Profiles of Aboriginal and Torres Strait Islander people with kidney disease

AIHW

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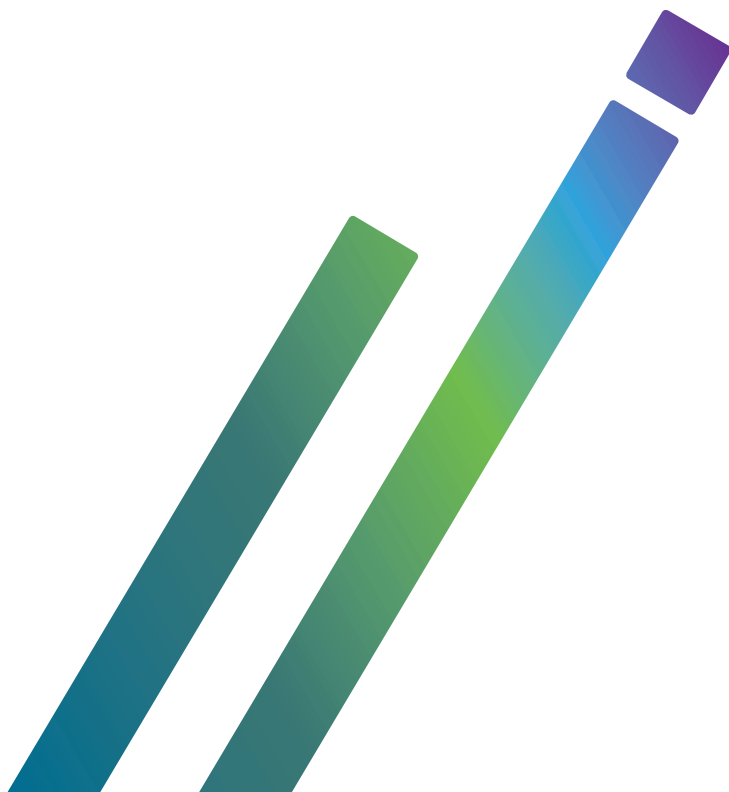Australian Institute of Health and Welfare 2020. Profiles of Aboriginal and Torres Strait Islander people with kidney disease. Cat. no. IHW 229. Canberra: AIHW.

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Contents

Summary

This report presents a demographic and health profile of Aboriginal and Torres Strait Islander Australians with kidney disease. The aim of this report is inform future policy development and service planning relating to kidney health among Indigenous people.

Chronic kidney disease (CKD) is defined as the presence of impaired or reduced kidney function lasting at least 3 months. A person who has the most severe form of CKD, end-stage kidney disease (ESKD), usually requires a kidney transplant or dialysis to survive. CKD is highly under-diagnosed, as it is often asymptomatic in the less severe stages.

In 2012–13, 18% (59,600) of Indigenous adults aged 18 and over had biomedical signs of CKD, but only around 1 in 10 (11%) of these self-reported having kidney disease. The rate of CKD increased with age, affecting approximately half (49%) of Indigenous adults aged 65 and over. After accounting for differences in age structure, Indigenous Australian adults were twice as likely as non-Indigenous adults to have biomedical signs of CKD (22% and 10%, respectively).

Characteristics of Indigenous Australians with CKD

Indigenous adults with CKD were significantly less likely than those without to have completed Year 12, be currently employed, or have a healthy waist circumference. After adjusting for differences in age, Indigenous Australians with CKD were also more likely to experience selected comorbidities than those without, including diabetes (36% compared with 12%), cardiovascular disease (35% compared with 24%) and high cholesterol levels (7% compared with 3.6%).

Results from multivariate regression modelling showed that the likelihood of having CKD increased consistently with age, decreased consistently with increasing household income, was similar for men and women, was higher in remote areas compared with non-remote areas, and was higher among individuals with high blood pressure or diabetes (2.0 and 2.9 times as likely, respectively).

Hospitalisations related to CKD

During the 2-year period from July 2015 to June 2017, there were almost 6,000 hospital separations of Indigenous Australians where kidney disease was the principal diagnosis, and a further 461,000 separations where kidney dialysis was the principal diagnosis. Separation rates were considerably higher among Indigenous Australians than among non-Indigenous Australians. The areas of Tennant Creek and Apatula in the Northern Territory had the highest separation rates for both dialysis and other kidney diseases.

End-stage kidney disease patients

At 31 December 2017, approximately 8.8% (2,160) of people receiving treatment for ESKD in Australia were Indigenous Australians. The treatment rate among Indigenous Australians was 5 times that among non-Indigenous Australians, and was highest in *Remote* areas.

The number of Indigenous Australians beginning ESKD treatment has increased over time, from 240 in 2007 to 352 in 2017. Over the 3-year period 2015 to 2017, Indigenous Australians aged 45–54 and 55–64 were the most likely to begin ESKD treatment (31% and 26% of all new Indigenous patients, respectively).

1 Introduction

Chronic kidney disease (CKD) is a chronic condition with complex causes, multiple risk factors, and persistent effects that require long-term management (AIHW 2015a). It contributes substantially to poor health and has major impacts on the overall health and wellbeing of individuals, families and communities, and on health service use. The population sub-groups at increased risk of CKD are the elderly, Aboriginal and Torres Strait Islander Australians, and people living in remote and socioeconomically disadvantaged areas.

An estimated 1.7 million Australian adults aged 18 and over (1 in 10) had clinically verified signs of CKD based on the biomedical component of the 2011–12 Australian Health Survey (ABS 2013b). This survey used blood and urine samples to identify whether respondents showed signs of various conditions, such as CKD. After adjusting for differences in age, Indigenous adults were twice as likely to have biomedical signs of CKD as their non-Indigenous counterparts (22% and 10%, respectively) (AIHW 2015a). More detail about the biomedical signs of CKD used in the AHS is provided in Appendix C.

In 2017–18, about 1.8 million hospitalisations were associated with CKD (principal and/or additional diagnosis), representing 16% of all Australian hospital separations, and CKD was the underlying or associated cause of more than 1 in 10 deaths (11%, or 16,800) in 2018 (AIHW 2020). CKD contributes to a greater share of total deaths among Indigenous compared with non-Indigenous Australians, partly because it is diagnosed in much younger age groups within the Indigenous population (AIHW 2015a).

Purpose of this report

This report presents a demographic and health profile of Indigenous Australians with kidney disease. It highlights demographic and socioeconomic characteristics of those with CKD, the associated risk factors and comorbidity profiles, as well as providing information on geographic distribution and service use. Additional analyses focus on hospitalisations for treatment related to kidney diseases and Indigenous Australians with-end stage (or Stage 5) kidney disease (ESKD).

Some of the key questions that this report answers are:

- How many Indigenous people have CKD alone or in combination with other conditions?
- How large is the gap in prevalence of CKD between Indigenous and non-Indigenous Australians?
- How do risk factors, disease rates, treatment and management vary among Indigenous people by demographic and socioeconomic factors and by geographic location?

The aim of this report is to inform future policy development and service planning relating to kidney health among Indigenous people. It provides useful input for detailed assessment of health care and related service needs of Indigenous Australians with kidney diseases and in identifying specific sub-groups within the Indigenous population that may have higher risks of developing kidney diseases.

Several known risk factors associated with chronic kidney disease, including low birthweight (particularly if small for gestational age), prematurity, reduced numbers of nephrons (the filtering units within the kidneys), family history of kidney disease, and personal history of

glomerulonephritis (inflammation of the blood vessels in the kidneys), are not covered in this report. For some of these factors, national data are not available, whereas for others, although national data are available, the relevant data sources do not include information about kidney disease outcomes. Data linkage and analysis of medical records would be needed to provide further insights into how these factors are distributed among the Indigenous population, and the magnitude of their association with CKD outcomes.

Supplementary tables providing detailed results from this report are available to download at <www.aihw.gov.au>. These tables are referred to within this report as 'Table SX.X'.

Chronic kidney disease and its stages

Chronic kidney disease refers to all conditions of the kidney, lasting at least 3 months, affecting the filtration and removal of waste from the blood by the kidneys (indicating kidney dysfunction), and/or leakage of protein or albumin in the urine (indicating kidney damage). CKD is common, costly to manage in its end stage, and often detected too late to be reversible, but it is considered largely preventable because many of its risk factors—including type 2 diabetes, high blood pressure, tobacco smoking and obesity—are potentially modifiable (Cass et al. 2010; Wyld et al. 2015). However, not all Australians have the same opportunities or access to services that could assist them with reducing these risks.

CKD is usually categorised into 5 stages according to the level of kidney function, or evidence of kidney damage (Box 1.1). The early stages generally have no symptoms, and so access to screening is important for detection and early treatment to prevent progression. In stage 5, also known as ESKD, patients usually benefit from kidney replacement therapy in the form of dialysis or kidney transplant. Dialysis is an artificial way of removing waste products from the blood and is mostly provided in hospitals or satellite centre dialysis units, but can also be carried out at home. All ESKD patients benefit from medical and holistic support, regardless of uptake of kidney replacement therapy (Hughes et al. 2019).

Box 1.1: Stages of chronic kidney disease

Chronic kidney disease is categorised into 5 stages according to the level of kidney function (measured as the estimated glomerular filtration rate, or eGFR), or evidence of kidney damage (measured as the albumin to creatinine ratio, or ACR).

The normal range for eGFR is between 90 and 130 mL/min/1.73m^2, depending on sex, though it may be lower in older people. The normal range for ACR is 1.0–<2.5 mg/mmol for males and 1.0–<3.5 mg/mmol for females.

Early stages (1–2)

eGFR ≥60 mL/min/1.73m^2 and/or ACR≥2.5 mg/mmol for males or ACR≥3.5 mg/mmol for females. There are usually no symptoms.

Middle stages (3–4)

eGFR of 15–59 mL/min/1.73m^2. Level of waste (urea and creatinine) in the blood rises due to reduced kidney function to remove waste. The person may start to feel unwell.

End stage (5)

eGFR <15 mL/min/1.73m^2. Person requires dialysis or a kidney transplant to stay alive.

Main data sources

The analyses in this report are based on survey data from the Australian Bureau of Statistics (ABS); an administrative collection managed by the Australian Institute of Health and Welfare (AIHW); and a clinical register.

- National Aboriginal and Torres Strait Islander Health Survey (NATSIHS), used in Chapters 2–4, and 7.

- National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS), used in Chapters 2–4, and 7.

- National Hospital Morbidity Database (NHMD), used in Chapter 5.

- Australia and New Zealand Dialysis and Transplant Registry (ANZDATA), used in Chapter 6.

Details on the various data sources are available in Appendix C.

The biomedical laboratory tests undertaken as part of the 2011–13 Australian Health Survey were not repeated in the subsequent versions of the National Health Survey of 2014–15 and 2017–18, or the 2018–19 NATSIHS, and hence the 2011–13 results are still the latest biomedical data for both the Indigenous and non-Indigenous populations.

Box 1.2 Acute kidney injury

Acute kidney injury (AKI) is marked by sudden decline in kidney function. In many cases the loss of function is temporary and will be recovered over time. Patients with severe AKI require dialysis, with some individuals needing long-term treatment due to permanent loss of kidney function.

AKI is a recognised risk factor for chronic kidney disease, but is also common among people who already have CKD (Chawla et al. 2014; Lewington et al. 2013). AKI has been found to be a trigger for kidney failure requiring dialysis among Indigenous Australians with CKD (Hughes et al. 2019). A study in the Kimberley region of Western Australia found that an infection of some kind was recorded as the principal or an additional diagnosis in almost three-fifths (59%) of hospitalisations for AKI among Indigenous Australians between 2009 and 2016. A history of CKD was recorded in 47% of cases for which a discharge summary was available. AKI was recorded as the principal or an additional diagnosis in only 27% of cases (Mohan et al. 2019).

This report focuses on CKD and does not provide information on AKI. Some data on AKI in Australia can be found in the AIHW report *Acute kidney injury in Australia: a first national snapshot* available on the AIHW website at <www.aihw.gov.au>.

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2 Demographic profile of Indigenous Australians with CKD

This chapter provides information on the prevalence of CKD among Indigenous adults aged 18 and over in 2012–13, and summarises the demographic characteristics of Indigenous adults with biomedical signs of CKD. These results were derived from the ABS 2012–13 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) and the 2012–13 National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS). A survey respondent who had biomedical signs of CKD is one who:

- had an eGFR result of less than 60 mL/min/1.73m^2, and/or
- had an ACR result of 2.5 mg/mmol or greater, if male, or 3.5 mg/mmol or greater, if female.

Note that in clinical practice, for a diagnosis of CKD to be made the abnormal result must persist for at least 3 months.

2.1 Prevalence of chronic kidney disease

In 2012–13, 18% (59,563) of Indigenous adults had biomedical signs of CKD. After adjusting for differences in age, Indigenous adults were more than twice as likely as non-Indigenous adults to have biomedical signs of CKD (ABS 2013b). Among Indigenous adults with CKD, 12% had stage 1 CKD, while 1.1% had stage 4 or 5 CKD (Figure 2.1). For more detail on how the stages of CKD are defined, see Appendix B.

Figure 2.1: CKD prevalence, Indigenous adults aged 18 and over, 2012–13

# denotes estimates that have relative standard errors of 25% to 50% and should be used with caution.
Notes

1. Total excludes 'not reported' category, that is, those who did not supply a blood/urine sample or for whom a valid test result was not obtained.

2. The available microdata do not support separate estimates of stage 4 and stage 5 CKD.

Source: AIHW analysis of NATSIHS 2012–13 Core Content File (ABS 2015a). Data available in Table S2.1.

2.2 Demographic characteristics

Prevalence of CKD

Age

In 2012–13, the prevalence of CKD among Indigenous adults increased consistently with age. Among those aged 18–34, 1 in 10 (9%) had biomedical signs of CKD, increasing to 5 in 10 (49%) among those aged 65 and over (Figure 2.2).

Sex

In 2012–13, the prevalence of CKD among Indigenous adults did not differ significantly by sex, although a slightly higher proportion of men than women had CKD (19% and 17%, respectively) (Figure 2.2). The proportion with stage 1 CKD was similar for men and women (12%), but the proportion of men with stage 4/5 CKD was slightly lower than for women (0.8% and 1.4%, respectively).

Remoteness of usual residence

In 2012–13, the prevalence of CKD among Indigenous adults differed considerably by remoteness area of usual residence. There was a significantly higher prevalence of CKD in remote areas (34%) than in non-remote areas (13%) (Figure 2.2).

State and territory

In 2012–13, the prevalence of CKD among the Indigenous population varied considerably by state or territory of usual residence (Figure 2.2).

The highest prevalence of CKD was in the Northern Territory (33%, or 12,000 persons), followed by Western Australia (22%, or 9,900) and Queensland (19%, or 16,300).

Distribution of demographic characteristics among people with CKD

The results above on prevalence showed the proportion of people within each group who had signs of CKD. The following results look just at people with signs of CKD, and show how they are distributed among the various groups.

Age distribution

Among those who had biomedical signs of CKD, 30% were aged 50–64 and 30% were aged 35–49 (Figure 2.3(a)). Just 17% of Indigenous adults with signs of CKD were aged 65 and over, although within this age group the prevalence of CKD was 49%. This reflects the younger age of onset of CKD among Indigenous Australians, as well as the relatively young age profile of the Indigenous population.

Sex distribution

Of Indigenous adults with CKD, 52% were men and 48% were women (Figure 2.3(b)). Among those with stage 1 CKD, 49% were men and 51% women. Men made up a larger proportion of Indigenous adults with stage 2 and stage 3 CKD (62%), while females contributed a larger proportion of Indigenous adults with stage 4/5 CKD (64%).

Figure 2.2: Prevalence of CKD by demographic characteristics, Indigenous adults aged 18 and over, 2012–13
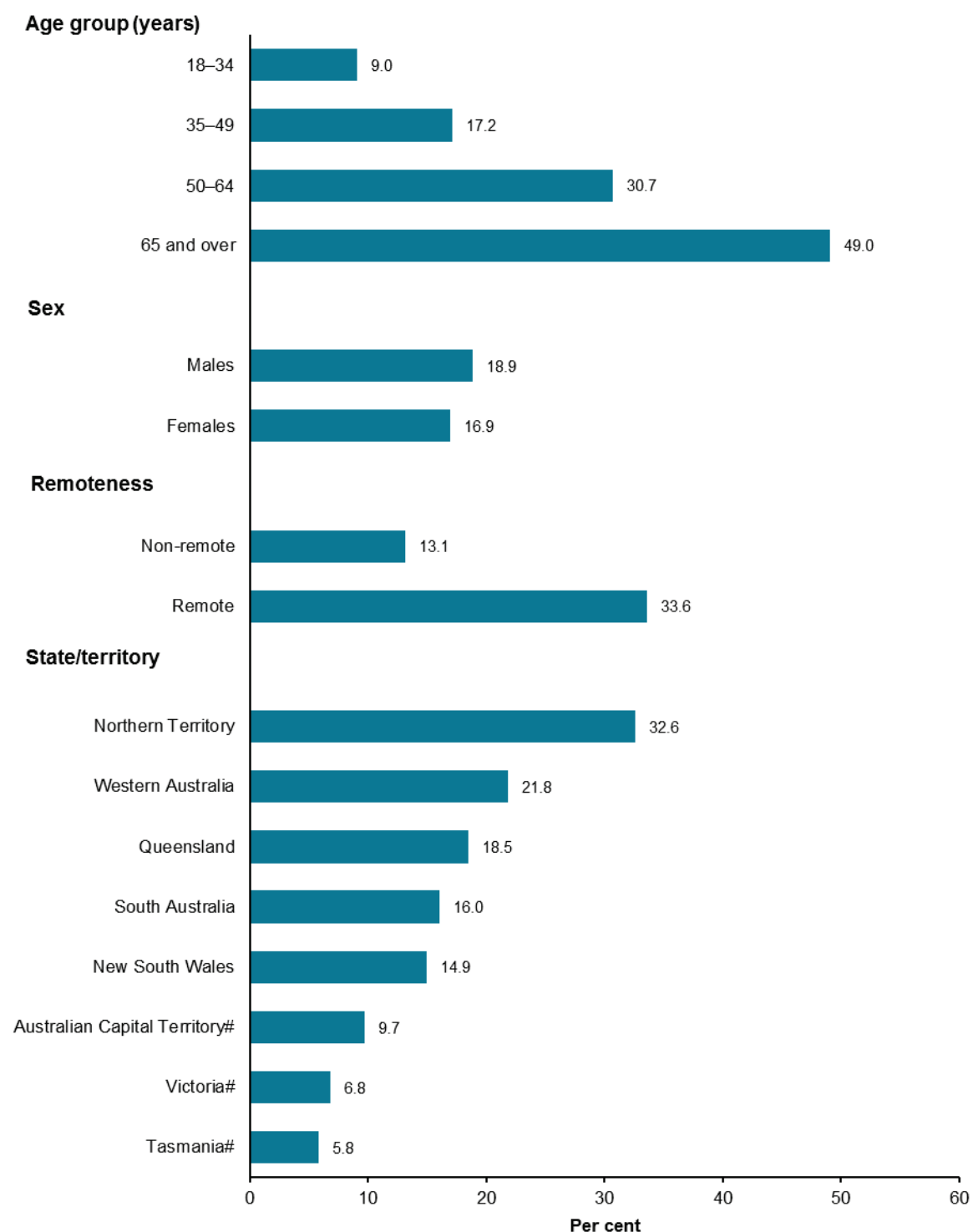
# denotes estimates that have relative standard errors of 25% to 50% and should be used with caution.
Note: Total excludes respondents who did not supply a urine sample or for whom a valid test result was not obtained.
Source: AIHW analysis of NATSIHS 2012–13 Core Content File (ABS 2015). Data available in Table S2.2.

