4 Causes of treated end-stage kidney disease

Introduction

As the most severe level of kidney function reduction, end-stage kidney disease (ESKD) could be seen as the last opportunity for preventive intervention in chronic kidney disease (CKD). In Chapter 2 it was shown that dialysis for ESKD was by far the most common cause of hospitalisation for people with CKD, had profound impacts on quality of life, and accounted for a large proportion of expenditure on CKD. It is therefore important to understand and monitor trends in the causes of treated ESKD in order to develop and evaluate policies and strategies to prevent its development and reduce the demand for kidney replacement therapy.

The natural history of CKD, its causes and the rate of progression to each stage are not clearly understood. Therefore, the proportion of people with CKD who will develop ESKD, and which people are at greatest risk, are unclear (White et al. 2005). In general, CKD can progress at different rates, depending on the underlying cause of the disease. In some cases, progression of kidney damage is relatively swift and almost always results in end-stage kidney disease. In other cases, progression is relatively slow and can be slowed further through appropriate management. Therefore, the distribution of causes for ESKD will be very different to that for CKD. In most cases of CKD, early detection and appropriate management may prevent progression to end-stage kidney disease.

There is no information available on the incidence or prevalence of different causes of CKD in Australia. However, the ANZDATA Registry collects data on the causes of treated ESKD. Using the data provided by the ANZDATA Registry, this chapter provides detailed information on the different causes of treated ESKD in Australia. The chapter begins with a summary of the different causes, looking at their contribution to the incidence and prevalence of treated ESKD in 2003 and comparing trends since 1981. It then provides data on the incidence and prevalence of treated ESKD due to each major cause, and describes recent trends.

A few causes account for the majority of cases of treated ESKD in Australia. These include:

- glomerulonephritis;
- diabetic nephropathy;
- hypertensive kidney disease;
- analgesic nephropathy;
- reflux nephropathy; and
- polycystic kidney diseases.

Although there are other causes of ESKD, such as kidney stones and cancers, they account for relatively few cases and are not covered in detail in this report.

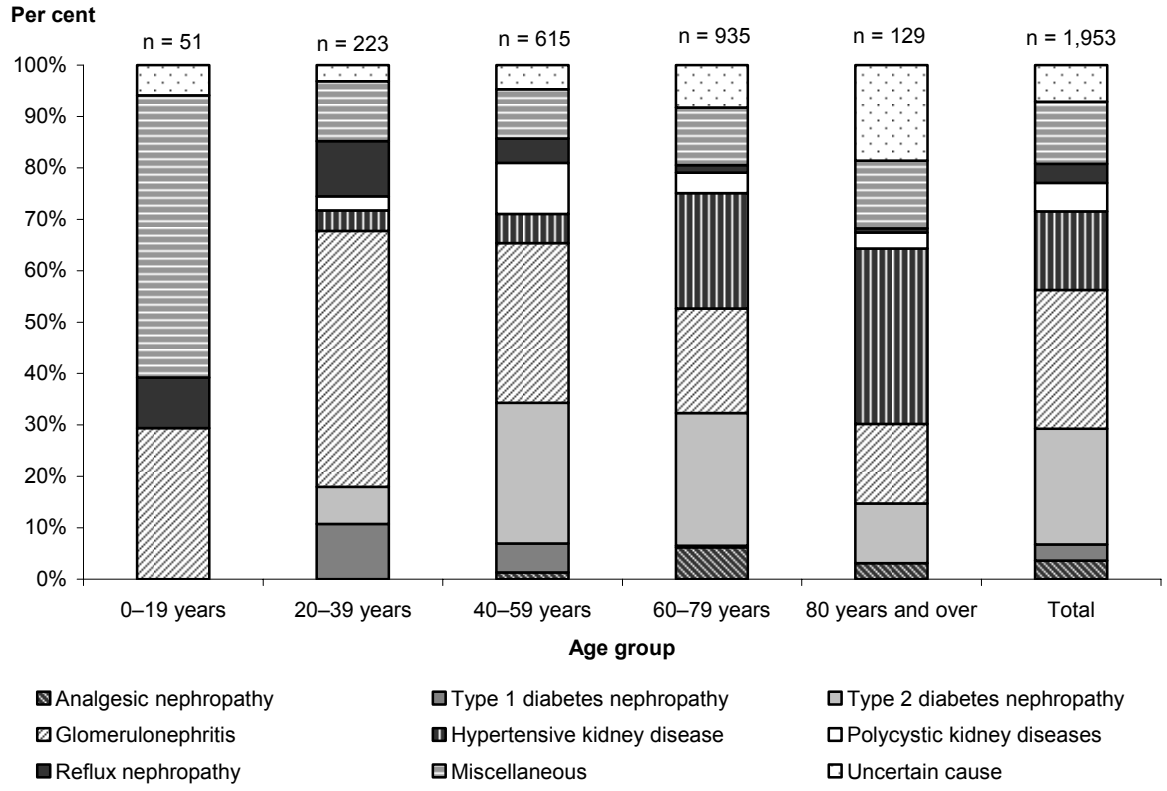
Major causes of treated end-stage kidney disease

The proportion of new and existing cases of treated ESKD attributed to different causes has changed over time, and differs across age groups and between males and females. Looking at the variation in treated ESKD from different causes across the population and how this changes over time can provide information to help target and refine policies and interventions, and to evaluate the success of prevention programs.

Incidence of treated end-stage kidney disease by cause

The major causes of new cases of treated ESKD in 2003 were glomerulonephritis (27%), diabetic nephropathy (26%) and hypertension (15%). These were followed by polycystic kidney disease (5%), analgesic nephropathy (4%) and reflux nephropathy (4%). Miscellaneous causes such as interstitial nephritis (an inflammation of the kidneys), cancers and congenital diseases accounted for a further 12%. There were about 7% of patients whose diagnoses were uncertain.

The causes of treated ESKD among new patients in 2003 varied with age (Figure 4.1). Glomerulonephritis was the major cause of new treated ESKD cases among people aged less than 40 years, accounting for 29% of new cases in 0–19-year-olds and half of all new cases in people aged 20–39 years. In people aged 40–79 years the most common cause was diabetic nephropathy, accounting for around 30% of new cases. One-third of new cases in people aged 80 years and over were due to hypertensive kidney disease.

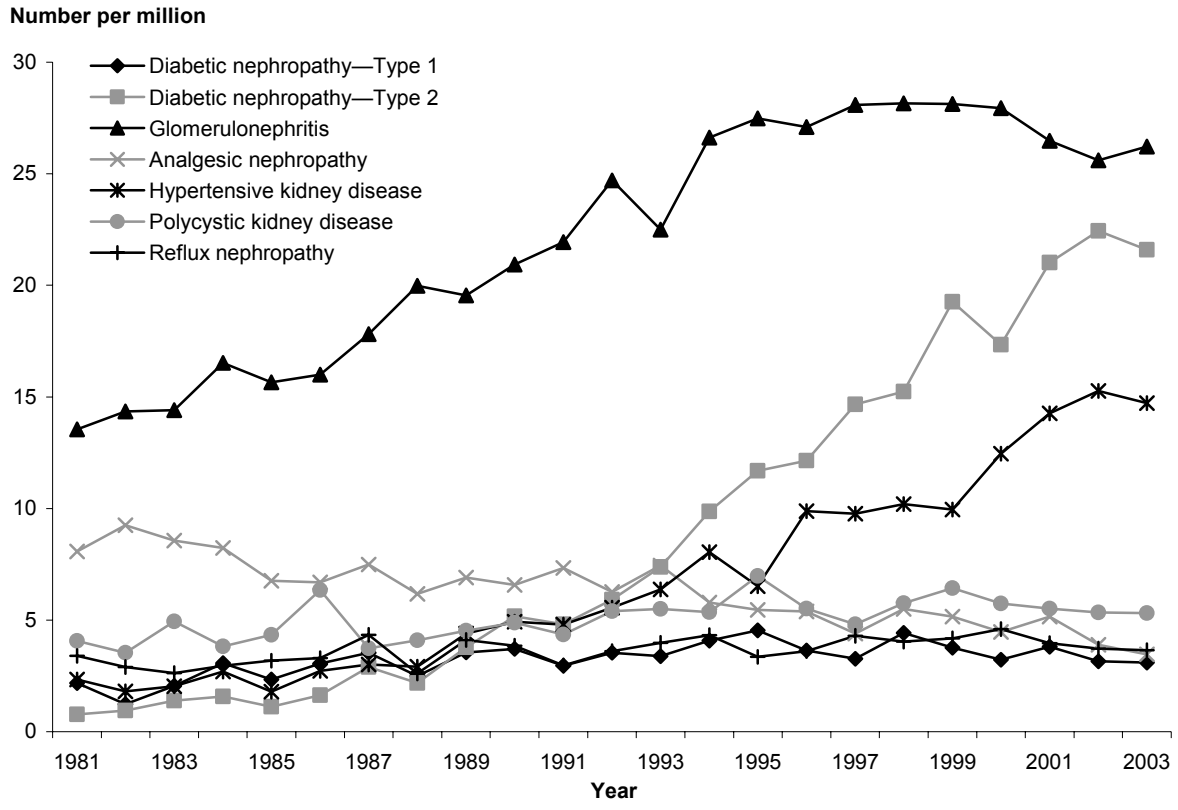


Source: AIHW analysis of ANZDATA Registry data.

