic composition of these populations living in Australia. Longitudinal data are required to fully explore whether and/or how the health characteristics of migrants change with length of time spent in Australia.

Self-assessed health status and year of arrival

Based on self-reported data from the NHSs, a higher proportion of adults who had arrived in Australia 0–10 years before (65%) assessed their health as 'excellent' or 'very good' than those born in Australia (56%), or those who had arrived more than 10 years before (50%). However, after adjusting for age, these proportions were very similar (Figure 8.1; Table S8.1).

There was also little difference in the proportions assessing their health as 'excellent' or 'very good' between those who had arrived 0–5 years before (66%) and those who had arrived 6–10 years before (64%). These proportions could not be age-standardised due to small numbers.

Figure 8.1: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by years spent in Australia, 2014–15 and 2017–18
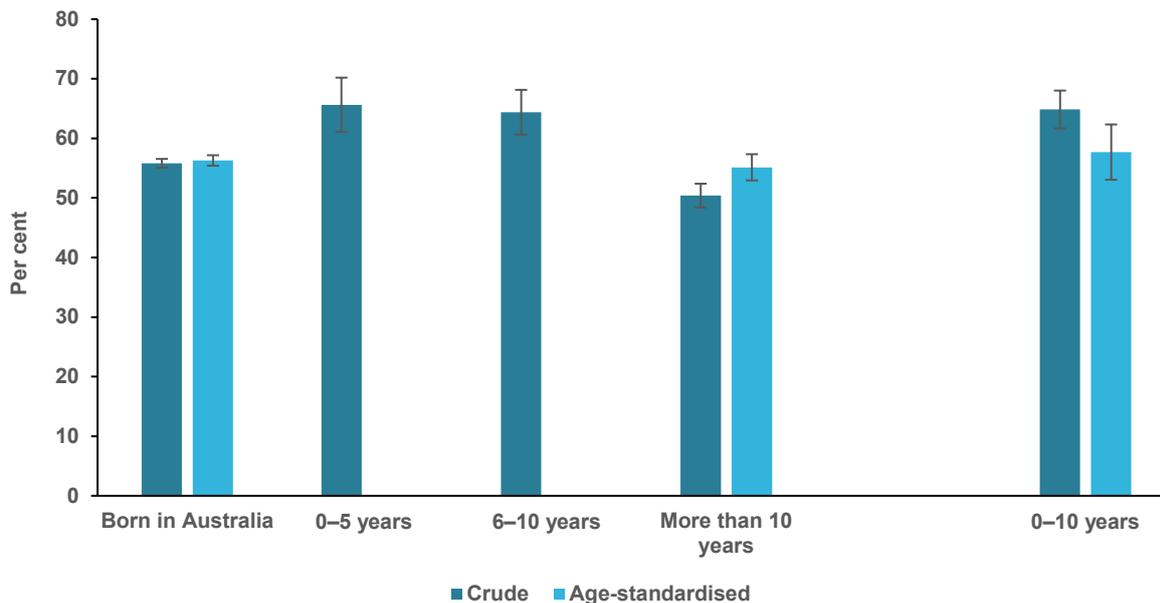
Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.
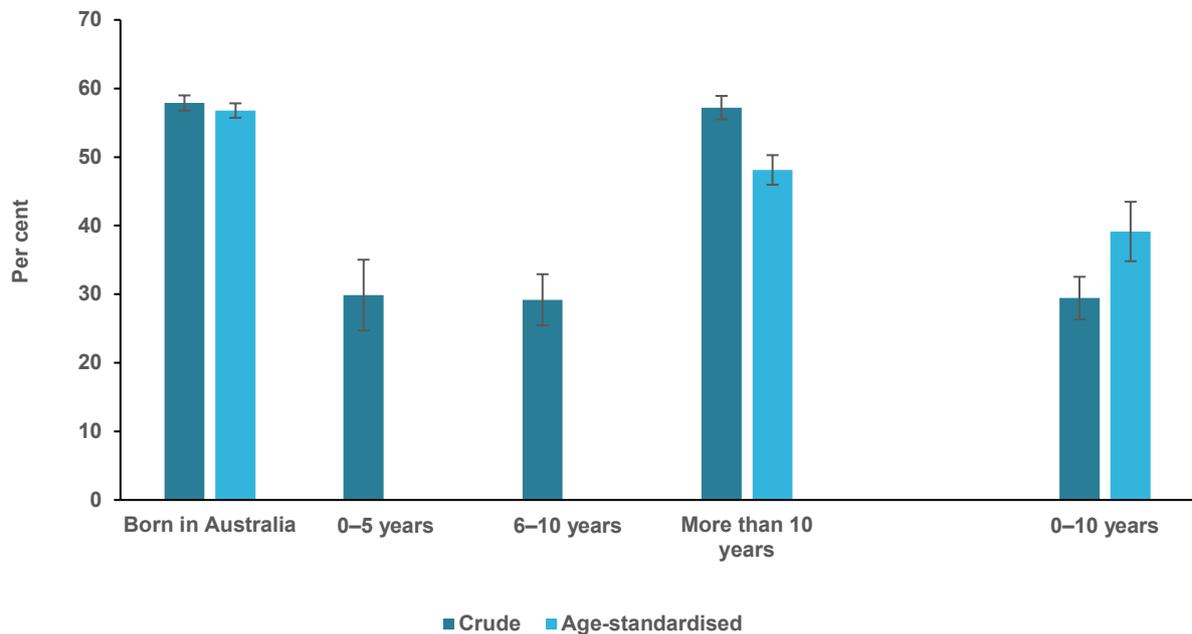
Source: AIHW analysis of ABS 2020c; Table S8.1.

Chronic conditions and year of arrival

Based on self-reported data from the NHSs, adults who had arrived in Australia 0–10 years before were least likely to have a chronic condition (29%), compared with those who had arrived more than 10 years before (57%) and those who were born in Australia (58%) (Figure 8.2; Table S8.1). After adjusting for age, 39% of adults who had arrived 0–10 years before had a chronic condition, compared with 48% of those who had arrived more than 10 years before, and 57% of those born in Australia.

There was no difference in the proportion with a chronic condition between those who had arrived 0–5 years before (30%) and those who had arrived 6–10 years before (29%). These proportions could not be age-standardised due to small numbers.

Figure 8.2: Proportion of Australian adults with a chronic condition, by years spent in Australia, 2014–15 and 2017–18

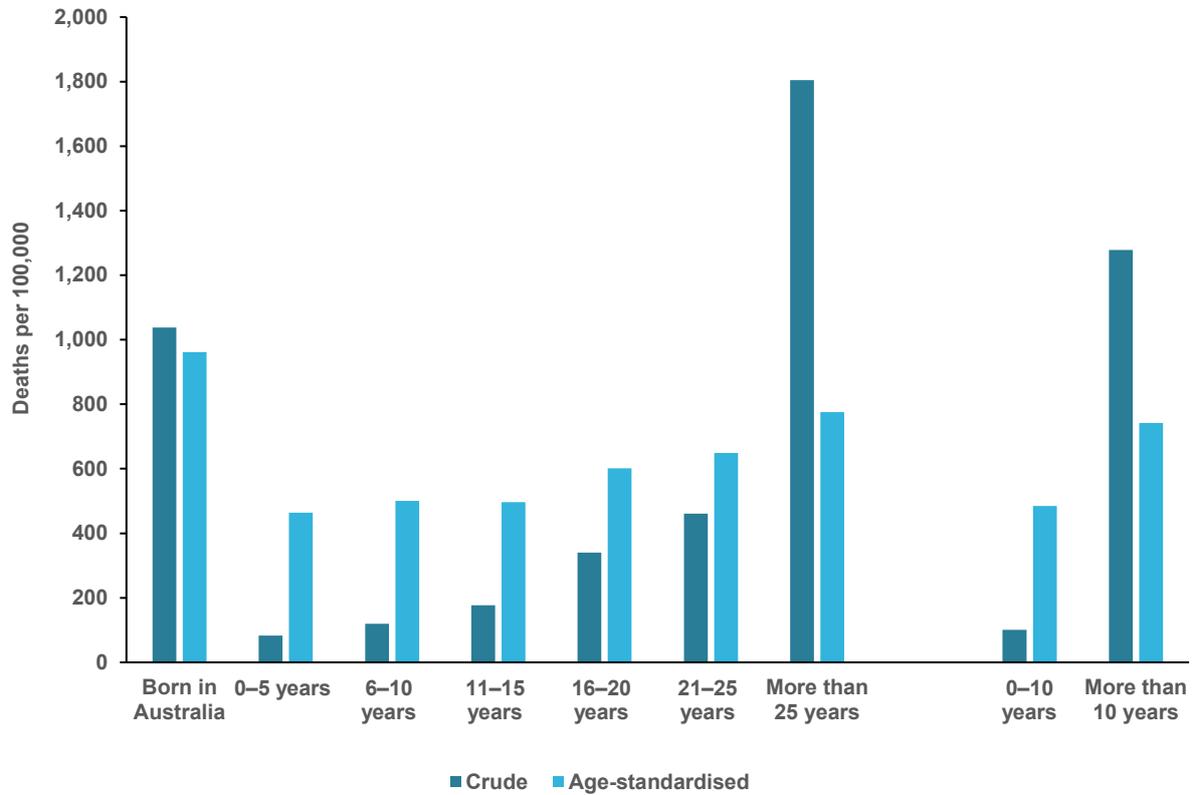Note: Age-standardised proportions were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S8.1.