Distribution by remoteness area

Among Indigenous adults who had CKD, a slightly higher proportion (56%) lived in non-remote areas than in remote areas (Figure 2.3(c)).

Distribution across states and territories

Among all Indigenous adults with CKD, the majority lived in NSW and Queensland. One in five Indigenous adults with CKD lived in the Northern Territory (Figure 2.3(d)).

Figure 2.3: Distribution of people with CKD, by selected characteristics, Indigenous adults aged 18 and over, 2012–13
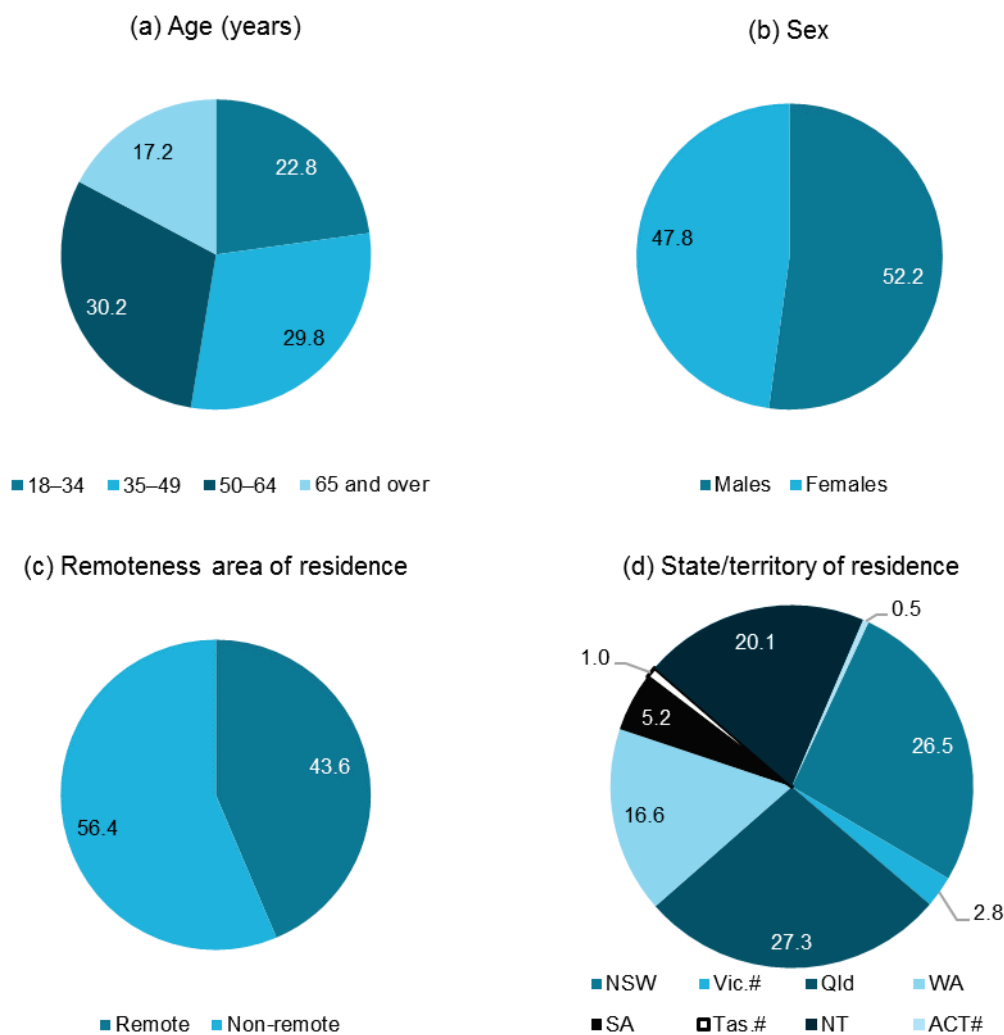
(a) Age (years)

17.2
22.8
30.2
29.8

■ 18–34 ■ 35–49 ■ 50–64 ■ 65 and over

(b) Sex

47.8
52.2

■ Males ■ Females

(c) Remoteness area of residence

43.6
56.4

■ Remote ■ Non-remote

(d) State/territory of residence

0.5
20.1
1.0
5.2
16.6
26.5
2.8
27.3

■ NSW ■ Vic.# ■ Qld ■ WA
■ SA □ Tas.# ■ NT ■ ACT#

# denotes estimates that have relative standard errors of 25% to 50% and should be used with caution.
Source: AIHW analysis of NATSIHS 2012–13 Core Content File (ABS 2015). Data available in Table S2.2.

2.3 Whether CKD was also self-reported

This section considers the extent to which individuals with biomedical signs of CKD were aware they had this condition, and self-reported it in the part of the NATSIHS 2012–13 survey that asks respondents about long-term conditions.

The 2012–13 NATSIHS collected self-reported information about the existence of several chronic health conditions, including kidney disease. In this survey, approximately 2.7% of Indigenous adults aged 18 and over self-reported kidney disease as a current long-term condition—that is, a condition that had lasted, or was expected to last, 6 months or more. The consistency between self-report of a chronic kidney condition and the biomedical test results can be compared for the sub-group of survey respondents who also participated in the voluntary NATSIHMS component.

The comparison of self-report and biomedical results suggests that a large proportion of respondents with signs of CKD were not aware that they had kidney problems. Among all Indigenous adults who had biomedical signs of CKD, around 1 in 10 (11%) also self-reported they had a current long-term kidney condition.

While consistency between self-reported and biomedical indicators of kidney disease among Indigenous adults was low, it was still higher than the equivalent proportion in the general Australian population derived from the 2011–12 Australian Health Survey, where only 6.1% of those with biomedical signs of CKD also self-reported having a chronic kidney condition (ABS 2013b).

Among Indigenous adults, the proportion of people with biomedical signs of CKD who also self-reported CKD increased consistently with severity of the kidney disease—from a rate of 2.8% self-reporting having CKD among Indigenous adults with biomedical signs of Stage 1 CKD, to 74% self-reporting among those with Stage 4/5 CKD (Figure 2.4).

Figure 2.4: Self-reported status of current and long-term kidney disease by stage of CKD from biomedical assessment, Indigenous people aged 18 and over, 2012–13
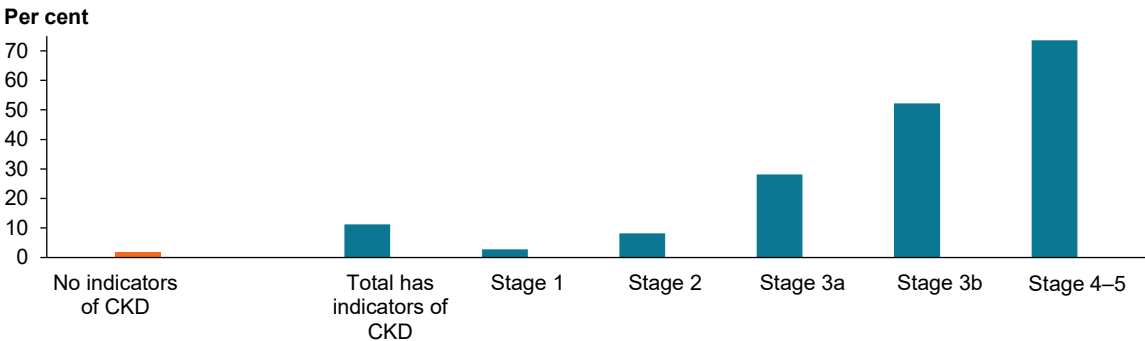
Source: AIHW analysis of NATSIHS 2012–13 Core Content File (ABS 2015a). Data available in Table S2.3.

Among Indigenous adults who did not have biomedical signs of CKD, a very small proportion (1.9%) self-reported that they had a current long-term kidney condition (Figure 2.4). This discrepancy is quite reasonable given that the one-off biomedical tests undertaken as part of the survey do not provide a formal diagnosis of CKD, which requires the relevant signs of kidney disease to persist for a longer period (ABS 2013a). Furthermore, CKD may also be diagnosed by structural abnormalities of the kidneys or renal tract, information which was not available from this study. Structural abnormalities of the renal tract are usually shown by imaging studies, such as ultrasound, and specifically requested by a health professional.

The results of the comparison between self-reported and biomedical information were similar among males and females, and between residents of remote and non-remote areas.

3 Selected characteristics of Indigenous Australians with and without CKD

This chapter summarises the characteristics of Indigenous adults (aged 18 and over) with biomedical signs of CKD using selected indicators in 5 domains—socioeconomic status; health conditions; risk factors; cultural factors, stress and trauma; and health service use. Comparison is also made with Indigenous adults who did not have biomedical signs of CKD in the 2012–13 NATSIHMS. Data are sourced from the ABS 2012–13 National Aboriginal and Torres Strait Islander Health Survey and the 2012–13 National Aboriginal and Torres Strait Islander Health Measures survey.

> *Results in this chapter are presented as crude proportions of each indicator among Indigenous adults with biomedical signs of CKD, followed by age-adjusted comparisons between Indigenous adults with and without CKD. No other adjustments have been made to account for other possible influences on the differences in factors between the 2 groups. Results of comparisons adjusted for a range of factors are presented in Chapter 7.*
>
> *More information on the indicators analysed and how they are distributed is provided in Appendix B.*

3.1 Socioeconomic indicators

In 2012–13, among Indigenous adults with biomedical signs of CKD:

- less than half (46%) had a Year 12 or non-school qualification
- the majority (84%) did not complete Year 12
- nearly three-quarters (71%) lived in a household with household income in the bottom 30% (after adjusting for household size and composition)
- around 2 in 3 (63%) had a personal income in the bottom 30% of incomes
- 2 in 3 (65%) of those aged 18–64 were not employed (Supplementary Table 3.1).

After accounting for differences in age structure between Indigenous adults with and without biomedical signs of CKD, those with CKD were less likely to:

- have completed Year 12 (18% compared with 27%)
- have obtained either a Year 12 or non-school qualification (46% compared with 27%)
- be employed (34% of those aged 18–64, compared with 59%)
- have a personal income in the top 30% of incomes (4.9% compared with 14%)
- live in a household with household income in the middle 40%—after adjusting for household size and composition (26%, compared with 37%) (Figure 3.1).

Indigenous adults with CKD were more likely than those without to:

- have a personal income in the bottom 30% of incomes (63% compared with 48%)
- have a household income in the bottom 30%, after adjusting for household size and composition (72% compared with 49%) (Figure 3.1).

Figure 3.1: Selected socioeconomic indicators among Indigenous people with and without CKD, aged 18 and over, 2012–13

Note: Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 75+.

Source: AIHW analysis of NATSIHS 2012–13 Detailed Condition File (ABS 2015a).
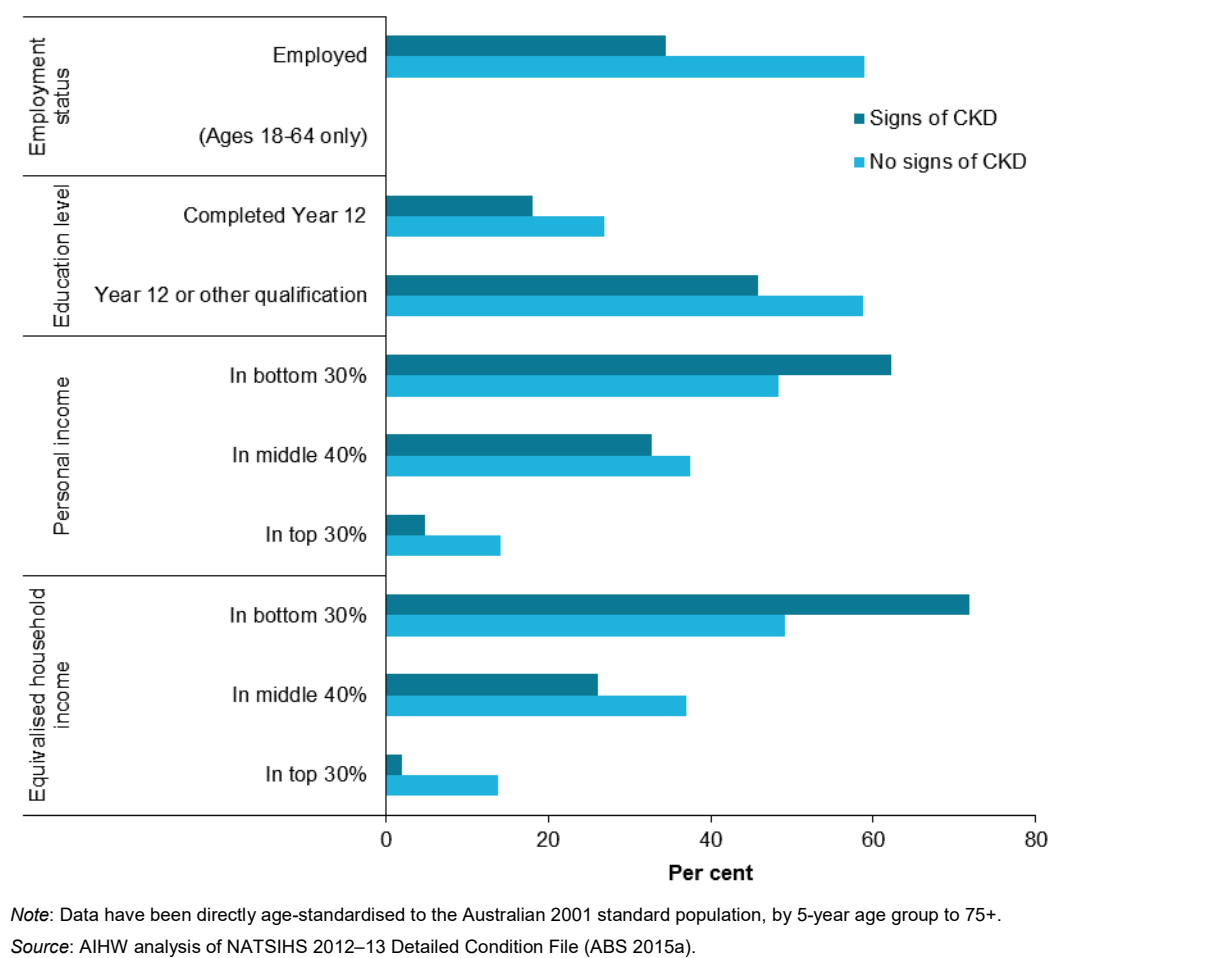
3.2 Health factors

In 2012–13, among Indigenous adults with biomedical signs of CKD:

- 86% had an elevated waist-to-hip ratio, indicating central body fat distribution, a common risk marker for diabetes and cardiovascular disease in Aboriginal and Torres Strait Islander people (Hughes et al. 2018).

- almost half (48%) were classified as obese based on body mass index of ≥30 kg/m^2

- 1 in 3 (32%) had high or very high psychological distress (K5 score greater than 11—see Appendix B)

- more than half (56%) had excellent or very good self-assessed health (Table S3.2).

After accounting for differences in age structure, Indigenous adults with CKD were:

- more likely than those without CKD to have an elevated waist circumference indicating substantially increased risk of developing chronic disease (68% and 56%, respectively)

- less likely than those without CKD to have excellent or very good self-assessed health (61% and 71%, respectively) (Figure 3.2).

Figure 3.2: Selected health factors among Indigenous people with and without CKD, aged 18 and over, 2012–13
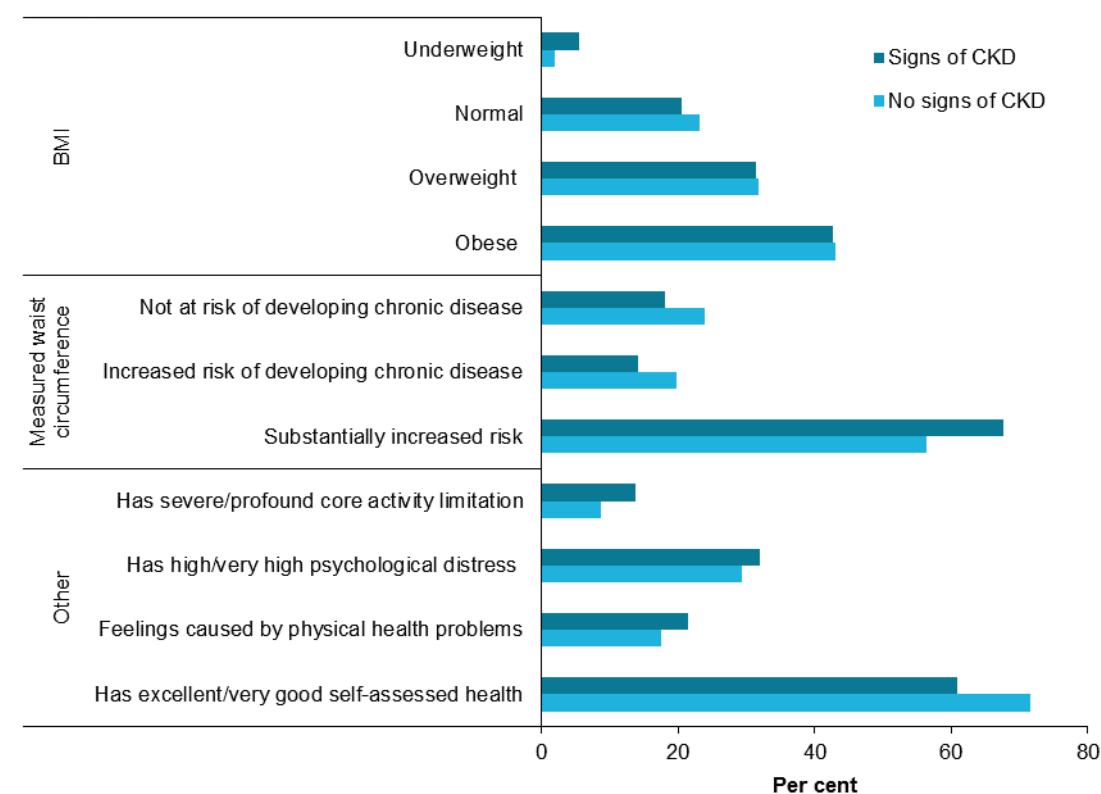
Note: Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 75+.

Source: AIHW analysis of NATSIHS 2012–13 Detailed Condition File (ABS 2015a).