Figure 4.1: Causes of new cases of treated end-stage kidney disease, by age group, 2003

Trends in incidence

Between 1981 and 2003, the incidence of treated ESKD increased for all causes except analgesic nephropathy (Figure 4.2). The incidence of treated ESKD caused by glomerulonephritis rose gradually until 1995 but appears to have stabilised and may be decreasing slightly. There have been large and rapid increases in the incidence of treated ESKD caused by hypertensive kidney disease and diabetic nephropathy in Type 2 diabetes since the early 1990s. The incidence of treated ESKD caused by diabetic nephropathy in Type 1 diabetes, reflux nephropathy and polycystic kidney disease have risen very slowly but gradually over the period.



Note: Age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.2: Incidence of treated end-stage kidney disease, selected causes, 1981 to 2003

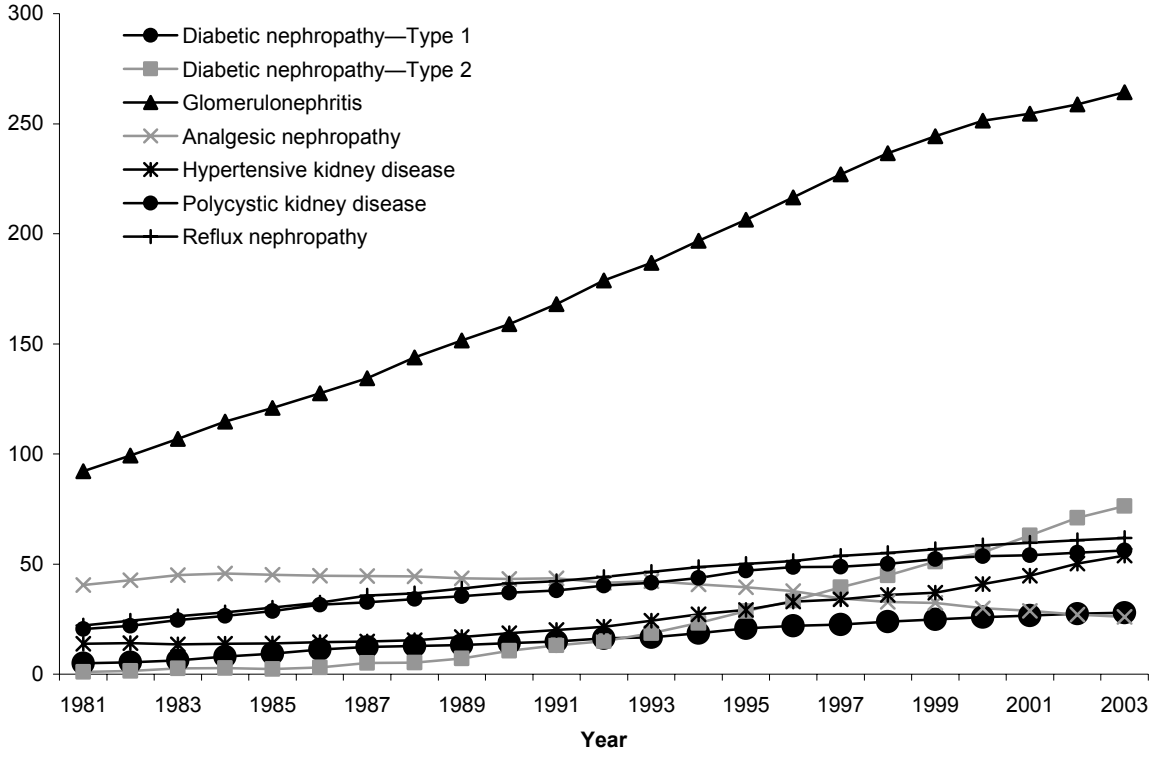
The increased incidence of treated ESKD in recent years can be attributed to a number of factors. The rising prevalence of diabetes and high prevalence of hypertension in the past may have led to increased incidence of CKD. At the same time, the significant reduction in mortality from cardiovascular disease may have resulted in a greater number of people surviving long enough to reach end-stage kidney disease. Also changing acceptance policies for older patients have led to increased numbers of older people being accepted for kidney replacement therapy. All these factors also interact with other factors such as demographic changes (ageing of the population and immigration of people at higher risk) and changes in coding and diagnostic criteria for ESKD (McDonald et al. 2005).

Prevalence of treated end-stage kidney disease by cause

The distribution of causes among the whole population who were receiving kidney replacement therapy in 2003 was similar to that of new patients. Of 13,625 patients, 39% had treated ESKD caused by glomerulonephritis, while diabetes and hypertension together accounted for 24% (Table 4.1).

Trends in prevalence

Compared with other causes, the prevalence of treated ESKD caused by glomerulonephritis is high. Although the incidence of ESKD due to this disease has been stable in recent years, the prevalence is still increasing slowly due to large numbers of ongoing cases. This reflects the high incidence rate of this disease in previous years and increasing survival of treated patients. In contrast, the total number of cases attributed to hypertensive kidney disease and nephropathy in Type 2 diabetes is lower than the number attributed to glomerulonephritis, but both prevalence and incidence of treated ESKD due to these causes have increased (Figure 4.3).



Note: Rates have been age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.3: Prevalence of treated end-stage kidney disease, selected causes, 1981 to 2003.

Table 4.1: Causes of end-stage kidney disease among all treated end-stage kidney disease patients, by age group, 2003

Cause	0–19 years	20–39 years	40–59 years	60–79 years	80 years and over	All ages
	Number of cases (per cent of age group)					
Analgesic nephropathy	0 (0%)	0 (0%)	38 (1%)	446 (9%)	41 (7%)	525 (4%)
Diabetic nephropathy	0 (0%)	208 (9%)	978 (18%)	875 (17%)	53 (10%)	2,114 (16%)
Glomerulonephritis	66 (23%)	1,087 (48%)	2,443 (45%)	1,619 (31%)	113 (20%)	5,328 (39%)
Hypertensive kidney disease	0 (0%)	38 (2%)	184 (3%)	685 (13%)	188 (34%)	1,095 (8%)
Polycystic kidney disease	0 (0%)	28 (1%)	544 (10%)	546 (11%)	28 (5%)	1,146 (8%)
Reflux nephropathy	29 (10%)	422 (19%)	591 (11%)	191 (4%)	4 (1%)	1,237 (9%)
Other causes	183 (64%)	395 (17%)	402 (7%)	429 (8%)	55 (10%)	1,464 (11%)
Uncertain cause	7 (2%)	81 (4%)	200 (4%)	357 (7%)	71 (13%)	716 (5%)
Total prevalent cases	**285**	**2,259**	**5,380**	**5,148**	**553**	**13,625**

Source: AIHW analysis of ANZDATA Registry data.

Glomerulonephritis

Incidence of treated end-stage kidney disease caused by glomerulonephritis

Glomerulonephritis accounted for 1,548 new patients (27%) who started kidney replacement therapy between 2001 and 2003, an incidence rate of 26 per million population. The incidence was higher among males than females and peaked among those aged 65–74 years (Table 4.2).

Table 4.2: Incidence of treated end-stage kidney disease caused by glomerulonephritis, 2001–2003

	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
	Number per million population						
Males	5	29	47	62	99	96	15
Females	5	18	27	33	47	40	7

Source: AIHW analysis of ANZDATA Registry data.

