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Dialysis and kidney transplantation in Australia

1991–2010

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Contents

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Abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
ANZDATA	Australia and New Zealand Dialysis and Transplant (Registry)
AKX	Australian Paired Kidney Exchange
CKD	chronic kidney disease
ESKD	end-stage kidney disease
ICD–10–AM	International Classification of Diseases, Tenth Revision, Australian Modification
KRT	kidney replacement therapy
NHMD	National Hospital Morbidity Database
NSW	New South Wales

Summary

End-stage kidney disease (ESKD) is a serious and costly health problem in Australia that usually requires kidney replacement therapy (KRT) for patients to survive. This therapy involves dialysis or kidney transplantation. Regional, sex and age differences influence the number of people starting and currently receiving KRT and the types of treatment used.

This report provides a detailed picture of KRT treatment in Australia using a variety of data sources. Differences are explored in KRT treatment rates and treatment patterns for ESKD between population groups and over time.

The number of people starting treatment for ESKD has increased

From 1991 to 2009, the rate of new cases of treated-ESKD increased by 80%, largely due to an increase in diabetes-related cases.

More people are receiving kidney replacement therapy

Between 1991 and 2009, the number of people receiving KRT for their ESKD almost tripled, from 6,643 to 18,267.

Kidney transplantation

From 1991 to 2009, the number of transplants performed each year increased from 470 to 772, largely due to a rise in donations from living donors.

At the end of 2009, about 40% of treated-ESKD patients living in non-remote areas had a functioning kidney transplant. This compares with 9% in *Remote* areas and 26% in *Very Remote* areas.

Dialysis treatment

From 1991 to 2009, the number of people receiving dialysis tripled, from 3,138 people to 10,431 in 2009.

The increase in the number of dialysis patients has resulted in an average increase of nearly 60,000 hospitalisations per year for dialysis from 2000–01 to 2009–10.

Treatment rates

For the period 2003–2007, for every new case of ESKD who received KRT, there was about one case that did not.

The vast majority (80%) of the new cases of ESKD who did not receive KRT were aged over 70.

1 Introduction

Dialysis and kidney transplantation are used to treat end-stage kidney disease (ESKD), which is the most severe stage of chronic kidney disease (CKD). For those people with ESKD, kidney function has deteriorated so much that it is no longer sufficient to sustain life, and kidney replacement therapy (KRT) in the form of dialysis or kidney transplantation is required for the patient to survive (Kidney Health Australia 2007). As not all ESKD patients receive KRT, those that do are referred to as 'treated-ESKD' in this report.

It is important to note that some ESKD patients receive non-KRT medical management, which involves a shift from efforts to prolong life to focusing on care, quality of life and symptom control (Chandna et al. 2011). Prognosis, anticipated quality of life (with or without dialysis), treatment burden (if dialysis is undertaken) and patient preferences all play a part in the decision for or against KRT (Murtagh et al. 2007).

The treatment of ESKD imposes a substantial burden on the Australian health-care system. Maintenance dialysis is the number one reason for hospitalisation in Australia, accounting for more than 13% of all hospitalisations in 2009–10 (AIHW 2011a).

Kidney transplantation

Transplantation is considered the preferred option for KRT by patients and health-care professionals (Mathew et al. 2005). Advantages of transplantation over dialysis include a lower long-term mortality risk, increased quality of life, and lower costs (CARI 2007). Kidney transplantation is not a cure for ESKD; recipients live with the possibility of chronic rejection and the loss of the donor kidney. This can mean a return to dialysis, as well as side effects associated with anti-rejection medications and comorbid conditions.

Donated kidneys come from either deceased or living donors (Kidney Health Australia 2007a). For deceased donors, the decision to donate is made by the next of kin. Most deceased donations are from people whose brain has irreversibly stopped functioning but they remain on a ventilator until their organs have been removed. Transplantation can now also occur after circulatory arrest (ANZDATA Registry 2010).

Because adequate kidney function can be maintained with only one kidney, donated kidneys can also come from living donors, usually close relatives of the recipient. However, if blood group and tissue typing match, donors can also be genetically unrelated, such as partners or friends (Kidney Health Australia 2007b).

There are clear-cut inclusion and eligibility criteria for kidney transplantation in Australia to allocate the few available donated kidneys. A number of factors can prevent people from being considered for kidney transplantation including: age, other health conditions, lifestyle factors such as obesity, smoking, drug and alcohol abuse, and an inability to comply with complex medical therapy (TSANZ 2011). The rate of organ donation in Australia is low compared with other developed countries, and the largest organ transplant waiting list by far is for a kidney transplant (AOTDTA 2010a). Once on the kidney transplant waiting list, the average waiting time for a transplanted kidney from a deceased donor is around three to four years (ANZOD Registry 2011). The more time spent on dialysis before transplantation increases mortality risk and decreases donor kidney survival rates (CARI 2007).

Dialysis

Dialysis is an artificial method of removing waste substances from the blood and regulating levels of circulating chemicals, a function usually performed by the kidneys. There are two main types: peritoneal, which occurs inside the body and can be performed almost anywhere, usually in the home setting; and haemodialysis, which occurs outside the body and is most often conducted in a hospital or satellite setting (see Box 1). Satellite dialysis centres are usually located away from their parent hospital and can help decrease the travel burden that people living in rural and remote areas face when accessing certain dialysis services.

Which form is used depends on the patient's health, age and lifestyle and may also be influenced by the availability of local resources. Both forms, particularly haemodialysis, involve a substantial time commitment by patients.

Box 1: Dialysis

Haemodialysis

In haemodialysis, blood is diverted from the body to a dialysis machine, where it is filtered before being returned to the body. This type of dialysis can be done at home, in hospital, or in satellite clinics. The machine requires special plumbing and the patient must limit their travel to places where dialysis facilities are available. In most cases, the patient requires assistance connecting to the machine, and a partner, relative or friend can be trained to do this for home dialysis patients. During haemodialysis, the patient is usually connected to the machine for about 4–5 hours 3 times per week, during which all their blood passes through the machine about 6 times. If performed at home, patients may have the option of dialysing more frequently for a shorter period (5–7 times per week for about 2 hours) or nocturnally (6 nights per week for about 8 hours). During a haemodialysis session the patient is unable to move away from the machine, though they can sleep and perform activities such as reading, talking, or using a computer.

Peritoneal dialysis

In peritoneal dialysis, the abdomen is filled with sterile dialysis solution and the blood is filtered through the peritoneal membrane (which covers the abdominal cavity organs such as the stomach, liver and intestines). The dialysis solution contains a type of sugar (usually glucose or dextrose) which draws the waste products and extra fluid out of the blood, through the peritoneal membrane and into the solution. After a few hours, the used solution, now containing the wastes and extra fluid, is drained out of the body and replaced with fresh solution. This process is called an exchange, and takes about 30–45 minutes. In between exchanges, the patient is free to continue their usual activities. Peritoneal dialysis can either be performed by the patient during the day (continuous ambulatory peritoneal dialysis), usually 3 or 4 times, or automatically by a machine at night for about 8–10 hours while the patient sleeps (automated peritoneal dialysis). As the necessary equipment is portable, peritoneal dialysis can be performed almost anywhere. The patient does not need to be in a hospital or clinic, and can usually manage the procedure without assistance.

Dialysis treatment can only replace some of the functions of the kidneys. Substantial pharmaceutical regimes are required to partly perform the hormone and other homeostatic functions of the kidneys. Common physical complaints identified by dialysis patients

include muscle, bone and joint aches, sleep disturbances, itchy/dry skin, stomach upsets, poor concentration, coughing, shortness of breath, headaches, decreased sexual function, cramps and dizziness (Cass et al. 2006). This combination of time demands and physical complaints for those on dialysis can lead to major changes in social and economic participation, and significant disruption to home life.

Structure of this report

This report presents information in eight thematic chapters. Chapter 2 presents information on the main data sources. Chapter 3 provides an overview on people receiving transplant and dialysis for ESKD and Chapters 4 and 5 go into more detail on transplant and dialysis. Chapter 6 presents information on hospitalisation for dialysis. Chapter 7 discusses people starting treatment for ESKD and Chapter 8 gives an overview on the costs of KRT. Further tables are in Appendix A and the methods, lists of tables/figures and references are in Appendix B.

2 Main data sources

Australia and New Zealand Dialysis and Transplant (ANZDATA) Registry

In Australia and New Zealand, all people receiving KRT where the intention to treat is long term—that is, kidney function is not expected to recover—are registered with the ANZDATA Registry. The registry compiles data on incidence and prevalence of treated-ESKD, complications, comorbidities and patient deaths. All relevant hospitals and related dialysis units participate. While patients have the option of opting-out of having part or all of their data recorded, this rarely happens.

The interpretation and reporting of ANZDATA Registry information in this report has been undertaken by the AIHW, and does not represent ANZDATA Registry policy or interpretation.

Figures and tables created using data available in the ANZDATA Registry Report are referenced using 'ANZDATA Registry Report 2010'. Figures and tables created using data not available in the report, and requiring analysis of the unit record database, are referenced using 'AIHW analysis of ANZDATA Registry data'. This analysis includes construction of long-term trends using the latest data and age-standardisation.

ANZDATA Registry data were provided to the AIHW in January 2011, and include data up to 2009.

AIHW National Hospital Morbidity Database

Information on hospitalisations in Australia is contained in the AIHW National Hospital Morbidity Database (NHMD). The AIHW compiles and maintains this national collection, using information supplied by state and territory health authorities. The database records information on patients who undergo a formal hospital admission process, complete an episode of admitted patient care, and 'separate' (discharge) from the hospital (AIHW 2009a).

Diagnoses and procedures in the NHMD for the years included in this report are classified according to the *International Statistical Classification of Diseases and Related Health Problems Tenth Revision, Australian Modification* (ICD–10–AM) 2nd to 6th editions.

3 Overview of people receiving treatment for ESKD

Key points

At the end of 2009:

- there were more than 18,000 people receiving KRT
- males were receiving KRT at 1.6 times the rate of females
- rates of treated-ESKD increased with age, peaking at 75–79.

With the exception of the Northern Territory, states and territories had similar rates of treated-ESKD. The higher rate in the Northern Territory is likely due to the large proportion of Indigenous Australians in that jurisdiction.

Remote and *Very remote* areas have higher rates of ESKD than other areas.

Since 1991, the rates of KRT have almost doubled and the actual numbers of people receiving KRT tripled.

Dialysis is now more common than transplant, with 57% of KRT patients on dialysis in 2009. This is an increase from 47% in 1991.

Measuring the number of people receiving KRT (dialysis or kidney transplant) for their ESKD at a point in time (prevalence) is important for determining the burden of treating ESKD.

It is important to note that the number of people receiving KRT does not equate to the overall number of people with ESKD in Australia as not all patients will be suitable candidates for KRT, and others may choose not to take it up (AIHW 2011b).

At the end of 2009, there were 18,267 people receiving KRT (treated-ESKD) in Australia, equating to 79.3 per 100,000 population. After adjusting for differences in age structure, males were receiving KRT at 1.6 times the rate for females (98.3 compared with 61.9 per 100,000, respectively) (Table 3.1).

Table 3.1 People with treated-ESKD in Australia as at 31 December 2009

	Males	Females	Persons
Number of treated-ESKD cases	11,008	7,259	18,267
Number per 100,000[(a)]	98.3	61.9	79.3
Rate ratio (male rate:female rate)		*1.59*	

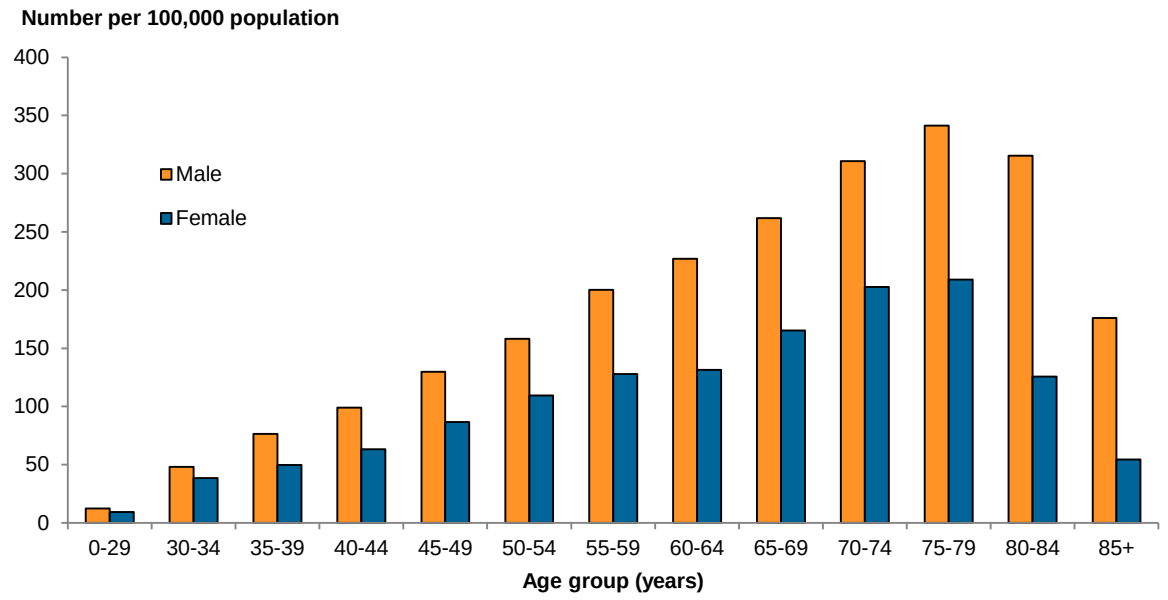
(a) Directly age-standardised to the 2001 Australian population.

Source: AIHW analysis of ANZDATA Registry data.

Treatment by age

Overall, the rate of people receiving treatment for ESKD increased with age, and peaked among those aged 75–79 at the end of 2009, at 270 per 100,000 population. This was observed for both males and females, with rates of 341.4 and 209.1 per 100,000 population, respectively (Figure 3.1).

The rate of treated-ESKD was higher for males than females in all age groups, with the greatest relative difference among those aged over 85 where the male rate was more than 3 times the female rate.



Source: AIHW analysis of ANZDATA Registry data.

