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Chronic kidney disease

Chronic kidney disease prevalence among Australian adults over time

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Chronic kidney disease (CKD) 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 and often detected too late to be reversible, but it is largely preventable because many of its risk factors are modifiable (Cass et al. 2010; Wyld et al. 2015). Over the past few decades, some of these risk factors, including diabetes and obesity, have increased in prevalence and the increase in size of the elderly population (as people are living longer) has exposed more people to the risk of CKD. Other risk factors, such as smoking, have decreased. But until now there has been little information on whether or how CKD prevalence has changed over time.

This report compares, for the first time, the most reliable national estimates of the prevalence of CKD to date from two national surveys, incorporating biomedical testings that were undertaken 12 years apart: the 1999–2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab) and the 2011–12 National Health Measurement Survey (NHMS). This comparison was possible after a number of adjustments were made to the scope (age), the biomedical measures and the sampling methodology (ABS 2013; Dunstan et al. 2002). As well, the overall CKD prevalence rates were adjusted for sex and age differences between the two survey populations.

Chronic kidney disease

CKD is defined by a reduction in the glomerular filtration rate (eGFR) (<60 mL/min/1.73 m^2) persisting over a 3-month period, or by persistent signs of kidney damage over a 3-month period that have not yet resulted in the reduction of the GFR (Kidney Health Australia 2015). The detection of CKD is based on two biomedical markers: eGFR (below 60); or eGFR between 60 and 90, and the urine albumin measured by the albumin to creatinine ratio (ACR) of at least 2.5 mg/mmol in males and 3.5 mg/mmol in females.

People aged 65 and over have substantially higher prevalence of CKD.

There was no change in the overall adjusted prevalence rate of CKD between 1999–2000 and 2011–12.

The number of Australians with stages 3–5 CKD increased significantly between 1999–2000 and 2011–12.

The 1999–2000 AusDiab and the 2011–12 NHMS are comparable after adjustments were made to their scope and the sampling methodology.

AIHW

Prevalence of CKD

In this report, CKD is present if there are signs of a loss of kidney function and/or kidney damage, both measured by a single collection of blood and urine in each survey.

Between 1999–2000 and 2011–2012, the CKD prevalence rate remained stable, at around 10% among adults aged 25 and over (Figure 1). There was no difference between men and women in the prevalence of CKD in both surveys.

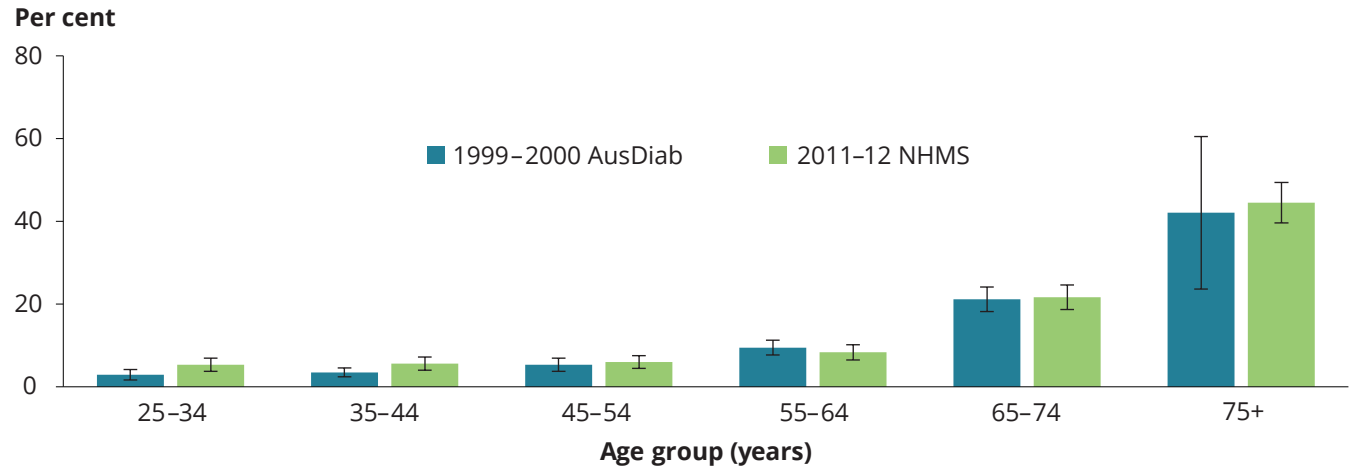
Figure 1: Age- and sex-adjusted prevalence of CKD over time, 25 year olds and over

Source: Table 1.