Mortality rates and year of arrival

Mortality rates increased as time spent in Australia increased and were highest in those who had arrived more than 25 years before (Figure 8.3; Table S8.2a). This is not surprising as people who had arrived more than 25 years before were likely to be older on average than those who arrived 0–5 years before. However, this pattern remained even after adjusting for age. Adults who were born in Australia had a higher age-standardised mortality rate than the overseas-born population, regardless of the number of years spent in Australia.

Additionally, mortality rates across all age groups for those not born in Australia increased with time spent in Australia (Table S8.2b). However, those who were born in Australia had higher age-specific mortality rates than the overseas-born population regardless of their period of residence. There was one exception. The mortality rate for those in the 18–34 age group was similar for those born in Australia and those who had arrived more than 25 years before. The numerator and denominator for this category is limited to people who nominated arriving more than 25 years ago in the Census and will therefore not include people younger than 25 years of age. If the health status of migrants does align more with their host country over time, this is perhaps unsurprising, as people in this age group who arrived more than 25 years before had spent the majority of their life in Australia.

Figure 8.3: Mortality rates for Australian adults, by years spent in Australia, August 2016–November 2017

Note: Age-standardised rates were calculated using the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020c; Table S8.2.

9 Combining CALD variables and defining CALD

As highlighted in the Introduction, the main purpose of this technical paper was to explore the variables available to identify CALD populations in the MADIP, and to assess whether these variables are associated with differences in the selected health outcomes, rather than to propose a definition of CALD.

Our analyses found that each CALD variable had its unique strengths and limitations. For example, *Country of birth* has the advantage of being the most collected variable, being consistent over time, and having annual population estimates for calculating population level rates. Used in isolation; however, it may fail to identify everyone who identifies as CALD. Likewise, the use of the *Ancestry* variable on its own may not be a particularly useful measure, as it is subjective in nature and can change over time and with subsequent generations (parents or grandfathers) (ABS 1999). However, when these 2 variables are combined, they can provide useful contextual information about a person's sociocultural identity, which is thought to affect health experiences (ABS 1999; El Masri et al. 2019).

Furthermore, when a language variable is used on its own, it will not capture all people who may identify as CALD. For example, 16% of the Australian population who were born in India spoke only English at home, and these would be grouped with the 91% of the Australian-born population who also spoke only English at home (ABS 2017a; Department of Home Affairs 2018).

A recent systematic review examined the results from different approaches to defining CALD in 108 epidemiologic studies in Australia (Pham et al. 2021). The review recommended the definition of CALD mentioned in Chapter 1, 'Reporting on CALD populations'*,* be used in epidemiological studies. That is, people born in non-main English-speaking countries (MESC), and/or who do not speak English at home. This definition is already in use for reporting in ageing and aged care and by the National Disability Insurance Agency (AIHW 2021d; NDIS 2019).

This proposed definition aligns with advice from the ABS in the Standards that more than one indicator of CALD may be required to identify CALD populations (ABS 1999). However, grouping Australians into CALD and non-CALD groups will still mask important differences in health status and outcomes for people within each group.

To demonstrate this, we analysed the selected health outcomes in this report using the definition recommended by Pham and others (2021). As was seen throughout this report, aggregating CALD groups into binary CALD and non-CALD groups masked potential differences, with the CALD group appearing to have better health outcomes than the non-CALD group. This definition did not seem to identify differences that would have been seen from the analyses that used more detailed information on the CALD status of people.

Based on self-reported data from the 2017–18 NHS, similar proportions of adults in the non-CALD (56%) and CALD (54%) groups assessed their health as 'excellent' or 'very good' (Figure 9.1;Table S9.1). However, after adjusting for age, the non-CALD group had a slightly higher proportion than the CALD group (57% and 53%, respectively).

Results for the CALD group presented here are very similar to the results for *Country of birth of person* in Chapter 3.

Figure 9.1: Proportion of Australian adults who assessed their health as 'excellent' or 'very good', by CALD status, 2017–18
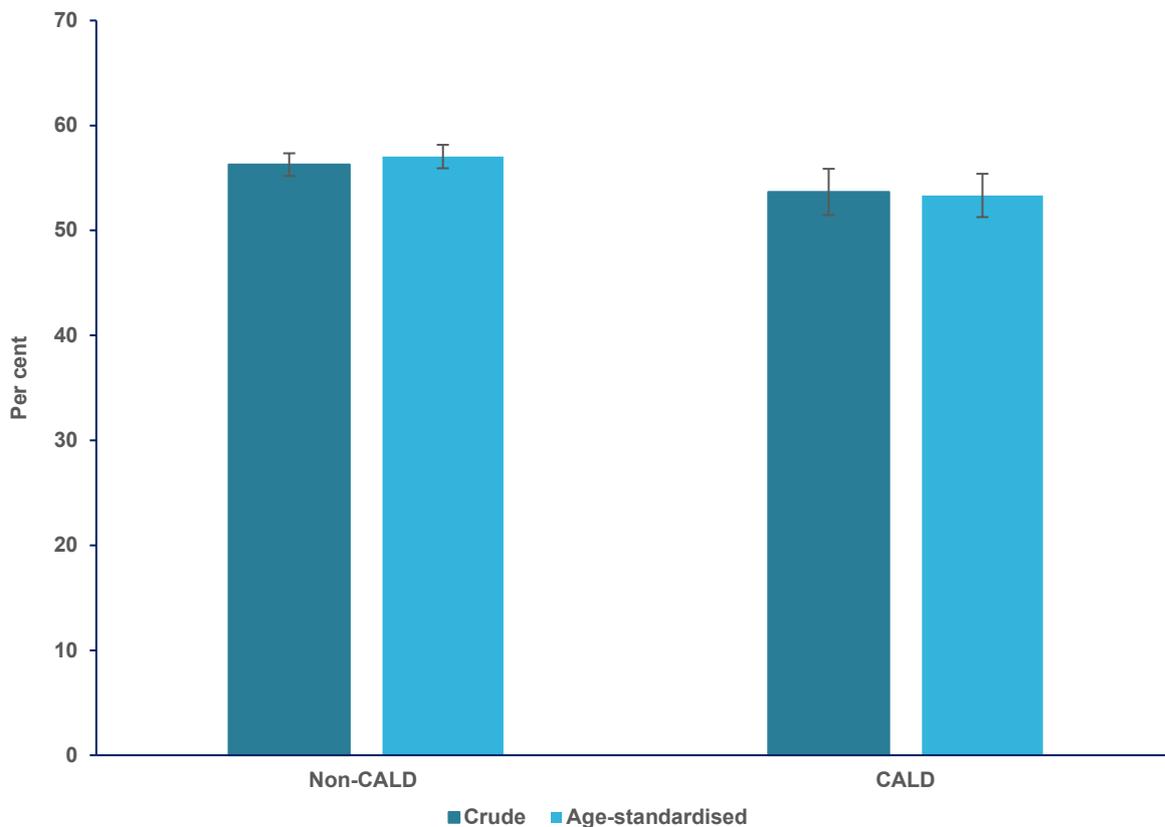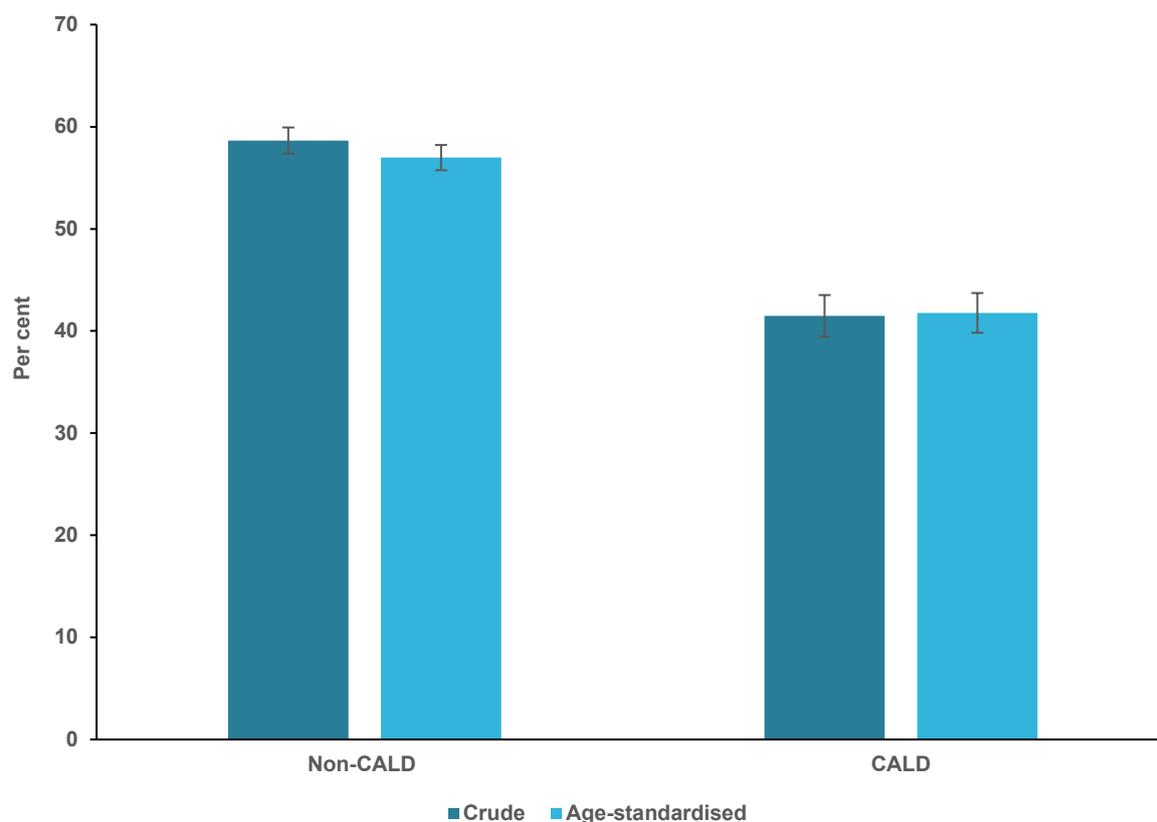

Notes:

1. Age-standardised proportions were calculated using the 2001 Australian Standard Population.

2. National Health Survey (NHS) 2017–18 only.

Source: AIHW analysis of ABS 2020c; Table 9.1.