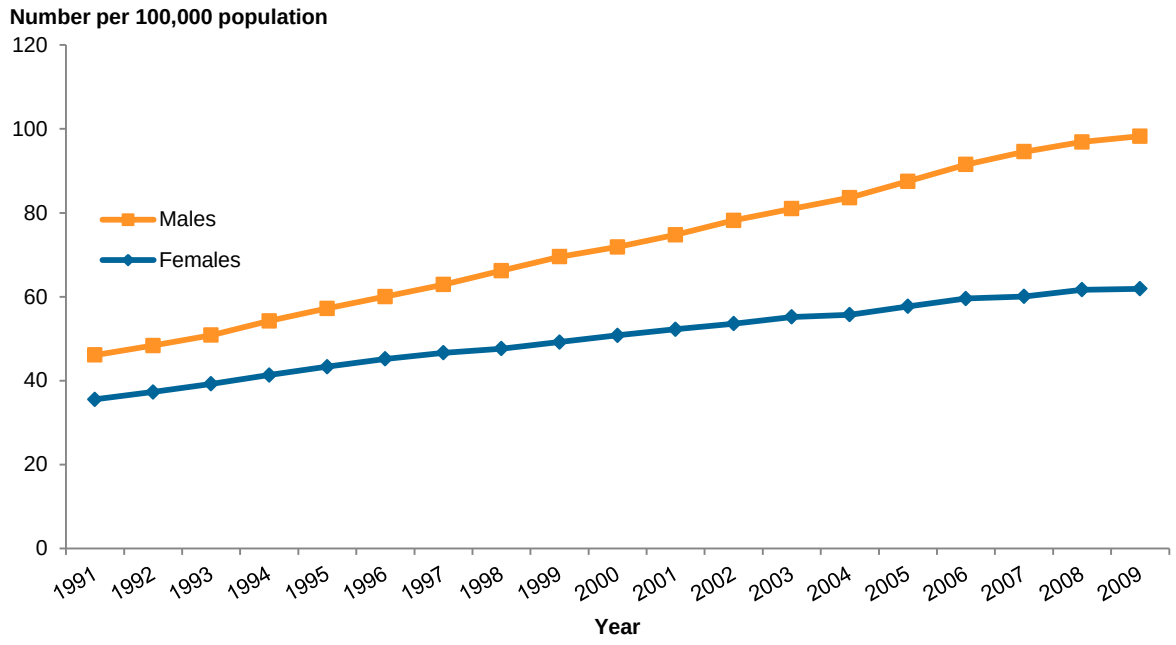
Figure 3.1: Rates of treated-ESKD by sex and age, 2009

Treatment trends over time

For the period 1991 to 2009, the number of people receiving KRT for ESKD almost tripled, from 6,643 to 18,267 people. After adjusting for differences in the population size and age structure over time, the rate almost doubled from 40.7 to 79.3 per 100,000 population. The increase was greater among males than females, 2.2 times compared with 1.7 times, respectively (Figure 3.2).

The reasons for the increasing number of people receiving KRT are complex, and are not necessarily due solely to an increase in the prevalence of ESKD. The increasing rate of diabetes has contributed to a greater number of treated-ESKD cases. This is reflected in the increasing proportion of new cases of treated-ESKD related to diabetic nephropathy from 1991 to 2009 (see Chapter 7). High prevalence of high blood pressure in the past, better survival for patients on KRT, and a reduction in the number of people dying from cardiovascular disease are also possible contributors (McDonald et al. 2005; Stewart et al. 2004). Progressively greater numbers of older people are being treated for ESKD (AIHW

2009b). This is illustrated by looking at the average age of people starting KRT which has increased from 44 in 1991 to 61 in 2009.



Note: Directly age-standardised to the 2001 Australian population.

Source: AIHW analysis of ANZDATA Registry data.

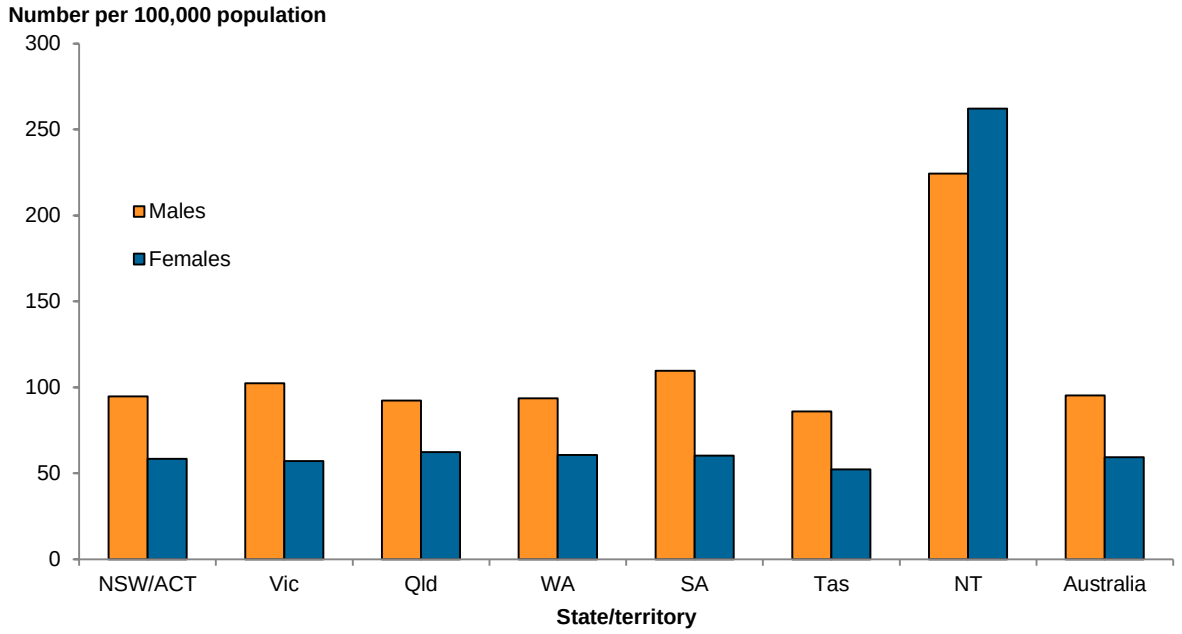
Figure 3.2: Rates of treated-ESKD by sex, 1991 to 2009

Treatment by state/territory

Data for New South Wales (NSW) and the Australian Capital Territory (ACT) were combined due to reasons outlined in Appendix B.

As at 31 December 2009, 33% of people with treated-ESKD received treatment in NSW/ACT (6,044 cases) and 25% of people with treated-ESKD received treatment in Victoria (4,541 cases), reflecting the high proportion of the Australian population living in these jurisdictions (Table A1). After adjusting for differences in age structure and population sizes the male and female rates of treated-ESKD were similar to the national rates in all jurisdictions except for the Northern Territory (Figure 3.3). The treated-ESKD rate for males in the Northern Territory was 2.6 times the Australian male rate and even greater differences were seen in females where the treated-ESKD rate was 4.4 times the female Australian rate.

The higher rates of treated-ESKD in the Northern Territory are likely due to the large proportion of Aboriginal and Torres Strait Islander people living in this jurisdiction (31.6% of the population versus 2.5% of the total Australian population), as the rate of treated-ESKD among Indigenous Australians is about 6 times the non-Indigenous rate (AIHW 2011c; McDonald & Russ 2003). This also explains why the female rate is higher than the male rate in the Northern Territory as Indigenous females are more likely to have treated-ESKD than Indigenous males (McDonald & Russ 2003).



Notes

1 Directly age-standardised to the 2001 Australian population.

2 The Australian age-standardised rates were calculated using the same age-groupings as the state/territory age-standardised rates. These age groupings result in slightly different Australian age-standardised rates than the ones reported elsewhere (Table 3.1).

Source: AIHW analysis of ANZDATA Registry data.

Figure 3.3: Treated-ESKD, by sex and state/territory of treatment, 2009

Treatment by geographical location of residence

The ANZDATA Registry records the postcode where treated-ESKD patients are currently living. This information has been used to assign a remoteness category based on the Australian Bureau of Statistic (ABS) Australian Standard Geographical Classification.

Health outcomes tend to be poorer outside major cities and there are clear differences in health service use between areas. However, it is not currently possible to apportion the generally poorer health outcomes outside major cities to access and treatment, environment or risk factor issues. It is likely that each of these three play a part (AIHW 2008).

As at the end of December 2009, when taking into account population size and adjusting for differences in age structure, the rate of treated-ESKD was highest for people living in *Remote* and *Very remote* areas (149.3 and 138.1 per 100,000 population, respectively) (Table 3.2).

Table 3.2: Treated-ESKD by geographical location of residence, 31 December 2009

	Major cities		Inner regional		Outer regional		Remote		Very remote	
	Number	Rate[(a)]	Number	Rate[(a)]	Number	Rate[(a)]	Number	Rate[(a)]	Number	Rate[(a)]
Male	7,530	102.3	2,086	87.2	1,022	89.2	251	141.5	110	130.2
Female	4,852	61.2	1,297	52.7	743	67.2	248	159.8	105	148.1
Persons[(b)]	12,381	80.6	3,383	69.5	1,765	78.3	498	149.3	215	138.1

(a) Treated-ESKD patients per 100,000 population, directly age-standardised to the 2001 Australian population.

(b) Male and female numbers may not add up to total numbers (persons) due to rounding associated with allocating postcodes of residence to ASGC categories.

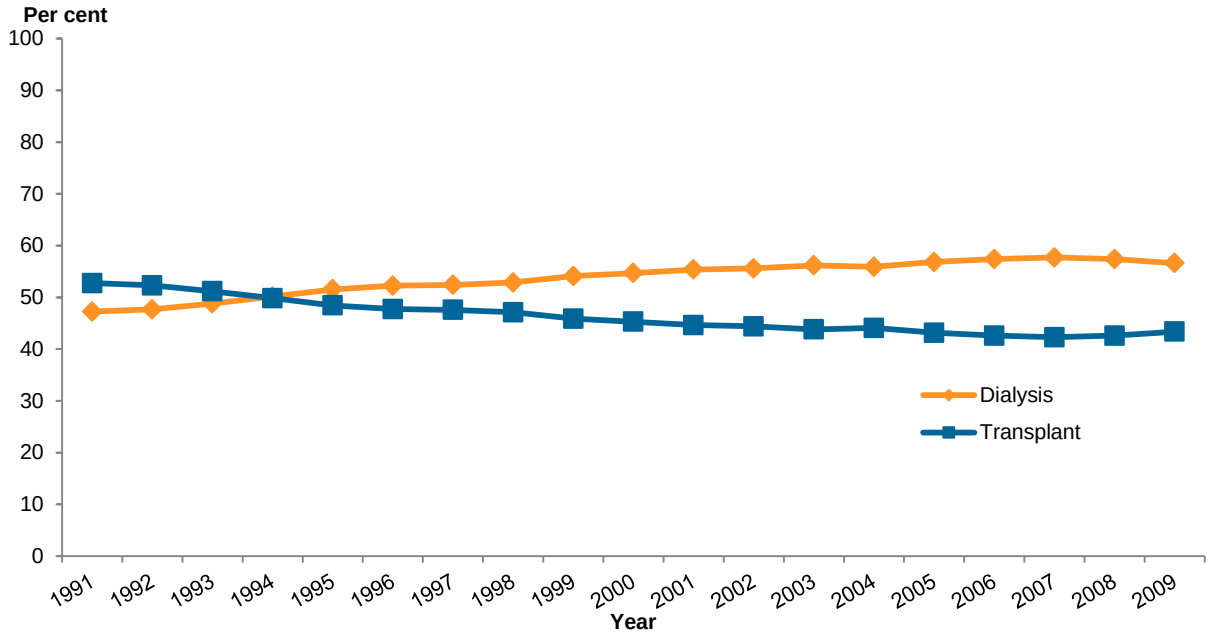
Source: AIHW analysis of ANZDATA Registry data.

Males had higher rates of treated-ESKD than females in *Major cities*, *Inner regional* and *Outer regional* areas. However, in *Remote* and *Very remote* areas the opposite trend occurred. The higher rates of treated-ESKD for females in *Remote and Very remote* areas is due to the relatively high proportion of Indigenous Australians making up the population in these areas (15% and 48%, respectively). Compared with urban areas, there is also less difference between male and female rates for non-Indigenous Australians in *Remote* and *Very remote* locations (AIHW 2011c).

It is worth noting that a different pattern is seen for people starting treatment, as opposed to currently receiving treatment. In 2009, the age-standardised rate of people starting treatment for ESKD in *Very remote* areas was 2.4 times the rate in *Remote* areas (see Chapter 7). The fact that this same pattern is not seen for people currently receiving treatment for ESKD is likely partly due to patients from *Very remote* areas moving to access services.

Type of kidney replacement therapy

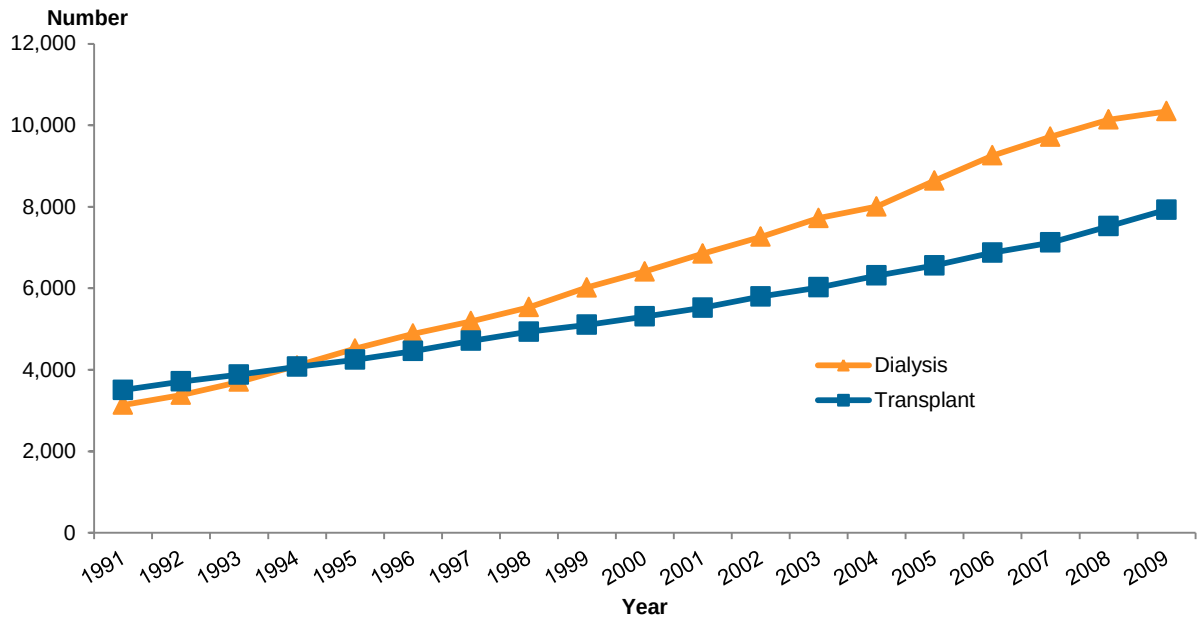
Dialysis is now more common than transplant. In 1991, there were more treated-ESKD patients treated with a functioning kidney transplant (53%) than dialysis. This proportion then decreased to 43% by 2009 (Figure 3.4) having remained relatively stable since 2001.