The proportion of Australians **aged 65–74** with CKD was **3 times higher** than for those **aged 55–64**.

The CKD prevalence rate over time followed a similar age pattern in both surveys, showing sharp increases of CKD extending into older ages: at age 65–74, the proportion with CKD (just over 21%) was almost 3 times as high as that for the 55–64 age group (over 8%) and was half that for the 75 and over age group (over 42%). CKD prevalence rates between the two surveys were similar for all age groups except for those aged 25–44, for whom the rates were significantly higher in 2011–2012 than in 1999–2000 (over 5% compared with around 3%) (Figure 2).

Figure 2: Age-specific prevalence of CKD over time



Source: Table 1.

Over the 12-year period, analysis of the 1999–2000 AusDiab and the 2011–12 NHMS indicates that the estimated total number of adults aged 25 and over with CKD has increased by almost 50%, from 1 million in 1999–2000 to over 1.5 million people in 2011–2012. Most of the estimated increase in the number of people with CKD was attributable to people aged 75 and over (42%) (Table 1).

Prevalence of CKD by stage

CKD blood and urine tests enable categorisation into five successive stages of severity of the disease. Stages 1–2 are marked by excessive protein (or albumin) loss in the urine—indicating kidney damage, with or without a modest loss of kidney function. Stages 3–4 are marked by a moderate to severe loss of kidney function. People with stage 5 CKD—end-stage kidney disease—require regular dialysis or a kidney transplant to survive.

Stages of kidney disease

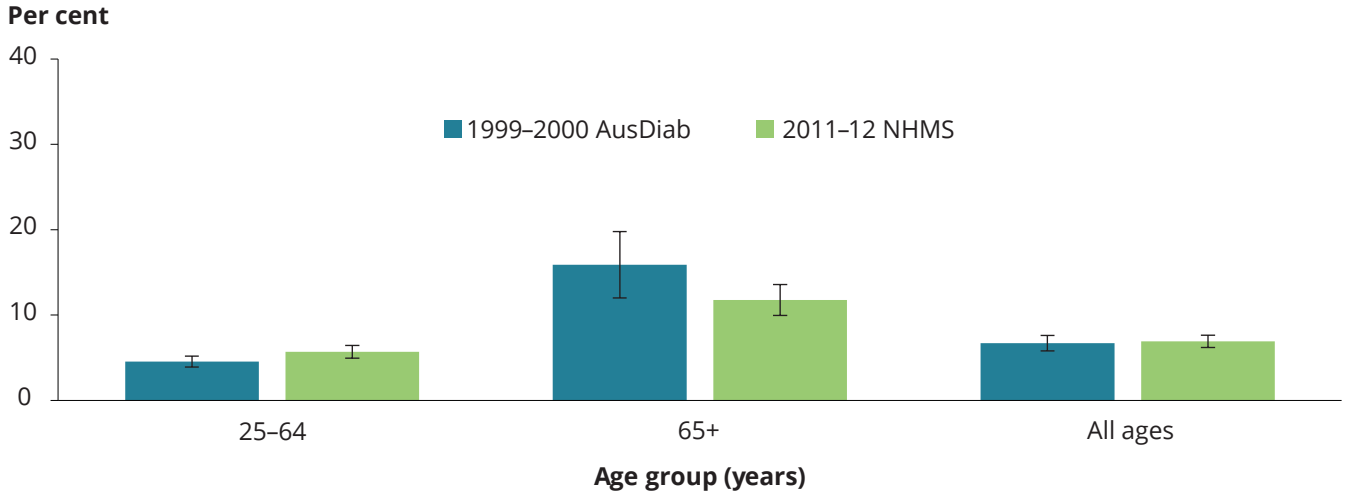
Early stages (1–2)—there are usually no symptoms as the kidneys are still able to function when they are slightly damaged. This makes diagnosis difficult.