Based on self-reported data from the 2017–18 NHS, the proportion of adults with a selected chronic condition was much higher among the non-CALD group (59%) than among the CALD group (41%) (Figure 9.2; Table S9.1). After adjusting the results for age, the non-CALD group was still more likely to have a chronic condition than the CALD group (57% and 42%, respectively).

Results for the CALD group presented here are very similar to the results for *Main language spoken at home* in Chapter 5.

Figure 9.2: Proportion of Australian adults with a chronic condition, by CALD status, 2017–18
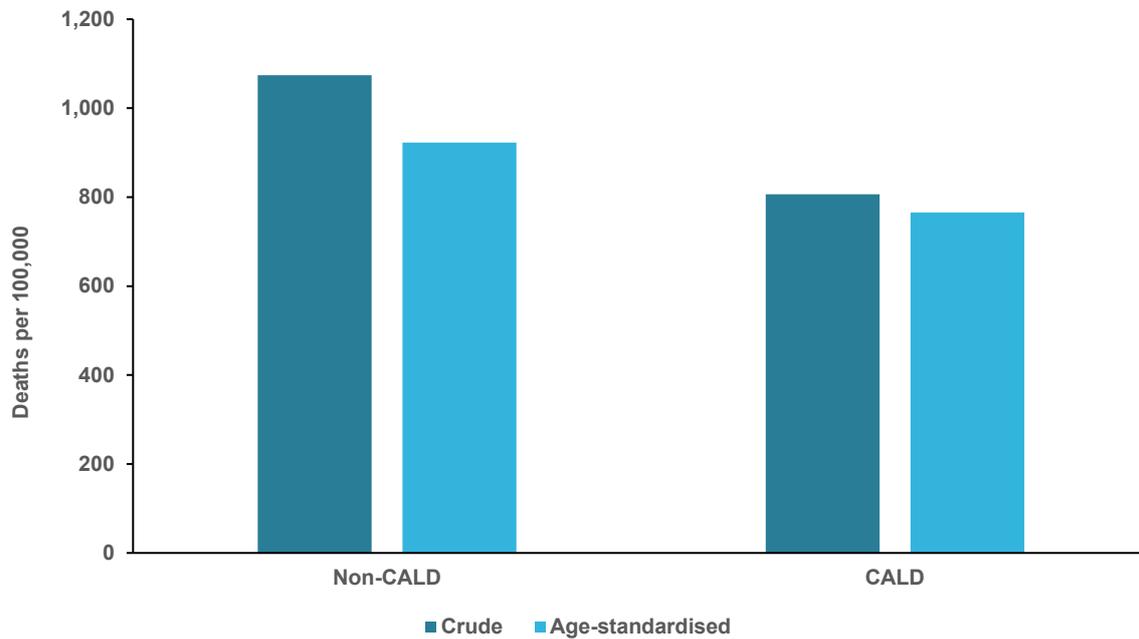

Notes:

1. Age-standardised proportions were calculated using the 2001 Australian Standard Population.

2. Analyses used the National Health Survey (NHS) 2017–18 only.

Source: AIHW analysis of ABS 2020c; Table 9.1.

The all-cause mortality rate for the non-CALD group was higher than for the CALD group (1,074 and 806 per 100,000 respectively). After adjusting for age, this difference remained (923 and 765 per 100,000, respectively) (Figure 9.3; Table S9.2).

Results for the CALD group presented here are very similar to the results for *Main language spoken at home* in Chapter 5.

Figure 9.3: All-cause mortality rates for Australians adults, by CALD status, August 2016– November 2017

Notes:

1. Age-standardised rates were calculated using the 2001 Australian Standard Population.

2. The rates were based on the data for usual residents in Australia with a Census record linked to the MADIP Spine, including those who died in August 2016–November 2017.

Source: AIHW analysis of ABS 2020c; Table 9.2.

There were some differences in the methodology between the results in this section and other chapters of the report (see Appendix B for more information)*.* However, the results overall were very similar to the binary results presented for *Country of birth of person* and *Main language spoken at home*. This indicates that when grouped into binary CALD and non-CALD classifications, the larger groups within the CALD group will average out discrepancies and disparities in health outcomes, even when using a combination of variables (and removing people from MESC countries who do not speak a language other than English at home).

10 Key findings

Reporting on CALD variables is complex and context dependent

This report found that each of the CALD variables had its own unique strengths and limitations (see Table 2.2 in Chapter 2). However, when only one CALD variable is used, people may be considered CALD using one variable and non-CALD using another, which will result in an under-representation of the full CALD population (Pham et al. 2021).

There is much to consider in monitoring the health of any population, and for CALD populations it can be even more complex. Awareness of cultural practices, health beliefs and structural barriers to access may provide information on health issues of concern for particular communities (Abbato 2011). Conditions that are common in the Australian context may not be common for some CALD groups, and vice versa. Our findings demonstrate the complexity of using CALD variables to report on population health.

Future reporting on the health of CALD population requires continuing consultation with representative stakeholder groups to ensure that interpretations from the data reflect the lived experience of CALD populations.

The healthy migrant effect

Overall, there were variations in the selected health outcomes by all of the indicators of CALD included in this report. When presenting the results for each variable in binary terms, the CALD group tended to have better outcomes than the non-CALD group, even after adjusting for age. This suggests that highly aggregated results are influenced by the comparatively larger number of 'healthy migrants' in the CALD group.

However, the disaggregated results showed that:

- those who were born in Asian countries, who spoke Asian languages, and who identified with Asian ancestries generally had the lowest proportions with a chronic condition and all-cause mortality rates
- those born in European countries, who spoke European languages and identified with European ancestries generally had the highest proportions with a chronic condition and all-cause mortality rates
- mortality rates were highest for adults who did not speak English at all
- even after adjusting for age, the proportion of people with a chronic condition and all-cause mortality rates were higher for migrants who had been living in Australia longer
- results for self-assessed health status were mixed and may reflect sociocultural factors rather than health status (OECD 2019).

Presenting aggregated results masks differences

Regardless of which variable was used in the analyses, differences in the selected health outcomes were more apparent where the data could be presented at the most detailed level. These differences tended to be masked if results were presented as what is generally considered CALD versus non-CALD groups (for example, Australian-born versus overseas-born, or English languages versus non-English languages spoken at home). This was true even when using a combination of variables (and removing people from MESC countries who did not speak a language other than English at home).

For example, for country of birth, if results were presented as Australian-born versus overseas-born, adults who were born overseas had a lower age-standardised mortality rate.

However, when the data were disaggregated into the most detailed classification, many countries of birth had higher mortality rates than the *Australian-born*. Our results highlighted that even aggregating to the middle tier (narrow or minor group level) reduced variation between groups and masked populations with significantly worse health outcomes.

For example, the mortality rate for people born in the minor group of *South Eastern Europe* was 968 per 100,000, lower than for those born in *Australia* at 1,206 per 100,000, after adjusting for age. However, the mortality rate for people born in countries within *South Eastern Europe* ranged from 896 per 100,000 for *Greece*, to 1,927 per 100,000 for *Serbia*.

Presenting results at the most granular level presents challenges; however, even for large data collections. This was particularly apparent when using the NHSs, as even after combining the 2 surveys very few groups could be presented at the most granular level and confidence intervals tended to be wide, making comparisons difficult.

Using linked data enhances the number of CALD variables and improves the range of health outcomes that can be investigated

The use of linked data sets in MADIP, with the inclusion of the Census, provides the option to report health outcomes by a comprehensive set of CALD variables. For example, deaths data contain information on the *Country of birth* and *Period of residence in Australia*, but no information on other CALD indicators such as *Ancestry*, *Main language other than English spoken at home*, or *Proficiency in spoken English*. With around 175,000 death records linked to the Census for our analyses, mortality rates could be presented for a wide range of CALD groups at the most granular level of the corresponding classification.

Additionally, linking the NHS to the Census provided the ability to enhance fields. When the same CALD variable was included in both the NHS and Census, the information from one data collection could complete or validate responses in the other. For example, when using the country of birth data from the Census, around 2% of responses were 'unknown'. After linkage with the NHS, there were no 'unknown' records for this field.