Source: AIHW analysis of ANZDATA Registry data.

Figure 3.4: Proportion of treated-ESKD patients receiving dialysis or with a functioning kidney transplant, 1991 to 2009

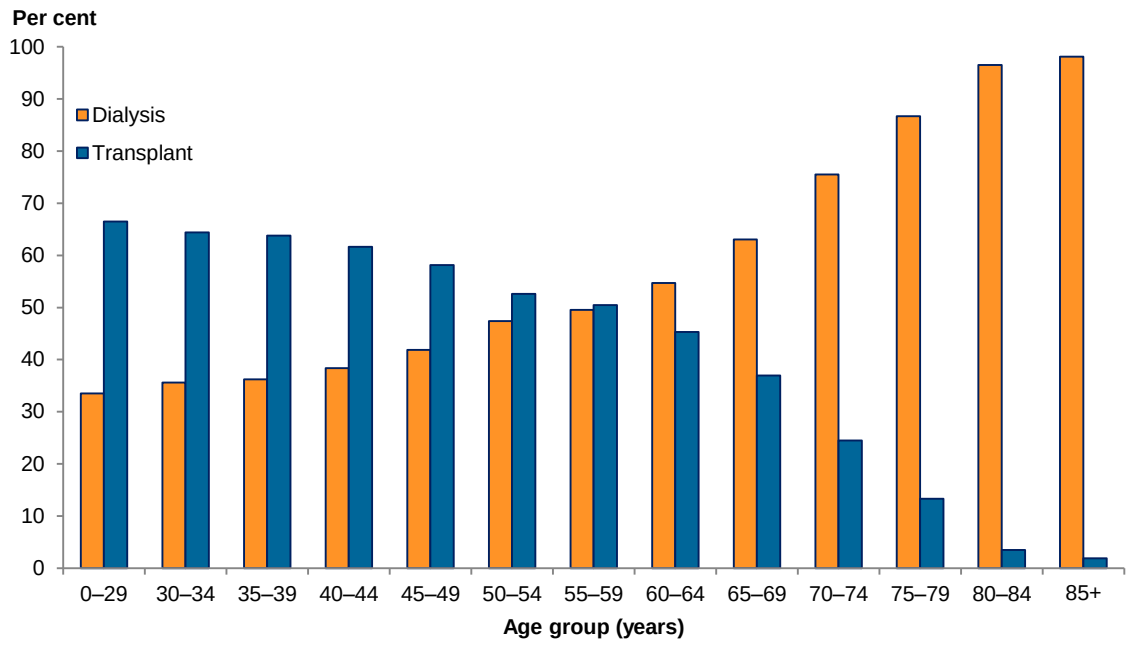
From 1991 to 2009 the number of treated-ESKD patients with a functioning kidney transplant more than doubled, increasing from 3,505 to 7,926 cases while the number of ESKD cases treated with dialysis almost tripled (3,138 to 10,341 people) (Figure 3.5).



Source: AIHW analysis of ANZDATA Registry data.

Figure 3.5: Number of treated-ESKD patients receiving dialysis or with a functioning kidney transplant, 1991 to 2009

Age is one factor that influences eligibility for kidney transplantation, with older Australians less likely to receive a kidney transplant. At the end of 2009, 66% of treated-ESKD patients with a functioning kidney transplant were under 30 (Figure 3.6). The proportion of patients living with a transplant decreased with age, with about 24% aged 70–74 and only 2% over 85 having a functioning kidney transplant.

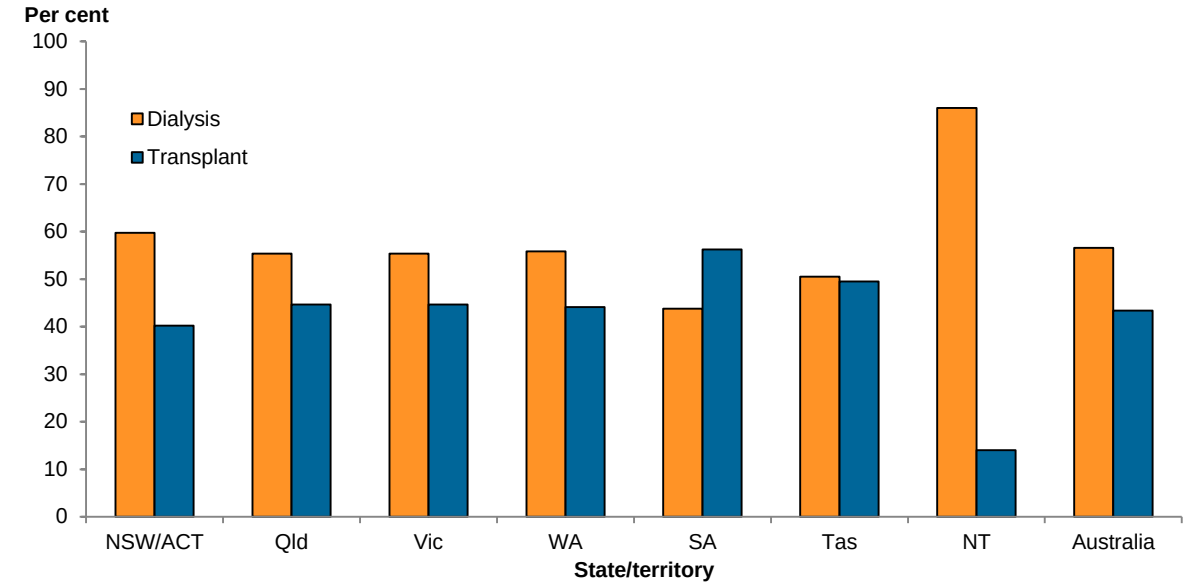


Source: AIHW analysis of ANZDATA Registry data.

Figure 3.6: Proportion of ESKD patients receiving dialysis or with a functioning kidney transplant by age, 2009

Type of kidney replacement therapy by state/territory

With the exception of the Northern Territory, across states and territories the proportion of treated-ESKD patients with a functioning kidney transplant differs only slightly (Figure 3.7). At the end of 2009, South Australia had the highest proportion of treated-ESKD patients with a functioning kidney transplant (56%), while the Northern Territory had the lowest proportion at 14%. The low rate of functioning transplants in the Northern Territory is most likely due to the relatively high proportion of Indigenous Australians in this jurisdiction, as Indigenous Australians with treated-ESKD are less likely to have a functioning kidney transplant (ANZDATA Registry 2010). NSW/ACT had the second lowest proportion of treated-ESKD patients with a functioning kidney transplant at around 40% of treated-ESKD patients.

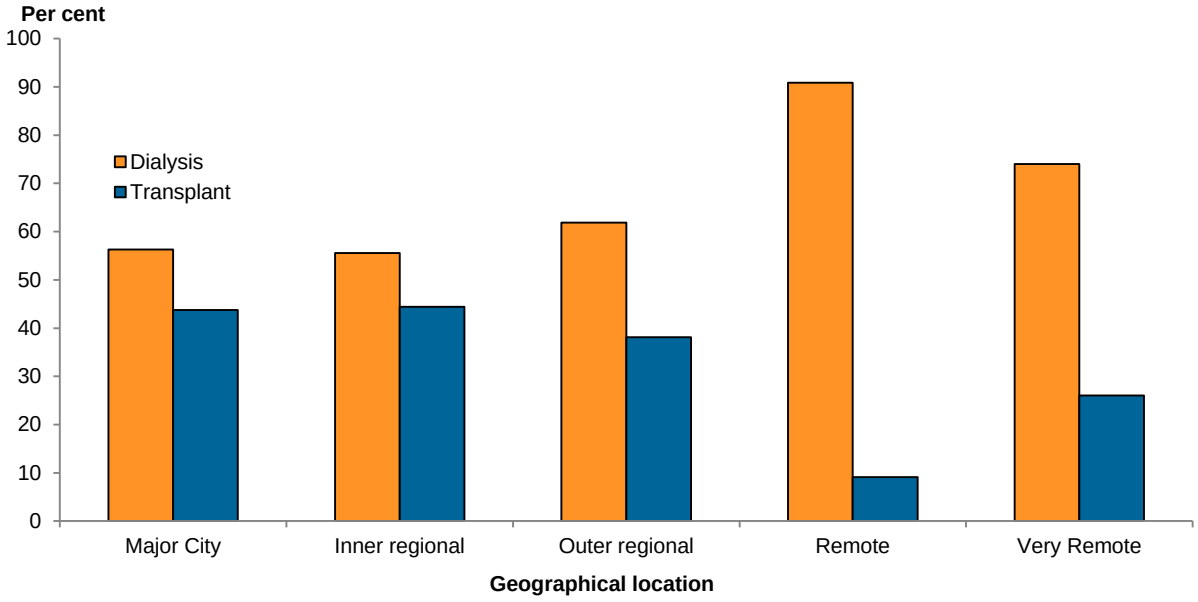


Source: AIHW analysis of ANZDATA Registry data.

Figure 3.7: Proportion of ESKD patients receiving dialysis or with a functioning kidney transplant by state/territory, 2009

Type of kidney replacement therapy by geographical location

The proportion of treated-ESKD patients with a functioning transplant also varies by geographical location of residence (Figure 3.8). At the end of 2009, around 44% of treated-ESKD patients living in *Major cities* or *Inner regional* areas and 38% of ESKD patients living in *Outer regional* areas had a functioning kidney transplant. This compares to 9% in *Remote* areas and 26% in *Very Remote* areas.



Source: AIHW analysis of ANZDATA Registry data.

Figure 3.8: Proportion of ESKD patients receiving dialysis or with a functioning kidney transplant by geographical location of residence, 2009

4 Transplants

Key points

During 2009 there were 772 kidney transplant operations, 446 kidneys were from deceased donors and 326 were from living donors.

The way kidneys are removed from living donors has changed over the last 10 years. Now almost all surgeries use the less invasive laparoscopic technique and hospital length of stay for donors has decreased.

Between 1991 and 2009:

- the annual number of kidney transplants performed each year increased by 65%
- donations from living donors increased four times
- donations from deceased persons increased by 16%.

During 2009 there were 772 kidney transplant operations performed in Australia. Recipients' ages ranged from 1 to 83, with a median age of 49 (ANZDATA Registry 2010).

The majority of transplanted organs were from deceased donors (58%), however this varied with age; younger recipients were more likely to receive a kidney from living donors. The highest proportion of donations from living donors was in the 0–14 and 15–24 age groups (64.3% and 72.7%, respectively) (Table 4.1). In contrast, those aged 55–64 and 65 and over had the highest proportion of donations from deceased donors (63.3% and 67.8%, respectively).

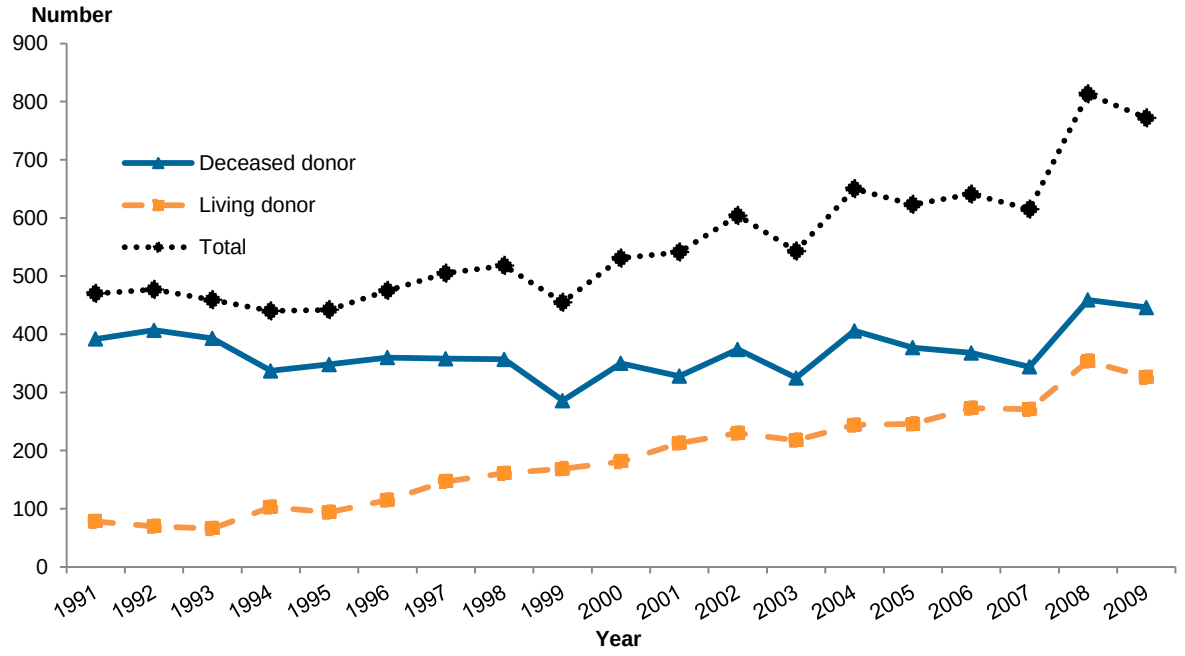
Table 4.1: Transplants performed in 2009 by donor source and age

	Deceased donor		Living donor	
Age group (years)	Number	Proportion[(a)]	Number	Proportion[(a)]
0–14	10	35.7	18	64.3
15–24	9	27.3	24	72.7
25–34	44	46.3	51	53.7
35–44	84	59.6	57	40.4
45–54	119	61.0	76	39.0
55–64	140	63.3	81	36.7
65+	40	67.8	19	32.2
Total	**446**	**57.8**	**326**	**42.2**

(a) Proportion of transplants for the age group.

Source: ANZDATA Registry Report 2010.

Between 1991 and 2009, the number of transplants performed each year increased by 65% (from 470 to 772) (Figure 4.1). This increase is attributable to the rise in donations from living donors, which increased more than four times during this period (from 78 to 326 transplants). As a result of this increase, 42% of transplants in 2009 were from living donors, compared with only 17% in 1991. Donations from deceased donors fluctuated, increasing by only 16% overall (392 to 446 transplants) (ANZDATA Registry 2010).



Source: ANZDATA Registry Report 2010.

Figure 4.1: Number of transplants from deceased donors and living donors, 1991 to 2009

Living donor kidney transplants

Source of transplant

In 2009, 56% (184) living donors were genetically related to the recipient. Of the genetically related donors, 44% were parents and 40% were siblings of the recipients. The remaining 16% of genetically related donors were other relatives such as children, cousins, aunts and uncles.