Trends in incidence

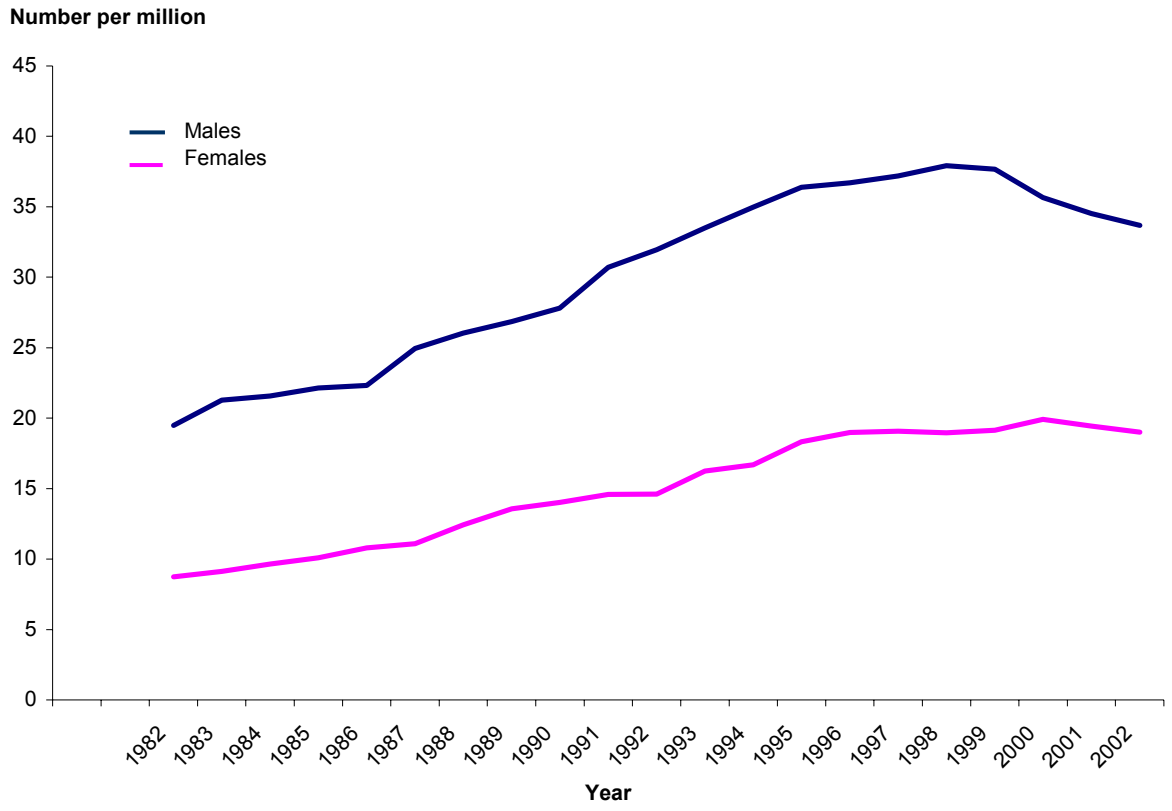
For males, the age-standardised incidence rate of treated ESKD due to glomerulonephritis increased substantially from 19 cases per million population in 1981 to 40 per million in 1999, then declined to 34 per million in 2003 (Figure 4.4). For females, the incidence rate increased from 8 cases per million population in 1982 to 20 per million in 1997, and has remained relatively steady around this rate since then.

Prevalence of treated end-stage kidney disease caused by glomerulonephritis

There were 5,328 people receiving kidney replacement therapy in 2003 for treated ESKD due to glomerulonephritis, an age-standardised prevalence rate of 264 per million population. There were almost twice as many males as females among these people, reflecting the much higher incidence rate among males.

Trends in prevalence

Although declining in incidence, the prevalence of treated ESKD due to glomerulonephritis is relatively high and still increasing slowly due to large numbers of ongoing cases. As with incidence, the prevalence rate in males is almost twice that in females (Figure 4.5).

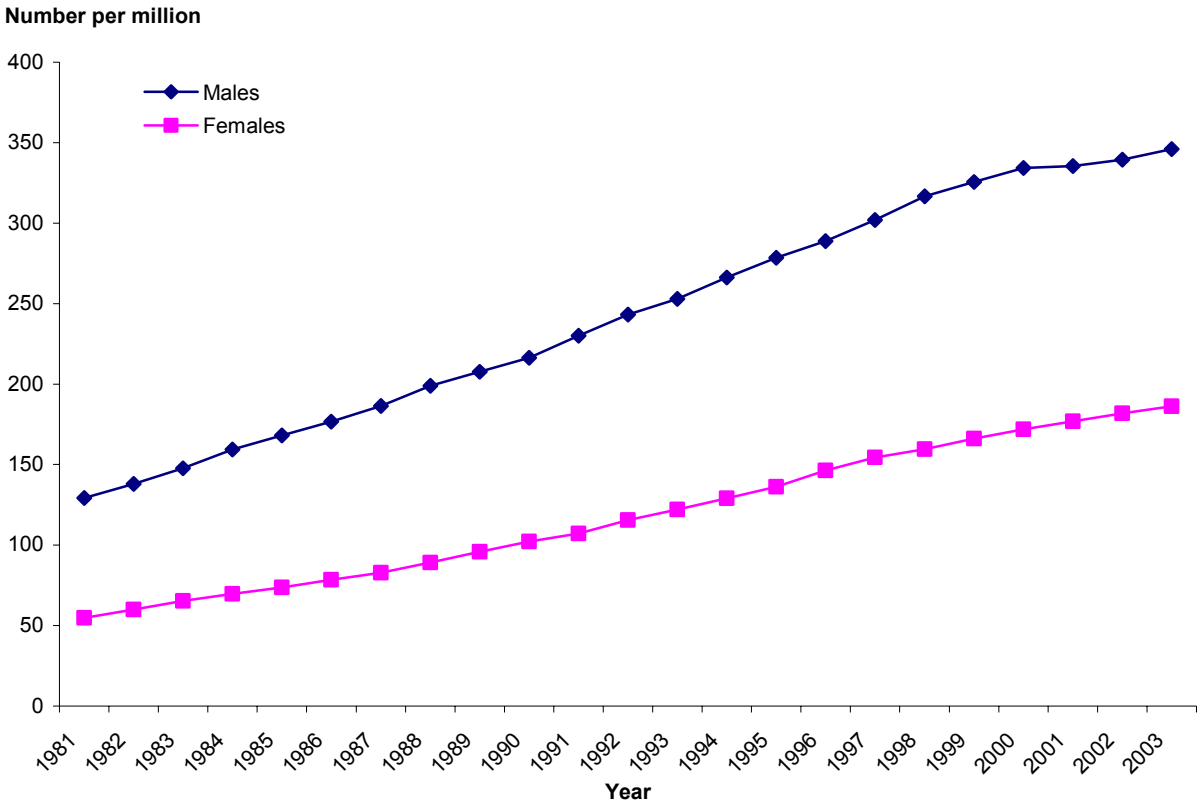


Notes

1. Age-standardised to the Australian population at 30 June 2001.
2. Data are three-year moving averages.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.4: Trends in the incidence of treated end-stage kidney disease due to glomerulonephritis, 1982 to 2002



Note: Age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.5: Trends in the prevalence of treated end-stage kidney disease due to glomerulonephritis, 1981 to 2003

As there is no information available on the incidence or prevalence of glomerulonephritis in the general population, it is not certain if increasing incidence of this disease has contributed to the rising numbers of people with treated ESKD due to the disease. However, given the high incidence among patients in the older age groups (Table 4.3), the increased acceptance of older patients into the kidney replacement therapy program and improved survival rates are likely to have been factors in the rising prevalence rates of treated ESKD due to glomerulonephritis.