Data linkage was also useful for comparing the 2 language variables – *Main language spoken at home* from the NHSs and *Main language other than English spoken at home* from the Census. For example, 28% of adults who nominated a *Chinese language* as the main language other than English spoken at home in the Census indicated that *English* was their main language spoken at home in the NHS. In comparison, 71% of adults who nominated speaking *Italian* as the main language other than English spoken at home in the Census indicated that *English* was the main language spoken at home in the NHS. This finding is important in a policy context when planning to provide accessible services to multilingual CALD groups.

Using linked data can introduce bias and underestimate health outcomes

Our analyses found large differences in the linkage rate and linkage quality by country of birth, which warrants further investigation for future reporting using the linked data. In our results, the linkage rate between the NHSs and death registrations and the MADIP Spine was high (94% and 97%, respectively) (see Appendix B). However, the overall linkage rate between these data sets and the Census was lower, at 79% and 81% respectively.

The proportion of death registrations that did not link to the Census by *Country of birth* ranged from 16% for those who were born in *Italy*, *Malta* and *Finland* to 45% for those born in *Tonga*. The proportion of records in the NHSs that did not link to the Census ranged from 16% for those born in *Italy* to 40% for those born in *China*.

Consistent with the literature, our report found that analyses based on the linked data can result in underestimation of the prevalence of health conditions and health outcomes, particularly for CALD populations with low Census linkage. For example, the age-standardised all-cause mortality rate based on the linked data for *Tonga-born* adults, who had the lowest proportions of death registrations linked to the Census (55%), was 1.9 times the rate based on the unlinked data (1,084 and 2,082 deaths per 100,000).

There were also differences in the linkage quality for each data set by country of birth. Overall, 88% of the linkages between death registrations and the Spine were considered very good quality and able to be used with confidence in most analyses. However, for the 2017–18 NHS, just over half (56%) of the links to the Spine were very good quality and able to be used with confidence in most analyses.

What is next?

This technical paper is the first step in a broader program of work using linked data to gain a better understanding of the health status of CALD populations in Australia. Potential future pieces of work are described below.

Identifying specific CALD groups, such as refugee populations

The health of migrants is a product of environmental, economic, genetic and sociocultural factors in their home country and Australia, as well as how and why they migrated (Gushulak et al. 2011). People who have migrated to Australia under the humanitarian program have vastly different health and welfare needs from those who move to Australia for personal, lifestyle, educational or financial reasons. Pre- and post-arrival factors can negatively influence their health, such as poor care at their country of origin, trauma, possibly prolonged detention, and barriers to appropriate care on arrival (Au et al. 2019).

Linked data from the 2016 Census and Migrants Integrated Dataset show that the social and economic outcomes for people migrating to Australia via the humanitarian stream were worse than for the skilled and family streams (ABS 2018b). For example, people relocating to Australia under the humanitarian stream were less likely to have a bachelor degree or above, less likely to speak English well or at all and likely to have lower incomes. These differences can in part be explained by the eligibility criteria for each migration stream, but they may negatively affect health outcomes.

Information on a person's visa and citizenship is available in the migration data contained in the MADIP, but it is limited to visas granted from the year 2000 onwards and will not identify people who arrived before this. Reporting health outcomes for humanitarian migrants using the data used in this report may be difficult due to small numbers, as they make up only a small proportion of migrants overall – 10% of permanent migrants between 2000 and 2016 (ABS 2018b).

Further analysis is required to explore how the combination of migration pathway, length of time spent in Australia, other sociocultural and economic factors affect health status and outcomes.

Establish a method to account for bias in linked data

Based on our findings, it is recommended that investigations into linkage rates and linkage quality are undertaken for the population groups of interest to establish the extent to which these may introduce bias. A sensitivity analysis should be conducted using linked and unlinked data (where possible) or excluding lower quality links to establish whether the linked

data are fit for purpose. It may also be possible to use existing methods to adjust for bias caused by linkage error, though this requires further exploration (Harron et al. 2017).

Adjusting for age for CALD populations

The choice of standard population can affect age-standardised rates and comparisons between groups if the age distributions do not adequately align with the standard population (WHO 2001). This includes the relative difference between groups and the overall rankings. For example, where the chosen standard population has higher proportions in the younger age groups than the population of interest, events for these ages will be weighted disproportionately. This can lead to large differences between the crude and age-standardised rates. However, as the age-structure of CALD groups in Australia varies tremendously, choosing a standard population that aligns with each group is not possible.

The use of one summary measure only, such as an age-standardised rate, can mask important differences between groups. It is possible to have similar age-standardised rates but very different age-specific rates and distribution of events. For example, *Tonga* and *Serbia* had similar age-standardised mortality rates (2,082 and 1,927 per 100,000 respectively), but the age-specific rates and distribution of deaths for these 2 populations was very different, with those born in *Tonga* dying at much younger ages than people born in *Serbia*.

The comparison of age-specific rates may be the most useful for many purposes but can be impractical when making a large number of comparisons.

Investigating the effects of multiple CALD variables in combination

Combining CALD variables can provide additional information about a person's sociocultural identity, which is thought to affect health experiences (ABS 1999; El Masri et al. 2019). However, the results from Chapter 9 indicate that even when combining variables, if results are presented by aggregated CALD and non-CALD classifications, the larger groups within the CALD group will average out discrepancies and disparities in health outcomes.

Future work will explore the relative effect of multiple CALD variables in combination.

Further investigation of the 'healthy migrant effect'

Our findings in this report suggest that the healthy migrant effect described in the literature warrants further investigation. Future analysis will investigate other factors that contribute to better health outcomes in migrants, such as income, education and remoteness. Additionally, the outcomes in this report were limited to all-cause mortality and a group of chronic conditions, and results may differ for specific conditions and causes of death. It has also been suggested that some migrants return to their home countries in the case of serious illness (Sevoyan and Hugo 2013). The exclusion of people who have left Australia permanently can be further explored using information on international departures from the migration data in the MADIP.

Finally, this report looked only at health outcomes rather than health service usage, the latter potentially being more sensitive to factors typically associated with better or poorer health in migrants.

Further work to account for sex and socioeconomic factors

There are differences in health outcomes and the need for health care by age, sex, and socioeconomic factors. There are also differences in the relative proportion of males to females who have migrated to Australia from some countries.

Future analyses will explore the interaction of these factors with health outcomes and health service use for CALD groups in more detail, including how these differ for males and females.

Appendix A: Data sources

The Multi-Agency Data Integration Project

The Multi-Agency Integration Project (MADIP) (ABS 2021c) is a partnership among 6 Australian Government agencies to link a number of administrative and survey data using a secure and enduring approach. The MADIP combines information on health care, education, government payments, personal income tax, and demographics (including the Census) to create a comprehensive picture of Australia over time.

The MADIP asset is created by the use of a Person Linkage Spine (Spine), which is a central linking infrastructure comprising all persons in the Medicare Enrolments Database, Personal Income Tax or Social Security and Related Information data sets at any point between 2006 and 2016. The Spine is a base data set of the 'ever-resident' population of Australia that generates a person-level Spine identification key (Spine ID). All other data sources such as the death registrations, the National Health Survey and the Census can be integrated with the MADIP asset through the Spine.

Census of Population and Housing 2016

The Census provides extensive geographic and sociodemographic coverage of the people who were usual residents of Australia on the Census night (9 August 2016). The 2016 Census counted almost 10 million dwellings and 23.4 million people across Australia. Different strategies to collect data were used to include people with disabilities, people experiencing homelessness, people from culturally and linguistically diverse backgrounds, and people from remote Aboriginal and Torres Strait Islander communities.

The Census captures information on 3 core CALD items (country of birth, main language other than English spoken at home, proficiency in spoken English), and 5 of the additional items (country of birth of father, country of birth of mother, ancestry, religious affiliation and year of arrival in Australia).

For information on Census data quality, see 2900.0 - Census of Population and Housing: Understanding the Census and Census Data, Australia , 2016 (abs.gov.au).

National Health Survey 2014–15 and 2017–18

The National Health Surveys (NHSs) are cross-sectional surveys, which means they are designed to provide information on a population of interest at a point in time. They collect a range of information about the health of Australians in all states and territories, urban, rural and remote areas (excluding very remote areas). The information includes self-assessed health, long-term health conditions, health risk factors, health service use and demographic and socioeconomic characteristics.

The survey captures information on 2 of the 3 core CALD items (country of birth, proficiency in spoken English), and 4 of the additional items (country of birth of father, country of birth of mother, main language spoken at home, year of arrival in Australia).

The 2014–15 NHS was conducted during July 2014–June 2015 and included around 19,000 people in almost 15,000 private dwellings. The 2017–18 NHS was conducted from July 2017 to June 2018 and included around 21,000 people in more than 16,000 private dwellings.

The results for 2014–15 and 2017–18 were combined, and therefore provide an 'average' for the years 2014–15 and 2017–18. It does not provide information on the years between the surveys.

For information on the 2014–15 NHS data quality, refer to 'Explanatory Notes' in *Microdata: National Health Survey, 2014–15* (ABS catalogue no. 4324.0.55.001), available at the corresponding ABS website (ABS 2016d).

For information on the 2017–18 NHS data quality, refer to 'Explanatory Notes' in *Microdata: National Health Survey, 2017–18* (ABS catalogue no. 4324.0.55.001), available at the corresponding ABS website (ABS 2019b).