3.3 Risk factors

In 2012–13, among Indigenous adults with biomedical signs of CKD:

- 44% had consumed alcohol at risky levels in the last 12 months according to the National Health and Medical Research Council (NHMRC) 2009 short-term/single occasion risk guidelines
- 38% were current smokers
- 35% had ever illicitly used substances for non-medical purposes
- 17% had consumed alcohol at a risky level in the last 12 months according to the NHMRC 2009 long-term/lifetime risk guidelines
- 17% had illicitly used substances for non-medical purposes in the last 12 months
- 47% met NHMRC 2013 guidelines for daily fruit or vegetable intakes
- 53% participated in sufficient physical activity in the previous week (Table S3.3).

Figure 3.3: Selected health risk factors among Indigenous people with and without CKD, aged 18 and over, 2012–13

Note: Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 75+.
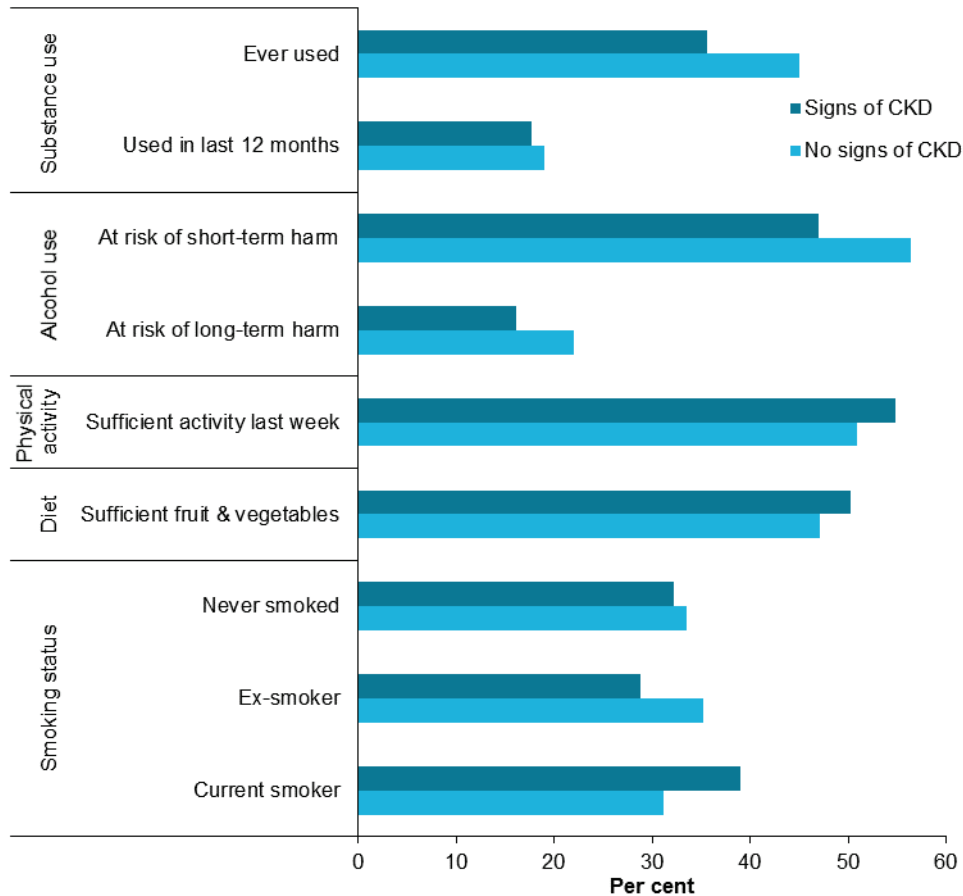
Source: AIHW analysis of NATSIHS 2012–13 Detailed Condition File (ABS 2015a).

After adjusting for age, Indigenous adults with CKD, compared with those without, were:

- less likely to have consumed alcohol in the last 12 months at a level risking short-term harm, based on NHMRC 2009 guidelines
- less likely to have ever used substances for non-medical purposes (Figure 3.3).

3.4 Cultural factors, stress and trauma

In 2012–13, among Indigenous adults with biomedical signs of CKD:

- 84% were very satisfied, satisfied or neutral with their own knowledge of culture
- 84% recognised an area as their homeland
- 34% were living on homelands
- 75% identified with a clan/tribal/language group
- 25% spoke an Australian Indigenous language as the main language at home
- 19% reported they had felt discriminated against in the last 12 months
- 14% had ever been removed from family (Supplementary Table 3.4).

After accounting for differences in age, Indigenous adults with CKD were more likely than those without CKD to:

- speak an Australian Indigenous language as the main language at home (25% compared with 7.1%)

- identify with clan/tribal/language group (74% compared with 58%)

- live on homelands (37% compared with 25%)

- report being very satisfied/satisfied/neutral with their own knowledge of culture (85% compared with 70%) (Figure 3.4).

Figure 3.4: Selected cultural factors, stress and trauma among Indigenous people with and without CKD, aged 18 and over, 2012–13
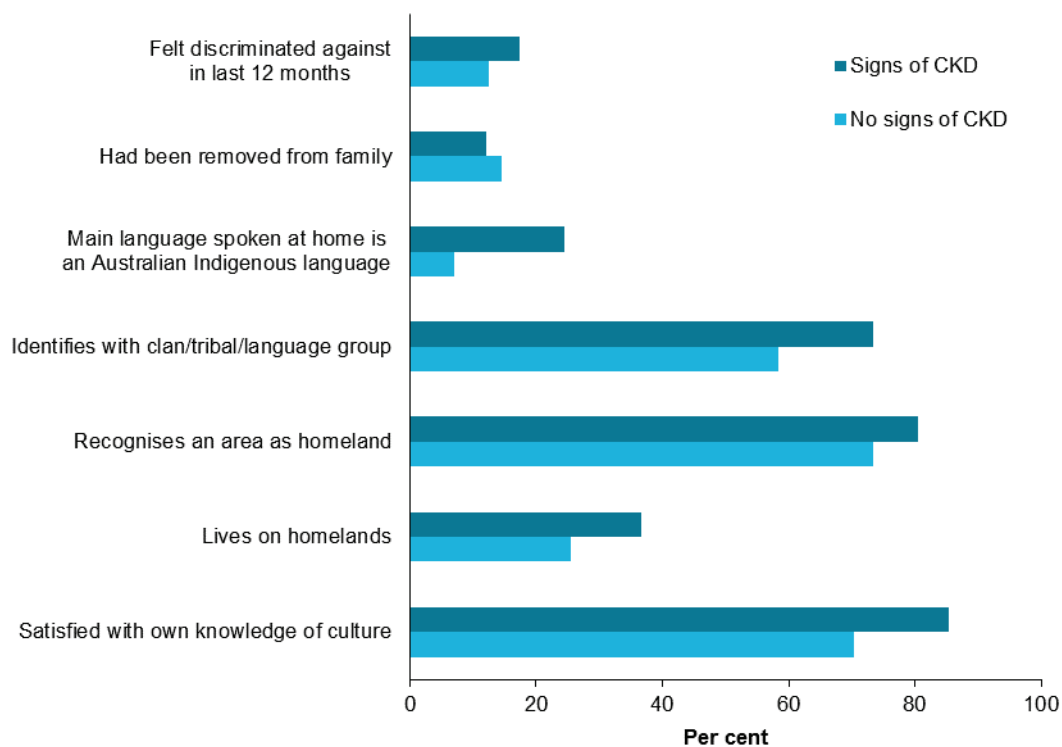
Note: Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 75+.

Source: AIHW analysis of NATSIHS 2012–13 Detailed Condition File (ABS 2015a).

3.5 Health service use

In 2012–13, among Indigenous adults with biomedical signs of CKD:

- 1 in 4 (25%) had been hospitalised in the previous 12 months

- around 1 in 10 (11%) had been admitted to hospital 2 or more times in the previous 12 months

- more than 1 in 12 (7.9%) had visited emergency or outpatient departments in the 2 weeks preceding the survey interview

- almost 1 in 4 (23%) had accessed health services for a mental health condition during their lifetime

- around 1 in 20 (5.3%) reported that they avoided seeking health care because they had been treated unfairly in the past (Supplementary Table 3.5).

When seeking health care, Indigenous adults with CKD preferred to go to a doctor/GP (35%) or Aboriginal Medical Service (28%). Among those who said they preferred a doctor/GP, 1 in 3 (32%) would prefer this was an Aboriginal Medical Service doctor.

After adjusting for age, Indigenous adults with CKD were:

- more likely than those without CKD to prefer attending an Aboriginal Medical Service (28% compared with 20%) or community clinic/other service (25% compared with 11%) for their health care
- less likely than those without CKD to usually attend a doctor/GP for their health care (32% compared with 63%)
- more likely than those without CKD to have been hospitalised 2 or more times in the previous 12 months (12% compared with 6.2%)
- less likely than those without CKD to have ever accessed services for a mental health condition (21% compared with 32%) (Figure 3.5).

Note that data on mental health service use does not necessarily reflect the prevalence of mental health conditions among Indigenous adults with and without CKD. As shown in Section 3.2, the age-adjusted prevalence of high psychological distress was similar among Indigenous adults with and without CKD.

Figure 3.5: Health service use among Indigenous people with and without CKD, aged 18 and over, 2012–13
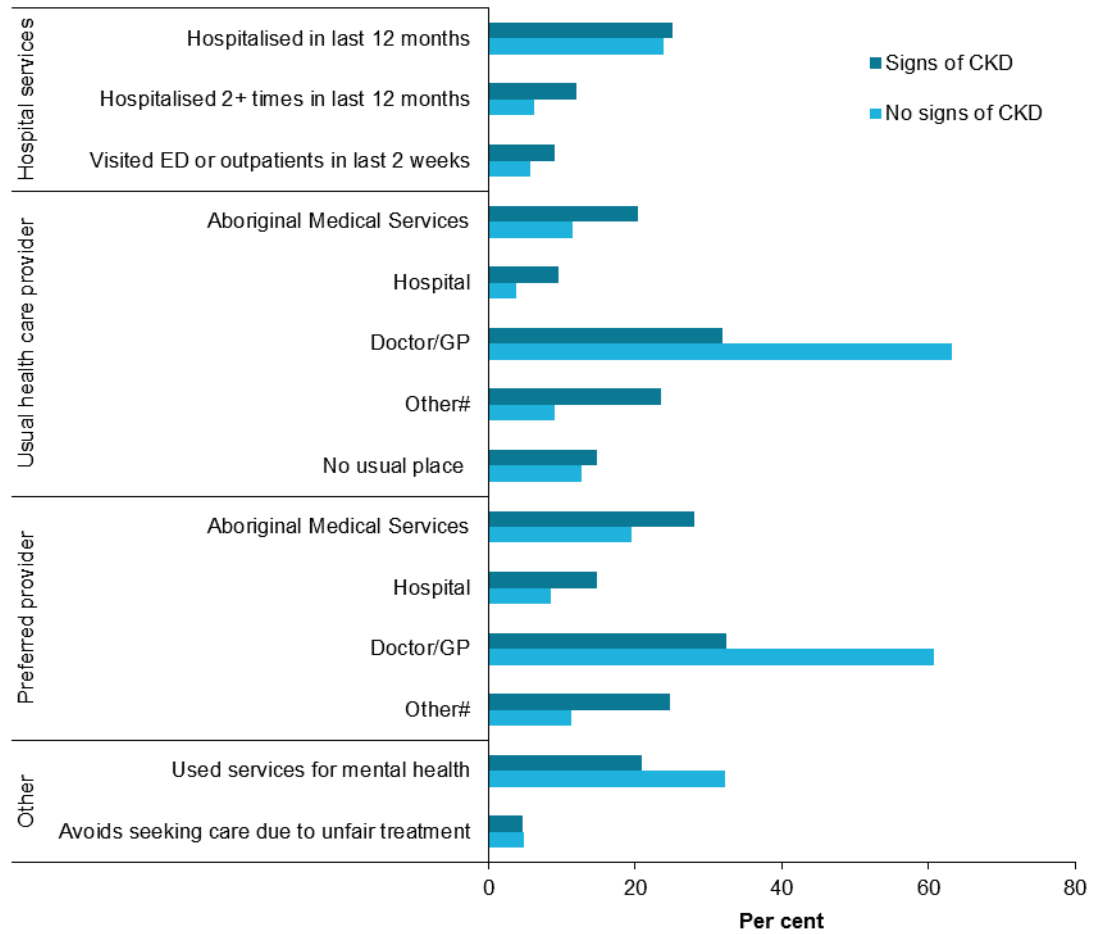
'Other' includes community clinics and other types of services.

Note: Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 75+.

Source: AIHW analysis of NATSIHS 2012–13 Detailed Condition File (ABS 2015a).

4 Comorbidity profile

Many chronic kidney disease patients may have 1 or more other diseases or chronic conditions (comorbidities) alongside the kidney disease. Diabetes, hypertension, cardiovascular disease (CVD), and certain connective tissue disorders are more common in people with CKD than in individuals who do not have CKD; the prevalence of these comorbidities increases as CKD progresses into higher stages (USRDS 2009). Diseases may co-occur with CKD because a condition is itself a risk factor for CKD, or because CKD shares risk factors with these other conditions (Thomas et al. 2008).

This chapter uses information from the 2012–13 NATSIHS to examine the prevalence of 2 groups of health conditions among Indigenous adults with and without biomedical signs of CKD:

- conditions that are directly associated with an increased risk of CKD (cardiovascular disease, hypertension, and diabetes)
- other conditions that are common among Indigenous Australians (arthritis and gout, high cholesterol, eye disease and ear disease).

Although certain types of inflammatory arthritis (such as rheumatoid arthritis) and gout are associated with CKD, the small number of cases did not allow these conditions to be analysed separately from other types of arthritis. These conditions have therefore been included in the second group above.

All comparisons have been adjusted for differences in age distribution between people with and without CKD, as many chronic conditions become more common with age. Comparisons are also broken down by sex and remoteness of usual residence.

More information on how conditions are defined is provided in Appendix A.

## 4.1 Selected comorbidities in summary

A large proportion of the Indigenous adults with biomedical signs of CKD in 2012–13 also had another chronic condition or disease. The most commonly reported comorbidities were eye disease (71%) and diabetes (44%) (AIHW 2015a). Cardiovascular disease was also reported by 2 in 5 (39%) Indigenous adults with CKD, arthritis by around 1 in 3 (32%), and some kind of ear disease by 1 in 4 (25%) (AIHW 2015a).

Age-standardised comparison

After adjusting for differences in age between Indigenous adults with and without CKD, those with CKD were more likely to have:

- diabetes (36%, compared with 12%)
- cardiovascular disease (35%, compared with 24%)
- high cholesterol (7.0%, compared with 3.6%) (Figure 4.1).

Figure 4.1: Prevalence of selected health conditions among Indigenous people with and without CKD, aged 18 and over, 2012–13
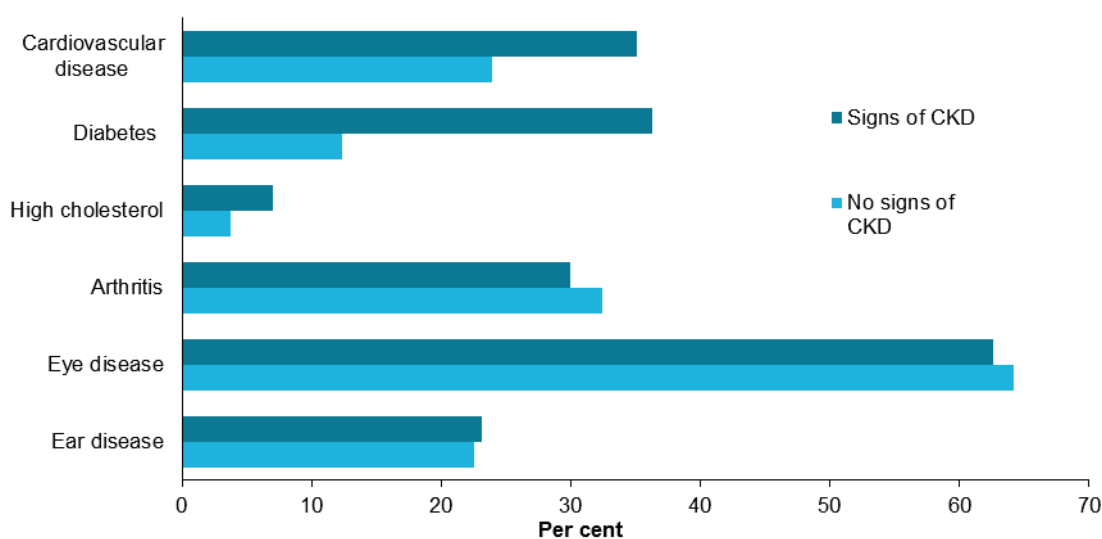
Notes

1. Prevalence of cardiovascular disease, high cholesterol, arthropathy, eye disease, and ear disease were generated using self-reported data only for people who participated in the biomedical component of the 2012–13 AATSIHS. Prevalence of diabetes was derived using a combination of blood test results and self-reported information on diabetes diagnosis and medication use. See further details in Appendix A.

2. Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 75+.

Source: AIHW analysis of NATSIHS 2012–13 Detailed Condition File (ABS 2015a).

4.2 Cardiovascular disease

The results for overall cardiovascular disease in this section are based on self-reported information from survey respondents about various cardiovascular conditions, including hypertension. This differs from the results for hypertension alone, which are based on a combination of self-reported information and measured blood pressure results. This difference can lead to estimates of the prevalence of hypertension in some sub-groups being higher than the prevalence of overall cardiovascular disease.

Due to these different definitions, the prevalence of hypertension and of overall cardiovascular disease in the following sub-sections should not be compared.

Overall cardiovascular disease

In 2012–13, 39% of Indigenous adults with biomedical signs of CKD also self-reported having CVD (Supplementary Table 4.1). After accounting for differences in age between Indigenous adults with and without CKD, those with CKD were more likely than those without to report having CVD (35% compared with 24%). When disaggregated by sex, this difference remained for males (36% compared with 17%), but the prevalence of CVD among females was similar for those with and without CKD (Figure 4.2).

The prevalence of CVD generally increased with age for both those with CKD and those without. The proportion who had CVD was significantly higher among those with CKD up to age 50, but was similar among those at older ages (Supplementary Table 4.1).

Figure 4.2: Prevalence of self-reported cardiovascular disease among Indigenous people with and without CKD, aged 18 and over, by sex and remoteness, 2012–13
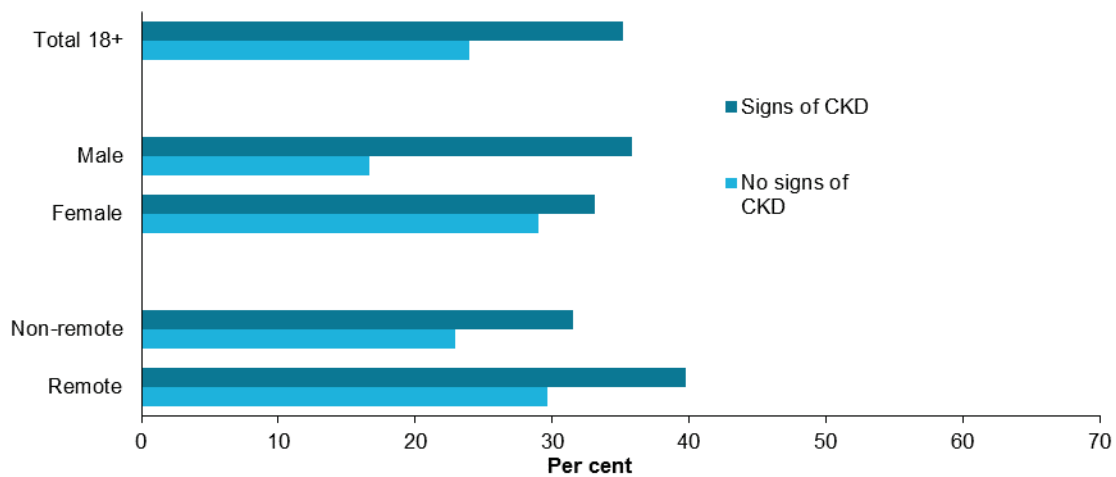
Notes

1. Prevalence of CVD was generated using self-reported data only for people who participated in the biomedical component of the 2012–13 AATSIHS. See further details in Appendix A.

2. Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 75+.
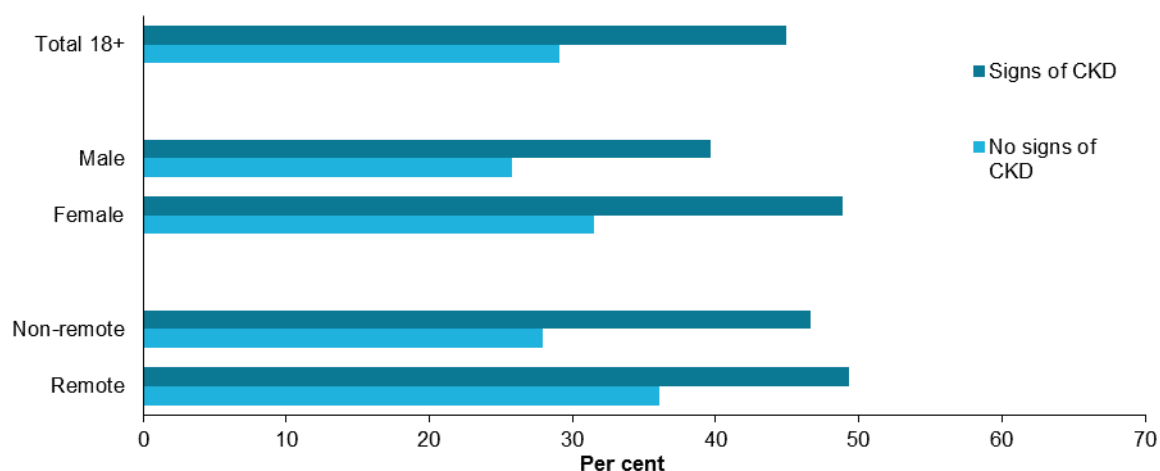
Source: AIHW analysis of NATSIHS 2012–13 Detailed Condition File (ABS 2015a).

Hypertension

In 2012–13, 50% of Indigenous adults with CKD also had hypertension, when looking at combined measured high blood pressure and self-reported responses. After adjusting for age, Indigenous adults with CKD were more likely than those without CKD to have hypertension (45% compared with 29%). This difference was apparent in both sexes and among people living in remote and non-remote areas (Figure 4.3).

The prevalence of hypertension generally increased with age, and was greater for Indigenous adults with CKD compared with those without CKD in all age groups under 65 (Supplementary Table 4.2).

Figure 4.3: Prevalence of hypertension among Indigenous people with and without CKD, aged 18 and over, by sex and remoteness, 2012–13
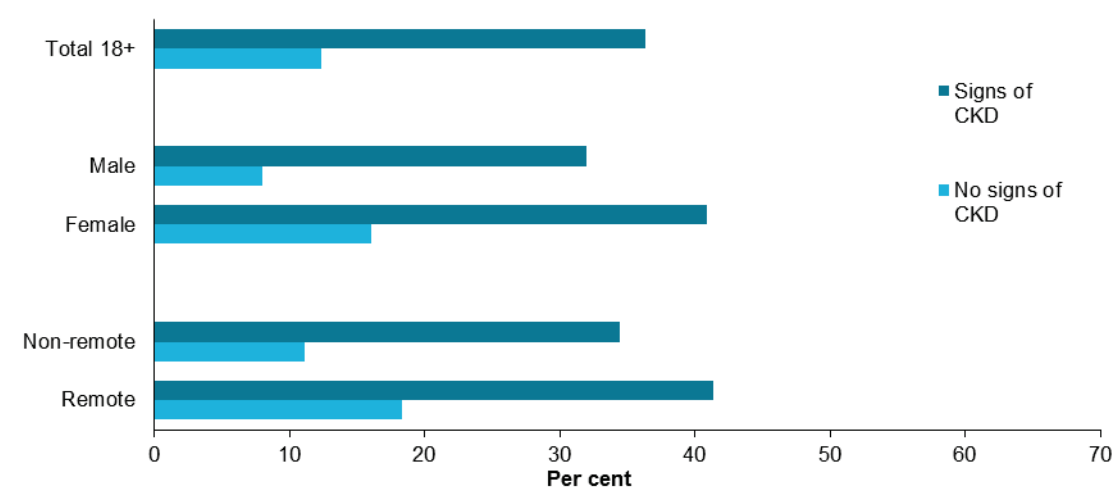
4.3 Diabetes

Data on the prevalence of diabetes are based on a combination of blood test results and self-reported information on diagnosis and medication use among Indigenous adults who participated in the biomedical component of the 2012–13 AATSIHS. See further details in Appendix A.

In 2012–13, 44% of Indigenous adults with biomedical signs of CKD also had diabetes. After adjusting for age, Indigenous adults with CKD were 3 times as likely as those without CKD to have diabetes (36% compared with 12%). The considerable difference in diabetes prevalence between those with and without CKD was observed in both males and females, and among people living in remote and non-remote areas (Figure 4.4).

Figure 4.4: Prevalence of diabetes among Indigenous people with and without CKD, aged 18 and over, by sex and remoteness, 2012–13

Notes

1. Diabetes prevalence was derived using a combination of blood test results and self-reported information on diabetes diagnosis and medication use. See further details in Appendix A.

2. Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 75+.

Source: AIHW analysis of NATSIHS 2012–13 Detailed Condition File (ABS 2015a).

4.4 Other conditions

Arthritis and gout

In 2012–13, 32% of Indigenous adults with biomedical signs of CKD also reported having gout or any form of arthritis, based on diagnosis from a health provider, or experience of joint pain and reduced function. After adjusting for age, the prevalence of arthritis and/or gout among those with and without CKD was similar overall (30% compared with 32%) and among males, but was lower among females with CKD compared with females without CKD (28% compared with 36%) (Supplementary Table 4.3).

High cholesterol

In 2012–13, 7.7% of Indigenous adults with biomedical signs of CKD also reported having high cholesterol. After adjusting for age, Indigenous adults with CKD were more likely than those without CKD to have high cholesterol (7% compared with 4%) (Supplementary Table 4.3).

Eye disease

Overall eye disease

In 2012–13, 71% of Indigenous adults with biomedical signs of CKD also reported having an eye condition. This includes short- and long-sightedness, as well as specific eye disorders such as glaucoma. After adjusting for age, the prevalence of eye conditions overall was similar for Indigenous adults with and without CKD (63% compared with 64%) (Supplementary Table 4.3).

Specific eye disorders

In 2012–13, 7.9% of Indigenous adults with CKD reported having either cataract, glaucoma or other disorders of the choroid and retina. After adjusting for age, the prevalence of these conditions was similar in people with and without CKD (6.8% compared with 4.7%) (Supplementary Table 4.3).

Ear disease

Overall ear disease

In 2012–13, 25% of Indigenous adults with biomedical signs of CKD also reported having an ear condition. This includes people with partial or complete hearing loss as well as those with specific conditions such as chronic otitis media. After adjusting for age, the prevalence of ear conditions was similar in Indigenous adults with and without CKD (23% compared with 22%) (Supplementary Table 4.3).

Hearing loss

In 2012–13, 22% of Indigenous adults with CKD reported having hearing loss. Hearing loss was the major contributor to overall ear disease, reported by more than 80% of those who reported having ear disease. The prevalence of hearing loss generally increased with age.

After adjusting for age, the prevalence of hearing loss was similar in Indigenous adults with and without CKD (21% compared with 20%) (Supplementary Table 4.3).

5 Hospitalisations for chronic kidney disease

This chapter presents data on hospital separations for Indigenous Australians with kidney disease in the 2-year period, July 2015 to June 2017, from the National Hospital Morbidity Database (NHMD) (more information on data sources is available in Appendix C).

Admitted patients of all ages are captured in the NHMD, and results in this chapter are presented for all patients, including both adults and children. For this reason, the prevalence of CKD, specific comorbidities, or characteristics of hospitalised patients with CKD will not be comparable with any equivalent measures derived in the previous chapters (which were for adults only).

Two types of hospitalisation data for kidney disease are presented in this chapter:

- hospitalisation for kidney dialysis
- hospitalisations where the principal diagnosis is chronic kidney disease, but excluding dialysis.

Hospitalisations for dialysis are analysed separately because of large numbers as a result of the frequency of dialysis treatment (generally 3 times per week, or around 150 events per person each year). The NHMD treats each dialysis event as a distinct hospital separation. The Australian modification of international classification of diseases (ICD-10-AM) codes used to identify hospital separations for chronic kidney disease are listed in Appendix C, Table C1.

The high rate of kidney disease-related hospitalisations among Indigenous Australians reflects the high prevalence of kidney disease, and the high cost and burden of disease imposed by CKD on Indigenous Australians.

5.1 Hospitalisations for chronic kidney disease (excluding dialysis)

In the 2-year period from July 2015 to June 2017 there were 5,998 separations of Indigenous Australians where CKD (excluding dialysis) was the principal diagnosis, corresponding to an annual crude rate of 4.0 hospitalisations per 1,000 population. After adjusting for age, Indigenous Australians were 3.4 times as likely as non-Indigenous Australians to be hospitalised for CKD (excluding dialysis) (5.6 and 1.6 per 1,000 population, respectively).

Sex and age

The rate of CKD hospitalisation among Indigenous Australians generally increased with age, for both males and females, from age 15 and over, but peaked in those aged 55–59. Females were more likely than males to be hospitalised for CKD (excluding dialysis). When comparing by sex and age group, the rate of hospitalisation was consistently higher among females aged 15 and over, while the rate among males was slightly higher among those aged 0–4, 5–9 and 10–14 (Figure 5.1 and Supplementary Table 5.1).

After adjusting for age, the rate of hospitalisation for CKD (excluding dialysis) among Indigenous females was 1.7 times that for Indigenous males (7.0 and 4.1 per 1,000 population, respectively). Indigenous females were 4 times as likely to be hospitalised as

non-Indigenous females, while Indigenous males were 2.5 times as likely to be hospitalised as non-Indigenous males.

Figure 5.1: Hospitalisations of Indigenous Australians for CKD, by age, July 2015 to June 2017 (crude rate per 1,000 population)
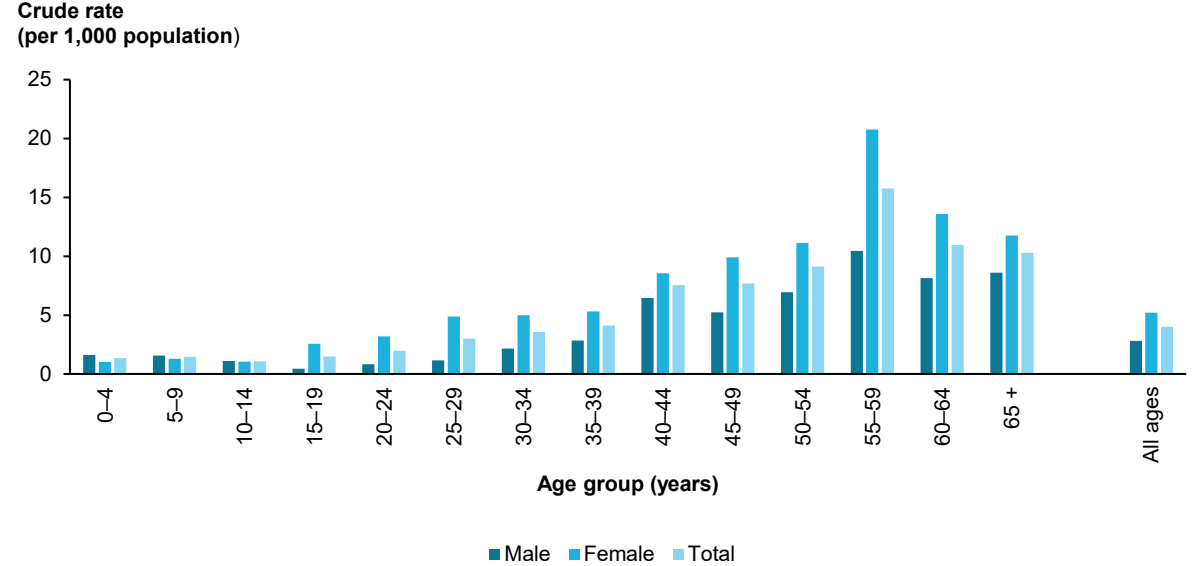
Crude rate
(per 1,000 population)

Age group (years)

■ Male ■ Female ■ Total

Note: Rates per 1,000 based on a period average reference population derived from the ABS Indigenous population projections, for June 2015, 2016 and 2017, derived from 2011 Census (ABS 2014b).

Source: AIHW analysis of National Hospital Morbidity Database 2015–16 and 2016–17.

# 5.2 Hospitalisations for dialysis

In the 2-year period July 2015 to June 2017, there were almost 461,000 hospital separations of Indigenous Australians where dialysis was the principal diagnosis—corresponding to an annual crude rate of 309 hospitalisations per 1,000 population. After adjusting for age, the dialysis hospitalisation rate among Indigenous Australians was 12 times that among non-Indigenous Australians.

Sex and age

Dialysis hospitalisation rates for Indigenous Australians increased with age for both males and females. Rates among Indigenous males were highest among those aged 65 and over (1,255 per 1,000) and among those aged 60–64 for females (2,224 per 1,000) (Supplementary Table 5.1).

After adjusting for age, the rate of hospitalisation for dialysis was greater among Indigenous females than males (601 and 466 per 1,000, respectively). Rates were consistently higher for females aged 35 and over (Figure 5.2).

Figure 5.2: Hospitalisations of Indigenous Australians for dialysis, by age, July 2015 to June 2017 (crude rate per 1,000 population)
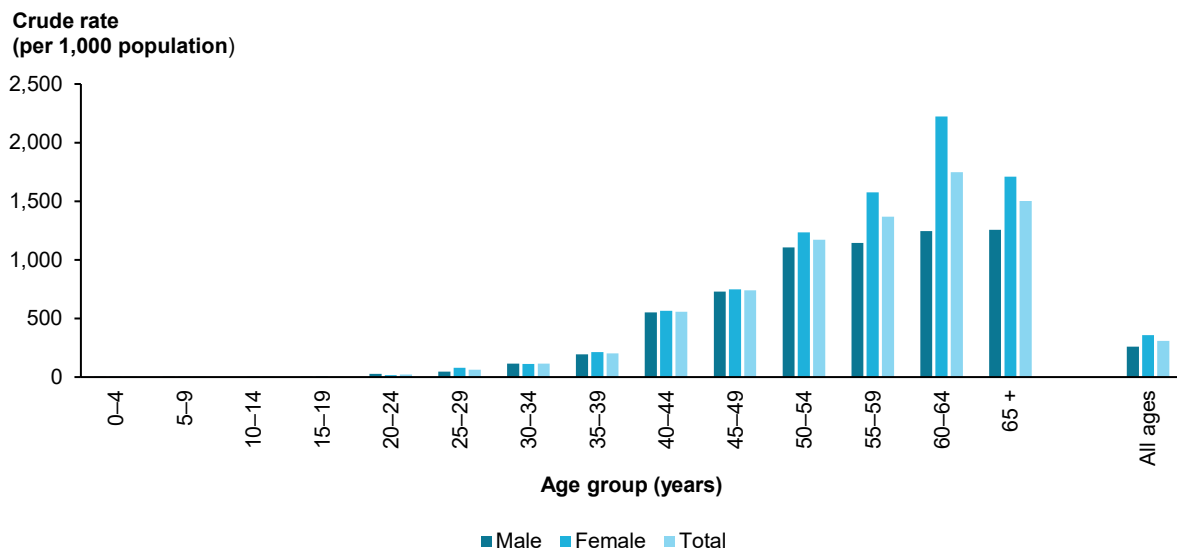
Note: Rates per 1,000 based on a period average reference population derived from the ABS Indigenous population projections, for June 2015, 2016 and 2017, derived from 2011 Census (ABS 2014b).

Source: AIHW analysis of National Hospital Morbidity Database 2015–16 and 2016–17.(Supplementary Table 5.1)

5.3 Hospitalisations for kidney disease by Indigenous Regions

This section maps CKD-related hospitalisations for Indigenous Australians by Indigenous Regions (IREG) geography. Maps are presented for the total number of hospitalisations for July 2015 to June 2017, as well as for the annual rate of hospitalisations per 1,000 population for other CKD episodes (excluding dialysis) and for dialysis episodes. The analyses are based on the patient's area of usual residence, not the place in which they were hospitalised.

The IREG geography has been developed by the ABS to enable regional comparisons that better reflect the spatial distribution of the Aboriginal and Torres Strait Islander population (compared with the standard geographic classifications that reflect the distribution of the total Australian population). Indigenous Regions are large geographical units loosely based on the former Aboriginal and Torres Strait Islander Commission boundaries, and the 2016 Australian Statistical Geography Standard defines a total of 58 Indigenous Regions to cover the whole of geographic Australia (ABS 2016). For example, Apatula is a region in Central Australia inclusive of very remote communities and surrounding the major township of Alice Springs, which is the main administrative hub of renal care for people with advanced kidney disease and who require dialysis treatments (Holwell et al. 2017). More information on analysis methods by IREG are available in Appendix B.

Hospitalisations for CKD excluding dialysis

The regional pattern of CKD hospitalisations excluding dialysis (Figure 5.3) shows specific 'hot spots' in the NSW Central and North Coast and Brisbane regions, which have the highest numbers of hospitalisations (more than 700 and 400 separations, respectively). There were also relatively high numbers of hospitalisations in Cairns-Atherton and Townsville-Mackay in Queensland, Apatula in the Northern Territory, and Perth in Western Australia (200 to 400 separations).

When adjusted for age and presented as rates (hospitalisations per 1,000 population living in each IREG), the 'hot spots' shift to the remote Northern Territory—the highest hospitalisation rate occurred in the Tennant Creek IREG (more than 20 per 1,000), followed by Apatula (15–20 per 1,000) (Figure 5.4). The lowest rates were recorded over the south-east corner of Australia—all of Victoria and Tasmania, most of New South Wales—as well as the Brisbane and Adelaide IREGs (5 or fewer hospitalisations per 1,000).