Diabetic nephropathy

Incidence of treated end-stage kidney disease caused by diabetic nephropathy

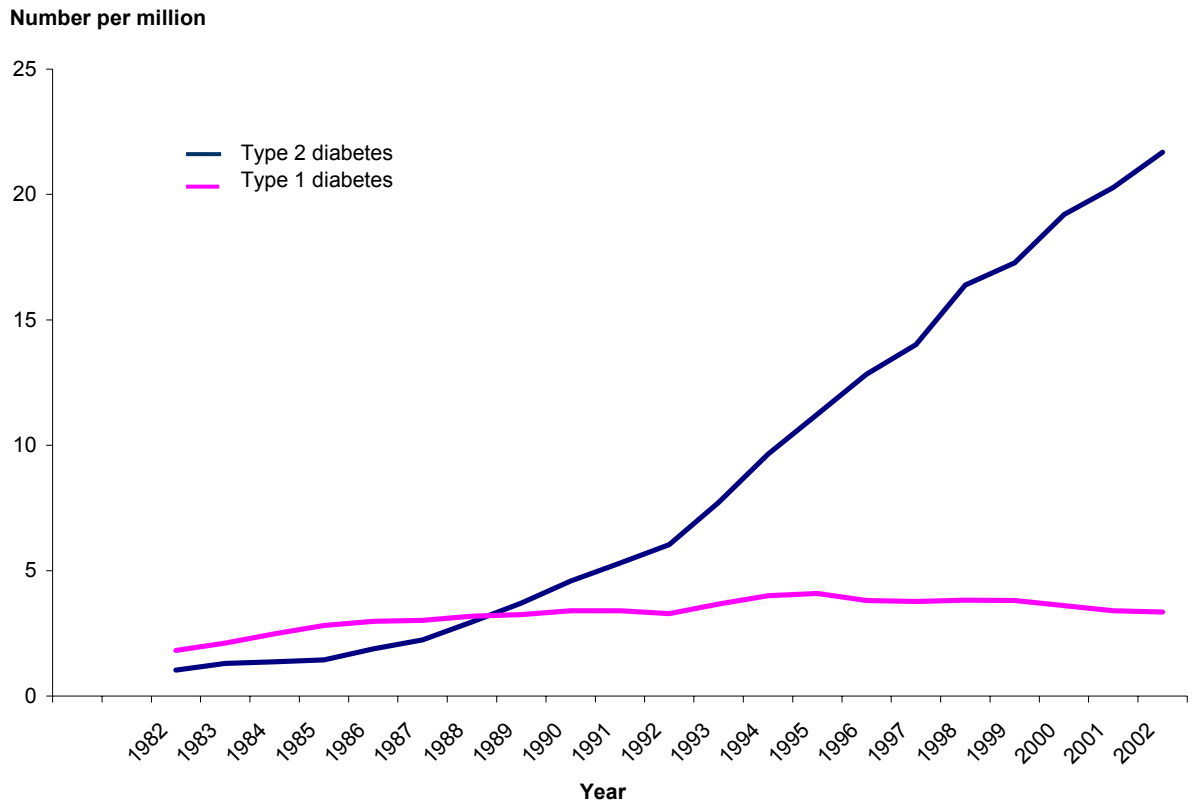
In line with the rising rate of diabetes, growing numbers of treated ESKD cases in Australia were caused by this illness. Between 2001 and 2003, 1,492 new treated ESKD cases (26%) registered in the ANZDATA Registry were attributed to diabetic nephropathy. The incidence of treated ESKD caused by nephropathy in Type 2 diabetes (1,294 cases, 22 per million population) was much higher than for Type 1 diabetes (198 cases, 3 per million population), reflecting the much higher rates of Type 2 diabetes in the Australian population.

Table 4.3: Incidence of treated end-stage kidney disease caused by diabetic nephropathy, 2001–2003

		0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
		Number per million population						
Type 1 diabetic nephropathy	**Males**	0	7	8	4	1	0	0
	Females	0	7	4	2	0	1	0
Type 2 diabetic nephropathy	**Males**	0	6	40	85	121	72	8
	Females	0	5	26	53	75	39	2

Source: AIHW analysis of ANZDATA Registry data.

Consistent with the generally much younger age of onset of Type 1 diabetes, treated ESKD due to nephropathy in Type 1 diabetes tended to occur at younger ages compared with Type 2 diabetes. In 2001–03, the incidence peaked at 25–54 years of age for people with Type 1 diabetes and at 65–74 years of age for people with Type 2. For both types of diabetes the incidence of treated ESKD caused by nephropathy was higher among males than females (Table 4.3).



Notes

1. Age-standardised to the Australian population at 30 June 2001.
2. Data are three-year moving averages.

Source: AIHW analysis of ANZDATA Registry data.

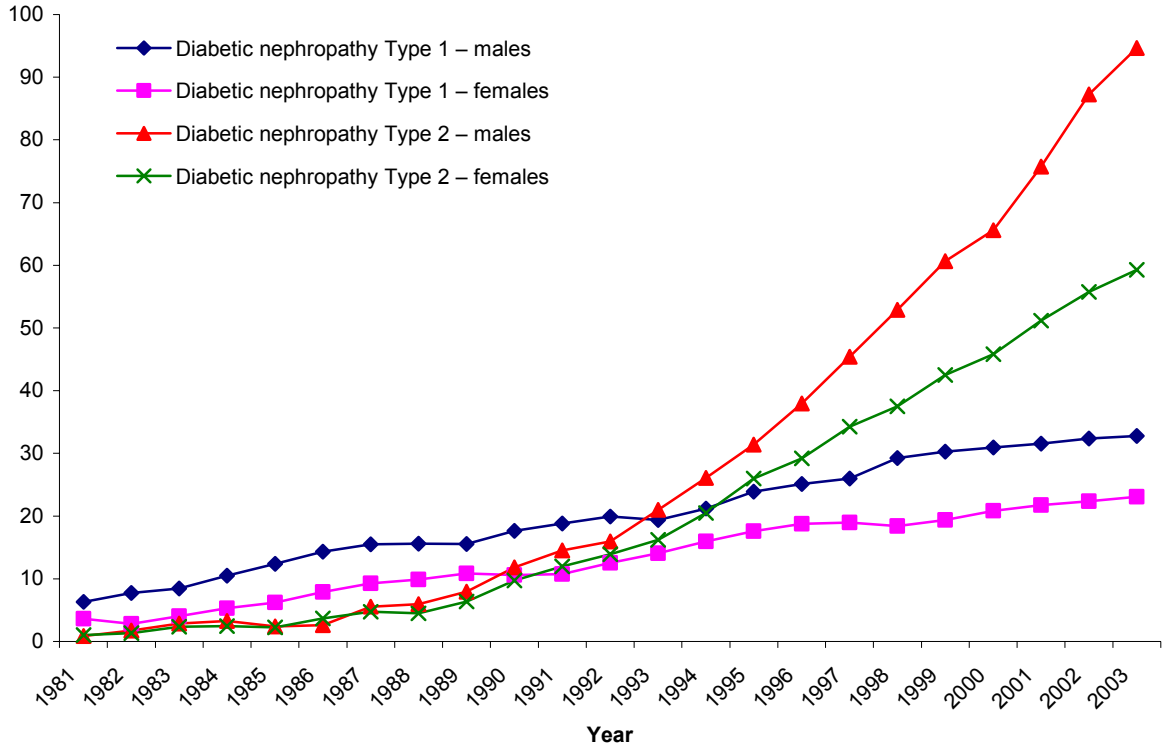
Figure 4.6: Trends in the incidence of treated end-stage kidney disease due to diabetic nephropathy, 1982 to 2002

Trends in incidence

From 1982 to 2002, the age-standardised incidence rate of treated ESKD caused by diabetic nephropathy in people with Type 1 diabetes increased slightly from 2 to 3 cases per million population. In the same period, the incidence rate in people with Type 2 diabetes increased from one case per million population to 22 cases per million population (Figure 4.6).

Prevalence of treated end-stage kidney disease caused by diabetic nephropathy

In 2003, 2,114 people (104 per million population) in the Australian kidney replacement therapy program had ESKD due to diabetic nephropathy. Among these, 557 (26%) had Type 1 diabetes and 1,556 (74%) had Type 2 diabetes. The prevalence rates among males were higher than among females for both types: 33 and 23 per million population respectively for Type 1 diabetes, and 95 and 59 per million population respectively for Type 2 diabetes. The prevalence rates for both types varied with age but, as with incidence, people with Type 1 diabetes tended to be younger. The prevalence was highest in the 35–44 years age group for people with Type 1 diabetes and the 65–74 years age group for people with Type 2 diabetes.



Note: Age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.7: Trends in the prevalence of treated end-stage kidney disease due to diabetic nephropathy, 1981 to 2003

Trends in prevalence

Although the incidence of treated ESKD caused by diabetic nephropathy in people with Type 1 diabetes has increased only slightly since 1981, its prevalence has increased fivefold, from 6 cases to 33 cases per million population for males and from 4 to 23 cases per million population for females (Figure 4.7). This is mostly attributed to improved treatment keeping patients alive.