Donations from spouses (wives, husbands and partners) made up 72% of donations from genetically unrelated sources, friends of recipients made up 13%, and the remaining 15% were from other sources such as siblings in-law (ANZDATA Registry 2010).

Pre-emptive transplants

Living donor kidney transplantation enables transplantation to occur before starting dialysis. This has advantages as the length of time spent on dialysis before transplantation is related to an increased risk of mortality and decreased survival rates of the donated kidney (CARI 2007). Because surgery can be planned ahead of time, living donations also reduce the time

between the kidney's removal and transplantation, increasing donor kidney survival rates (Kidney Health Australia 2007b).

In 2009, 14% (109) of all transplants in Australia were for patients receiving their first transplant without prior dialysis treatment ('pre-emptive transplants') (ANZDATA Registry 2010).

Subsequent transplants

The majority of transplant recipients only receive one transplanted kidney in their lifetime, however some patients may require several transplants, due to a failed previous transplant.

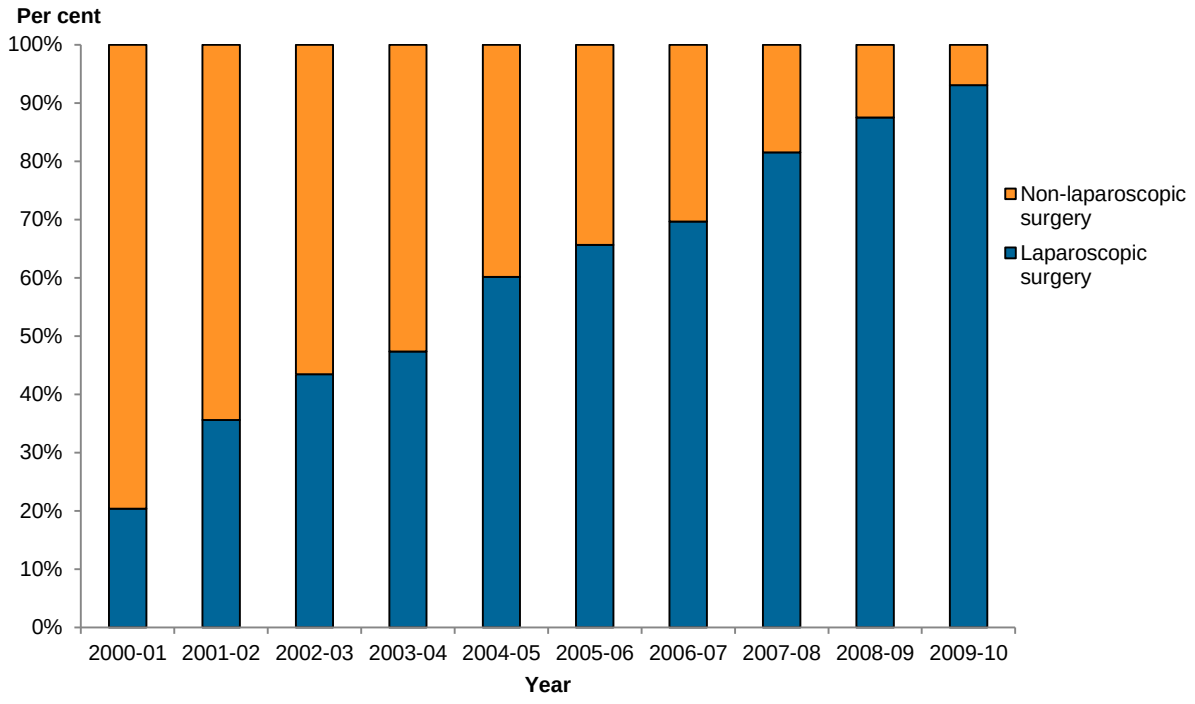
In 2009, the majority of transplants from living and deceased sources were for recipients receiving their first transplant (91% and 84%, respectively). Only 8% of living donor transplantations and 14% of deceased donor transplantations in 2009 were for second kidney transplants, and less than 2% of all transplants were for third transplants (ANZDATA Registry 2010).

Length of stay for recipient and donor transplant operations

Information in this section is based on analysis of the AIHW NHMD.

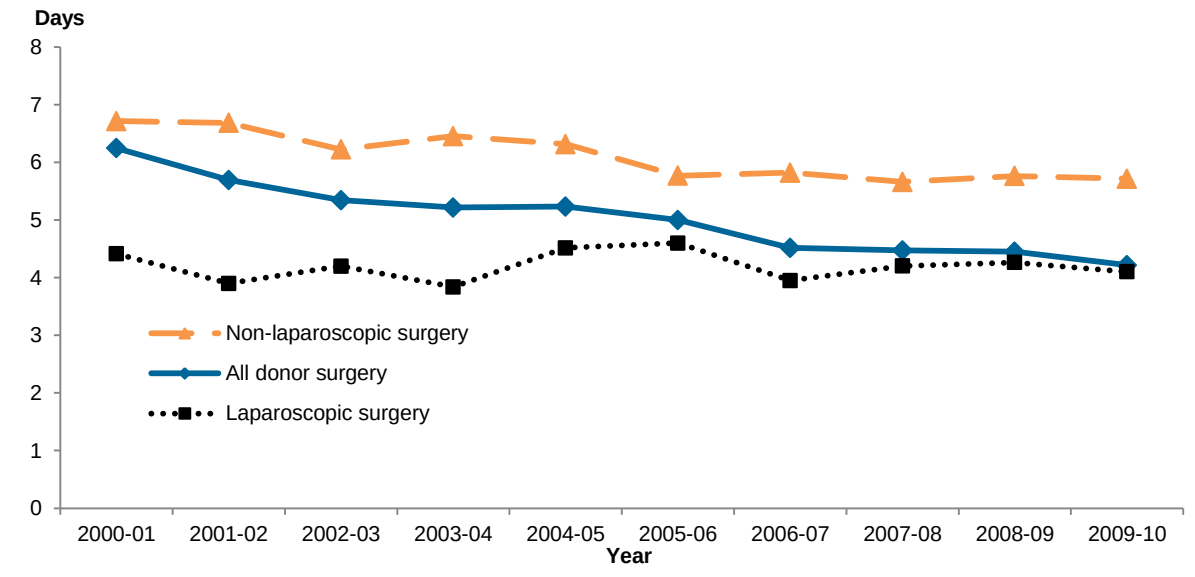
The length of stay in hospital for kidney recipients depends on how well the new kidney works and the occurrence of any complications. After discharge from hospital, it may be necessary to return daily as an outpatient for some weeks. These visits become less frequent as kidney function stabilises (Renal Resource Centre 2009). In the 2009–10 financial year, there were 818 kidney transplantations recorded in the NHMD and the average length of stay for recipients was 10.9 days. This has decreased from 12.3 days in 2000–01.

Surgery to remove a kidney from a living donor can be performed as either an open procedure, involving a large incision under the ribs or, increasingly, as laparoscopic (keyhole) surgery, involving much smaller incisions in the abdomen and much faster recovery times (Renal Resource Centre 2009). In 2000–01 only 19.9% of all live kidney donations were laparoscopic donations while in 2009–10 this proportion increased to 93.7% (Figure 4.2). Over the period 2000–01 to 2009–10, the average length of stay for (living) kidney transplant donors decreased from 6.2 days to 4.1 days (Figure 4.3). This decrease is partly due to the increase in the number of laparoscopic living kidney donations, which on average results in less time in hospital compared to non-laparoscopic surgery. The average length of stay for non-laparoscopic donation also decreased over this period, from 6.7 days in 2000–01 to 5.7 days in 2009–10.



Source: AIHW NHMD.

Figure 4.2: Proportion of living donor operations, by surgery type, 2000–01 to 2009–10



Source: AIHW NHMD.

Figure 4.3: Average length of stay for living donor operations, by surgery type, 2000–01 to 2009–10

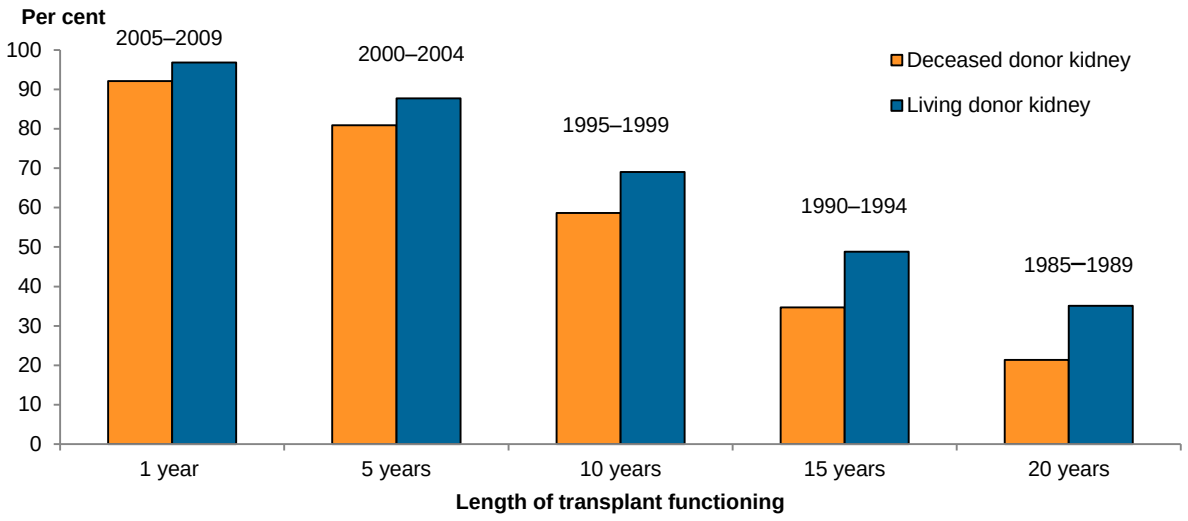
Kidney transplant survival

Transplant recipients can face problems if their body rejects the presence of the transplanted kidney, in much the same way it fights off other foreign bodies like bacteria or viruses. This can ultimately lead to the transplanted kidney failing and the need for dialysis. However, most rejection episodes can be reversed with immunosuppressant drugs treatment (Renal Resource Centre 2009).

The ANZDATA registry reports on graft survival and patient survival. Graft failure includes both transplant failure (i.e. patient survival but a return to dialysis) and patient death (with kidney transplant function). Patient survival refers to the number of patients that do not die from any cause during the reference period.

Graft survival

For kidney transplants performed in Australia and New Zealand on first time recipients (primary transplants) during the 5-year period 2005 to 2009, the vast majority of transplanted kidneys survived 1 year after transplantation, with a slightly better graft survival rate for kidneys from living donor kidneys as opposed to deceased donor kidneys (96.8% versus 92.1%, respectively) (Figure 4.4). The 5-year survival rate for primary transplants performed during 2000 to 2004 was around 87.7% for living donor transplants and 80.9% for deceased donor transplants. Graft survival rates progressively drop off 10, 15 and 20 years after transplantation, however, primary transplants from a living donor on average result in longer transplant survival than deceased donor transplants. This could possibly be due to the higher proportion of younger patients receiving a living donor transplant (ANZDATA Registry 2010).



Notes

1. Graft failure includes both transplant failure (i.e. patient survival but a return to dialysis) and patient death (with kidney transplant function).
2. Graft survival rate equals the proportion of transplanted kidneys still functioning after a set period of time.
3. Figure 4.4 and 4.5 are the only figures that include New Zealand data.

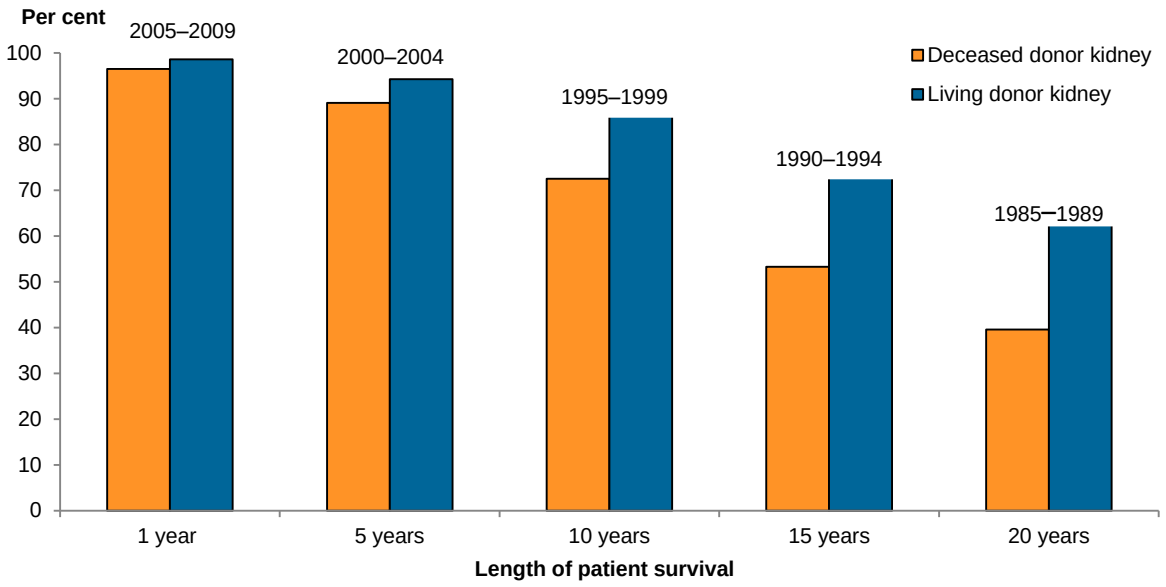
Source: ANZDATA Registry Report 2010.

Figure 4.4: Primary kidney transplant graft survival rates for transplants performed in Australia and New Zealand by transplant source and period when transplantation occurred

Graft survival rates have increased markedly over time for both deceased donor and living donor kidney transplants performed in Australia and New Zealand, but particularly for deceased donor transplants. For example, for transplants performed in 1975–79 the 5-year transplant survival rate was 36.0% for deceased donor transplanted kidneys and 63.3% for living donor transplanted kidneys. By 2000–2004, the 5-year survival rates increased to 80.9% and 87.7%, respectively.

Patient survival

The survival rates of primary transplant recipients follow the same trend as graft survival rates (Figure 4.5), with higher survival rates for living donor transplant recipients compared with those from deceased donor recipients. It is worth noting though that transplant patient survival rates are higher than graft survival rates (shown in Figure 4.4) as treated EKSD patients often survive after kidney transplant failure.



Notes

1. Primary kidney transplant patient survival rate equals the proportion of patients alive after their first transplant.
2. Figure 4.4 and 4.5 are the only figures that include New Zealand data.

Source: ANZDATA Registry Report 2010.