Death registrations

The Australian Bureau of Statistics (ABS) Death Registrations collection includes all deaths that occur and are registered in Australia, including deaths of persons whose place of usual residence is overseas. In order to complete a death registration, the death must be certified by either a doctor using the Medical Certificate of Cause of Death, or by a coroner. It is the role of the coroner to investigate the circumstances surrounding all reportable deaths and to establish, wherever possible, the circumstances surrounding the death, and the cause(s) of death. Important demographic information, such as the sex of the person and their age at death or country of birth, is also reported.

Deaths of Australian residents that occur outside Australia may be registered by individual registrars, but are not included in ABS deaths statistics. The death registrations data in the MADIP asset provided information on year of death occurrence, month of death occurrence, underlying cause of death and associated causes of death registered in Australia between the 2007 and 2017 calendar years. It also contained information on birthplace of the deceased, period of residence of the deceased in Australia, age at death, sex of the deceased and other demographic characteristics of the deceased.

The collection captures information on one of the 3 core CALD items (country of birth) and one of the additional items (year of arrival in Australia – recorded as period of residence in Australia).

For a more detailed description of the coverage and processing and quality of deaths data, including deaths certified by the coroner, refer to the relevant ABS website (ABS 2020a).

Appendix B: Methods

How were health outcomes measured in this technical paper?

The linked 2016 Census and the combined 2014–15 NHS and 2017–18 NHS data set in MADIP was used to estimate the following health outcomes for people who were aged 18 and over when they participated in one of these surveys:

- self-assessed health status
- proportion with a chronic condition.

These estimates were based on the data for Australian adults who participated in the 2014–15 and 2017–18 NHSs and had a linked 2016 Census record in the MADIP.

The third outcome, all-cause mortality, was calculated using death registrations for the period August 2016 to November 2017 and the 2016 Census.

Analyses excluded people who were overseas visitors at the time of the Census and those for whom the information of interest (for example, health outcome, CALD status) was unknown (for example, not stated or inadequately described responses).

As the selected health outcomes relate to age, results were adjusted for differences in the age structure between the populations using the direct age-standardisation method, where possible.

For more information on methods for age-standardisation, refer to the relevant section in this appendix.

Self-assessed health status

Self-assessed health status is a commonly used measure of overall health which reflects a person's perception of their own health at a given point in time. It is a useful measure of a person's current health status and provides a broad picture of a population's overall health (ABS 2018a).

Self-assessed health status was collected in both the 2014–15 NHS (ABS 2017c) and 2017–18 NHS (ABS 2019c), which reported the responses to a single question about how respondents rated their overall health. This Information was obtained for people aged 15 and over at the time of the survey.

The question on self-assessed health asked whether in general they felt their health was:

- excellent
- very good
- good
- fair
- poor.

In this report, self-assessed health status is presented for those who assessed their health as 'excellent or 'very good'. The same methodology is used as an indicator of wellbeing in

the Australian Health Performance Framework (AIHW 2021a) and is similar to that used in international reporting (OECD 2019).

Proportion with a chronic condition

Self-reported data from the 2014–15 and 2017–18 NHSs were used to estimate the proportion of people with at least 1 of 10 selected chronic health conditions:

- asthma
- chronic obstructive pulmonary disease (COPD)
- diabetes
- cancer
- heart, stroke and vascular disease
- mental and behavioural conditions
- kidney disease
- arthritis
- back pain and problems
- osteoporosis.

These chronic conditions were selected for reporting because they are common, pose significant health problems, have been the focus of ongoing AIHW surveillance and, in many instances, action can be taken to prevent their occurrence (AIHW 2021c).

Mortality rates

Mortality rates were calculated for people aged 18 and over in the 2016 Census who died between August 2016 (Census month) and November 2017 (the latest month for which complete death registrations data were available at time of analyses). Information about the date of death was obtained from the *Month of death occurrence* and the *Year of death occurrence* data items available in the 2016–17 Death Registrations data set.

Data linkage

Linked National Health Survey and Census data

The outcomes 'self-assessed health status' and 'proportion with a chronic condition' were sourced from the ABS's 2014–15 and 2017–18 National Health Surveys linked with the 2016 Census. The corresponding estimates presented in this report were limited to people who were 18 at the time of the survey and had a 2016 Census record linked to the Spine in MADIP. The NHSs are a household survey, and do not include very remote areas of Australia and non-private dwellings.

The 2014–15 and 2017–18 NHSs were pooled to provide a larger CALD sample for our analyses in the hope that this would allow for greater disaggregation of results. Initially, there were 40,572 participants in the pooled NHSs. Of those, 37,946 linked to the Spine (94%) and 32,153 (79%) linked to the Census (Figure B1).

After restricting the age at survey to 18 and over, the number of records in the pooled NHSs reduced from 40,572 to 30,930 (Figure B2). Of those, 29,080 (94%) linked to the Spine and

25,249 (82%) linked to the Census. Therefore, the analytical file contained a sample of adults from across Australia consisting of 12,342 and 12,907 individuals who participated in the 2014–15 and 2017–18 NHSs, respectively, and had a record in the Census linked to the Spine.

The existing replicate and person weights for each survey were used in these analyses to infer results for the in-scope total Australian population.
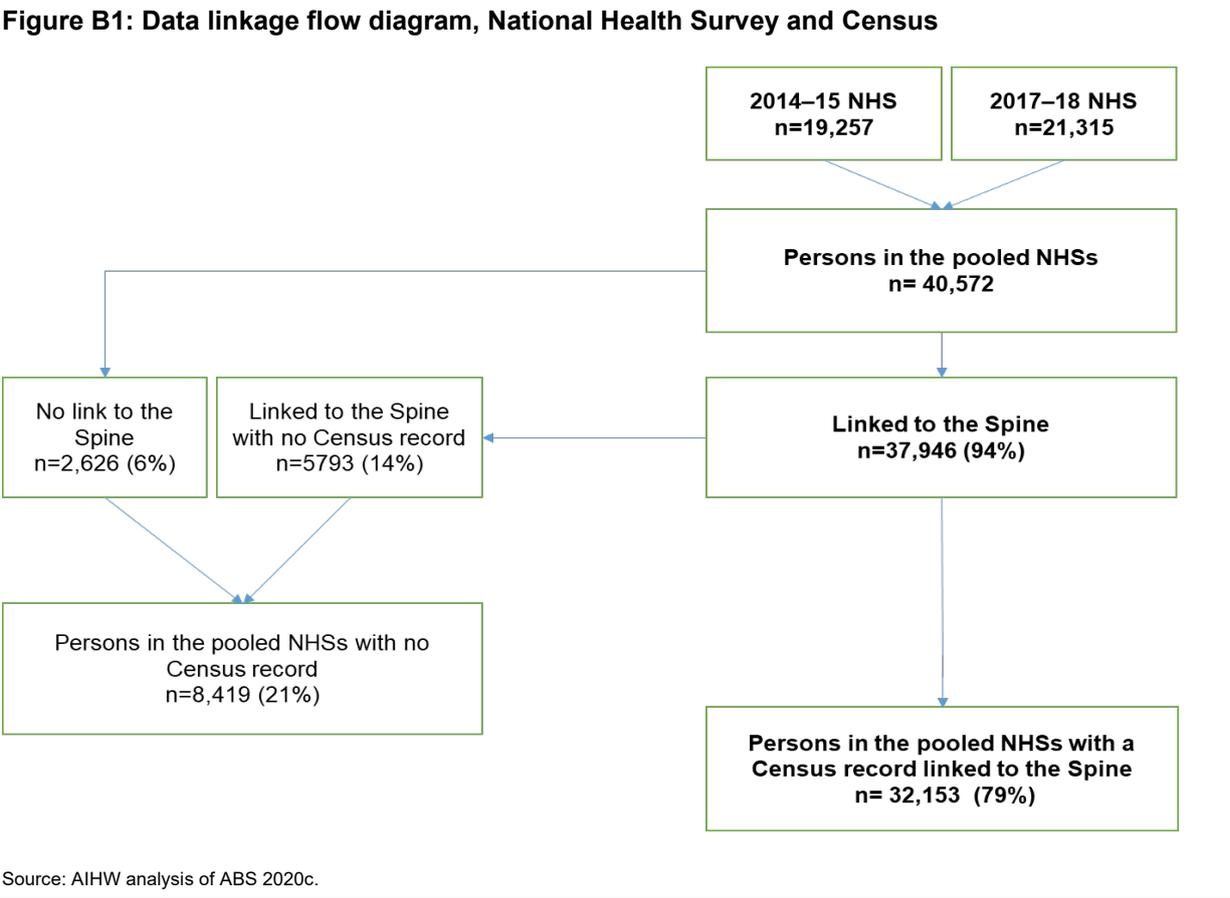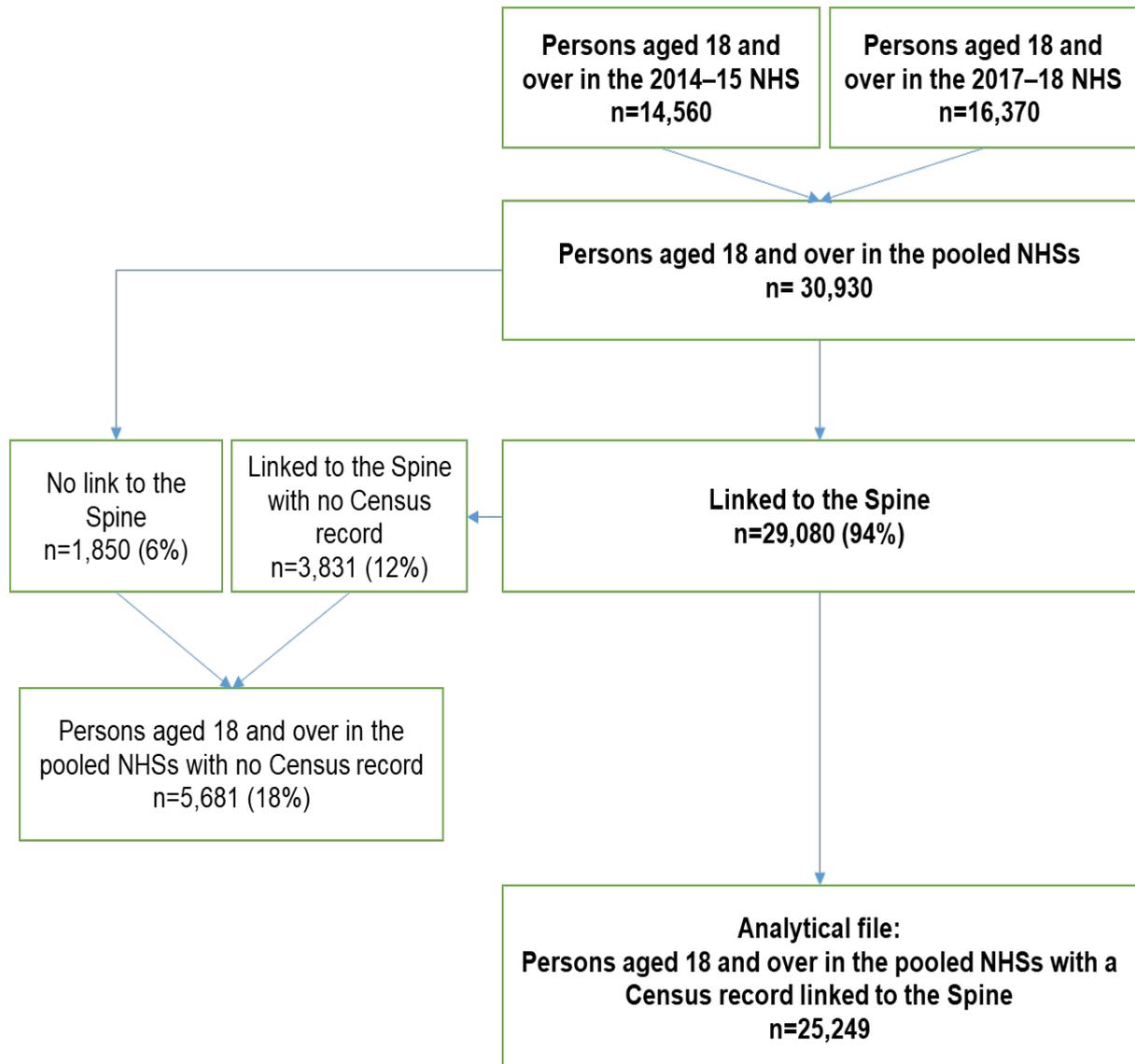
Figure B1: Data linkage flow diagram, National Health Survey and Census