In the same period, the prevalence rate of treated ESKD caused by diabetic nephropathy in people with Type 2 diabetes increased sharply. From 1981 to 2003, it increased from 1 case per million to 95 cases per million for males and from 1 case per million to 59 cases per million for females (Figure 4.7). Improvements in treatment, the increasing acceptance of older patients into the kidney replacement therapy program and the rising prevalence of Type 2 diabetes are all believed to have contributed to this increase.

Hypertensive kidney disease

Incidence of treated end-stage kidney disease caused by hypertensive kidney disease

Hypertensive kidney disease accounted for 878 new cases of treated ESKD (15%) between 2001 and 2003, an age-standardised incidence rate of 15 per million population. The incidence rate was higher among males (572 cases, 21 per million population) than among females (306 cases, 10 per million population). The incidence of treated ESKD due to hypertensive kidney disease increased sharply with age, being highest in the 75–84 years age group for both sexes (Table 4.4).

Table 4.4: Incidence of treated end-stage kidney disease caused by hypertensive kidney disease, 2001–2003

	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
				Number per million population			
Males	0	2	8	27	101	209	54
Females	0	1	4	14	53	82	14

Source: AIHW analysis of ANZDATA Registry data.

Trends in incidence

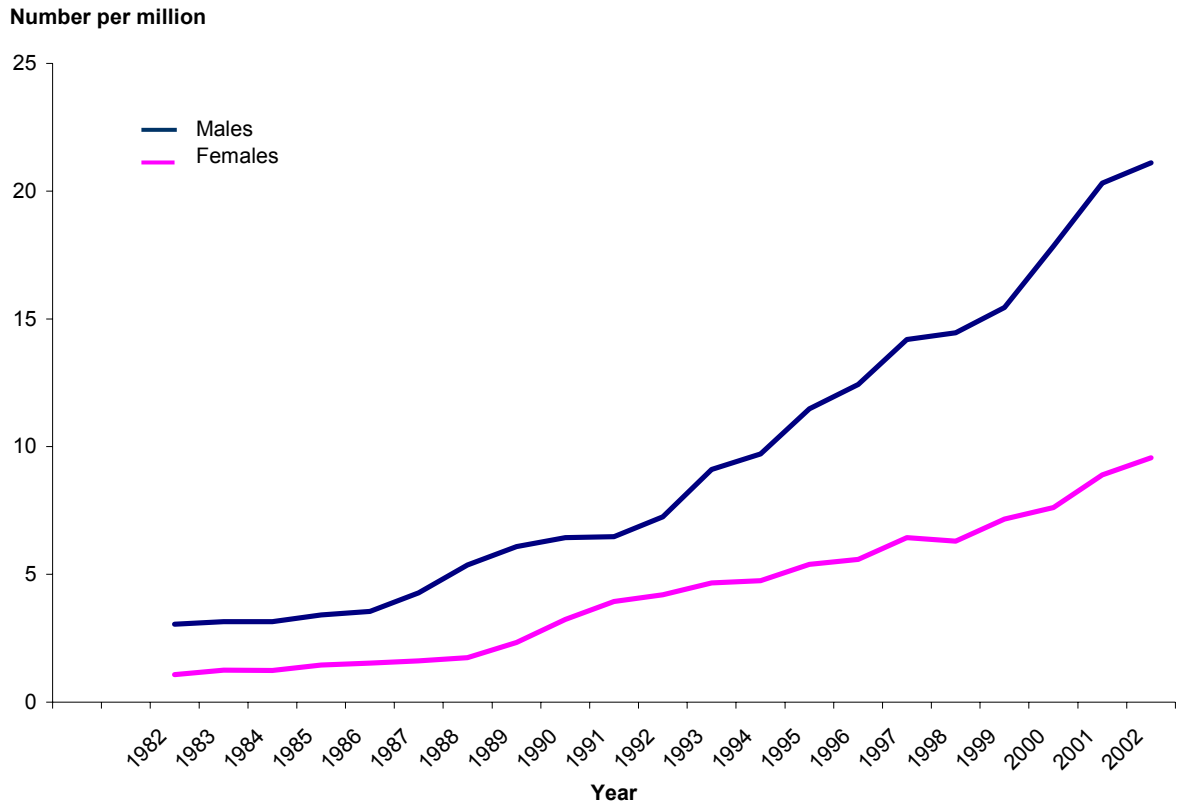
Between 1982 and 2002, the age-standardised incidence rate of treated ESKD due to hypertensive kidney disease increased by five times among males (from 4 to 20 cases per million population), and by more than ten times among females (from 1 to 11 cases per million population) (Figure 4.8).

Prevalence of treated end-stage kidney disease due to hypertensive kidney disease

In 2003, there were 1,095 people receiving treatment for ESKD due to hypertensive kidney disease. About twice as many males (714 cases, 76 per million population) as females (381 cases, 35 per million population) were receiving treatment. The highest prevalence occurred among those aged 75–84 years.

Trends in prevalence

In line with increased incidence of treated ESKD caused by hypertensive kidney disease, its prevalence rate also increased sharply between 1981 and 2003, from 14 to 54 cases per million population. Most of this increase has occurred over the past decade (Figure 4.9).



Notes

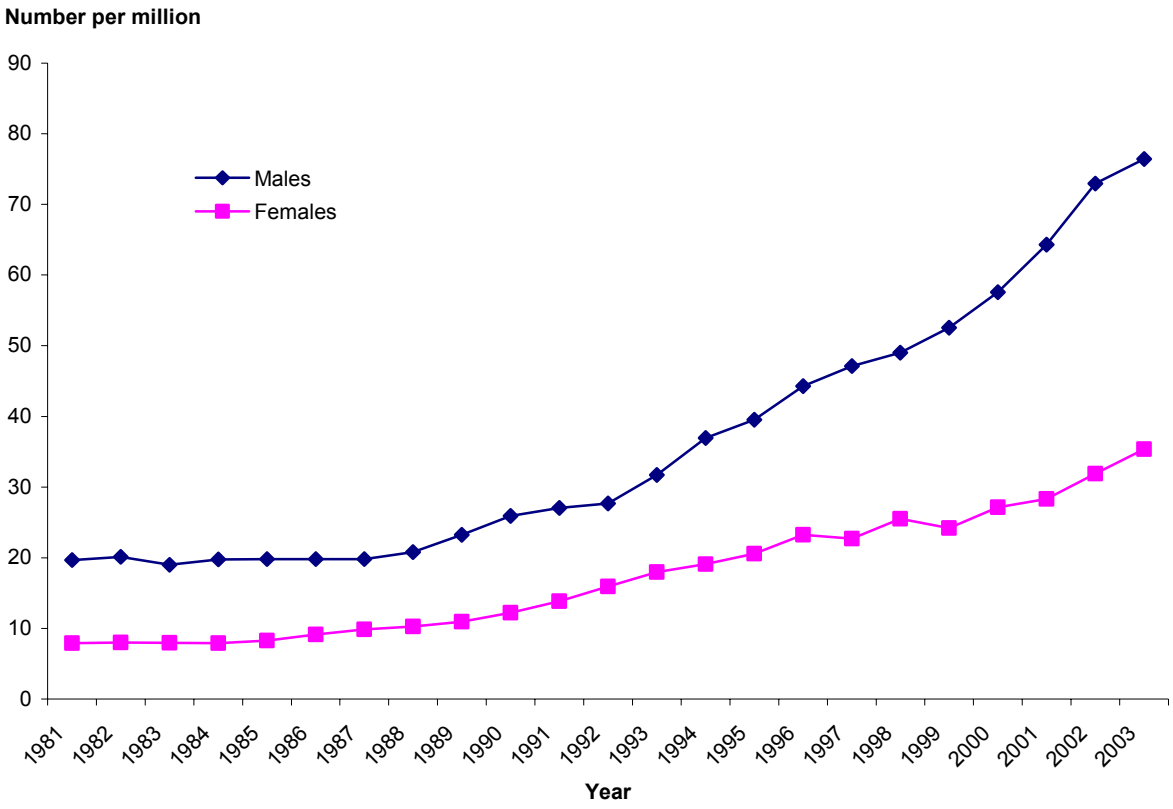
1. Age-standardised to the Australian population at 30 June 2001.
2. Data are three-year moving averages.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.8: Trends in the incidence of treated end-stage kidney disease due to hypertensive kidney disease, 1982 to 2002

There is an apparent incongruence between the decreasing prevalence of hypertension (Chapter 3, Figure 3.2) and the increasing incidence and prevalence of treated ESKD due to hypertensive kidney disease (Figures 4.9 and 4.10). The reasons for this are not clear, but there are several possible explanations. First, there is considerable time from the onset of hypertension to the development of hypertensive kidney complications. That is, the group of people who had hypertension 20 years ago are now suffering kidney complications of hypertension. It is possible that the decline in the prevalence of high blood pressure may

result in reduced incidence of treated ESKD due to hypertensive kidney disease in the future. Second, improvements in the management of cardiovascular diseases, especially improvements in intensive care, allow cardiovascular patients with hypertension to survive long enough to develop kidney complications. Third, the diagnosis of hypertensive kidney disease is usually confirmed through a kidney biopsy, but these are not performed in all cases. Therefore some misclassification is possible. Finally, people at older ages are now being accepted onto the kidney replacement therapy program. As the prevalence of hypertension increases with age, it might be expected that the number of patients with hypertensive kidney disease on the kidney replacement therapy program would increase. A combination of these factors may have contributed to the rising incidence and prevalence rates of treated ESKD due to hypertensive kidney disease.