Sex

Hospitalisation rates for CKD excluding dialysis were higher among Indigenous females than males in 32 of the 34 IREGs (where sex-based rates could be calculated). The 2 exceptions were North-Eastern NSW and Tasmania, where rates were similar for males and females (see Supplementary Table 5.2 for details).

The 5 highest sex-specific hospitalisation rates were all among females and occurred in Tennant Creek (32.5 per 1,000 population), West Kimberley (21.3), Apatula (21.2), Kununurra (17.1) and Nhulunbuy (15.4). The highest male hospitalisation rate occurred in Tennant Creek (14.4 per 1,000 population).

The female hospitalisation rate was more than double the male rate in 8 Indigenous Regions: Tennant Creek, Darwin, Katherine, Nhulunbuy and Alice Springs in the Northern Territory, West Kimberley in Western Australia, Cape York in Queensland, and the Central and North Coast region of New South Wales (Supplementary Table 5.2).

Figure 5.3: Number of hospitalisations of Indigenous Australians for CKD, excluding dialysis, by Indigenous Regions, July 2015 to June 2017
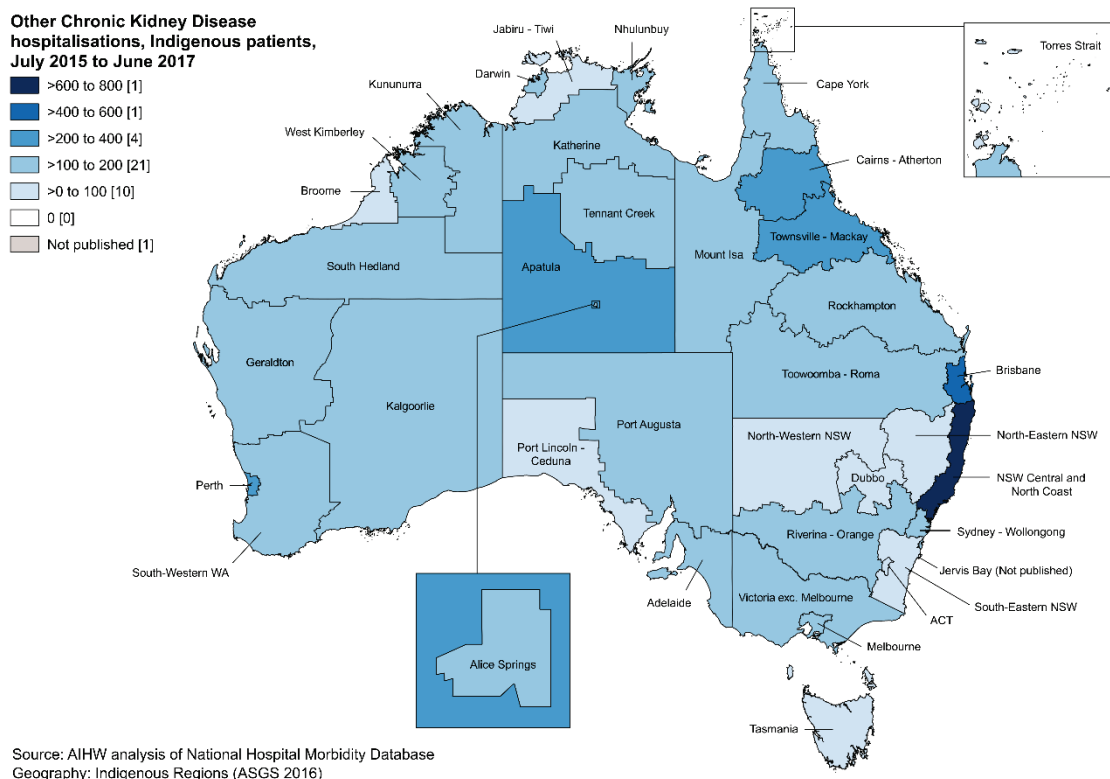

Other Chronic Kidney Disease hospitalisations, Indigenous patients, July 2015 to June 2017

- >600 to 800 [1]
- >400 to 600 [1]
- >200 to 400 [4]
- >100 to 200 [21]
- >0 to 100 [10]
- 0 [0]
- Not published [1]

Source: AIHW analysis of National Hospital Morbidity Database
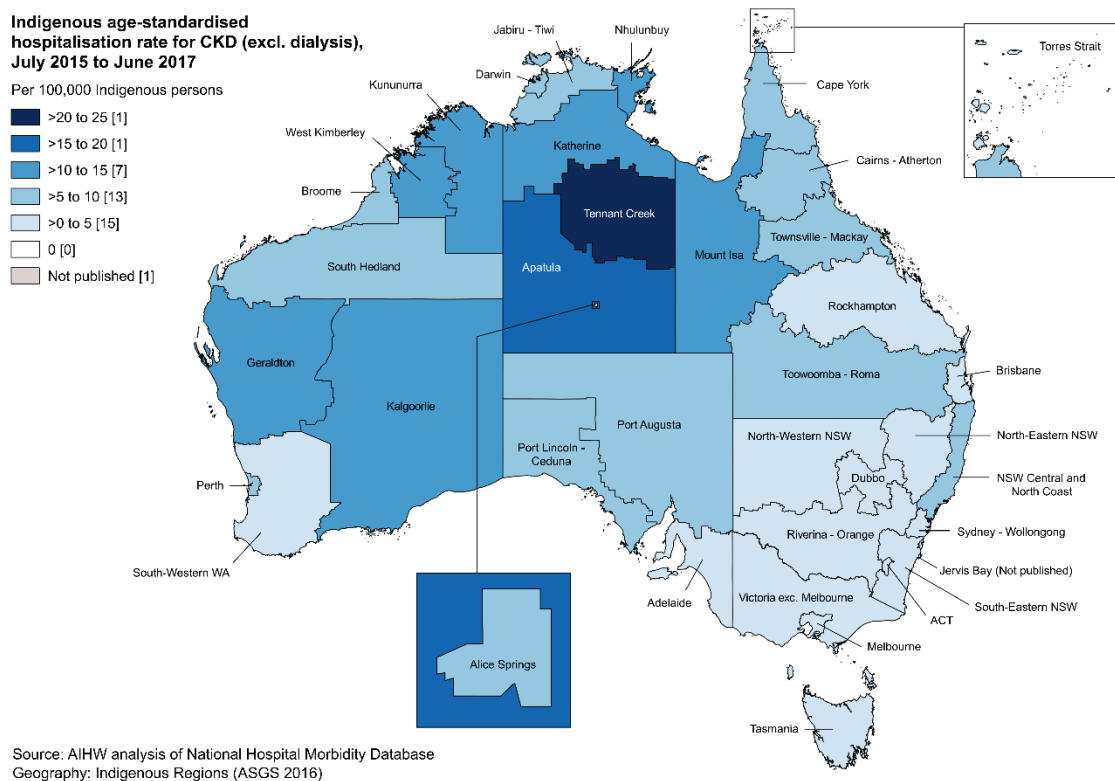Geography: Indigenous Regions (ASGS 2016)

Figure 5.4: Rate of hospitalisation for CKD, excluding dialysis, Indigenous Australians, by Indigenous Regions, July 2015 to June 2017

Source: AIHW analysis of National Hospital Morbidity Database
Geography: Indigenous Regions (ASGS 2016)

Note: Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 65+.

Hospitalisations for dialysis

During the 2-year period July 2015 to June 2017, 27 of the 37 IREGs had more than 5,000 hospital separations of Indigenous Australians for dialysis—indicating the high frequency and wide regional coverage of dialysis events for Indigenous Australians (Figure 5.5). The largest number of dialysis hospitalisations were reported for the residents of 2 very different Indigenous Regions—Apatula, with around 41,750 hospitalisation episodes, and Perth, with around 30,560 episodes. There was also a relatively higher number of dialysis hospitalisations for Indigenous Australians (between 30,000 and 40,000 episodes in the 2-year period) in Townsville-Mackay and Cairns-Atherton, and Darwin and Tennant Creek. The 10 IREGs with the lowest numbers of dialysis hospitalisations (fewer than 5,000 in this period) included low-population urban regions (Australian Capital Territory), low-population remote areas (Port Lincoln-Ceduna and Cape York) and relatively high-population regional areas (Dubbo and Toowoomba-Roma).

When mapping the annual rate (per 1,000 population) of dialysis hospitalisations among Indigenous Australians, 'hot spots' occurred in remote areas of the Northern Territory and Western Australia (Figure 5.6). The highest rates were recorded in Tennant Creek and Apatula (more than 3,000 per 1,000), and in 3 regions in Western Australia: Kalgoorlie, Broome, and West Kimberley (between 1,500 and 2,500 per 1,000).

Sex

After adjusting for age, dialysis hospitalisation rates were higher among Indigenous females than males in 22 of the 37 IREGs (Supplementary Table 5.2). In regions where overall dialysis hospitalisation rates were high, such as in the Northern Territory (all 7 regions) and Western Australia (5 of 8 regions), female rates were generally higher than for males. In regions where dialysis hospitalisation rates were relatively low, such as in New South Wales (6 of 7 regions) and Queensland (6 of 8), female rates tended to be similar to, or less than, the rates among males.

The largest relative difference between female and male rates occurred in the Darwin Indigenous Region, where the rate for females was more than 3 times that for males (1,381 and 429 per 1,000 population, respectively). The female rate was more than double the male rate in Alice Springs and Katherine, in Broome, and in Melbourne Indigenous regions.

The variation across IREGs in relation to total counts of hospitalisations for kidney dialysis and derived rates are sensitive to the availability and accessibility of alternative sources of dialysis treatment outside a public or private hospital, which are not covered by the NHMD collection. Therefore the differences observed in the maps in figures 5.5 and 5.6 may not reflect the underlying variation in the extent of CKD and the specific need for dialysis services for Indigenous Australians across these regions. Chapter 6 of this report provides analysis of dialysis rates that include those people receiving treatment in non-hospital settings.

Figure 5.5: Number of hospitalisations of Indigenous Australians for kidney dialysis, by Indigenous regions, July 2015 to June 2017
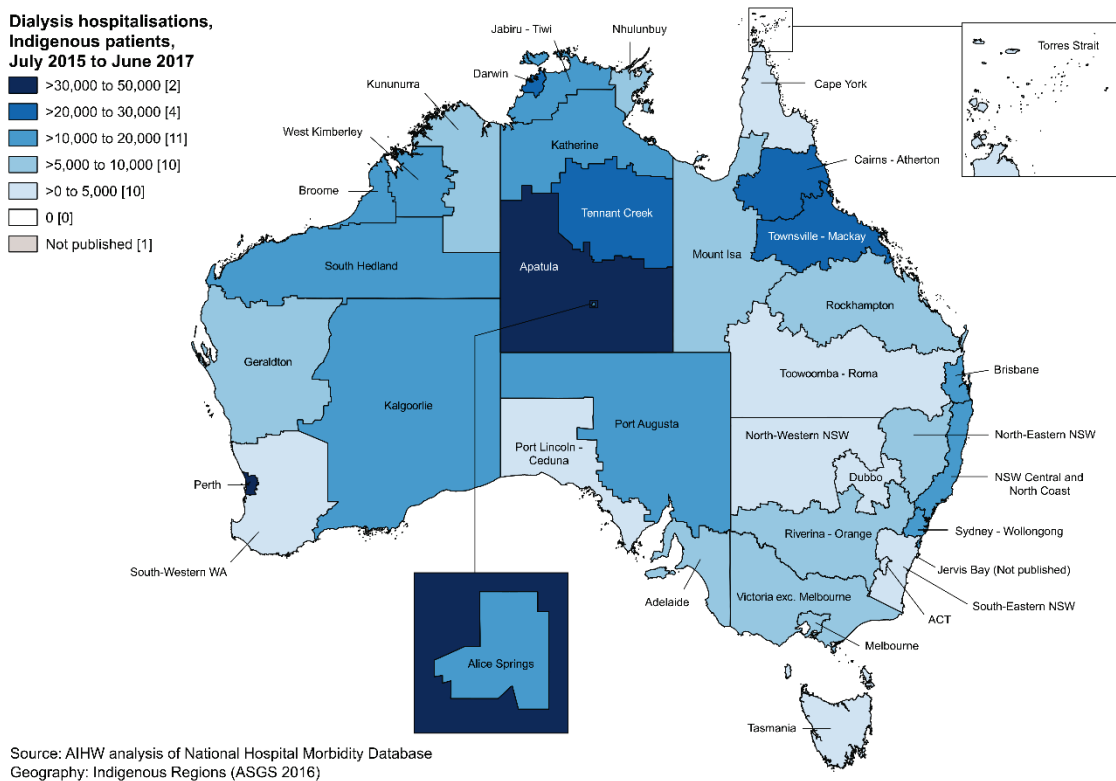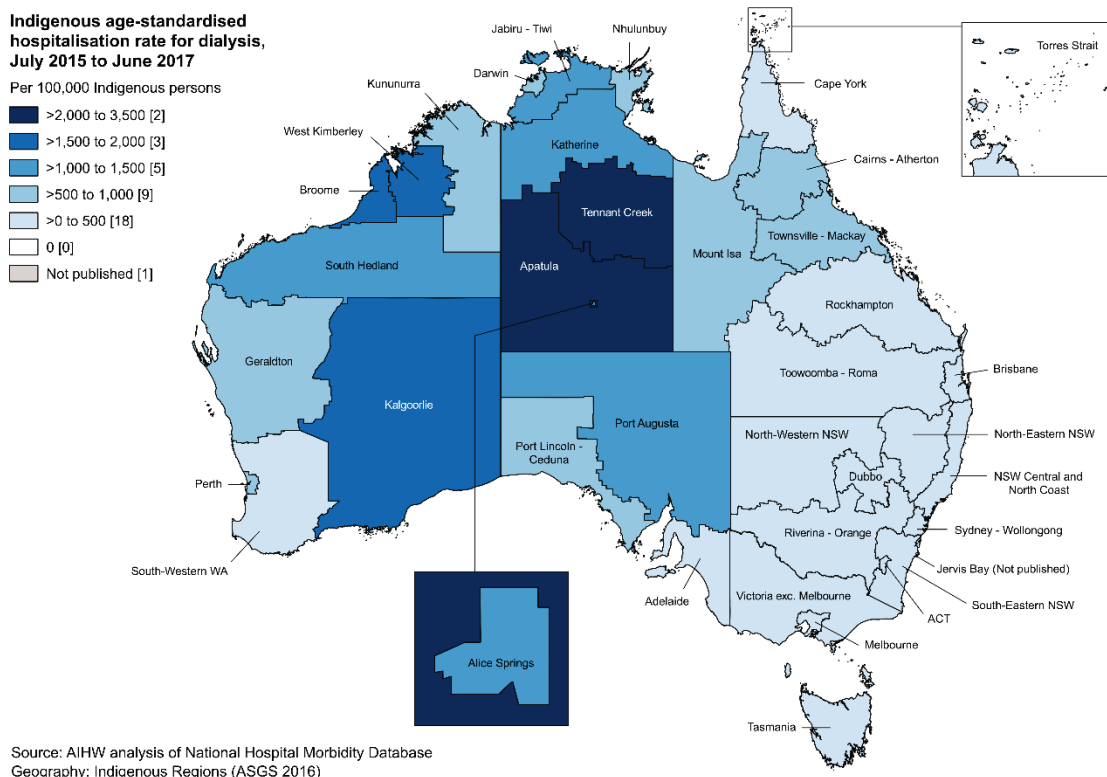

Source: AIHW analysis of National Hospital Morbidity Database
Geography: Indigenous Regions (ASGS 2016)

Figure 5.6: Rate of hospitalisation for kidney dialysis, Indigenous Australians, by Indigenous Regions, July 2015 to June 2017

Indigenous age-standardised hospitalisation rate for dialysis, July 2015 to June 2017

Per 100,000 Indigenous persons

- >2,000 to 3,500 [2]
- >1,500 to 2,000 [3]
- >1,000 to 1,500 [5]
- >500 to 1,000 [9]
- >0 to 500 [18]
- 0 [0]
- Not published [1]

Source: AIHW analysis of National Hospital Morbidity Database
Geography: Indigenous Regions (ASGS 2016)

Note: Data have been directly age-standardised to the Australian 2001 standard population, by 5-year age group to 65+.

6 End-stage kidney disease

End-stage kidney disease (ESKD) is the most severe form of chronic kidney disease. People with ESKD often require a kidney transplant or dialysis to survive. Information on all people with treated ESKD is available from the Australia and New Zealand Dialysis and Transplant Registry (ANZDATA, <https://www.anzdata.org.au/anzdata/>). This is a register of all patients receiving kidney replacement therapy where the intention to treat is long-term, and the treatment type is distinguished mainly by dialysis or transplant. Information on dialysis and transplant treatments are collected from all renal units in Australia and New Zealand. ANZDATA also records individuals who received kidney transplant treatment overseas, but such individuals are not usually included in the standard reporting on the prevalence and incidence of ESKD in Australia (AIHW 2015a).

The ANZDATA registry is updated every calendar year and the analysis in this chapter is based on the 2017 collection, which includes records for continuing ESKD patients who commenced dialysis in previous years. Also, the ANZDATA registry uses its own detailed classification of the racial/ethnic or country of origin background of patients. The definition adopted in this report to identify the Aboriginal and Torres Strait Islander ESKD patients, which is consistent with previous AIHW practice, is limited to the following two categories— 'Oceania–Australian Aboriginal' and 'Oceanian–Torres Strait Islander'. This may vary from the definition used in other (non-AIHW) reports.

ANZDATA has a publicly available infographic called 'Treatment of Kidney Failure of Aboriginal and Torres Strait Islander people in 2017' which summarises information about Aboriginal and Torres Strait Islander people receiving kidney replacement therapy. It can be downloaded at <https://www.anzdata.org.au/wp-content/uploads/2020/04/ ANZDATA_2017_Infographic_vMar2020.pdf>.

6.1 End-stage kidney disease prevalence and treatment

Based on ANZDATA registry data, at 31 December 2017 around 2,160 Indigenous Australians of all ages were receiving treatment for ESKD in Australia—8.8% of the total of more than 24,500 Australians receiving treatment for ESKD.

At 31 December 2017, among Indigenous Australians receiving treatment for ESKD:

- more than 4 in 5 (87%) were on dialysis, while about 1 in 10 (13%) had a kidney transplant—among non-Indigenous Australians, the distribution between dialysis and kidney transplant was roughly even. This disparity has been highlighted in multiple research studies (for example, Khanal et al. 2018) and is the subject of an expert review led by the Transplantation Society of Australia and New Zealand, which published its first report in 2019 (TSANZ 2019). The National Indigenous Kidney Transplantation Taskforce, established in 2019, is responsible for implementing and evaluating the review's priority recommendations to improve access to and outcomes from kidney transplantation among Indigenous Australians.

- 2 in 3 (66% or 1,236) of those receiving dialysis accessed treatment through satellite centre-based services. Some of these services may be co-located with hospitals, whereas others may be located in community health centres, or run as mobile services (such as the Kimberley Renal Services Mobile Dialysis Unit).

- around 1 in 5 (22%) of those receiving dialysis were being treated in a hospital
- home-based dialysis was the least common mode, accounting for 13% of persons who were using dialysis (Supplementary Table 6.1).