Source: AIHW analysis of ABS 2020c.

Figure B2: Data linkage flow diagram, National Health Survey and Census, people aged 18 and over

Source: AIHW analysis of ABS 2020c.

The outcomes from the NHS were chosen as they were relatively common – in 2017–18, it was estimated that more than half (56%) of Australians considered their health to be excellent or very good, and nearly half (47%) had 1 of the selected chronic conditions. Despite this, very few results could be presented at the most granular level due to small numbers, highlighting a key difficulty with reporting on such a diverse population.

The country of birth of NHS respondents was compared with those in the Census to assess representativeness of the CALD population. The sample in the NHS had a slightly lower proportion of people born overseas when compared with the Census, and there were slight differences by specific countries and regions of birth. However, direct comparisons are difficult due to the different time periods of the data collections and the small sample sizes of

specific groups in the NHS. As the NHS collects a range of CALD information, data linkage is required to report only by *Ancestry* and *Main languages other than English spoken at home*.

When the variables reporting the same CALD characteristic were available in both data sets (for example, *Country of birth*, *Country of birth mother* and *Country of birth of father*), the data from the Census and the NHS data sets were combined to enhance the completeness of information recorded by these CALD variables. When reporting the results by these CALD indicators, the data were obtained mainly from the NHSs. However, where the information was missing in the NHSs, the data were supplemented by the Census. When the information on a CALD characteristic of interest was not available in the NHS data set (for example, *Ancestry* and *Main language other than English spoken at home*), then this information was collected only from the corresponding Census variable.

Year of arrival information from the Census variable was used for all analyses in this report as it is collected and reported in single years. The 2014–15 NHS data set used in the analyses for this report did not have year of arrival in single years so could not be derived using the pooled NHSs alone.

The results presented for the Australian-born population in the 'Year of arrival' section of the report differ slightly from the results presented for the same population in the 'Country of birth of persons' section. This is due to the different methodologies used. Country of birth results were based on a derived variable which combined information from the NHSs and the Census, and analyses for year of arrival used only information from the Census.

The data linkage was also useful for comparing between the 2 language variables. The NHS variable, *Main language spoken at home*, by its definition will identify fewer people who regularly speak a language other than English but whose main language is English. Using the *Main language other than English spoken at home* variable identified more than 1,700 additional adults who spoke a language other than English, which allowed for more analysis.

Self-assessed health status and the proportions with a chronic condition for the CALD and non-CALD populations in the section 'Combining CALD variables and defining CALD' used only the 2017–18 NHS data. At the time of the analyses, the country of birth variable in the MADIP extract of the 2014–15 NHS did not provide sufficiently disaggregated information to identify Australians who were born in main English-speaking countries such as Republic of Ireland, Canada, the United States of America, and South Africa. The 2017–18 NHS data in MADIP included both a detailed country of birth item and the main language spoken at home variable which was needed to identify populations meeting the recommended definition of CALD (Pham et al. 2021), which includes people born in non-main English-speaking countries, and/or who do not speak English at home. Merging the 2017–18 NHS data with the Census was not required to conduct these analyses, which also avoided the loss of unlinked records between the 2 data sets.

Linked death registrations and Census data

All-cause mortality rates (other than for 'Country of birth of person' in Chapter 3) presented in this report are based on the data for usual residents in Australia with a Census record linked to the Spine (n=20,712,394), including people who died between August 2016 and November 2017 (n= 175,395) (Figure B3).

The analyses were restricted to people who were aged 18 and over on Census night (9 August 2016), using the age variable in the 2016 Census. After this, the number of records reduced to 16,104,351, including 174,674 deaths that occurred during August 2016–November 2017.

Figure B3: Data linkage flow diagram, death registrations and 2016 Census, people aged 18 and over

| No link to the Spine n=3,005,024 (13%)	←	**Residents with a Census record** **n= 23,717,418**

Linked to the Spine
n=20,712,394 (87%)
including 175,395 deaths in August 2016–November 2017

Analytical file:
Residents aged 18 and over on Census night with a Census record linked to the Spine
n=16,104,351 including 174,674 deaths in August 2016-November 2017
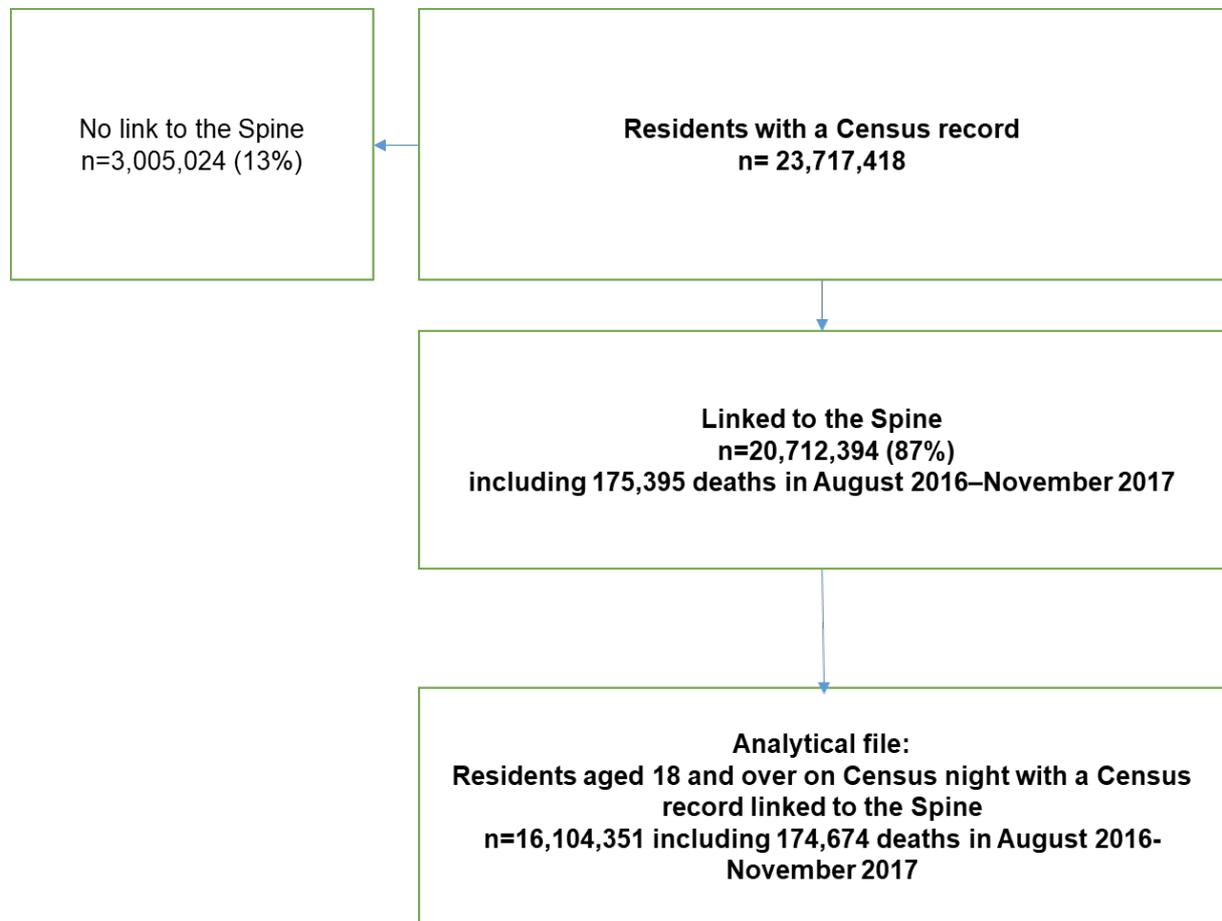
Source: AIHW analysis of ABS 2020c.