Note: Age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.9: Trends in the prevalence of treated end-stage kidney disease due to hypertensive kidney disease, 1981 to 2003

Analgesic nephropathy

Incidence of treated end-stage kidney disease caused by analgesic nephropathy

Between 2001 and 2003, 247 new treated ESKD cases (4%) in Australia were attributed to analgesic nephropathy, an incidence rate of 4 cases per million population. The incidence

was significantly higher among females (7 cases per million population) than males (1 case per million population). All cases over this period occurred among people aged 40 years and over, with the incidence rates being considerably higher among those aged 65–84 years (Table 4.5).

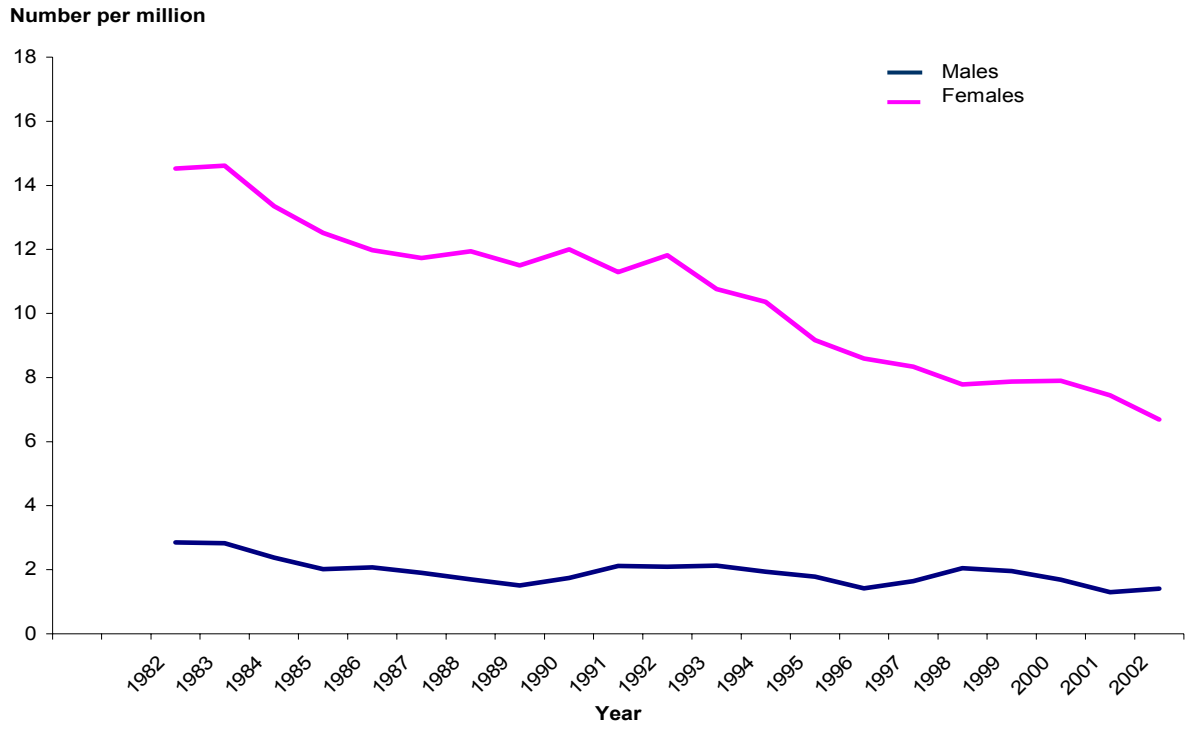
Table 4.5: Incidence of treated end-stage kidney disease caused by analgesic nephropathy, 2001–2003

	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
	Number per million population						
Males	0	0	0	1	10	11	0
Females	0	0	1	15	50	36	2

Source: AIHW analysis of ANZDATA Registry data.

Trends in incidence

The age-standardised incidence rate among females decreased by more than half over the last 20 years, from 14 cases per million population in 1982 to 6 cases per million population in 2002 (Figure 4.10). The incidence rate also decreased for males over this period, from 2 to 1 cases per million population. The decrease in incidence is attributed to the tighter controls on access to analgesics brought about by Commonwealth legislation passed in 1979. This is discussed in more detail in Chapter 5 of this report.



Notes

1. Age-standardised to the Australian population at 30 June 2001.
2. Data are three-year moving averages.

Source: AIHW analysis of ANZDATA Registry data.

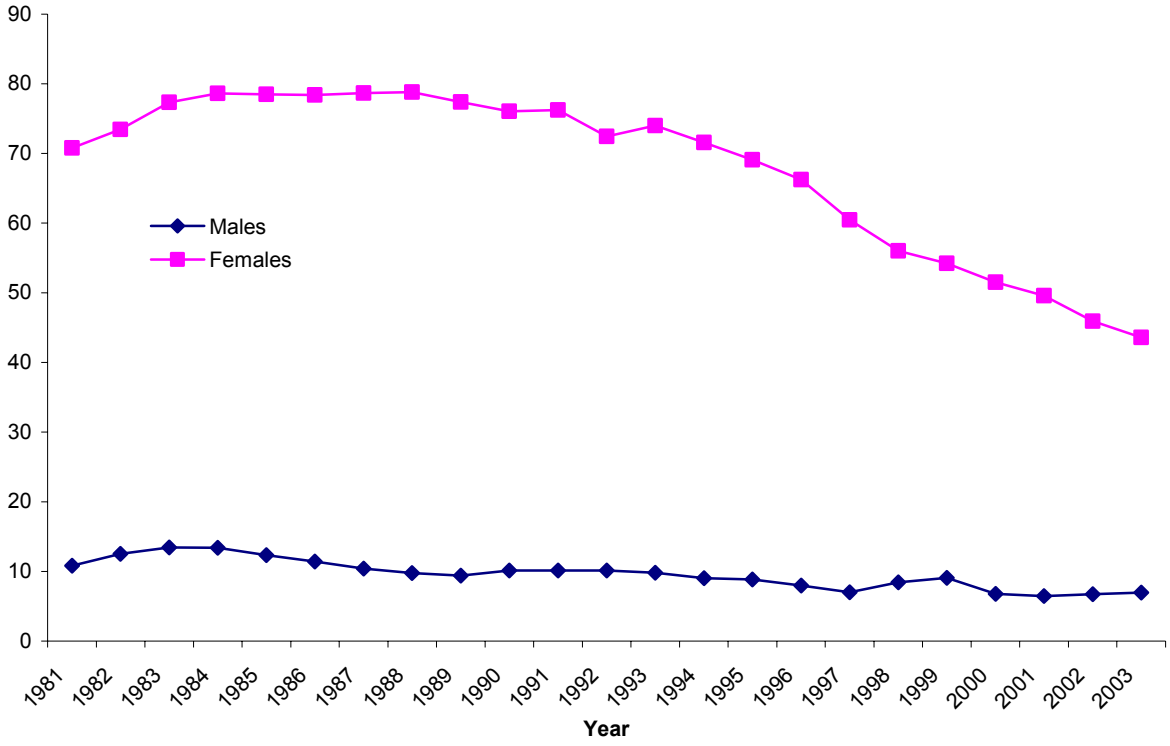
Figure 4.10: Trends in the incidence of treated end-stage kidney disease due to analgesic nephropathy, 1982 to 2002

Prevalence of treated end-stage kidney disease caused by analgesic nephropathy

There were 525 patients receiving kidney replacement therapy for ESKD due to analgesic nephropathy in 2003. The majority of these were females, with an age-standardised prevalence rate of 44 per million population compared with 7 per million population for males. All patients were 40 years of age or more.