Middle stages (3–4)—level of waste (urea and creatinine) in the blood rises and the person starts to feel unwell. Kidney function slows down and the number of times urine is passed increases.

End stage (5)—person requires dialysis or a transplant to stay alive.

Analysis of the 1999–2000 AusDiab and the 2011–12 NHMS shows that the overall percentage of adults at stages 1–2 remained unchanged (almost 7%); however, the estimated size of the adult population with CKD stages 1–2 grew by 29% between 1999–2000 and 2011–2012 (from 740,000 to 950,000), due primarily to population growth and ageing. The prevalence rate of adults with early stages of CKD increased modestly for those aged 25–64 between the two surveys (from 4.5% to 5.7%), offset by a slight decrease among the 65 and over population (Figure 3).

Figure 3: Prevalence of CKD stages 1–2, by broad age groups over time

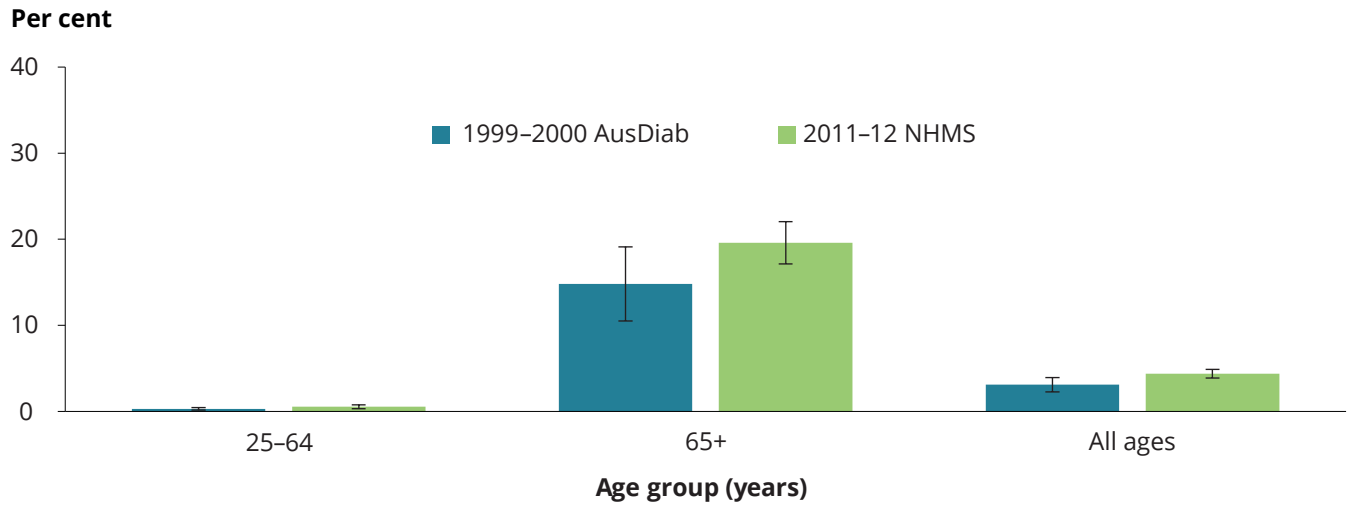


Source: Table 1.

The size of the population with moderate to severe loss of kidney function (stages 3–5) nearly doubled; it increased by 88% between 1999–2000 and 2011–2012 (from 322,000 to 604,000). Stage 3 accounted for over 90% of all CKD stages 3–5 cases in both surveys. Most cases were aged 65 and over (over 90%); however, an approximate doubling in number was seen for both above and below age 65 (from 292,000 in 1999–2000 to 544,000 in 2011–2012 among those aged 65 and over, and from 30,000 to 60,000 among those aged 25–64) (Table 1). The prevalence rate of moderate to severe CKD among adults increased from 3.1% in 1999–2000 to 4.4% in 2011–2012 (Figure 4).