After adjusting for age, the rate of treatment for ESKD among Indigenous Australians was 5 times that among non-Indigenous Australians (450 and 86 per 100,000, respectively).

Age

The prevalence of ESKD treatment among Indigenous Australians increased with age, peaking among those aged 65–69 (Supplementary Table 6.2). Around 1 in 3 (34%) Indigenous ESKD patients were aged 50 or under, compared with 1 in 4 (26%) non-Indigenous ESKD patients. This reflects the early onset of CKD and progression to ESKD among the Indigenous population.

Remoteness area

The prevalence of treated ESKD for Indigenous Australians was higher among people living in non-urban areas, with the highest rate occurring in *Remote* areas (Figure 6.1). The non-Indigenous prevalence did not vary much by remoteness.

The Indigenous ESKD prevalence of treated ESKD in the combined *Very remote* and *Remote* areas (602 per 100,000 population) was 5.1 times as high as the Indigenous rate in *Major cities*.

Figure 6.1: Total patients with end-stage kidney disease per 100,000 population, by Indigenous status and remoteness area, at 31 December 2017
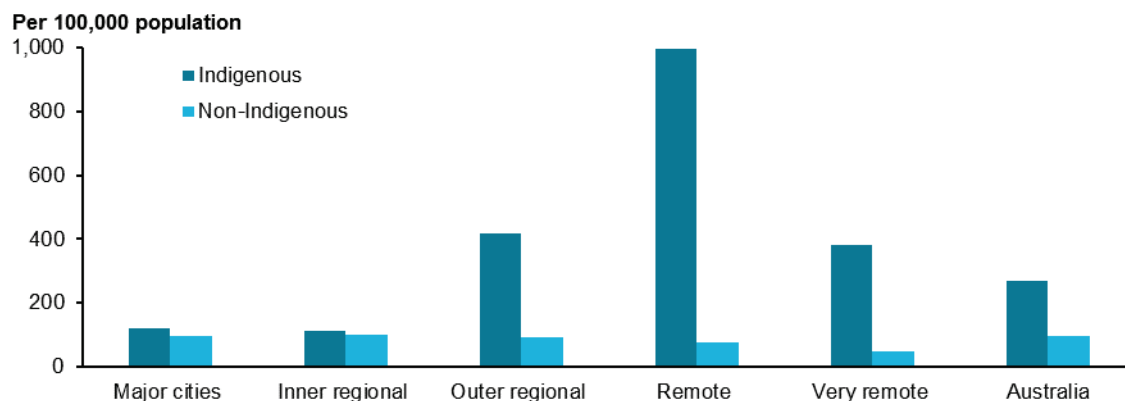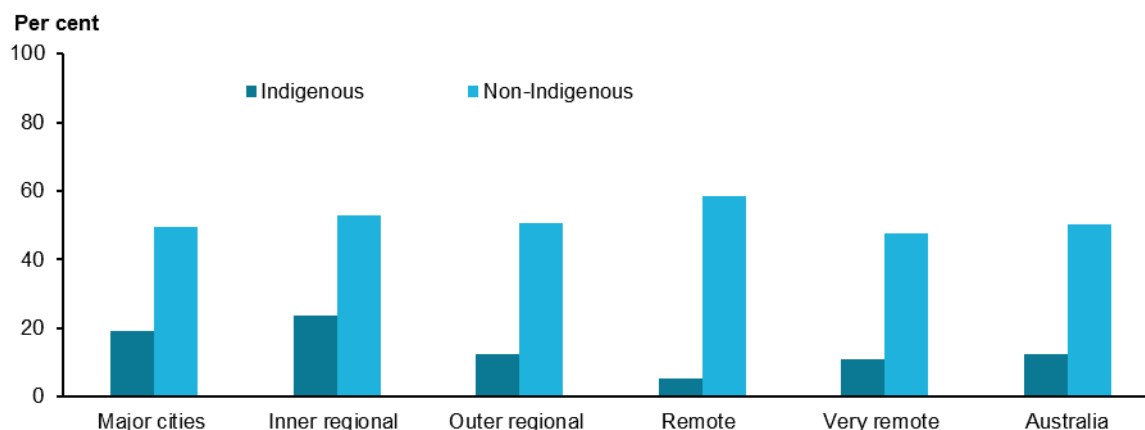

Notes

1. Rates are calculated based on 2016 estimated resident Aboriginal and Torres Strait Islander and Non-Indigenous populations by remoteness areas.
2. Rates per 100,000 population by remoteness area category are crude rates. National (Australia) rate is age-standardised and matches values in Supplementary Table 6.1

Source AIHW analysis of ANZDATA 2017 registry data.

The type of treatment for Indigenous ESKD patients also varied considerably by remoteness area (Figure 6.2). Transplant treatment was most common in *Inner regional* areas and *Major cities* (24% and 19% of all ESKD treatments, respectively), and least common in *Remote* and *Very remote* areas (5.4% and 11%, respectively). For non-Indigenous patients, the share of transplant among all those treated for ESKD varied little by remoteness, ranging from 48% (*Very remote*) and 49% (*Major cities*) to 58% (*Remote*).

Figure 6.2: Proportion of treated ESKD patients who have received a kidney transplant, by Indigenous status and remoteness, at 31 December 2017
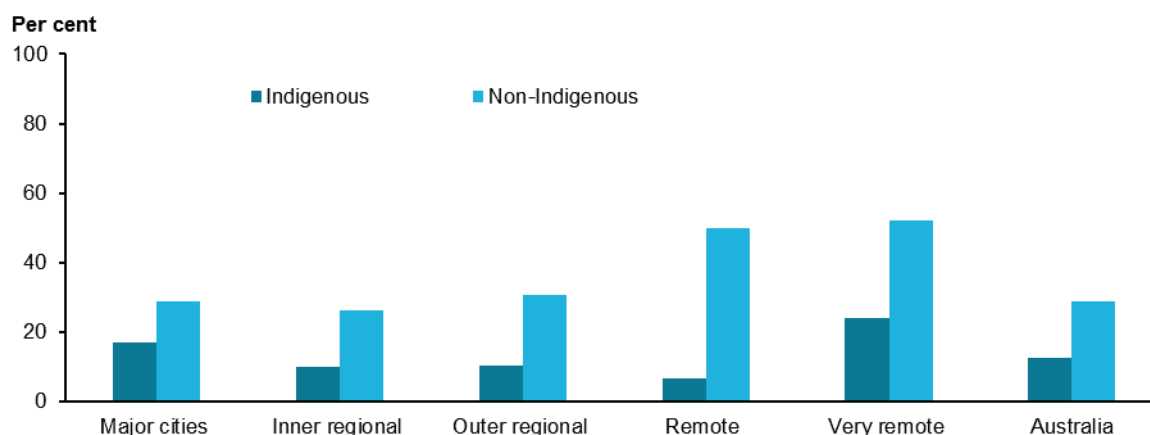
Per cent

Note: Rates are calculated based on 2016 estimated resident Aboriginal and Torres Strait Islander and Non-Indigenous populations by remoteness areas.
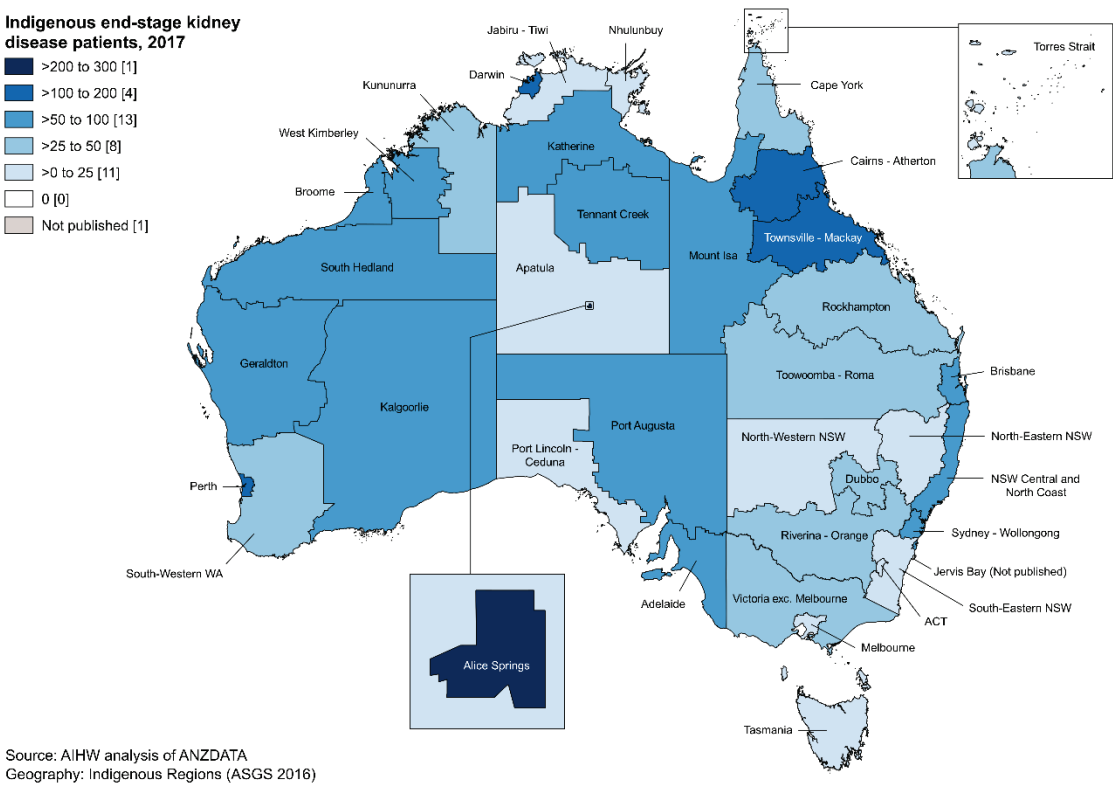
Source: AIHW analysis of ANZDATA 2017 registry data.

Location by remoteness area also affects the share of home-based dialysis among all Indigenous patients receiving dialysis treatment (Figure 6.3). *Very* remote areas had the largest proportion of patients receiving home-based dialysis (24%), followed by *Major cities* (17%)*.* In all remoteness areas, however, the proportion of patients receiving home-based dialysis was considerably lower among Indignenous compared with non-Indigenous patients.

Figure 6.3: Proportion of dialysis patients receiving home-based dialysis, by Indigenous status and remoteness, at 31 December 2017

Per cent

Note: Rates are calculated based on 2016 estimated resident Aboriginal and Torres Strait Islander and Non-Indigenous populations by remoteness areas.

Source: AIHW analysis of ANZDATA 2017 registry data.

6.2 End-stage kidney disease prevalence by Indigenous Regions

This section maps ESKD prevalence among Indigenous Australians by Indigenous Regions geography (see Appendix B for more information). The results are presented for the total counts of ESKD patients recorded for each region, in December 2017, as well as for the derived ESKD prevalence per 100,000 population.

The highest number of current Indigenous ESKD patients, in December 2017, was recorded in the Alice Springs and Darwin Indigenous regions of the Northern Territory (283 and 200 total patients, respectively). High numbers of ESKD patients were also recorded in Cairns-Atherton, Townsville-Mackay, and Perth regions (100 to 199 in each). Almost one-third (11 of 37) of IREGs had 25 or fewer ESKD patients. These regions included areas such as South-Eastern NSW and Melbourne, as well as remote areas such as Apatula and Port Lincoln-Ceduna (Figure 6.4 and Supplementary Table 6.3).

Figure 6.4: Number of Indigenous Australians being treated for end-stage kidney disease, by Indigenous Regions, at 31 December 2017

Source: AIHW analysis of ANZDATA
Geography: Indigenous Regions (ASGS 2016)

Source: AIHW analysis of ANZDATA 2017 registry data.

The highest rates (ESKD patients per 100,000 population, age-standardised) or 'hot spots', by IREG, occurred in Alice Springs (5,110 per 100,000), Tennant Creek and Darwin (1,500 to 2,500 per 100,000). Katherine, and 4 of the 8 Indigenous Regions of Western Australia, had rates between 1,000 and 1,500 per 100,000. The lowest rates of Indigenous ESKD prevalence occurred in the IREGs in the south-east corner of Australia (all of Victoria and

Tasmania, and most of New South Wales), but also in Apatula (250 or fewer persons per 100,000 population).

In all of the 17 IREGs within the 3 major jurisdictions of New South Wales, Victoria and Queensland, which have a high share of the total Indigenous population, the Indigenous ESKD prevalence was below 1,000 per 100,000, with most being below 500 per 100,000 (Figure 6.5 and Supplementary Table 6.3).

Figure 6.5: End-stage kidney disease prevalence (number per 100,000 population), Indigenous Australians, by Indigenous Regions, at 31 December 2017
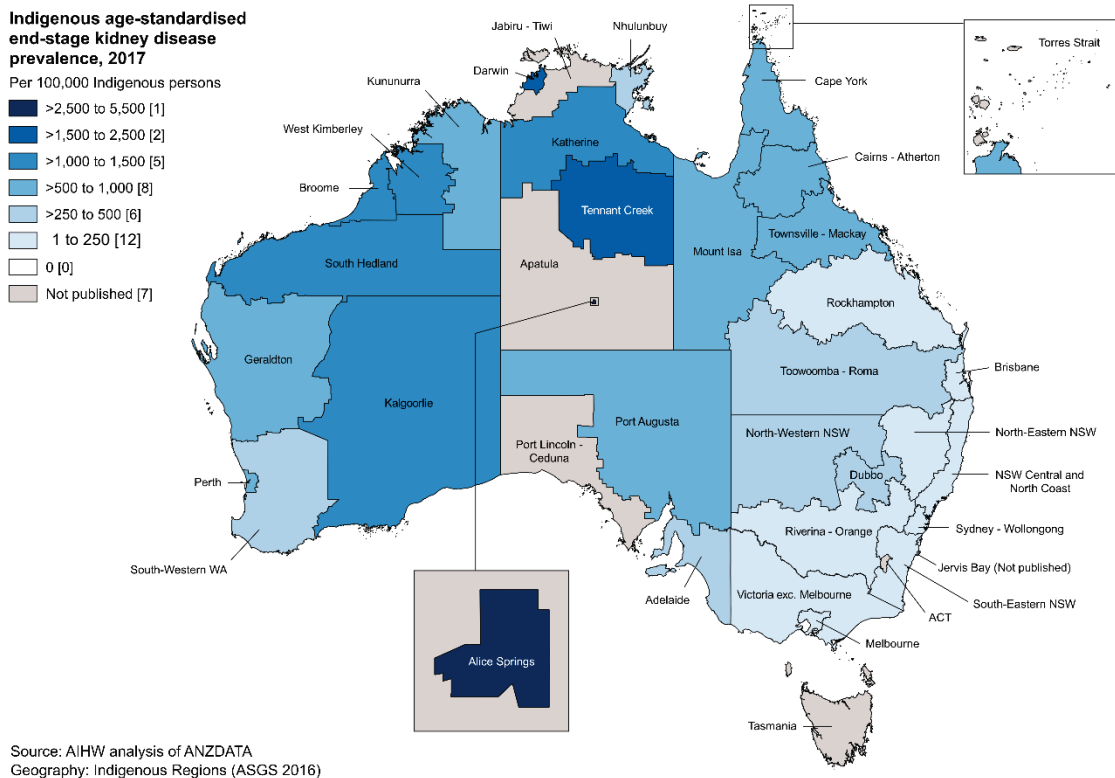
Source: AIHW analysis of ANZDATA
Geography: Indigenous Regions (ASGS 2016)

Note: Rates are calculated based on 2016 estimated resident Aboriginal and Torres Strait Islander populations by IREG, and directly age-standardised using the Australian 2001 standard population, by 5-year age group to 65+. Age-standardised rates have not been calculated where the total number of cases in a region was fewer than 20.

Source: AIHW analysis of ANZDATA 2017 registry data.

Non-Indigenous comparison

Compared with Indigenous ESKD patients, rates for non-Indigenous ESKD patients were substantially lower—after adjusting for age, 36 of the 37 IREGs had an ESKD rate of fewer than 250 per 100,000 non-Indigenous population (Figure 6.6; Supplementary Table 6.3) .

Figure 6.6: End-stage kidney disease prevalence (number per 100,000 population), non-Indigenous Australians, by Indigenous Regions, at 31 December 2017
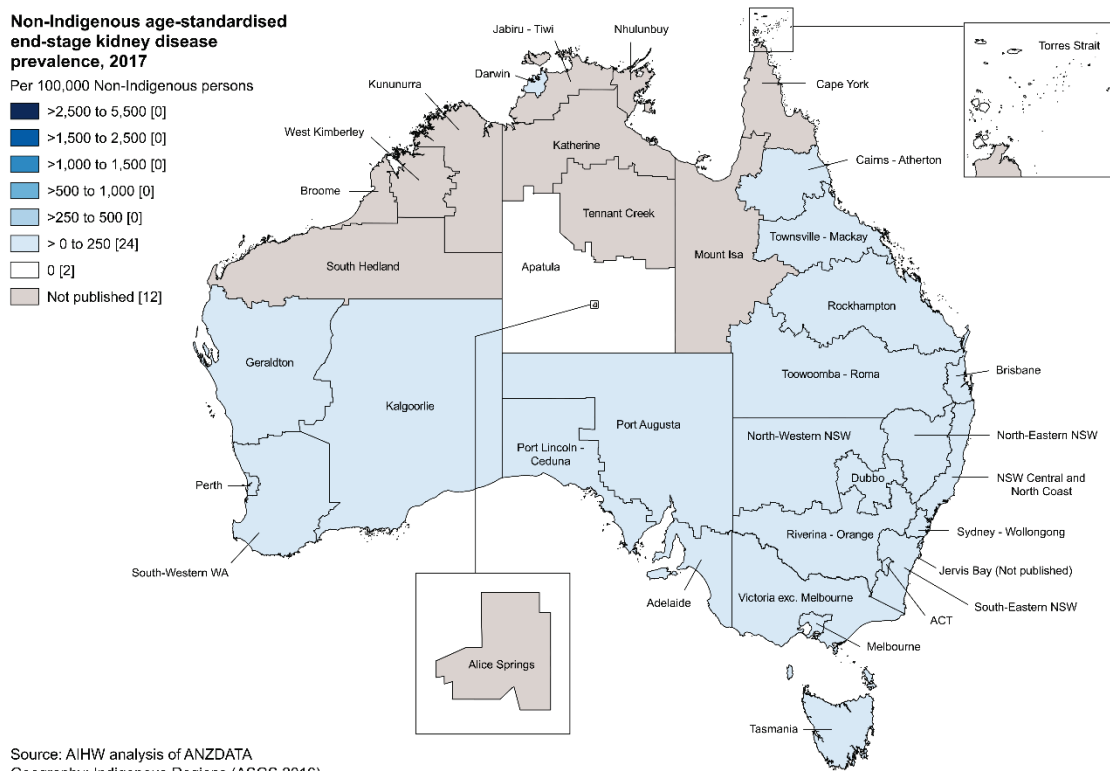
Source: AIHW analysis of ANZDATA
Geography: Indigenous Regions (ASGS 2016)

Note: Rates are calculated based on 2016 estimated resident Aboriginal and Torres Strait Islander and non-Indigenous populations by IREG, and directly age-standardised using the Australian 2001 standard population, by 5-year age group to 65+. Age-standardised rates have not been calculated where the total number of cases in a region was fewer than 20.