Trends in prevalence

In line with the drop in incidence rates over the past two decades, the prevalence of treated ESKD due to analgesic nephropathy has also decreased (Figure 4.11). This decrease is apparent mainly among females, who account for the majority of cases. After a relatively stable period at around 78 per million population during the 1980s, the prevalence rate among females dropped steadily to 44 per million population in 2003. The prevalence rate among males also decreased slightly to 7 per million in 2003 after peaking at 13 per million in 1983.



Note: Age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.11: Trends in the prevalence of treated end-stage kidney disease due to analgesic nephropathy, 1981 to 2003

Reflux nephropathy

Incidence of treated end-stage kidney disease caused by reflux nephropathy

Between 2001 and 2003, 223 new treated ESKD cases (4%) were caused by reflux nephropathy, at an age-standardised rate of 4 cases per million population. The age distribution of these new cases differed between males and females (Table 4.6). For males, the new cases occurred most frequently in younger adults, with the highest incidence rate in the 25–44 years age group. For females the incidence rate peaked in the 55–64 years age group. The reasons for the age difference between the sexes are not clear.

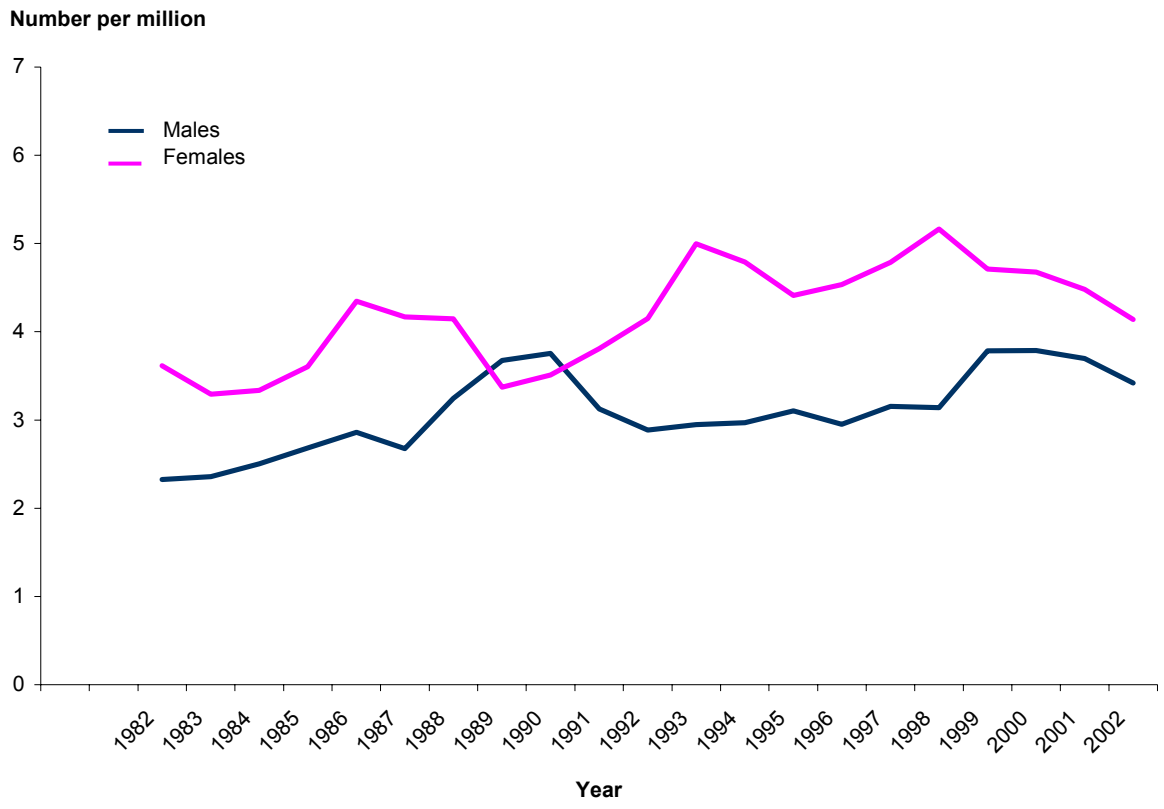
Table 4.6: Incidence of treated end-stage kidney disease caused by reflux nephropathy, 2001–2003

	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
				Number per million population			
Males	1	6	4	2	4	2	0
Females	1	5	6	7	5	3	0

Source: AIHW analysis of ANZDATA Registry data.

Trends in incidence

The age-standardised incidence rate increased slightly in both sexes between 1982 and 2002 (Figure 4.12). It increased from 2 to 4 cases per million for males and from around 3.5 to 4 cases per million for females. This may be partly due to improved diagnostic techniques (such as using ultrasound rather than X-ray) increasing the number of cases where reflux is able to be detected.



Notes

1. Age-standardised to the Australian population at 30 June 2001.
2. Data are three-year moving averages.

Source: AIHW analysis of ANZDATA Registry data.

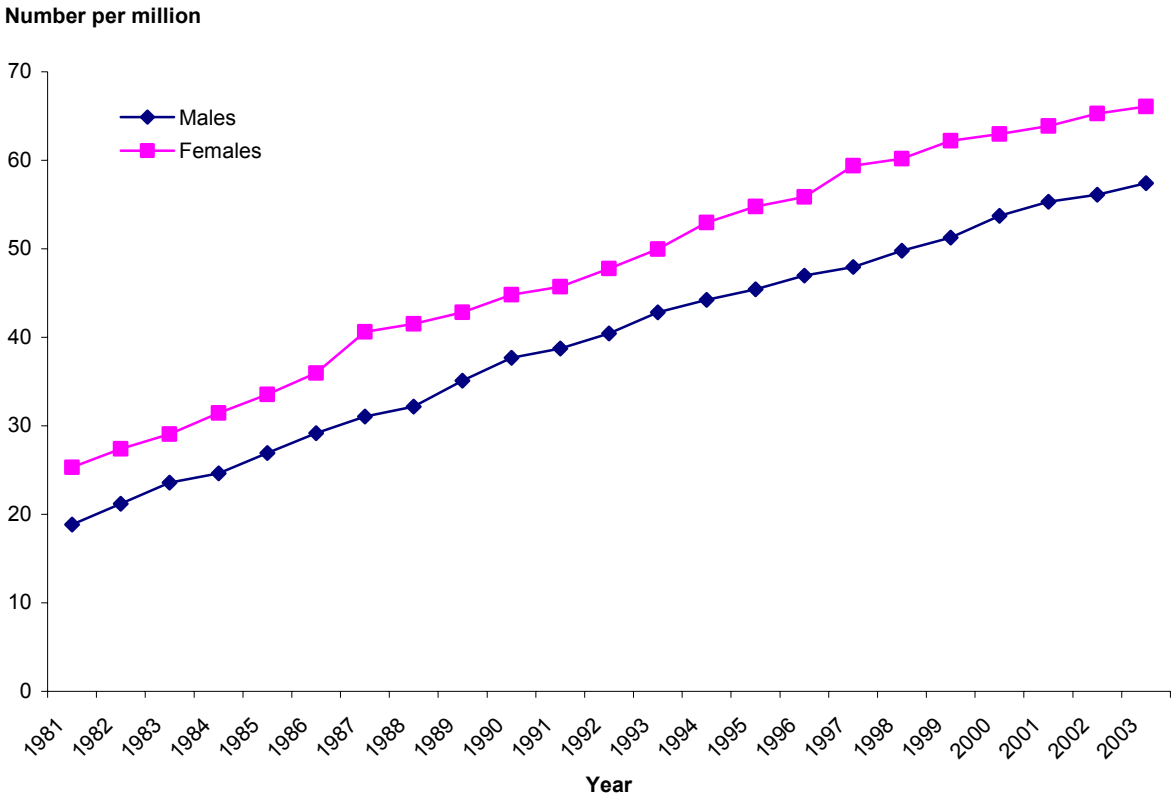
Figure 4.12: Trends in the incidence of treated end-stage kidney disease due to reflux nephropathy, 1982 to 2002

Prevalence of treated end-stage kidney disease caused by reflux nephropathy

There were 1,237 patients in the kidney replacement therapy program in 2003 who had treated ESKD due to reflux nephropathy, an age-standardised prevalence rate of 62 per million population. The prevalence of this condition was slightly higher among females than males, with 66 cases per million and 57 cases per million population, respectively. Prevalence was highest among males aged 35–44 years and females aged 45–54 years.