The number of Australians with **moderate to severe loss of kidney function nearly doubled** between 1999–2000 and 2011–12.

Figure 4: Prevalence of CKD stages 3–5 by broad age groups over time



Source: Table 1.

Conclusion/implications

- Based on these survey results, the 12 years from 1999–2000 to 2011–2012 saw:
  - no change in the overall CKD prevalence rate, though the number of Australians with CKD increased nearly 50% as a result of population growth and ageing
  - a large increase in the prevalence of moderate to severe CKD (stages 3–5), mostly driven by an increase in CKD stage 3 due to growth in the size of the population aged 65 and over.
- The increase in the size of population with moderate to severe CKD is reflected by an increase in the use of CKD-related health care services over the same period, during which time the number of CKD hospitalisations and regular dialyses have markedly increased (51% and 58%, respectively) (AIHW 2017).
- In turn, the number of Australians with end-stage kidney disease (stage 5) kept alive by dialysis or kidney transplant rose by 51% between 1997 and 2013 (AIHW 2017; ANZDATA Registry 2015).
- The CKD-related mortality rate and incidence rate of treated end-stage kidney disease were stable between 1997–2013, which supports both findings: a stable prevalence rate but an increase in the size of the population with CKD at more advanced stages (AIHW 2017).

What's missing?

- The most recent of the two surveys is already several years old. A new biomedical survey (or regular biomedical surveys) would allow more up-to-date trends in CKD to be tracked.
- Both surveys rely on a single measure and assume chronicity of changes, which may lead to an overestimate of CKD prevalence.
- Reliable estimates for severe CKD (stages 4 and 5) could not be derived due to sample limitations of both surveys limiting the analysis of changes in severity of CKD in the population.
- It would also be useful to assess changes in CKD prevalence in high-risk populations, such as people with diabetes, high blood pressure, obesity or cardiovascular disease; Aboriginal and Torres Strait Islander Australians; people living in low socioeconomic areas; and old people living in residential aged care facilities. However, these comparisons are not possible with the available data.
- Reliable estimates of CKD incidence require longitudinal data about individuals over a long period of time—a gap these two cross-sectional surveys cannot fill.

Data sources

Australian Diabetes, Obesity and Lifestyle Study (1999–2000 AusDiab)

AusDiab is a national survey that was conducted by the International Diabetes Institute (now Baker IDI). It collected national measurements of CKD biomarkers: serum creatinine and albuminuria for an adult population aged 25 and over (11,700 people). Of the eligible households, 70% responded to the biomedical survey, and 37% of eligible respondents got tested (Dunstan et al. 2002). Standardised creatinine results from the survey participants were supplied by the research team to conduct this to conduct analysis on comparable eGFR measures.

National Health Measurement Survey (2011–12 NHMS)

The 2011–12 NHMS collected voluntary samples from around 11,200 Australian adults and children. Urine samples were collected from respondents aged 5 and over, and blood samples from respondents aged 12 and over. Of the sampled households, 85% responded to the biomedical survey; 36% of the survey participants volunteered to get the biomedical tests, covering 85% of the sampled households. CKD biomarkers collected were used to derive the eGFR measure from the CKD-epi formula and the ACR (ABS 2014, Australasian Creatinine Consensus Working Group 2005).

Statistical adjustments for survey comparability

The 1999–2000 AusDiab results in this report may differ from those in other publications as this analysis was performed for the first time on the complete sample of people with standardised creatinine, and it has used the CKD-epi formula to calculate the eGFR. As well, the variance estimation is based on the replicate weight method (similar to that from the 2011–12 NHMS) by adjusting for selection probability of primary collection district included in the AusDiab sample. The 2011–12 NHMS analysis is new as it is restricted to people aged 25 and over to align with the AusDiab sample. Both surveys had low coverage of *Remote* areas and no coverage of *Very remote* areas, nor of areas with a large proportion of Indigenous Australians. Institutionalised populations were excluded from the sampling frame (for example, old people living in residential aged care facilities). Significance of the difference between estimated rates or counts is based on a non-overlapping confidence interval and/or an additional test to assess when the overlap between either limit of the confidence interval is small and could not clearly warrant non-significance. The terms 'increase', 'decrease' and 'higher' were used when the difference was significant; the terms 'similar' or 'no change' were used when this was not the case.