Source: AIHW analysis of ANZDATA 2017 registry data.

Note: *For Aboriginal and Torres Strait Islander people, the ESKD rate reported for the Alice Springs IREG is very high, more than twice that in other IREGs. Tabulations by IREG are based on the usual place of residence—it is very likely many Indigenous ESKD patients reporting Alice Springs as the usual place of residence have come from other parts of the Northern Territory, or South Australia, or Western Australia, to receive the treatment services that are not available in their more permanent place of residence. These semi-permanent movements then inflate the rate recorded for residents of Alice Springs, and lower it for the regions they have come from—such as for the surrounding region of Apatula, which has a very low rate of ESKD treatment.*

A similar explanation of semi-permanent movements of ESKD patients to receive the required renal services may also apply for the combination of a high ESKD prevalence recorded for the Darwin Indigenous Region together with substantially lower rates recorded for the neighbouring regions of Nhulunbuy and Jabiru-Tiwi.

6.3 End-stage kidney disease incidence

The ANZDATA register can also be used to track the flow of persons who begin treatment for ESKD over specific time periods (the incidence of ESKD).

In 2017, there were 352 new Indigenous ESKD patients (166 male, 86 female), compared with 240 in 2007. This increase was not consistent over time, with small decreases seen in several years (Figure 6.7). Between 2007 and 2017, the number of new ESKD patients beginning treatment was slightly higher for females than for males, across all years.

Figure 6.7: Number of Indigenous Australians beginning treatment for end-stage kidney disease, by sex, 2007–2017
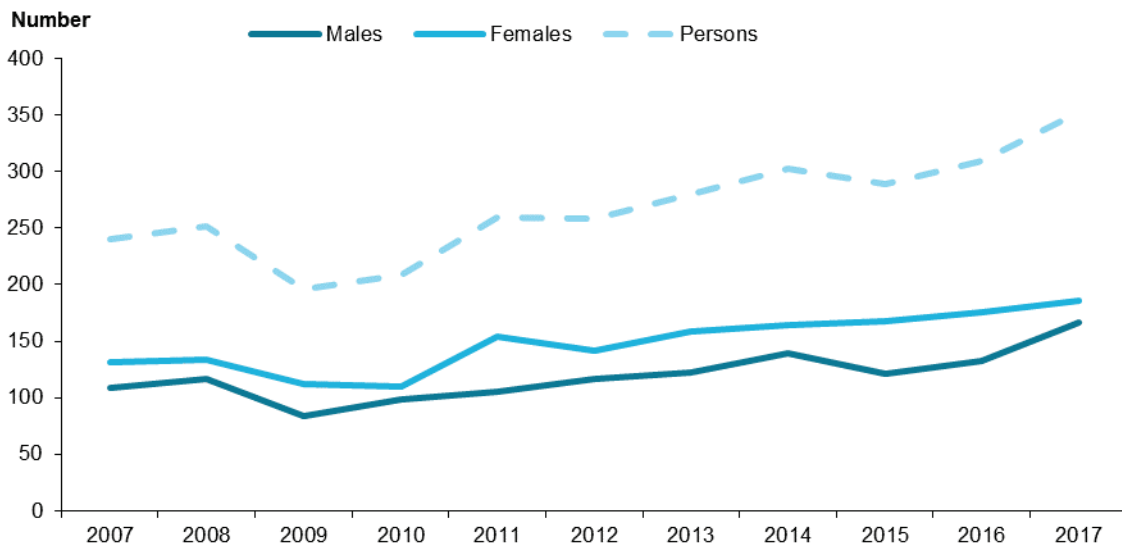
Source: AIHW analysis of ANZDATA 2017 registry data.

Combining incidence data for 2015, 2016 and 2017, a total of 950 new patients started ESKD treatment (Supplementary Table 6.4).

For Indigenous Australians beginning ESKD treatment from 2015 to 2017:

- the most common age was 45–54, accounting for 31% of all new ESKD patients. A further 26% were aged 55–64. Among non-Indigenous ESKD patients, almost half (48%) were aged 65 and over
- the ESKD incidence rate (adjusted for age) was 7.1 times the non-Indigenous rate (68 and 9.6 per 100,000, respectively)
- females had an age-standardised ESKD incidence rate 1.2 times that for males.

Primary renal diseases leading to end-stage kidney disease treatment

The ANZDATA registry also records the type of primary renal disease responsible for the progression to ESKD of patients requiring kidney replacement therapy to ensure their survival.

Among the 950 new Indigenous patients from 2015 to 2017, the dominant renal disease category was diabetic nephropathy (70%), demonstrating clearly the strong link between diabetes and ESKD for the Indigenous population (Figure 6.8). Diabetic nephropathy was also recorded as the most common primary disease category for non-Indigenous new ESKD patients (33%), however it was much less commonly recorded than among Indigenous patients.

The next most common primary renal diseases reported among new Indigenous ESKD patients were glomerulonephritis (10%) and hypertension (7%) (Figure 6.8).

Figure 6.8: Primary renal disease among new ESKD patients, by Indigenous status, 2015–2017
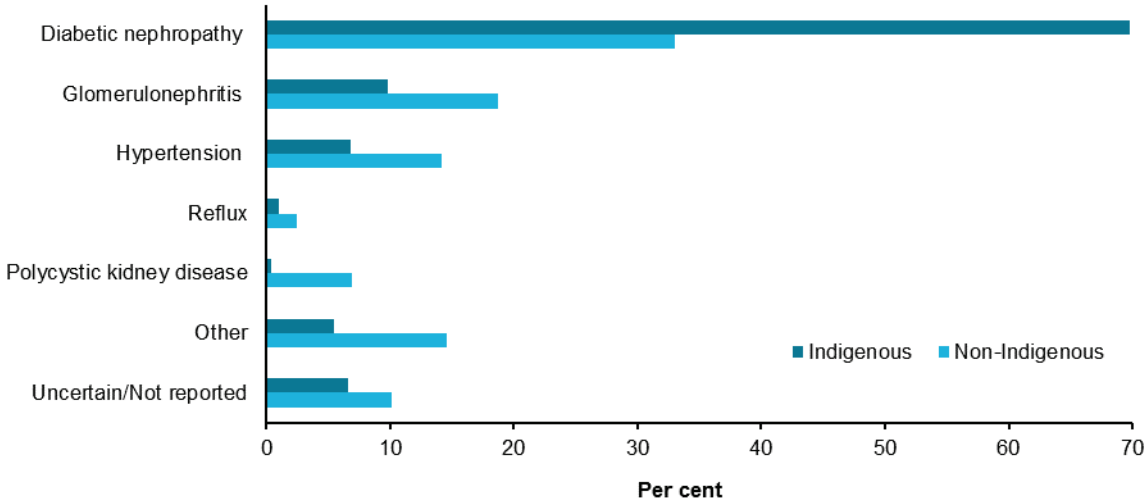
Note: Calendar year reporting. Combined data for 3 calendar years are presented because of small numbers in each year.

Source: AIHW analysis of ANZDATA 2017 registry data.

7 Factors significantly associated with CKD

This chapter presents results of regression analysis on the significant factors associated with whether an individual Indigenous person, aged 18 or over, had biomedical signs of chronic kidney disease based on the blood/urine tests carried out in the National Aboriginal and Torres Strait Islander Health Measures Survey component of the AATSIHS 2012–13. The specific modelling approach used is a logistic regression estimated over the sample of all persons who participated in the NATSIHMS, where the outcome variable analysed is a binary (Yes or No) classification on whether any particular person was assessed to have CKD based on the results of the blood and urine tests.

The results describe statistical associations, rather than causal effects, between the selected explanatory variables (or associated factors) and biomedical signs of CKD.

More details about this methodology are provided in Appendix B.

Regression results

The results of the regression analysis are provided as odds ratios.

Variables or categories that increase the likelihood of having biomedical signs of CKD will have estimated odds ratios significantly greater than 1, while variables that decrease the likelihood of CKD will have an estimated odds ratio significantly less than 1.

In 2012–13, the main factors associated with having biomedical signs of CKD among Indigenous adults were:

- older age group
- living in a remote area
- lower household income
- high blood pressure
- having diabetes.

Several of these estimated effects are quite large; for example, people aged 65 and over are 3.6 times as likely to have CKD as persons in the reference age group of 18–34. Indigenous adults in the lowest household income category (bottom 30% of the decile distribution) are also 6.6 times as likely to have CKD compared with those in the top 30%, highlighting the socioeconomic determinants of the prevalence of CKD.

For these variables, age and income, the model distinguished several sub-categories, and estimated effects across different sub-categories are generally consistent. That is, the likelihood of CKD increases consistently with higher age and with lower income.

The main findings are summarised below, with detailed data provided in Supplementary Table 7.1.

Age
People aged 50–64 were 3 times as likely to have CKD as the youngest reference group of 18–34 year olds. The effect of age was greater in older people, with those aged 65 and over being 3.6 times as likely as young adults to have CKD.

Income

Having household income in the middle 40% of income distribution significantly increases the likelihood of having CKD compared with being in the top 30% (3.4 times as likely); the effect was even larger for those in the bottom 30% of income distribution, who were 6.6 times as likely to have CKD as those in the top 30%.

Remoteness

Living in a remote area increases the likelihood of having biomedical signs of CKD. Compared to the reference group who live in non-remote areas, those in remote Northern Territory were 2.7 times as likely to have CKD, while those living in remote areas in other jurisdictions were 1.9 times as likely. This indicates there is a clear difference between the CKD prevalence in remote Northern Territory and other remote areas even for people who share the other demographic, socioeconomic and health risk factors.

Health risk factors

Among the several health risk factors included in the model, only the effects of having high blood pressure and having diabetes were significant factors associated with CKD. Those with high blood pressure were estimated to be twice as likely to have CKD as those with normal blood pressure levels, while those with diabetes were estimated to be 2.9 times as likely to have CKD as those without.

These findings are consistent with the regularly reported comorbidity relationships with kidney disease (Hoy 2014; Stumpers & Thomson 2013). Risk factors that did not have significant effects on the odds of CKD were being a current smoker, being obese (defined by BMI≥30 kg/m^2) and having high cholesterol levels.

Language

The sole language and cultural factor considered was whether the main language spoken at home was an Indigenous Australian language. This factor had an odds ratio of 1.8 for those whose main language at home was Indigenous, indicating a higher likelihood of CKD, but the effect was not statistically significant at the 95% level.

Appendix A: Classifications

This appendix provides classification information for cardiovascular disease, hypertension, diabetes, arthritis, and eye and ear diseases for the AATSIHS 2012–13 estimates. These classifications were used in Chapter 4 for analysing the comorbidity profile of those with chronic kidney disease.

Cardiovascular disease

Overall cardiovascular disease (CVD)

The prevalence of CVD was calculated using self-reported data only, for people who participated in the biomedical component of the 2012–13 AATSIHS.

The conditions listed in Table A1 were included as part of the definition for CVD. Different condition statuses were included for counts of each of the conditions:

1. Ever told has condition, still current and long-term.

2. Ever told has condition, still current but not long-term.

3. Ever told has condition, not current.

Table A1: 2012–13 Australian Aboriginal and Torres Strait Islander Health Survey CVD classification

Condition	Condition status
Hypertensive diseases	1
Ischaemic heart diseases (also known as CHD)	1, 2 and 3
Other heart diseases	1, 2 and 3
Tachycardia	1
Cerebrovascular diseases	1, 2 and 3
Oedema	1
Diseases of arteries arterioles and capillaries	1
Diseases of veins, lymphatic vessels etc.	1
Other diseases of circulatory system	1
Symptoms signs involving circulatory system	1

Hypertension

A different approach was adopted for measuring hypertension, which is 1 type of cardiovascular disease. Prevalence of hypertension was based on both measured blood pressure results and self-reported data for people who participated in the biomedical component of the 2012–13 AATSISHS (see Box A1).

This approach aligns with methods in the Aboriginal and Torres Strait Islander Health Performance Framework report (AIHW forthcoming 2020).

High cholesterol

The prevalence of high cholesterol was generated using self-reported data only, for people who participated in the biomedical component of the 2012–13 AATSIHS.

The condition statuses 1 and 4 were included for accounting the prevalence of high cholesterol from the below list:

1. Ever told has condition, still current and long-term.
2. Ever told has condition, still current but not long-term.
3. Ever told has condition, not current.
4. Not known or not ever told, but condition current and long-term.

Diabetes

Diabetes prevalence was derived using a combination of blood test results and self-reported information on diabetes diagnosis and medication use by people who participated in the biomedical component of the 2012–13 AATSIHS (Figure A1).

Measured diabetes prevalence estimates in this report use HbA1c results rather than fasting plasma glucose (FPG) results. Using HbA1c results allows the inclusion of the greatest number of respondents with biomedical markers for diabetes—approximately 23% of people aged 18 and over who participated in the AATSIHS biomedical component did not fast, so their FPG results could not be used.

Prevalence of diabetes

Total people with diabetes was defined as the total of: *known diabetes* and *newly diagnosed diabetes* (Figure A1).

Known diabetes

Ever been told by a doctor or nurse that they had diabetes and were taking diabetes medication (either insulin or tablets)

Ever been told by a doctor or nurse that they had diabetes and their HbA1c blood test result was greater than or equal to the cut-off point for diabetes (that is, ≥6.5%).

Newly diagnosed diabetes

Reported no prior diagnosis of diabetes but had HbA1c ≥ 6.5%.

Source: ABS 2014a.

Figure A1: 2012–13 National Aboriginal and Torres Strait Islander Health Measurement Survey diabetes classification

Source: ABS 2014a.
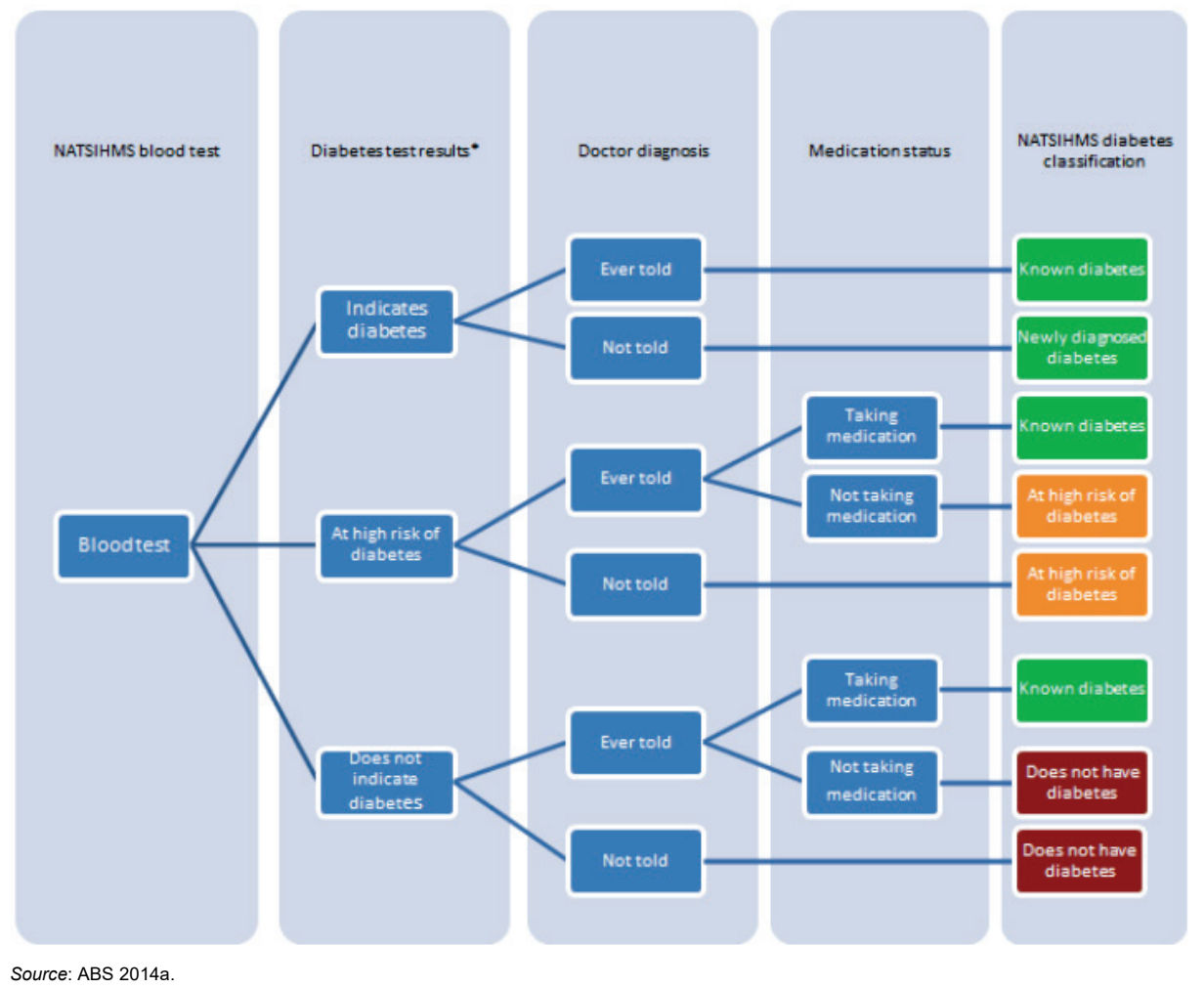
Arthritis and gout

The prevalence of arthritis and gout was generated using self-reported data only, for people who participated in the biomedical component of the 2012–13 AATSIHS.

The conditions listed in Table A2 were all included within this group. Condition status 1 and 4 were included for all selected conditions.

1. Ever told has condition, still current and long-term.

2. Ever told has condition, still current but not long-term.

3. Ever told has condition, not current.

4. Not known or not ever told, but condition current and long-term.

Table A2: 2012–13 Australian Aboriginal and Torres Strait Islander Health Survey arthropathy classification

Condition	Condition status
Gout	1 and 4
Arthritis—Rheumatoid	1 and 4
Arthritis—Osteoarthritis	1 and 4
Arthritis—Other & type unknown	1 and 4
Other arthropathies	1 and 4

Eye disease

Overall eye disease

The prevalence of overall eye disease was generated using self-reported data only, for people who participated in the biomedical component of the 2012–13 AATSIHS.

The conditions included as part of the definition for overall eye disease were:

- cataract
- glaucoma
- disorders of choroid and retina (including macular degeneration, and other disorders of choroid and retina)
- disorders of ocular muscles binocular movement accommodation & refraction (including astigmatism, presbyopia, short sight, long sight, and other disorders of ocular muscles binocular)
- visual disturbances and blindness (including complete blindness of 1 or both eyes, partial blindness of 1 or both eyes, and other visual disturbances of loss of vision)
- other diseases of eye & adnexa (including colour blind, and other diseases of eye & adnexa).

All eye conditions were reported as current and long-term, regardless of whether the patients had been told by doctors or nurses (that is, condition status of 1 and 4).