Trends in prevalence

The trends in prevalence have been similar between the sexes (Figure 4.13). From 1981 to 2003, the prevalence rate increased from 19 to 57 cases per million population for males and from 25 to 66 cases per million population for females.



Note: Age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.13: Trends in the prevalence of treated end-stage kidney disease due to reflux nephropathy, 1981 to 2003

Polycystic kidney diseases

Incidence of treated end-stage kidney disease caused by polycystic kidney diseases

Between 2001 and 2003, 321 new treated ESKD cases (6%) were caused by PKD, at an incidence rate of 5 cases per million population. Most of these cases occurred among people aged 45 years and over (Table 4.7), and the condition was more common among males than females (incidence rates of 7 per million population and 4 per million population respectively).

Trends in incidence

Between 1981 and 2003, the incidence of treated ESKD due to PKD slowly but steadily increased in males (Figure 4.14). No clear trend was apparent for females.

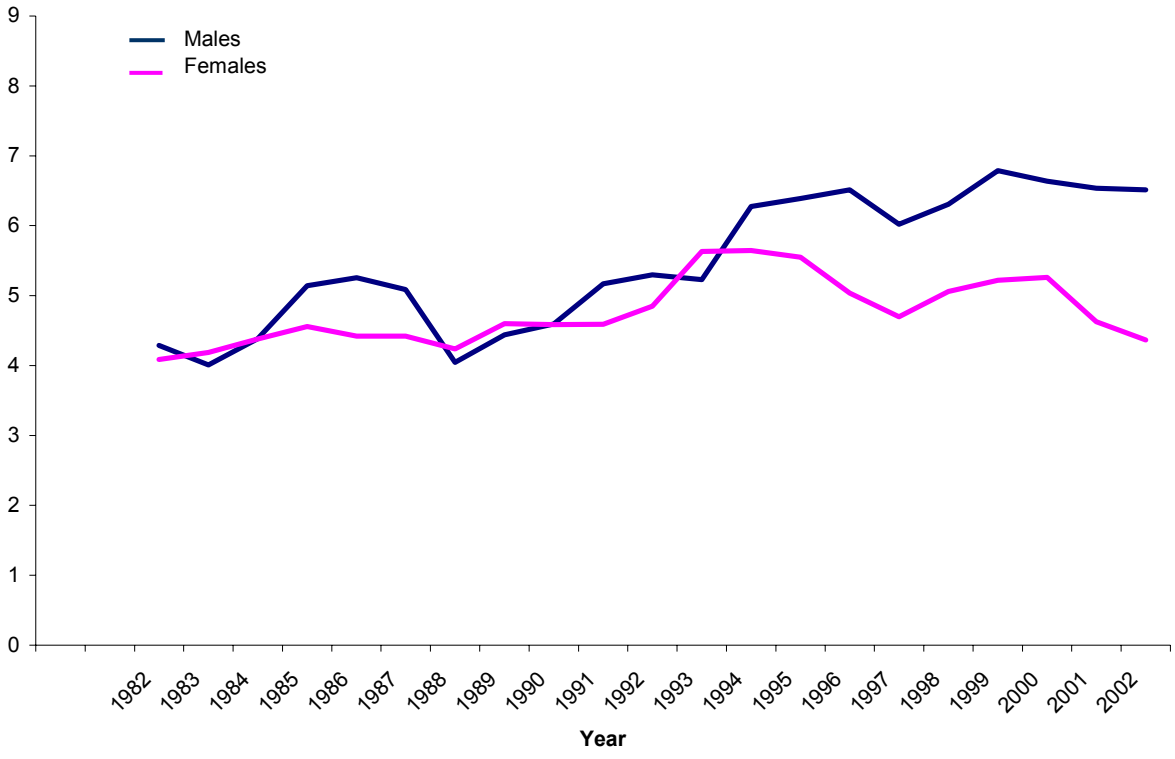
Table 4.7: Incidence of treated end-stage kidney disease caused by polycystic kidney diseases, 2001–2003

	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
	Number per million population						
Males	0	5	14	13	17	15	8
Females	0	2	11	14	8	9	2

Source: AIHW analysis of ANZDATA Registry data.

Prevalence of treated end-stage kidney disease caused by polycystic kidney diseases

In 2003, 1,146 people (62 cases per million population for males and 50 cases per million population for females) received kidney replacement therapy in Australia for ESKD due to PKD. Prevalence was highest among males aged 55–64 years (219 per million population) and females aged 65–74 years (217 per million population).



Notes

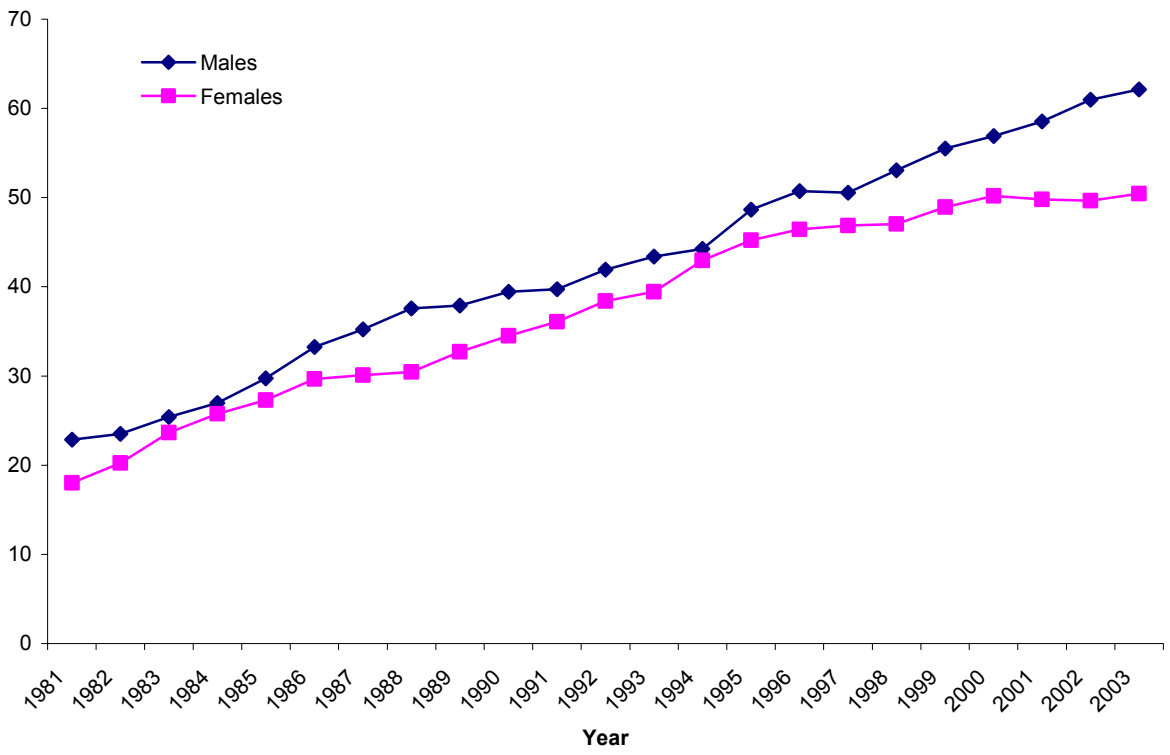
1. Age-standardised to the Australian population at 30 June 2001.
2. Data are three-year moving averages.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.14: Trends in the incidence of treated end-stage kidney disease due to polycystic kidney diseases, 1982 to 2002

Trends in prevalence

The prevalence rate of treated ESKD due to PKD gradually increased for both males and females from 1981, when it was 23 and 18 cases per million population, respectively (Figure 4.15). The prevalence was similar between males and females until 1998, but since then has been increasingly higher among males.



Note: Age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of ANZDATA Registry data.

Figure 4.15: Trends in the prevalence of treated end-stage kidney disease due to polycystic kidney diseases, 1981 to 2003

References

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