Table 1: Prevalence of chronic kidney disease over time by selected characteristics: 1999–2000, 2011–12

Characteristics	1999–2000	2011–2012	1999–2000[a]	2011–2012[a]
	Number 95% CI		Per cent 95% CI	
Sex[b]				
Males	520,051 [445,928–594,174]	799,097* [719,166–879,028]	9.6 [8.1–11.2]	11.0 [9.8–12.2]
Females	540,196 [421,091–659,302]	757,431 [670,762–844,100]	10.0 [7.6–12.3]	11.1 [9.9–12.4]
Persons	1,060,247 [891,227–1,229,218]	1,556,528* [1,449,470–1,663,587]	9.8 [8.4–11.2]	11.1 [10.2–11.9]
Age group				
25–34	78,733 [44,951–112,514]	156,149* [109,504–202,794]	2.9 [1.7–4.2]	5.3* [3.7–6.9]
35–44	95,050 [66,689–123,411]	159,653 [113,604–205,703]	3.5 [2.4–4.5]	5.6* [4.0–7.2]
45–54	123,605 [87,045–160,165]	169,511 [126,607–212,414]	5.4 [3.8–6.9]	6.0 [4.5–7.5]
55–64	142,420 [115,552–169,289]	200,160 [156,033–244,286]	9.5 [7.7–11.3]	8.4 [6.5–10.2]
65–74	302,582 [262,490–348,157]	347,491 [299,752–395,230]	21.2 [18.2–24.1]	21.7 [18.7–24.6]
75+	315,115 [177,104–453,127]	523,564* [464,490–582,639]	42.1 [23.7–60.5]	44.5 [39.6–49.4]
CKD stages[c]				
Stages 1–2				
25–64	409,586 [347,745–471,745]	625,815* [543,721–707,909]	4.5 [3.9–5.2]	5.7* [4.9–6.4]
65+	328,727 [243,530–413,924]	326,941 [276,186–377,696]	14.8 [10.5–19.1]	11.8 [9.9–13.6]
All ages	738,313 [616,289–860,338]	952,756* [851,944–1,053,561]	6.7 [5.8–7.6]	6.9 [6.2–7.6]
Stages 3–5				
25–64	30,222 [16,187–44,257]	59,658* [36,325–82,992]	0.3 [0.2–0.5]	0.5 [0.3–0.8]
65+	291,712 [210,017–373,406]	544,114* [475,478–612,750]	14.8 [10.5–19.1]	19.6 [17.1–22.9]
All ages	321,934 [238,817–405,052]	603,773* [532,956–674,589]	3.1 [2.3–3.9]	4.4* [3.9–4.9]

***** Significant difference between the two surveys has been tested and found at 95% confidence level (CI).

(a) Participants with missing or unreliable measurement of eGFR or ACR were excluded from the denominator population.

(b) Overall rates by sex have been adjusted by age and sex using the 2001 Australian standard population.

(c) CKD stages are defined according to the eGFR and ACR results: CKD stages 1–2 includes people with eGFR >59 mL/min/1.73m^2 with albuminuria and CKD stages 3–5 includes people with eGFR <60.

Sources: AIHW analysis of 1999–2000 AusDiab and analysis of ABS 2014. ABS 2011–12 NHMS findings based on AIHW analysis of ABS microdata using Data Laboratory.

Glossary

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

Age-and-sex adjustment (standardisation) is a method removing the influence of age and sex when comparing populations with different age and sex structures. This is usually needed because the age and sex structure changes over time and the risk of a disease differs according to age and sex.

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