Information about the date of death was obtained from the *Month of death occurrence* and the *Year of death occurrence* data items available in death registrations. Using year of occurrence of death is common when the analyses require information on the exact period of death (AIHW 2021b). The analyses required the data on exact period of death to investigate the deaths that occurred during the selected study period. However, lags in registrations of deaths can occur so the available data may underestimate the occurrence of recent deaths. The MADIP extract used included deaths for the period 2007–2017, but the number of recorded deaths in December 2017 was considerably lower than for deaths that occurred in the same month in previous years, so these were excluded from the analyses.

Of the 217,096 post-Census deaths that occurred during August 2016–November 2017, 97% (n=209,574) linked to the Spine and 81% (n=175,395) had a Census record (Figure B4). Of the 175,395 people who died in August 2016–November 2017 with a Census record linked to the Spine, 174,674 were aged 18 and over during Census.

As the linkage of deaths to Census varied across country of birth, mortality rates presented for some subpopulations would be underestimated. Linkage from deaths data to Census overall and by country of birth was lower than that from Census to MADIP Spine, with a higher proportion of records being excluded from the numerator (that is, people who died)

than from the denominator (that is, people who died and did not die). The rates presented for those who were born in countries with lower linkage rates from deaths to Census would also have been more underestimated than those who were born in countries with higher linkage to Census.

Figure B4: Data linkage flow diagram, death registrations, people aged 18 and over
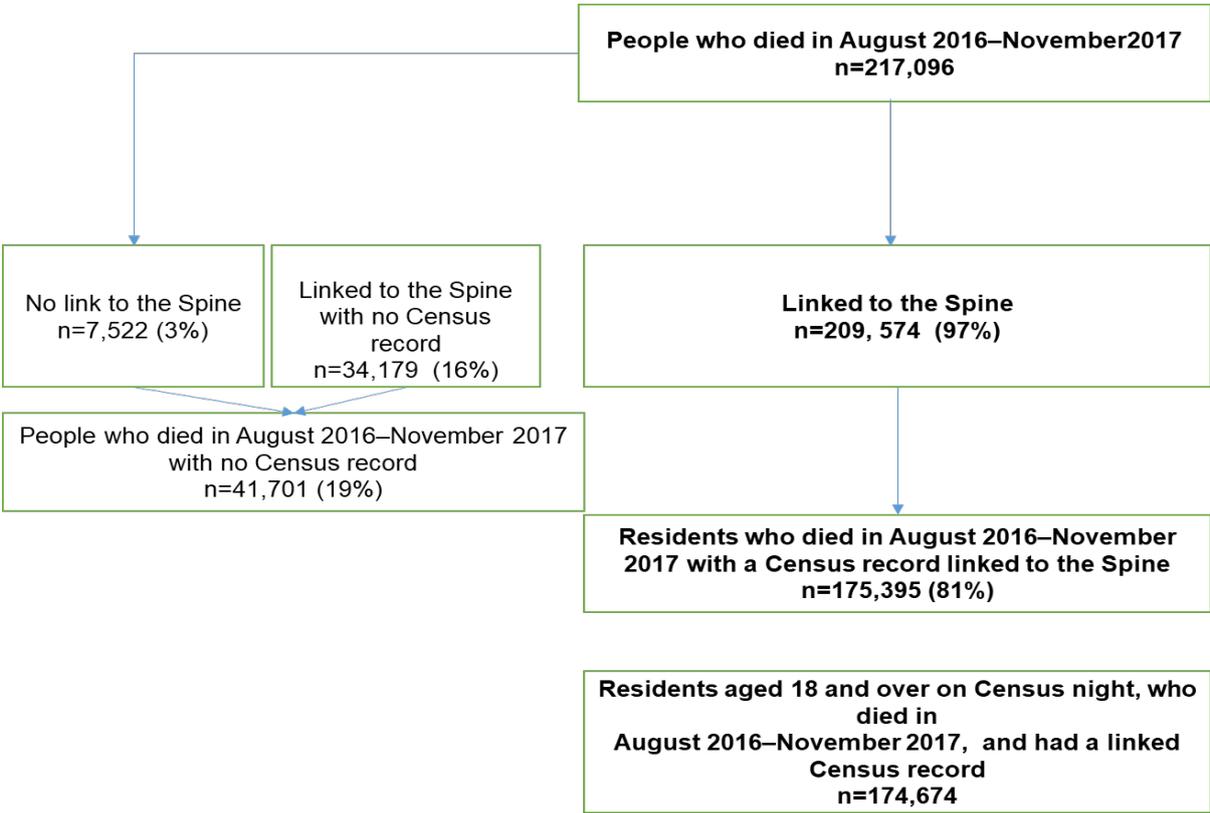
Source: AIHW analysis of ABS 2020c.

Overall, the country of birth and age data in the Census were quite consistent with those in the deaths data, with more than 95% match for country of birth and 98% match for age, after excluding the not stated (or not recorded) data. However, for some CALD populations, there were inconsistencies between what people reported as their country of birth in the Census, and what was recorded on their death certificate. This was the case particularly for populations born in countries that saw changes to their names due to historical break-ups or disintegration of some countries in the early 1990s, such as the 1991 break-up of the Soviet Union and the disintegration of Czechoslovakia and Yugoslavia in the early 1990s (Ministry of Defence UK 2021). For example, Bosnia and Herzegovina is one of the new country names consequent on the breakup of Yugoslavia in the early 1990s (Ministry of Defence UK 2021). For Bosnia and Herzegovina, when considering deaths that linked to Census, only half of the country of birth information in the death registrations data set had the same country of birth in the Census, with around 20% being reported as Croatia and Serbia in the Census.

In order to understand how analysing between the linked and unlinked records affected results and variations, mortality rates by country of birth were calculated also by using the complete Death Registrations data set in the numerator and the complete Census in the denominator. The mortality rates presented in the 'Country of birth of person' section are based on this approach. As expected, using the entire death registrations additionally identified more than 40,000 deaths in the numerator, and resulted in higher mortality rates for adults, compared with those calculated from the linked data sets, particularly for countries of birth with relatively low Census linkage.

The mortality rates for the Australian-born population in the 'Country of birth of person' section differ from the rates presented for the same population in the 'Year of arrival in Australia' section, which used the linked Census and death registrations, rather than the unlinked data sets.

The mortality rates for the CALD and non-CALD populations in the section 'Combining CALD variables and defining CALD' were based on the linked death registrations and the Census data. The information from the Census variables, *Country of birth of persons* and *Main language other than English spoken at home* were combined to identify populations meeting the recommended definition of CALD (Pham et al. 2021), which includes people born in non-main English-speaking countries, and/or who do not speak English at home.

Data linkage provided the opportunity to investigate variations in the selected health outcome by more CALD indicators than was possible with the death registrations data set alone, as the death registrations does not include many of CALD indicators available in the Census, including *Country of birth of mother*, *Country of birth of father*, *Main language other than English spoken at home*, *Religious affiliation*, *Proficiency in spoken English* and *Ancestry*.

Crude proportion estimates and crude rates

Crude estimates for the National Health Survey outcomes are presented as proportions in this report. A crude proportion is the number of people with a particular characteristic in a population under study, divided by the number of people in that population, multiplied by 100. All crude proportion estimates are weighted using person weights allocated to each survey participant by the ABS (2017e, 2019c).

The crude all-cause mortality rate for a population under study was calculated by dividing the number of deaths in August 2016–November 2017 by the size of that corresponding population, multiplied by 100,000 to express the result as the number of deaths per 100,000.

Age-specific proportions and age-specific rates

Age-specific proportions or rates are useful for comparing the results across age groups when results are strongly age-dependent.

For the National Health Survey health outcomes, the age-specific proportions are calculated by dividing the number of events occurring in each specified age group in a population of interest by the total number of people in the same age group of that corresponding population, multiplied by 100. All age-specific proportions are weighted estimates that use person weights allocated to each survey participant by the ABS.