Figure 4.5: Primary kidney transplant patient survival rates for transplants performed in Australia and New Zealand, by transplant source and period where transplantation occurred

As with graft survival rates, recipient survival rates have increased markedly over time for both deceased donor and living donor kidney recipients. For transplants performed in 1975–79, the 5 year patient survival rate was 63.6% for deceased donor transplants and 78.5% of living donor transplants. While in 2000–2004, the 5 year survival rates increased to 94.3% and 89.1%, respectively (ANZDATA Registry 2010).

Australian Paired Kidney Exchange Program

The Australian Organ and Tissue Donation and Transplantation Authority (AOTDTA) was established on 1 January 2009 as part of the Australian Government's national reform package, *A World's Best Practice Approach to Organ and Tissue Donation for Transplantation* (AOTDTA 2010) which aims to improve donation rates through a nationally-coordinated approach to organ and tissue donation.

One of the initiatives of the Authority is the Australian Paired Kidney Exchange Program (AKX), which aims to increase the number of living donor kidney transplants.

A paired kidney exchange occurs when a live donor wants to donate to a spouse, friend or relative but is unable, due to blood or tissue incompatibilities. The AKX Program aims to increase live donor kidney transplants by finding compatible donors among other registered pairs, enabling two compatible living donor transplants to occur. Paired donations can occur across a chain of donors and recipients (AOTDTA 2010).

The AKX Program started enrolling donor–recipient pairs in August 2010, and up until December 2011, 26 people have received a kidney transplant through the AKX Program.

5 Dialysis treatment

Key points

Between 1991 and 2009, the number of people receiving haemodialysis increased four times (from 2,161 to 8,164 people), while the number of people receiving peritoneal dialysis doubled (from 977 to 2,177 people).

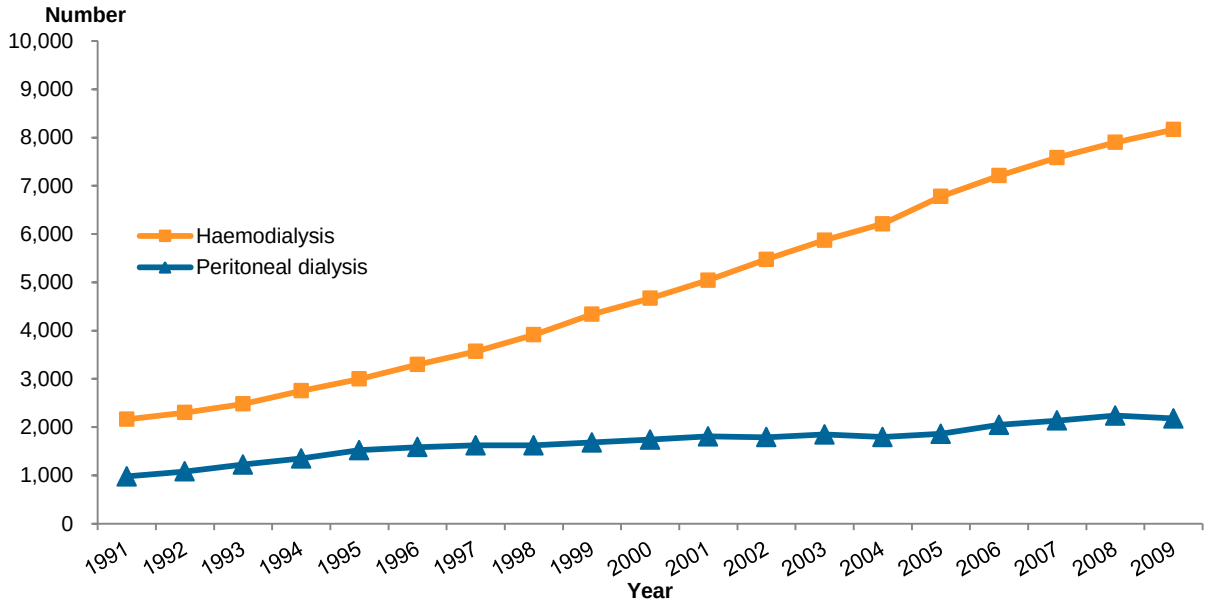
Compared with 1991, in 2009 relatively more haemodialysis patients dialysed in satellite centres (59% compared with 28%) and less patients dialysed at home (12% compared with 27%) and in the hospital setting (29% compared with 45%).

Where dialysis occurs and what form is used varies significantly between the states and territories of Australia.

In 2004–2006, 94% of peritoneal dialysis patients and 93% of haemodialysis patients survived for 6 months.

Of the ESKD patients receiving dialysis at the end of 2009, nearly 79% were receiving haemodialysis (8,164 people) and 21% (2,177) were receiving peritoneal dialysis.

Between 1991 and 2009, the number of people receiving haemodialysis increased four times (from 2,161 to 8,164 people), while the number of people receiving peritoneal dialysis doubled from (977 to 2,177 people) (Figure 5.1). Over the same period, the proportion of dialysis patients receiving haemodialysis increased from 69% to 79%.



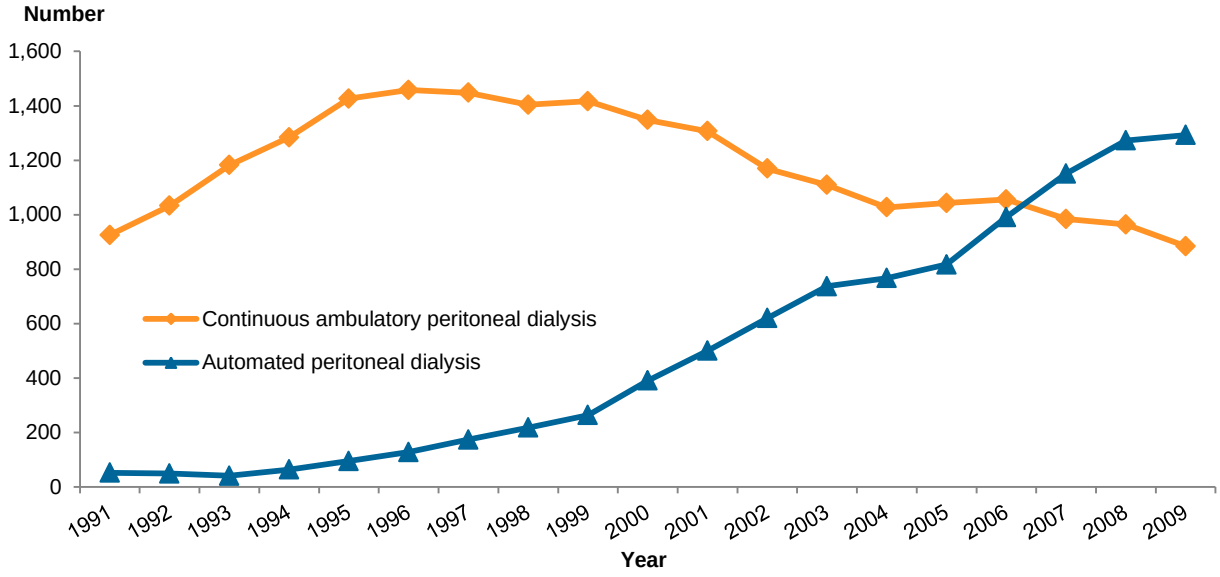
Source: AIHW analysis of ANZDATA Registry data.

Figure 5.1: Trends in the number of haemodialysis and peritoneal dialysis patients, 1991 to 2009

Peritoneal dialysis

Peritoneal dialysis can either be performed by the patient during the day (continuous ambulatory peritoneal dialysis) or while the patient sleeps (automated peritoneal dialysis). Peritoneal dialysis is almost always performed in the home setting, rather than in a hospital or satellite clinic. In 2009 less than 1% (20) of peritoneal dialysis patients dialysed out of the home setting.

Over the period 1991 to 2009, there has been a shift from continuous ambulatory peritoneal dialysis to automated peritoneal dialysis. The proportion of peritoneal dialysis patients receiving continuous ambulatory peritoneal dialysis decreased from 95% (925 people) to 41% (884 people), while the proportion of peritoneal dialysis patients using automated peritoneal dialysis increased from 5% (52 people) to 59% (1,293 people) (Figure 5.2).



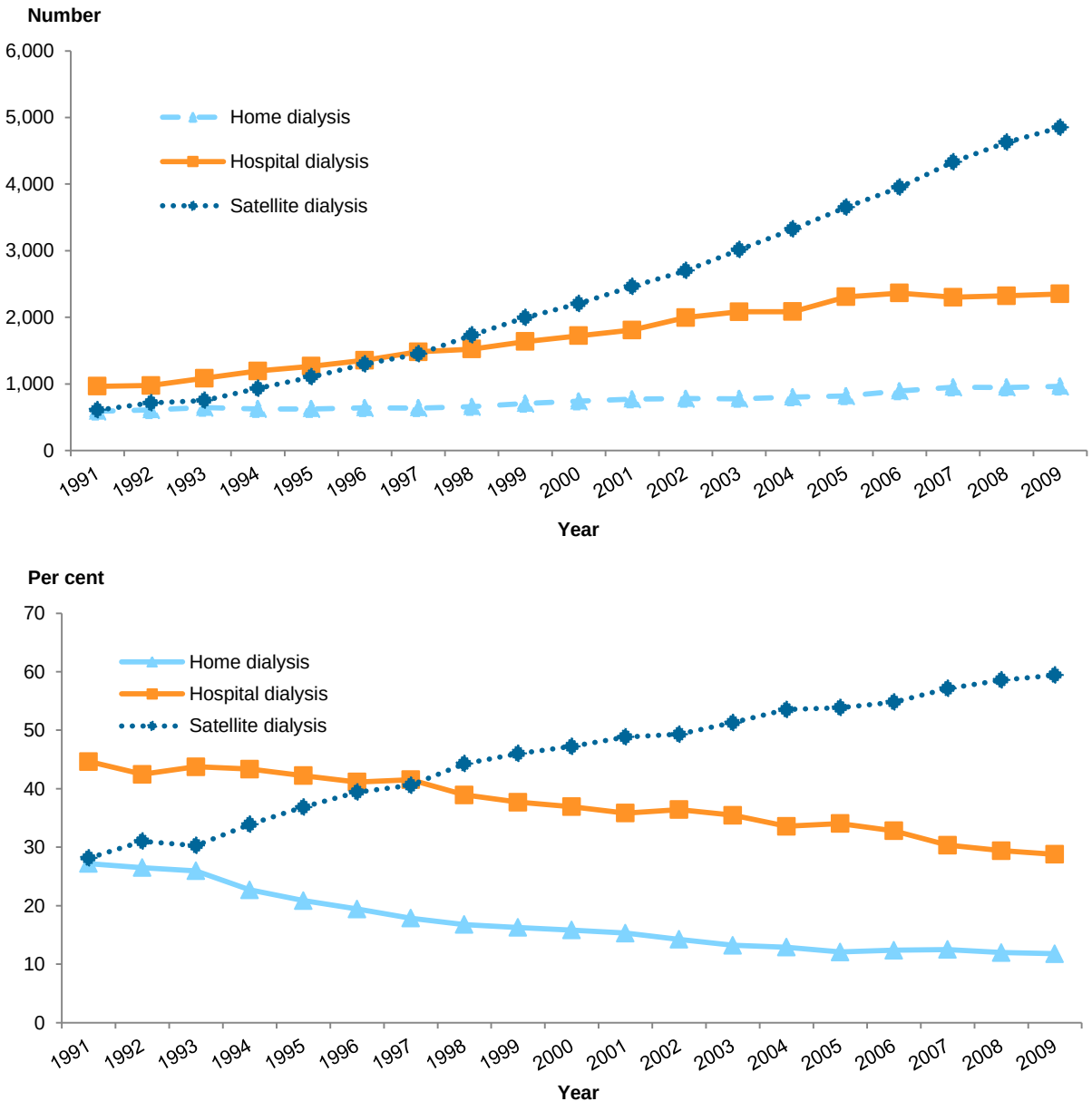
Source: AIHW analysis of ANZDATA Registry data.

Figure 5.2: Trends in the number of people receiving peritoneal dialysis for ESKD, by peritoneal dialysis type, 1991 to 2009

Haemodialysis

Haemodialysis is commonly performed in hospitals or specialised dialysis centres attached to a parent hospital known as satellite centres (see Box 1).

The number of haemodialysis patients dialysing at every location increased from 1991 to 2009 (Figure 5.3), with the number dialysing at satellite clinics increasing markedly over this period. In 2009, 59% of haemodialysis patients dialysed at satellite centres, 29% at a hospital, and the remaining 12% at home (Figure 5.3). The breakdown in 1991 was somewhat different, with 28% of patients dialysing at satellite centres, 45% at hospitals and 27% at home. The increasing number of satellite dialysis centres throughout Australia is one of the likely reasons why there has been an increase in the proportion of haemodialysis patients dialysing at satellite clinics over time (George 2009).



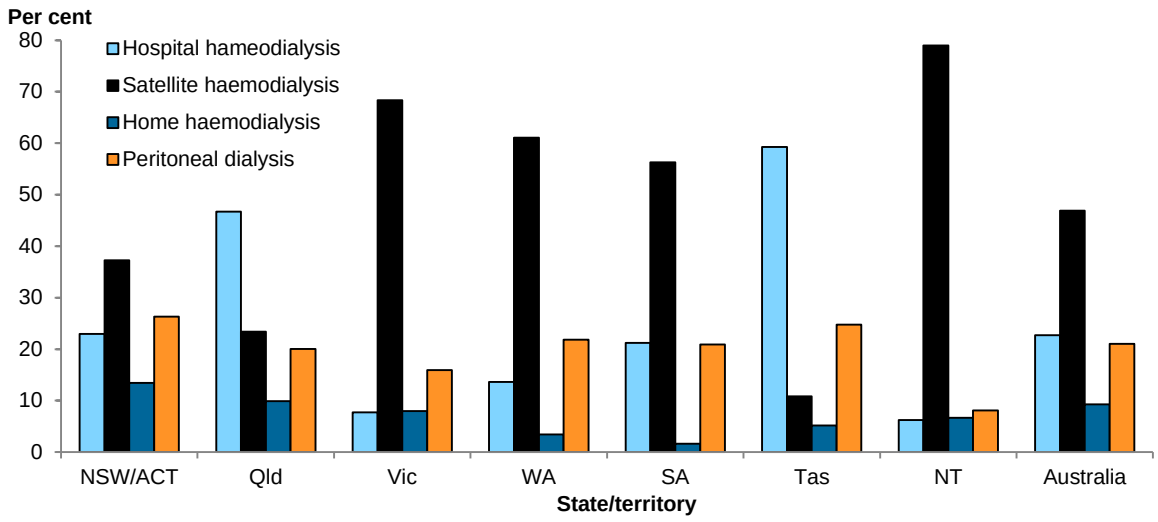
Source: AIHW analysis of ANZDATA Registry data.