Cataract/glaucoma/disorders of choroid and retina

This indicator examines only the prevalence of a narrower selection of eye diseases—cataract, glaucoma, macular degeneration or other disorders of choroid and retina.

The prevalence of these selected eye diseases was also generated using self-reported data only, for people who participated in the biomedical component of the 2012–13 AATSIHS. Conditions had to be reported as current and long-term.

Ear disease

Overall ear disease

The prevalence of overall ear disease was generated using self-reported data only, for people who participated in the biomedical component of the 2012–13 AATSIHS.

The conditions included as part of the definition for overall ear disease were:

- complete deafness
- partial deafness & hearing loss not elsewhere classified
- diseases of middle ear & mastoid process (including otitis media, and other diseases of middle ear & mastoid)
- diseases of inner ear (including Meniere disease, and other diseases of inner ear)
- other disease of the ear.

All ear conditions were reported as current and long-term, regardless of whether the patients had been told by doctors or nurses (that is, condition status of 1 and 4).

Hearing loss

All types of hearing loss were reported as current and long-term.

Appendix B: Methodological information

Selected characteristics analyses

Analyses for selected characteristics of Indigenous adults, with and without biomedical signs of CKD, in relation to selected indicators is available in Chapter 3. Data for these analyses are drawn from the biomedical component of the 2012–13 NATSIHMS.

The results presented in Chapter 3 describe statistical relationships between selected characteristics and having biomedical signs of CKD based on the blood and urine tests associated with the survey. No causal inference can be made based on the comparative results from Chapter 3, as comparisons were estimated with cross-sectional data and so do not identify how long ago CKD developed, and the levels of the selected indicators before onset of CKD. The characteristics present at the time of the survey, for individuals who have CKD, may not necessarily have contributed to the development of CKD, but could reflect the consequences of having developed CKD.

In addition, comparisons of the characteristics of Indigenous adults with and without CKD look at each characteristic/indicator in isolation—no adjustment for other potential influences or differences in other factors between the 2 groups relating to specific indicators has been made. The analysis presented in Chapter 7, using a multivariate regression approach, considers differences in characteristics of Indigenous adults with and without CKD, while controlling for differences in other factors.

Psychological distress

Analysis of psychological distress in section 3.2 uses results from the Kessler 5-item (K5) scale. The K5 is a subset of questions derived from the Kessler Psychological Distress Scale (Kessler & Mroczek 1994), a 10-item questionnaire based on questions about people's level of negative emotional states (such as nervousness, agitation, psychological fatigue and depression) in the previous 4 weeks. The K5 includes 5 of the 10 original questions but incorporates minor wording changes for use in surveys of Aboriginal and Torres Strait Islander people (ABS 2012). It has been used in several ABS surveys including the 2012–13 NATSIHS.

Scoring for the K5 results in a minimum possible score of 5 and a maximum possible score of 25, with lower scores indicating lower levels of psychological distress. Scores are grouped into 2 categories for analysis as follows:

- score of 5–11: low to moderate level of psychological distress
- score of 12–25: high to very high level of psychological distress.

Health profile analyses

Analyses for the overall prevalence of 6 health conditions—cardiovascular disease, high cholesterol, diabetes, arthritis and gout, eye disease and ear disease—are available in Chapter 4. The results presented make comparisons for 2 groups—Indigenous adults with and without the biomedical indicators of CKD.

Outputs for cardiovascular disease, eye disease and ear disease include more detail on the prevalence of specific types of these conditions, in addition to overall prevalence.

As the prevalence of most of these conditions increases with age, in order to enable more valid comparisons between the 2 groups the effect of different age distributions has been adjusted for using age-standardised rates. Analysis on the age-standardised presence of comorbidities by sex and remoteness of usual residence is also available in Chapter 4. Wherever possible, analysis of the crude rates broken down by age is also presented in supplementary tables.

Data used

Information on the presence of the majority of the selected health conditions is sourced from the subjective self-reported assessments provided by survey respondents.

Two exceptions occur—for hypertension and diabetes—which use a combination of biomedical data (that is, results from a blood or a urine test, or both) and self-reported data to define whether that disease is present. Using both measured and self-reported data can provide a more reliable estimate of the overall prevalence of a disease/comorbidity (see further details in Appendix A).

Indigenous Regions analyses

The 2016 Australian Statistical Geography Standard (ASGS) defines a total of 58 Indigenous Regions (IREGs) to cover the whole of geographic Australia (ABS 2016). The data presented by IREG are tabulated for the 37 main IREGs, which exclude the non-spatial regions defined as 'Migratory-Offshore-Shipping' and 'No Usual Address' in each state and territory, and a few very small special Indigenous Regions such as Jervis Bay. Each Indigenous Region also occurs wholly within a specific state or territory. In 2 instances there is a single Indigenous Region defined within a state or territory—ACT and Tasmania. In these instances the Indigenous Region level data will be equivalent to the jurisdiction level data.

Hospitalisations for kidney disease (Chapter 5, Section 5.3) and end-stage chronic kidney disease prevalence (Chapter 6, Section 6.2) are reported by IREG.

Hospitalisations for kidney disease

The assignment of CKD-related hospital separations to specific IREGs is based on the patient's usual place of residence, as recorded via the Statistical Area Level 2 (SA2) information in the NHMD. The SA2 information is then mapped into the boundaries of the (2016) Indigenous Region structure, using the relevant ABS concordance tables (ABS 2018).

This allocation is incomplete when the SA2 data is missing, or if non-standard SA2 codes are used in the NHMD. Thus, a small number of hospitalisation records cannot be assigned to a specific IREG and are excluded from analysis and mapping. The sum of the counts of hospitalisation episodes across IREGs therefore may not match the total counts derived independently for a state or territory, or at the national level.

Prevalence of ESKD

The assignment of ESKD patients to a specific IREG is based on the patient's usual place of residence, as recorded via the postcode information in the ANZDATA register. Postcode values are first assigned to the ABS geography of SA2, then the derived SA2 for each patient is mapped into the boundaries of the Indigenous Regions structure, using the relevant ABS concordance tables (ABS 2018).

This allocation is incomplete when the postcode data is missing, or if non-standard postcode values are used in the ANZDATA records. Thus, a small number of ESKD patients cannot be assigned to a specific IREG and are excluded from the analysis and mapping. The sum of the counts of ESKD patients across IREGs therefore may not match the total counts derived independently for a state or territory, or at the national level.

Interpreting regression results

Regression results describe statistical associations, rather than causal effects, between the selected explanatory variables (or associated factors) and the outcomes (in this case, having biomedical signs of CKD). These standard caveats on the interpretation of regression results estimated with cross-sectional data apply even more clearly in the present analysis because the explanatory variables available in the data are not from the period before CKD has developed.

All of the explanatory variables used in this analysis reflect the individual and household characteristics at the time of the survey, and some of these characteristics could represent outcomes that are the consequence of having CKD, rather than the causes or associated risk factors that led to the development of CKD. Care has been exercised in the choice of explanatory variables not to include specific variables that are more likely to be consequences of having CKD. Nevertheless, caution must be applied in the interpretation of these regression results on factors significantly associated with CKD.

What do odds ratio estimates from logistic regressions show?

The odds ratio is a measure of the association between an exposure and an outcome. The odds ratio represents the odds (or likelihood) that an outcome will occur, given a particular exposure, compared with the odds of the outcome occurring in the absence of that exposure.

The odds of a specific outcome, such as having biomedical signs of CKD, is related to the probability of having biomedical signs of CKD, but they are not the same concept. The odds of an event occurring is represented as the probability of that event occurring divided by the probability of that same event not occurring, given the same circumstances (as represented by the explanatory variables in the model).

The standard statistical inference related to an estimate of the odds ratio is whether it is significantly different from a value of 1. An odds ratio:

- **close or equal to 1** means the exposure has little or no effect on the odds of that outcome occurring in the population being studied
- **greater than 1** means the exposure increases the odds of that outcome occurring
- **less than 1** means the exposure decreases the odds of the outcome occurring.

Explanatory variables used in the model

Explanatory variables were grouped into 3 broad categories—demographic and locational, socioeconomic, and health risk factors.

A larger set of explanatory variables was used in preliminary analyses, based on similar models for health outcomes estimated from the 2012–13 NATSIHS, in previous AIHW reports (for example, AIHW 2018)—as well as informed by literature on the risks of CKD among the Indigenous population. Many other variables of interest identified in the literature—such as low birthweight, history of post-streptococcal glomerulonephritis (a kidney infection) and family history of renal disease—could not be included as this information was not collected in the 2012–13 NATSIHS and NATSIHMS. An additional cultural variable included in this analysis as a possible factor related to CKD is whether the main language spoken at home is an Indigenous Australian language.

The explanatory variables used in the model are detailed by broad category group below.

Demographic and locational factors

- male or female
- age categories (18–34, 35–49, 50–64 and 65+)
- is currently married
- remoteness classification (in 3 categories: all non-remote, remote NT only, and other remote)

Socioeconomic factors

- has completed Year 10 or has a non-school qualification of Certificate III or higher
- household income level adjusted for household size (ranked into 3 aggregates of the 10 decile groupings: 1–3, 4–7, and 8–10 income deciles)
- lives in an over-crowded home
- Index of relative socio-economic disadvantage (SEIFA) for local area (ranked into 2 aggregates of the 10 decile groupings: 1–5 and 6–10 SEIFA deciles

Language and cultural factors

- main language spoken at home is Indigenous

Health risk factors

- is a current smoker
- is obese (based on BMI measure)
- has high blood pressure (based on both measure and self-reporting)
- has high cholesterol level (based on self-reporting)
- has diabetes (based on HbA1c test)

Appendix C: Data sources

The analyses in this report are based on survey data from the ABS, an administrative collection managed by the AIHW, and a clinical register.

Survey data

The ABS conducts a periodic detailed health survey of the Aboriginal and Torres Strait Islander population only. The latest data available in this series are in the 2018–19 National Aboriginal and Torres Strait Islander Health Survey. The previous survey was undertaken in 2012–13 in conjunction with the Australian Health Measures Survey. That survey had 3 components, with the latter 2 being new elements conducted for the first time in the 2012–13 survey:

- a National Aboriginal and Torres Strait Islander Health Survey (NATSIHS)
- a National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey (NATSINPAS)
- a National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS).

National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS)

The analyses in chapters 2 to 4 and Chapter 7 of this report are based on the NATSIHMS data, which have been linked to additional information collected in the main survey (2012–13 NATSIHS).

The NATSIHMS component is a particularly valuable source of data in relation to Indigenous health conditions, as it incorporates biomedical test results (blood and urine samples) for Indigenous people, aged 18 years and over, at a population level. It provides objective measures of the presence of several chronic conditions, including kidney disease, in the Indigenous adult population. These results can be related to additional information collected from the survey respondents in the other components of AATSIHS 2012–13.

About 3,300 Indigenous adults participated in the voluntary NATSIHMS, drawn from across Australia (ABS 2013a). Selected results on the biomarkers of chronic disease (such as diabetes, cardiovascular disease and kidney disease) and nutrients (such as vitamin D, iron and iodine) were published by the ABS (ABS 2014a).

Box C1 presents more information on the identification of kidney disease in the biomedical test results, and the specific benchmarks, from the blood and urine test results used to identify the different stages of kidney disease in the unit records from that survey.

Box C1: Chronic kidney disease (CKD) biomedical tests in NATSIHMS 2012–13

The NATSIHMS component of the AATSIHS 2012–13 measured 2 aspects of kidney function: estimated glomerular filtration rate (eGFR) and the presence of albuminuria.

The measures of CKD staging were then determined by combining the eGFR results with the albumin creatinine ratio (ACR) results. However, while abnormal eGFR and ACR measurements may indicate impaired kidney function, kidney disease can be confirmed only if albuminuria or eGFR of less than 60 mL/min/1.73 m² has persisted for at least 3 months.

Estimated glomerular filtration rate

Measured via blood test eGFR estimates the flow rate of filtered fluid through the kidney based on the levels of creatinine in the blood. The formula used takes into account age, sex and ethnicity. Abnormal kidney function using eGFR is defined as a reading of less than 60 mL/min/1.73m².

Albumin creatinine ratio

A method for detecting the level of albumin passed from the blood into the urine, as a result of kidney damage. Presence of albuminuria was defined as an ACR reading of greater than or equal to 2.5 mg/mmol for males, and greater than or equal to 3.5 mg/mmol for females.

Stages of CKD

The results of the eGFR and ACR tests are then combined to produce the following benchmarks for classifying the presence and stages of CKD:

No indicators of chronic kidney disease—eGFR ≥60 mL/min/1.73 m² and no presence of albuminuria

Stage 1 (Kidney damage with normal kidney function)—eGFR ≥90 mL/min/1.73 m² and presence of albuminuria

Stage 2 (Kidney damage with mild loss in kidney function)—eGFR 60–89 mL/min/1.73 m² and presence of albuminuria

Stage 3a (Mild to moderate loss of kidney function)—eGFR 45–59 mL/min/1.73 m²

Stage 3b (Moderate to severe loss of kidney function)—eGFR 30–44 mL/min/1.73 m²

Stage 4 (Severe loss of kidney function)—eGFR 15–29 mL/min/1.73 m²

Stage 5 (End-stage kidney disease)—eGFR <15 mL/min/1.73 m² or on dialysis.

In the published data from the NATSIHMS (and its non-Indigenous equivalent source), the ABS coded biomedical results on kidney disease by creating a combined category for 'Stage 4 and 5'.

All of the results on the stages of kidney disease in this report are based on that modified coding structure.

Note that people who live in non-private dwellings, such as hostels, hospitals and nursing homes, were not in the scope of the ABS surveys, including AATSIHS 2012–13 and its NATSIHMS component. This may affect estimates of the number of people with specific conditions related to kidney disease. For example, those who may require frequent periods of hospitalisation may be in hospital at the time of the survey interviews, and hence will be excluded from the scope of the survey, leading to underestimation of the prevalence of kidney diseases in the general Indigenous population.

Source: ABS 2014a, 2015; KHA 2019.

National Hospital Morbidity Database

The National Hospital Morbidity Database (NHMD) is a compilation of all episodes of hospital services for admitted patients in Australian public and private hospitals, together with their morbidity conditions and underlying cause for hospitalisations.

Extracts can be made from this large annual collection, which has had more than 10 million records in recent years, of only admitted patients for whom the principal diagnosis of their condition is related to kidney disease, including hospital visits for dialysis. Chapter 6 in this report analyses that component of the NHMD records of Indigenous Australians hospitalised for kidney disease-related diagnoses in the 2-year period July 2015 to June 2017.

The NHMD is a financial year-based compilation of all episodes of hospital services for admitted patients in Australian public and private hospitals. This collection also gives information on the morbidity conditions and underlying cause for hospitalisation for each admitted patient. This information can be used to identify the hospitalisation episodes of Indigenous Australians related to kidney disease.

Table C1: ICD-10-AM codes for CKD hospital separations

ICD-10-AM codes	Condition
Z49.1, Z49.2	Dialysis
E10.2, E11.2, E13.2, E14.2	Diabetic nephropathy
N11, N12, N14, N15, N16	Renal-tubulo interstitial diseases
N18, N19	Chronic renal failure
I12, I13, I15.0, I15.1	Hypertensive renal disease
N25–N28, Q60–Q63, N39.1, N39.2, T82.4, T86.1, Z49.0, Z94.0, Z99.2	Other chronic kidney disease

Australia and New Zealand Dialysis and Transplant Registry

The Australia and New Zealand Dialysis and Transplant Registry (ANZDATA) is a clinical registry of people who are being or have been treated for end-stage kidney diseases (ESKD).

All renal units in Australia and New Zealand contribute data to ANZDATA. The registry's data files are used mainly to report on the incidence, prevalence and outcomes of dialysis and transplant treatment for all patients with ESKD. Special tabulations are made with this data in Chapter 7 to analyse the current prevalence and time trends in the prevalence and treatment modes of ESKD in the Australian Indigenous population. The latest available ANZDATA was for the 2017 calendar year.

Acknowledgments

Abbreviations

AATSIHS	Australian Aboriginal and Torres Strait Islander Health Survey
ABS	Australian Bureau of Statistics
ACR	albumin to creatinine ratio
AKI	acute kidney injury
ANZDATA	Australia and New Zealand Dialysis and Transplant Registry
ASGS	Australian
ASR	age-standardised rate
AIHW	Australian Institute of Health and Welfare
BMI	Body Mass Index
CKD	chronic kidney disease
CVD	cardiovascular disease
eGFR	estimated glomerular filtration rate
ESKD	end-stage kidney disease
HBP	high blood pressure
ICD-10-AM	International Classification of Diseases and Injuries, version 10, Australian modification
IREG	Indigenous Regions geographical classification
NATSIHS	National Aboriginal and Torres Strait Islander Health Survey
NATSIHMS	National Aboriginal and Torres Strait Islander Health Measures Survey
NATSINPAS	National Aboriginal and Torres Strait Islander Physical Activity Survey
NHMD	National Hospital Morbidity Database
NHMRC	National Health and Medical Research Council
SA2	Statistical Area level 2 geographical classification
SEIFA	Index of relative socio-economic disadvantage
WHO	World Health Organization

Symbols

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

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Related publications

The following AIHW publications relating to Aboriginal and Torres Strait Islander people and kidney disease might also be of interest:

- AIHW 2017. Aboriginal and Torres Strait Islander Health Performance Framework report 2017. Cat. no. IHW 194. Canberra: AIHW. https://www.aihw.gov.au/reports/indigenous-australians/health-performance-framework/contents/overview.

- AIHW 2020. Chronic kidney disease. Cat. no. CDK 16. Canberra: AIHW. <https://www.aihw.gov.au/reports/chronic-kidney-disease/chronic-kidney-disease/contents/what-is-chronic-kidney-disease>.

- AIHW 2016. Incidence of end-stage kidney disease in Australia 1997–2013. Cat. no. PHE 211. Canberra: AIHW. <https://www.aihw.gov.au/reports/chronic-kidney-disease/incidence-of-end-stage-kidney-disease-in-australia-1997-2013/contents/table-of-contents>.

  AIHW 2011. Projections of the incidence of treated end-stage kidney disease among Indigenous Australians, 2009-2020: a working paper with preliminary results. Cat. no. WP 65. Canberra: AIHW. <https://www.aihw.gov.au/reports/chronic-kidney-disease/projections-incidence-treated-end-stage-kidney/contents/table-of-contents>.

- AIHW 2015. AIHW Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: Aboriginal and Torres Strait Islander people. Cat. no. CDK 5. Canberra: AIHW. <https://www.aihw.gov.au/reports/heart-stroke-vascular-disease/cardiovascular-diabetes-chronic-kidney-indigenous/contents/table-of-contents>.

National survey data suggest that almost 1 in 5 Indigenous Australian adults have signs of chronic kidney disease. This report shows that the likelihood of having chronic kidney disease increases with age, and is higher among people with high blood pressure or diabetes, and among those living in remote areas. It also shows that rates of hospitalisation for kidney disease or treatment for end-stage kidney disease among Indigenous Australians tends to be highest in remote areas, particularly in Central Australia.

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better decisions,
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