For each population under study, the age-specific all-cause mortality rates were calculated by dividing the number of deaths that occurred during August 2016–November 2017 in a specific age group by the size of the same age group, multiplied by 100,000.

Age-standardised proportions and age-standardised rates

When comparing the results between populations, it is sometimes necessary to account for the fact that the number of events depends not only on the number of people in the population, but also on the age structure of the population. The selected health outcomes in this report relate to age – whether it be the self-assessed health status, having a long-term chronic condition or mortality. This may make comparisons across populations misleading as they may be confounded by differences in the age structures of the populations being compared. Age-specific comparisons can be made – that is, comparing rates or proportions at specific ages – but this can be cumbersome because it requires numerous comparisons.

Variations in age structure between populations can be adjusted for by a statistical procedure called age standardisation. In this report, the direct age-standardisation approach was used. Direct age standardisation applies the age-specific results to a 'standard population' in order to determine the proportion or rate that would have occurred if the populations under study had the same age distribution as the 'standard population'. The method provides the age-standard proportions or rates as single summary measures. The 2001 Australian Standard Population was used to calculate age-standardised proportions and age-standardised rates.

Results based on small populations or a small number of events are unreliable and exhibit a large amount of random variation. Age-standardised proportions were not presented if the total number of events was less than 20 over all age groups or the denominator was less than 30 in any one age group, for any population under study. For mortality rates, results were presented only if the number of deaths in a population of interest was at least 100.

Direct standardisation may not remove all confounding and produce precise age adjustment if the categories used are not sufficiently narrow. Conversely, age groups that are too fine can introduce excessive volatility into the age-standardised rates. Having no events in an age group can produce misleading results, since cells with zero events are assumed to have zero variance, resulting in an underestimation of the true variance. For many populations of interest, the number of events was zero at some specific ages, particularly younger ages, regardless of the health outcome. In order to avoid age groups with zero events in the numerator, the following age groups were used:

- 10-year age groupings starting with the age group 18–34, up to age 65 and over, was used when calculating the age-standardised proportions from the National Health Surveys
- 10-year groupings starting with the age group 18–34 up to age 75 and over, was used when calculating the age-standardised mortality rates.

For NHS outcomes, estimates are presented as age-standardised proportions. For all-cause mortality, the age-standardised rates are presented as deaths per 100,000.

Sampling error

The aim of sampling is to achieve representation so that the results are the same as if the whole population had been included. When estimates are based on data from a random sample selected from a population, rather than a full enumeration of that population, they are subject to sampling error. This means the estimates may differ from the value that would have been produced if the data had been obtained from the complete population.

Standard error

One measure of the sampling error is given by the standard error (SE), which indicates the degree to which an estimate would vary from sample to sample. The SE is an indicator of the extent to which an estimate might have varied.

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

Relative standard error

Another measure of sampling error is relative standard error (RSE), which is obtained by expressing the standard error as a percentage of the estimate. The RSE of an estimate is a measure of the percentage errors likely to have occurred due to sampling. It indicates the extent to which an estimate might have varied because only a sample of the population was included.

The RSE is obtained by expressing the SE as a percentage of the estimate

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

Margin of error

The margin of error (MOE) describes the distance from the population value that the sample estimate is likely to be within, and is specified at a given level of confidence. The confidence level typically used is 95%. At the 95% confidence level, the MOE indicates that there are about 19 chances in 20 that the estimate will differ by less than the specified MOE from the population value.

The 95% MOE is calculated as 1.96 multiplied by the SE.

$$95\% \, MOE = 1.96 * SE(estimate)$$

In this technical paper, proportion estimates with a margin of error greater than 10 percentage points are preceded by a hash (#) to indicate that the proportion has a high MOE and should be interpreted with caution.

Confidence intervals

For analyses based on survey data (linked NHS and Census data), confidence intervals are presented in order to describe the uncertainty around an estimate. A point estimate is the value of a sample statistic, which is used as an estimate of a population parameter. For example, the proportions for the selected health outcomes from the NHSs are point estimates of the proportion for a selected population. Generally speaking, confidence intervals describe how different the estimate could have been if the underlying conditions stayed the same, but chance had led to a different set of observed data. The confidence interval is a range of values that is likely to include the true population parameter value with a certain degree of confidence.

The confidence interval (CI) expresses the sampling error, and is a range of values that is likely to include the true population parameter value with a certain degree of confidence. The degree of confidence level that was chosen in the report was 95%. A 95% confidence interval provides information about a range of values that should contain the actual rate 95% of the time (95 times out of 100). Wider confidence intervals reflect less certainty in the estimate.

The 95% confidence interval is calculated as the estimate plus or minus the 95% MOE of the estimate.

$$95\% \, CI = estimate \pm 95\% MOE$$

If the 95% confidence intervals around the 2 estimates do not overlap, we can be confident that the apparent difference between the estimates is not due to chance (that is, the difference is statistically significant). If the confidence intervals do overlap, this does not always indicate that the difference is not statistically significant – an appropriate statistical test may indicate a statistically significant difference even though the confidence intervals do overlap.

In this report, additional significance testing was not undertaken where confidence intervals overlapped, due to the large number of populations and numerous comparisons made throughout the report.

Acknowledgments

Abbreviations

ABS	Australian Bureau of Statistics
ASCCEG	Australian Standard Classification of Cultural and Ethnic Groups
ASCL	Australian Standard Classification of Languages
CALD	Culturally and linguistically diverse
Census	Australian Census of Population and Housing
COPD	Chronic obstructive pulmonary disease
LEP	Limited English proficiency
MADIP	Multi-Agency Data Integration Project
MESC	Main English-speaking countries
MOE	Margin of error
MBS	Medicare Benefits Schedule
NHSs	National Health Surveys
PBS	Pharmaceutical Benefits Scheme
SACC	Standard Australian Classification of Countries
SE	Standard error

Symbols

\# Estimate has a high margin of errors (> 10 percentage points) and should be interpreted with caution.

\> Greater than

Glossary

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 (usually increasing) with age. The age structures of the different populations are converted to the same 'standard' structure, and then the disease rates that would have occurred with that structure are calculated and compared.

death rate: The number of deaths for the specified period per 100,000 population.

arthritis: A group of disorders for which there is inflammation of the joints – which can then become stiff, painful, swollen or deformed. The 2 main types of arthritis are osteoarthritis and rheumatoid arthritis.

asthma: A common, chronic inflammatory disease of the air passages that presents as episodes of wheezing, breathlessness and chest tightness due to widespread narrowing of the airways and obstruction of airflow.

back pain and problems: A range of conditions related to the bones, joints, connective tissue, muscles and nerves of the back. Back problems are a substantial cause of disability and lost productivity. In this report, back problems include sciatica, disc disorders, back pain/problems not elsewhere classified and curvature of the spine.

cancer: A large range of diseases where some of the body's cells become defective, begin to multiply out of control, invade and damage the area around them, and can then spread to other parts of the body to cause further damage.

chronic obstructive pulmonary disease (COPD): A serious, progressive and disabling long-term lung disease where damage to the lungs (usually because of both emphysema and chronic bronchitis) obstructs oxygen intake and causes increasing shortness of breath. By far the greatest cause of COPD is cigarette smoking.

data linkage: The bringing together (linking) of information from 2 or more different data sources that are believed to relate to the same entity (for example, the same individual or the same institution). This linkage can yield more information about the entity and, in certain cases, provide a time sequence, helping to 'tell a story', show 'pathways' and perhaps unravel cause and effect. The term is used synonymously with 'record linkage' and 'data integration'.

data set specification: A metadata set that is not mandated for collection but is recommended as best practice.

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. This report includes type 1 diabetes, type 2 diabetes and type unknown.

heart, stroke and vascular disease (HSVD): Includes angina, heart attack, other ischaemic heart diseases, stroke, other cerebrovascular diseases, oedema, heart failure, and diseases of the arteries, arterioles and capillaries.

kidney disease: A subset of symptoms including: problems or complaints about the kidneys, renal pain and renal colic (kidney stones).

mental and behavioural conditions: Includes organic mental problems, alcohol and drug problems, mood (affective) disorders such as depression, anxiety-related problems and other mental and behavioural problems.

metadata: Often called the 'data about data', metadata can be defined as information about how data are defined, structured and represented. It provides meaning and context to data by describing how it is captured and collected, and can assist in the interpretation of data.

mortality: Number or rate of deaths in a population during a given time period.

national minimum data sets: a set of data elements agreed for mandatory collection and reporting at a national level. It may include data elements that are also included in other national minimum data sets. They are contingent upon a national agreement to collect uniform data and to supply it as part of the national collection, but do not preclude agencies and service providers from collecting additional data to meet their own specific needs.

osteoporosis: A condition that causes bones to become thin, weak and fragile, such that even a minor bump or accident can break a bone.

self-assessed health status: Self-assessed health status is a commonly used measure of overall health which reflects a person's perception of their own health at a given point in time.

social determinants of health: The circumstances in which people are born, grow up, live, work and age, and the systems put in place to deal with illness. These circumstances are in turn shaped by a wider set of forces: economics, social policies and politics.

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This report explores the use of linked data to report on the health of culturally and linguistically diverse (CALD) populations, including its benefits, challenges and limitations. It investigates each of the available CALD variables individually, using 3 health outcomes to explore differences between CALD groups within each CALD variable.

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