Figure 5.3: Number and proportion of haemodialysis treated-ESKD patients by dialysis treatment location, 1991 to 2009

Dialysis treatment by state/territory

The form and location of dialysis treatment varies significantly between the states and territories of Australia. For example, at the end of 2009 almost 79% of dialysis patients in the Northern Territory received satellite haemodialysis, compared with only 11% in Tasmania (Figure 5.4). The highest use of home haemodialysis and peritoneal dialysis was in NSW/ACT (13% and 26%, respectively). Hospital haemodialysis rates were highest in Tasmania (59% of dialysis patients). A combination of remoteness, socioeconomic factors,

physician preferences and availability of local training facilities are all likely reasons for state/territory differences in dialysis treatment location rates (George 2009).

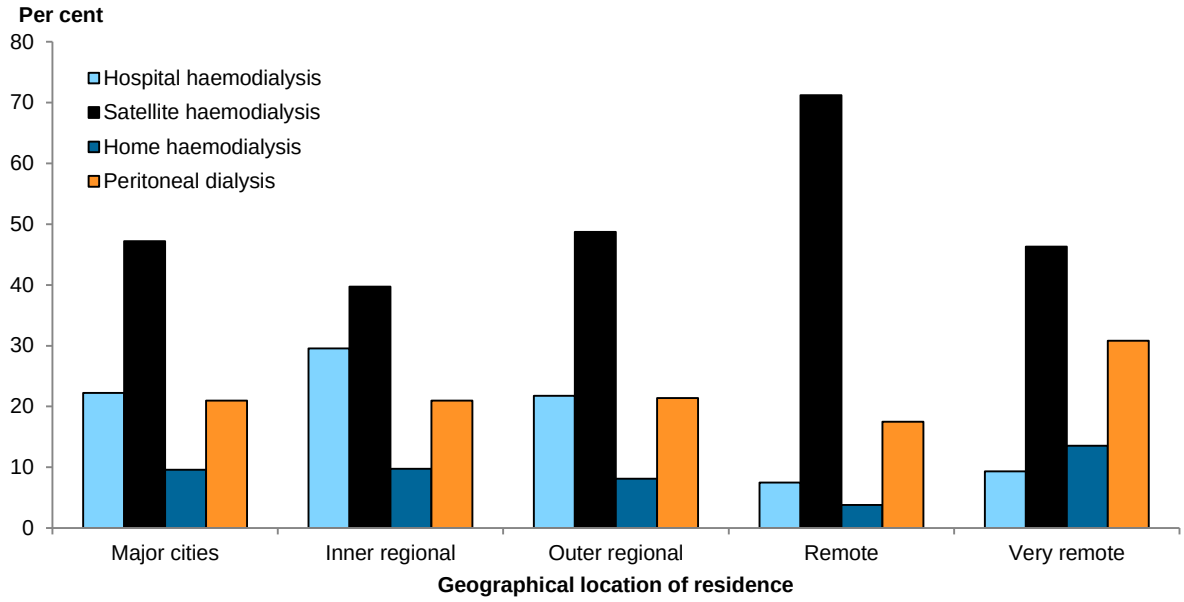


Source: AIHW analysis of ANZDATA Registry data.

Figure 5.4: Dialysis treatment location by state/territory, 2009

Dialysis treatment by geographical location of residence

Satellite haemodialysis was the most common dialysis treatment in all geographical locations. *Remote* areas had the highest proportion of patients receiving haemodialysis at satellite clinics (71%). In non-remotes areas, more patients received haemodialysis in hospital rather than at home. Home haemodialysis rates were highest in *Very remote* areas (14%). Peritoneal dialysis rates were also highest in *Very remote* areas (31%) and similar in all other areas (ranging from 17–22%).

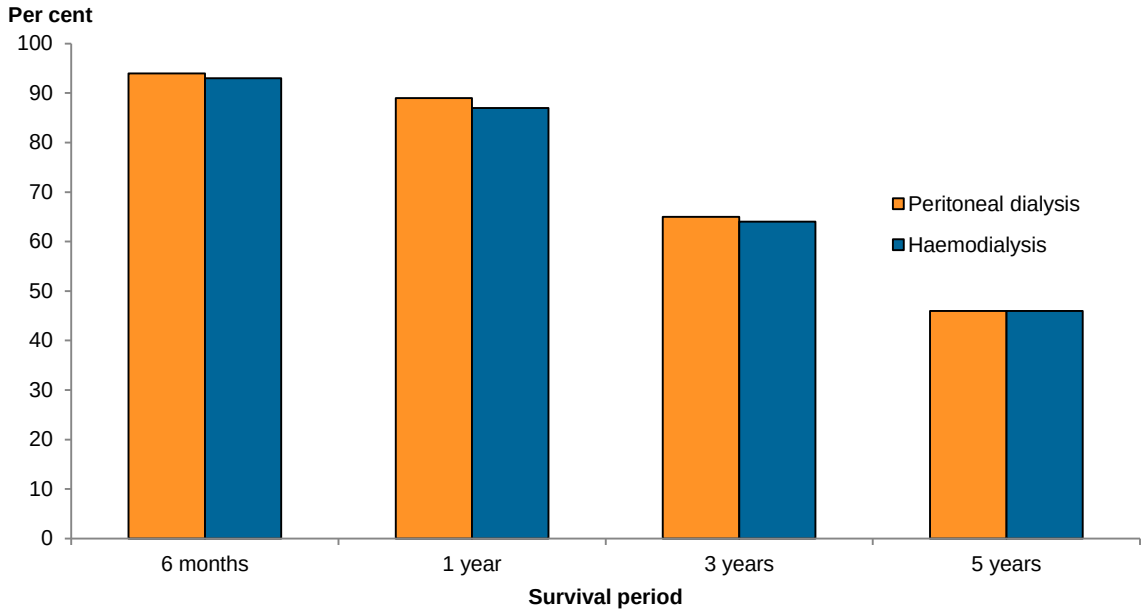


Source: AIHW analysis of ANZDATA Registry data.

Figure 5.5: Dialysis treatment type by geographical location of residence, 2009

Dialysis treatment and survival

In 2004–2006, 94% of peritoneal dialysis patients and 93% for haemodialysis patients survived for 6 months (Figure 5.6). Survival rates at 6 months, 1, 3 and 5 years were similar for haemodialysis and peritoneal patients, but both decreased rapidly with time. In 2004–2006, only 46% of haemodialysis and peritoneal dialysis patients survived more than 5 years. Since 1998, these survival rates have remained relatively stable for haemodialysis patients but have increased slightly for peritoneal patients (ANZDATA Registry 2010).



Note: Only peritoneal dialysis and haemodialysis patients that had received peritoneal or haemodialysis for over 90 days, respectively, were included in the analysis.

Source: ANZDATA Registry Report 2010.

Figure 5.6: Patient survival rates by dialysis type and survival period, 2004 to 2006

6 Hospitalisations for dialysis treatment

Key points

In 2009–10:

- There were over 1.1 million hospitalisations for regular dialysis making up nearly 13% of the total hospitalisations for this period. This was a 92% increase from 2000–01 (582,440 hospitalisations).
- The male age-standardised rate for hospitalisations for regular dialysis was nearly 1.6 times higher than the female rate.
- Hospitalisation rates for regular dialysis increased with age up to 75–79.
- People living in Tasmania had the lowest rates of hospitalisations for regular dialysis while the Northern Territory had the highest—4.3 times that of the Australian rate.
- Hospitalisation rates for regular dialysis in Very remote areas are at least twice the rates in other areas.
- The majority (82%) of hospitalisations for dialysis treatment occurred in public hospitals.

People with CKD, particularly those with ESKD, often require hospital services—in fact dialysis treatment is the most common reason for hospitalisation in Australia.

As outlined in the introduction, there are two types of dialysis used for the treatment of ESKD—haemodialysis and peritoneal dialysis. The majority of hospitalisations for dialysis in hospital are for haemodialysis with patients attending on average 3 times per week, 52 weeks per year for treatment.

In 2009–10 there were over 1.1 million hospitalisations for regular dialysis (see Appendix B for definition), making up nearly 13% of the total hospitalisations for this period. The male age-standardised rate for hospitalisations for regular dialysis was nearly 1.6 times higher than the female rate (6,104 compared with 3,745 hospitalisations per 100,000 population) (Table 6.1). This matches the sex related differences in the treated-ESKD data (Table 3.1).

Table 6.1: Hospitalisations with a principal diagnosis of regular dialysis, by sex, 2009–10

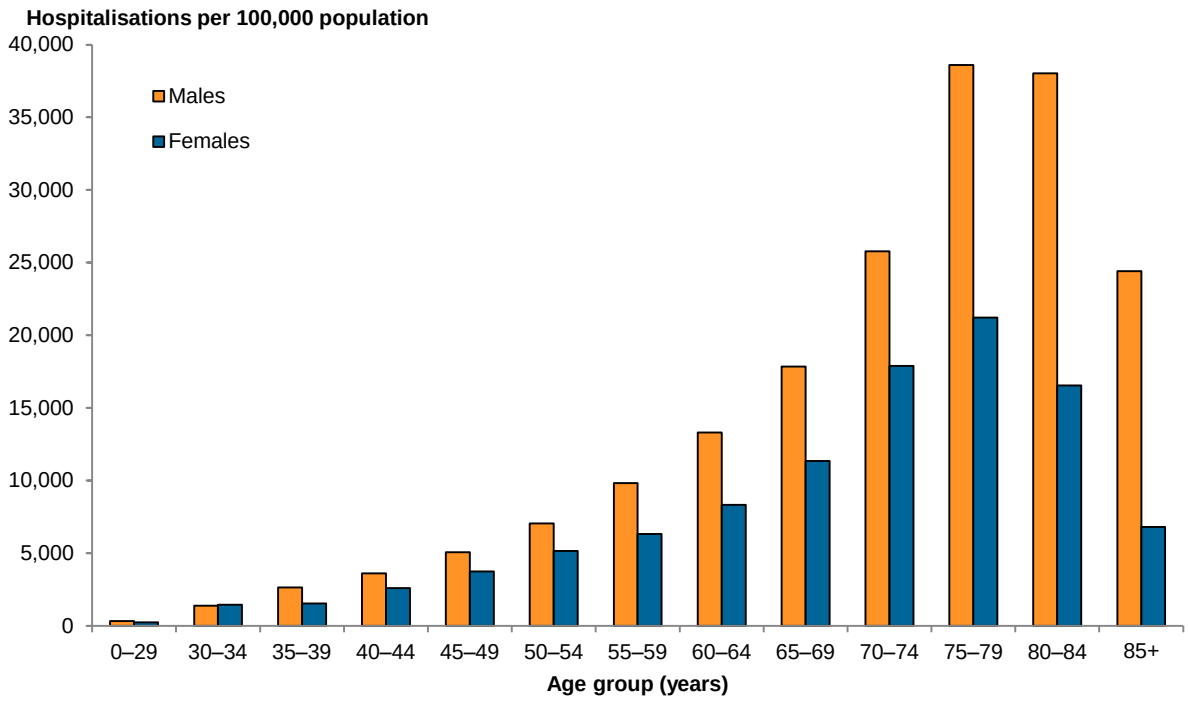
	Males	Females	Persons
Hospitalisations	674,722	450,3331	1,125,053
Hospitalisations per 100,000[(a)]	6,104	3,745	4,836
Rate ratio (male rate:female rate)		*1.63*	

(a) Directly age-standardised to the 2001 Australian population.

Note: Regular dialysis as defined here includes ICD codes Z49.1 and Z49.2 (see Appendix B).

Source: AIHW NHMD.

Hospitalisation rates for regular dialysis increased with age up to 75–79, peaking at 38,590 per 100,000 population for males and 21,227 per 100,000 population for females (Figure 6.1). Males had higher hospitalisation rates for regular dialysis than females for most age groups, with the exception being the 30–34 age group. The greatest relative difference in hospital rates between males and females was in the 85 and older age group, where males were hospitalised at around 3.6 times the female rate.



Note: Regular dialysis as defined here includes ICD codes Z49.1 and Z49.2 (see Appendix B).

Source: AIHW NHMD.

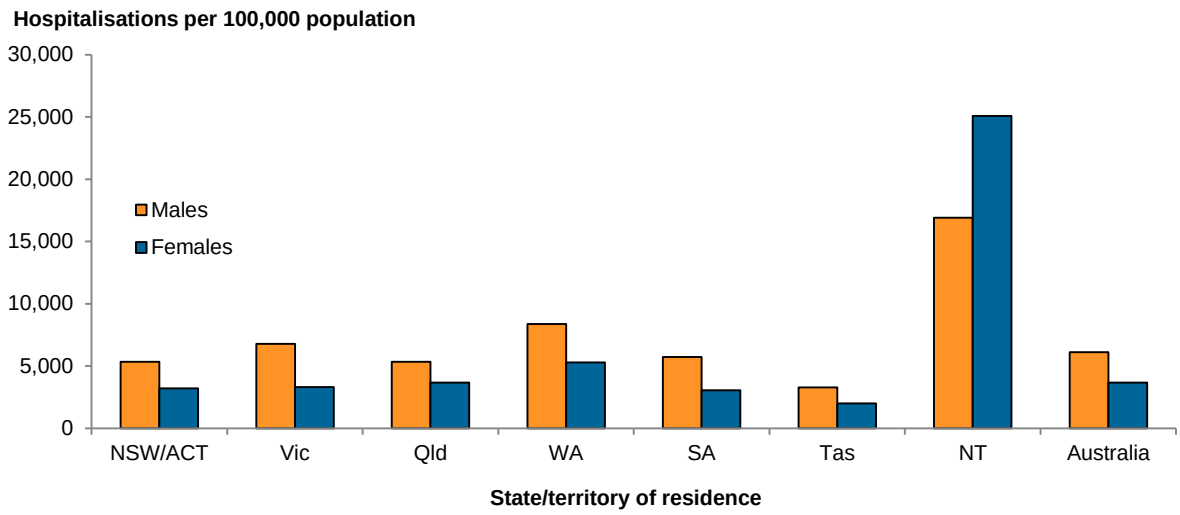
Figure 6.1: Hospitalisation rates for regular dialysis, by sex and age, 2009–10

Hospitalisation by state/territory

In 2009–10, people living in Tasmania had the lowest rates of hospitalisations for regular dialysis while those in the Northern Territory had the highest—4.3 times that of the Australian rate (Figure 6.2, Table A2). Males were hospitalised for regular dialysis at around 1.5 to 2 times the female rate in all jurisdictions, with the exception being the Northern Territory, where females were hospitalised at 1.5 times the rate of men.

The higher hospitalisation rate seen in the Northern Territory and the higher rates among females in the Northern Territory is likely to be due to the high rates of ESKD among Indigenous Australians and the high proportion of Indigenous Australians in the Northern Territory.

Dialysis rates between states and territories also vary because of differences in service provision, such as the proportion of patients treated with home dialysis, and because of differences in recording practices between jurisdictions and between hospitals.



Notes

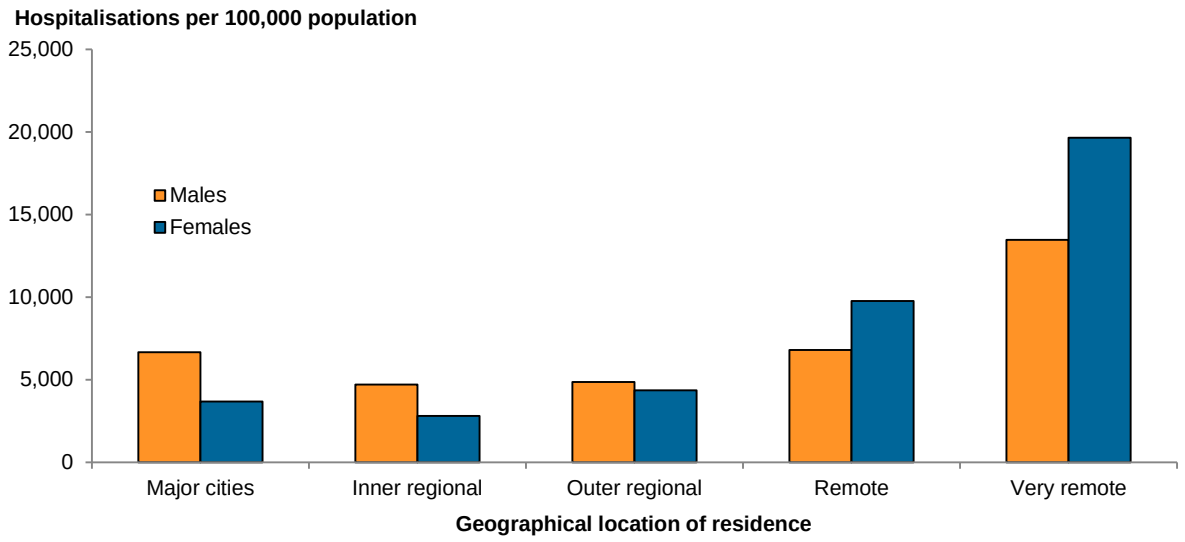
1. Directly age-standardised to the 2001 Australian population.
2. Regular dialysis as defined here includes ICD codes Z49.1 and Z49.2 (see Appendix B).

Source: AIHW NHMD.

Figure 6.2: Hospitalisation rates for regular dialysis, by state/territory of residence, 2009–10

Hospitalisation by geographical location of residence

In 2009–10, the hospitalisation rate for regular dialysis for people in *Major cities* was around 1.4 times higher than the rate in *Inner regional* areas and 1.1 times higher than rates in *Outer regional* areas (5,035 compared with 3,710 and 4,597 per 100,000 population, respectively) (Table A3). However, hospitalisation rates in *Very remote* areas are at least twice the rates in other areas. Males were hospitalised at higher rates in *Major cities*, *Inner regional* and *Outer regional* areas, while females had higher hospitalisation rates in *Remote* and *Very remote* areas (Figure 6.3).



Notes

1. Directly age-standardised to the 2001 Australian population.
2. Regular dialysis as defined here includes ICD codes Z49.1 and Z49.2 (see Appendix B).
3. Excludes 2,155 cases where geographical location of residence was not recorded.

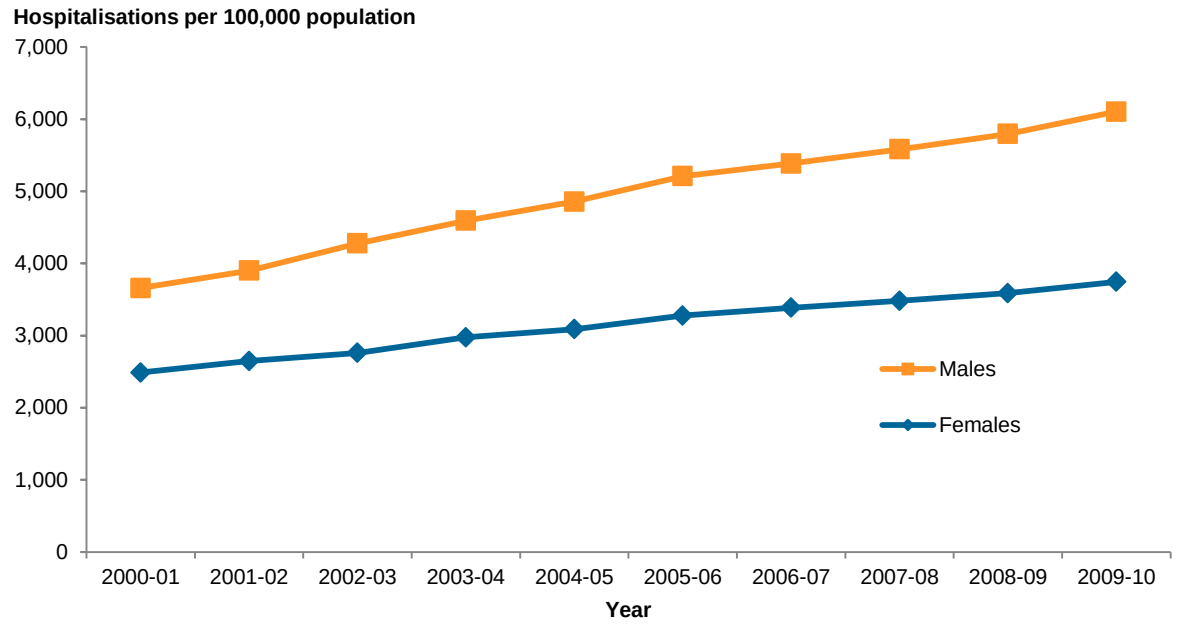
Source: AIHW NHMD.

Figure 6.3: Hospitalisation rates for regular dialysis, by geographical location of residence, 2009–10

Hospitalisation trends over time

Over the period 2000–01 to 2009–10, the number of hospitalisations for regular dialysis increased 92% from 582,440 to 1,125,053. After adjusting for population growth and differences in the age-structure of the population, the hospitalisation rate for dialysis treatment increased 1.6 times over this period—from 3,034 to 4,836 per 100,000 population. The increase was greater for males than females (1.7 times compared with 1.5 times, respectively).

The increase in hospitalisation rates for regular dialysis over time is likely a reflection of the increase in treated-ESKD rates over time (Figure 3.2).



Notes

1. Directly age-standardised to the 2001 Australian population.

2. Regular dialysis as defined here includes ICD codes Z49.1 and Z49.2 (see Appendix B).

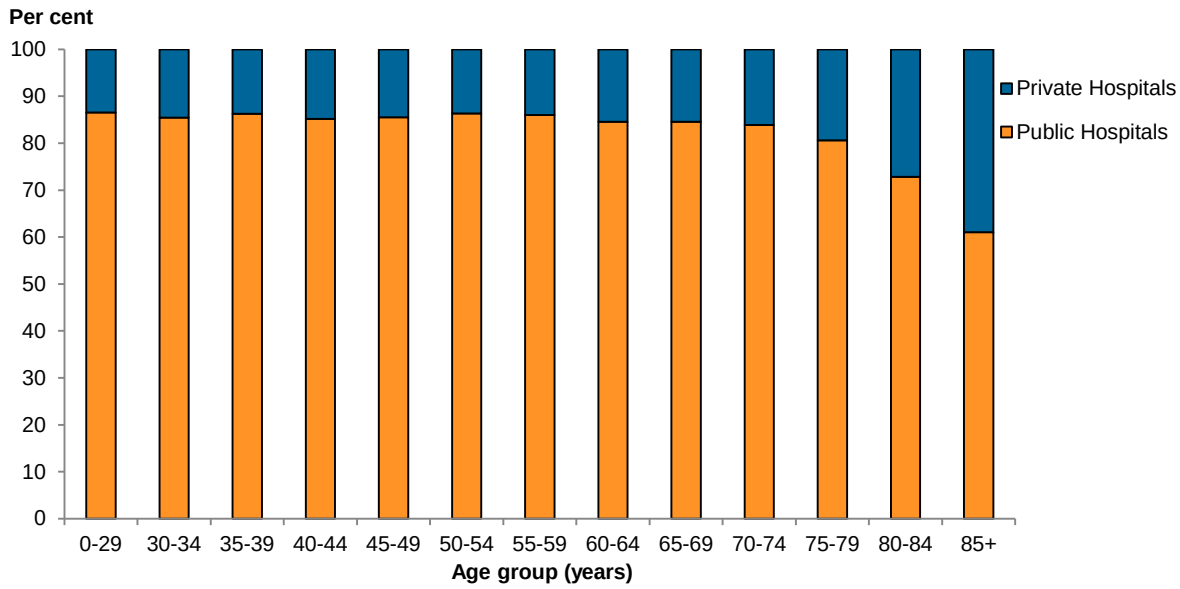
Source: AIHW NHMD.

Figure 6.4: Hospitalisation rates for regular dialysis, by sex, 2000–01 to 2009–10

Private and public hospital admissions

In 2009–10, the majority (82%) of hospitalisations for dialysis occurred in public hospitals, with the remaining occurring in private hospitals. This trend has remained relatively constant for the period 2000–01 to 2009–10.

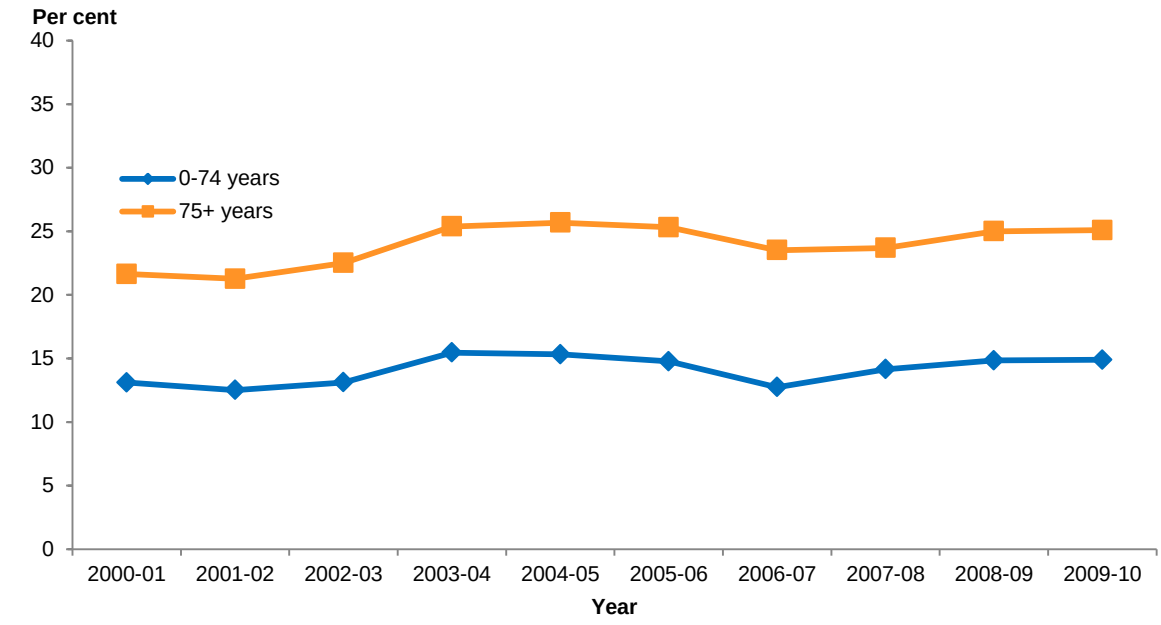
The proportion of hospital admissions occurring in private hospitals was stable across most age groups, but increased in groups above 75 (Figure 6.5). The highest proportion of patients receiving dialysis in a private hospital was for those aged over 85 (39%). This pattern has remained relatively stable from 2000–01 to 2009–10, with around 24% of patients aged over 75 dialysing at private hospitals, compared with 14% of admissions for people aged under 75 (Figure 6.6).



Note: Regular dialysis as defined here includes ICD codes Z49.1 and Z49.2 (see Appendix B).

Source: AIHW NHMD.

Figure 6.5: Proportion of regular dialysis hospitalisations occurring in public or private hospitals, by age group, 2009–10



Note: Regular dialysis as defined here includes ICD codes Z49.1 and Z49.2 (see Appendix B).

Source: AIHW NHMD.

Figure 6.6: Proportion of all regular dialysis hospitalisations occurring in private hospitals, by age group, 2000–01 to 2009–10

7 New cases of treated-ESKD

Key points

In 2009:

- more than 2,300 patients started KRT treatment for ESKD in Australia
- the rate of new cases of treated-ESKD for males was 1.6 times the rate for females.

For the period 1991 to 2009 the number of people starting KRT for ESKD increased from 979 to 2,337 people.

Diabetes was the leading cause of treated-ESKD in 2009, accounting for 33% of new cases.

Between 2007 and 2009 the rate of new cases was highest in *Remote* and in *Very remote* areas.

For the period 2003–2007, there was about one new case of ESKD who did not receive KRT for each case that did.

The vast majority (80%) of the new cases of ESKD that did not receive KRT were among those aged over 70.

In 2009, more than 2,300 patients started KRT treatment for ESKD in Australia, equating to 10.2 per 100,000 population (Table 7.1). After adjusting for age, the rate of new cases of treated-ESKD (treated-incidence) for males was 1.6 times the rate for females (12.8 per 100,000 compared with 7.9 per 100,000, respectively).

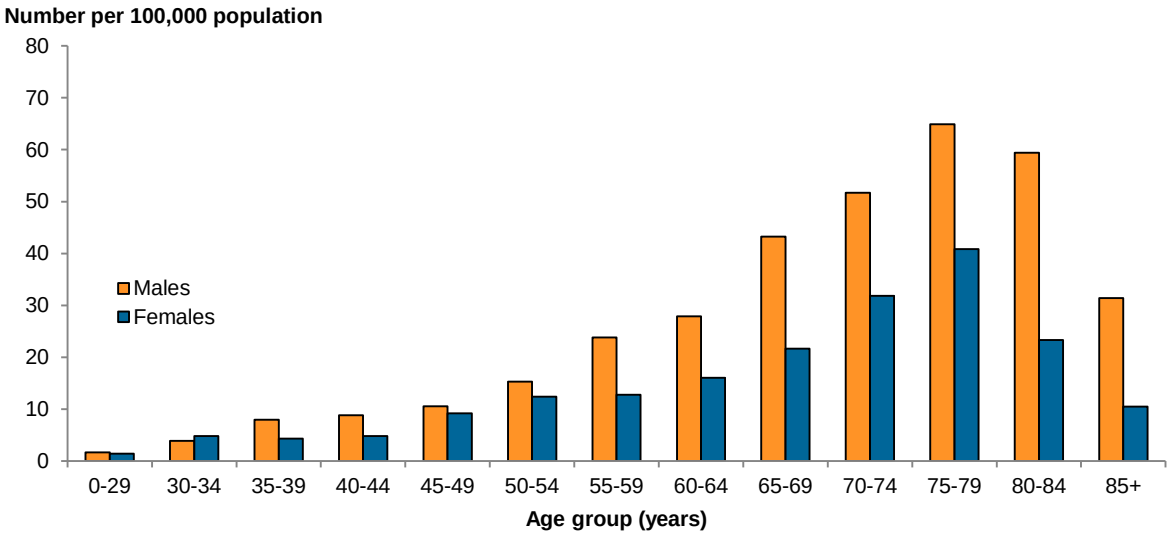
Table 7.1: New cases of treated-ESKD in Australia, 2009

	Males	Females	Persons
New cases	1,415	922	2,337
Rate per 100,000 population [(a)]	12.8	7.9	10.2
Rate ratio (male rate : female rate)		1.63	

(a) Directly age-standardised to the 2001 Australian population.

Source: AIHW analysis of ANZDATA Registry data.

The rate of people starting KRT treatment for ESKD increases with age. In 2009, the highest rate was among those aged 75–79, where 52.0 per 100,000 population started treatment (Figure 7.1). This same pattern was observed for both males and females. Males had higher rates than females in nearly all age groups, the exception being those aged 30–34, where the female rate was 1.2 times the male rate. The greatest difference was for those over 85, where the male rate was nearly 3 times the female rate.

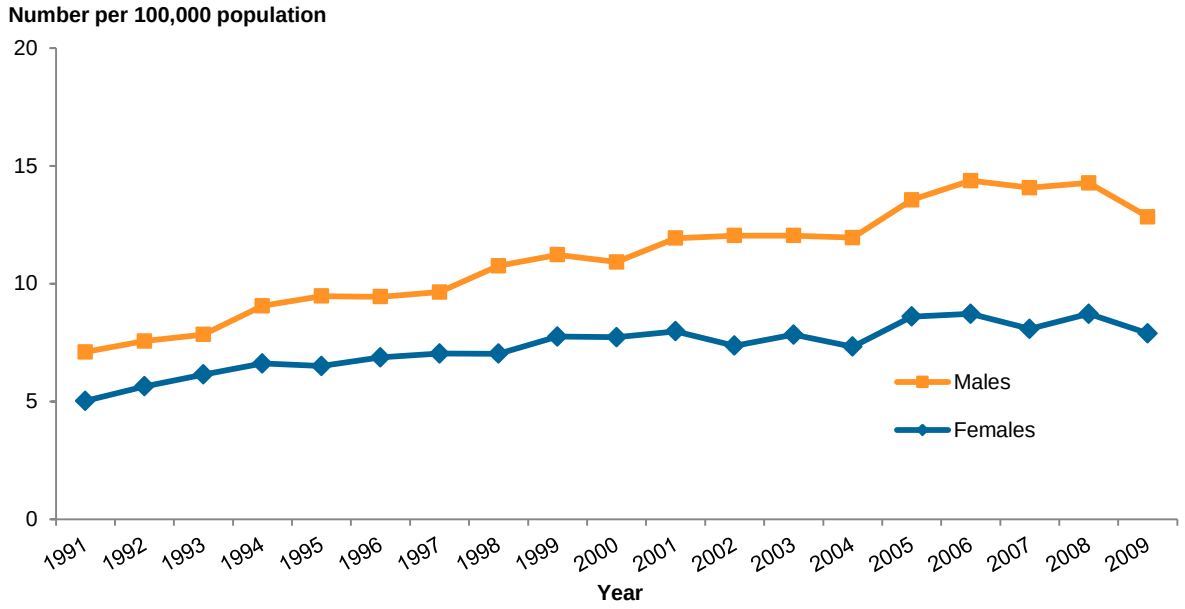


Source: AIHW analysis of ANZDATA Registry data.

Figure 7.1: Rate of new cases of treated-ESKD by sex and age, 2009

New cases of treated-ESKD over time

For the period 1991 to 2009 the number of people starting KRT for ESKD increased from 979 to 2,337 people. In the same period, the age-standardised rate of new cases increased 1.8 times from 6.0 to 10.2 per 100,000 population. From 2005, however, the rate of new cases appears to have stabilised (Figure 7.2). The highest rate of new cases occurred in 2006 for both males and females (14.4 and 8.7 per 100,000 population, respectively). The male rate of new cases was higher than the female rate in each year during the period 1991 to 2009.



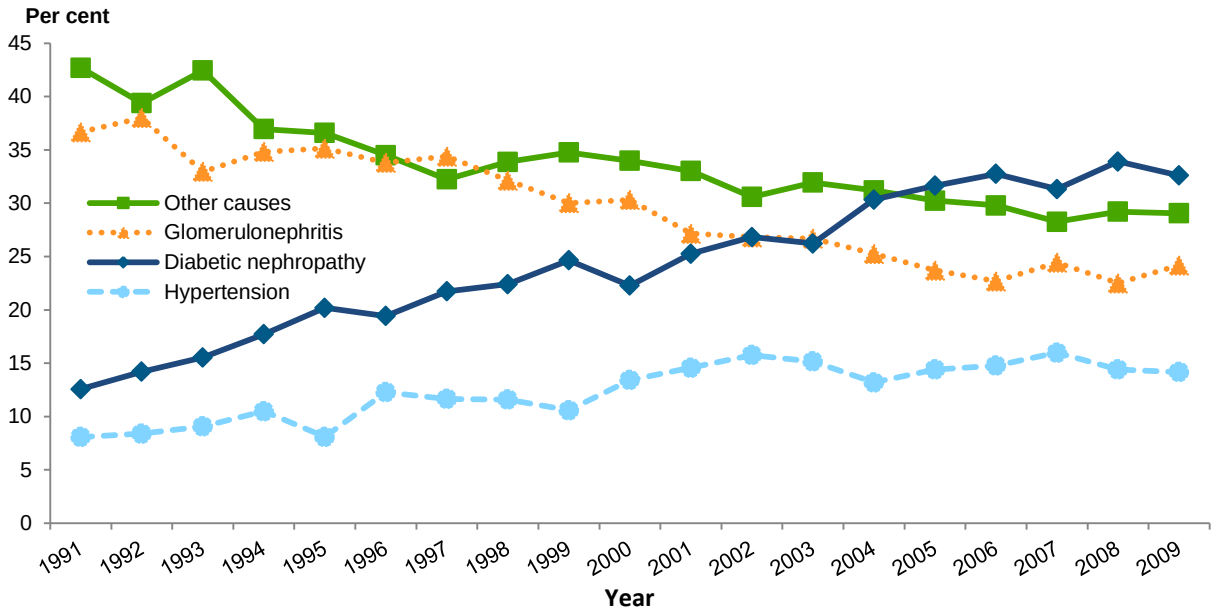
Note: Age-standardised to the 2001 Australian population.

Source: AIHW analysis of ANZDATA Registry data.

Figure 7.2: Rate of new cases of treated-ESKD by sex, 1991 to 2009

Causes of treated-ESKD

From 1991 to 2009, the number of new cases attributable to diabetic nephropathy increased almost six times (from 123 to 763 cases). Diabetic nephropathy was the leading cause of treated-ESKD in 2009, accounting for 33% of new cases, compared with only 13% in 1991 (Figure 7.3). This largely reflects an increase in the number of new cases caused by diabetic nephropathy among those aged 55 and older, rather than a decrease in other causes. Glomerulonephritis remains the major cause of ESKD in those under 55, however diabetic nephropathy cases have also increased markedly (tripled) in this age group.



Source: AIHW analysis of ANZDATA Registry data.

Figure 7.3: Proportion of new cases treated-ESKD by cause of ESKD, 1991 to 2009

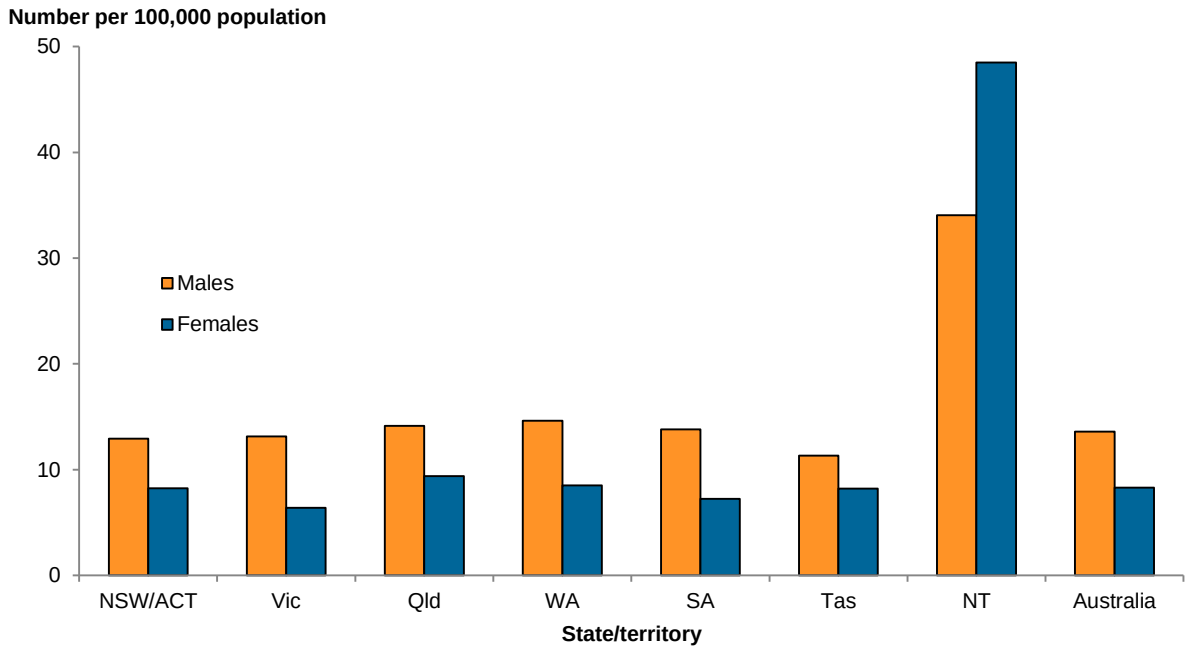
New cases of treated-ESKD by state/territory

For this section, data from 2008 and 2009 were combined because of the small number of cases in some jurisdictions.

After adjusting for differences in age structures, in 2008–2009 male and female age-standardised rates of new cases in each jurisdiction (except the Northern Territory) were similar to the Australian rates (Figure 7.4 and Table A4). The male and female rates in the Northern Territory were 2.5 and 3.8 times the Australian rate, respectively.

The high rate of new cases in the Northern Territory reflects the relatively larger proportion of Aboriginal and Torres Strait Islander people living in this jurisdiction, as Indigenous Australians begin KRT for ESKD at around 8 times the rate of non-Indigenous Australians (AIHW 2011c).

The Northern Territory was the only jurisdiction where females were more likely than males to start treatment for ESKD. This can also be attributed to the higher proportion of Aboriginal and Torres Strait Islander people in the Northern Territory, as Indigenous females are more likely than Indigenous males to start treatment for ESKD (McDonald & Russ 2003). In all other jurisdictions, male age-standardised rates were at least 1.4 times the female rates. The greatest relative difference between male and female rates was in Victoria, where males were more than twice as likely to start treatment for ESKD than females (13.1 versus 6.4 per 100,000 population, respectively).



Notes

1 Directly age-standardised to the 2001 Australian population.

2 The Australian age-standardised treated-ESKD rates differ slightly to those reported in Table 7.1 due to rounding associated with age-standardisation.

Source: AIHW analysis of ANZDATA Registry data.

Figure 7.4: New cases of treated-ESKD by sex and state/territory of first treatment, 2008–2009

New cases of treated-ESKD by geographical location of residence

Because of the small number of cases in *Remote* and *Very remote* areas, 2007–2009 data have been combined in this section.

Between 2007 and 2009 more than half (65%) of the new cases of treated-ESKD were for people living in *Major cities* and only 6% of cases were from *Remote* or *Very remote* areas. However, when taking into account population size, and adjusting for differences in age-structures, the rate of new cases was highest in *Remote* and in *Very remote* areas (21 and 52 per 100,000 population, respectively) (Table 7.2 and Figure 7.5).

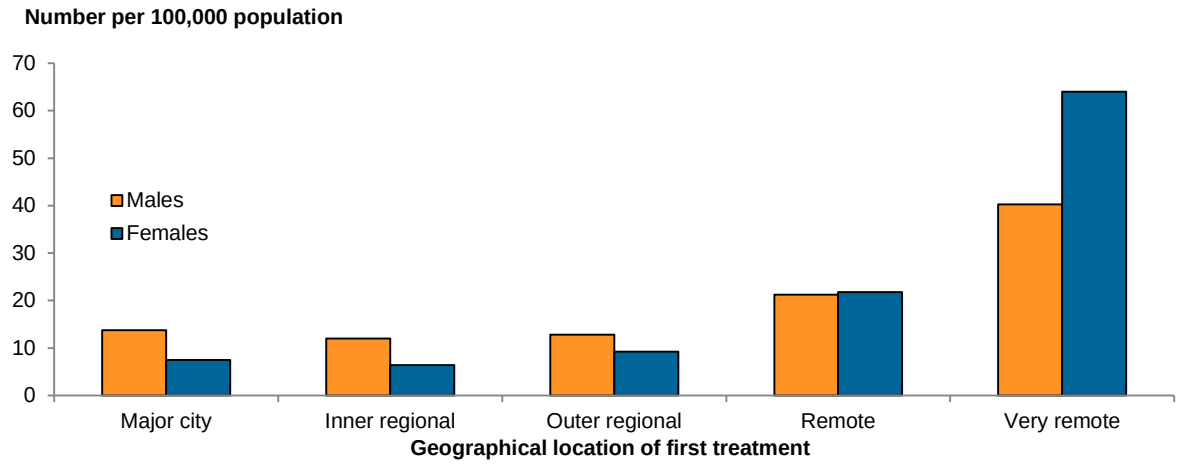
Differences between male and female rates varied across regions. In *Major cities,* male rates were 1.85 times higher than female rates (13.8 compared with 7.5 per 100,000 population, respectively) while male rates in *Inner regional* areas were around 1.88 times the female rates (12.0 compared with 6.4 per 100,000 population, respectively). Rates were similar in *Remote* areas, however, in *Very remote* areas, female rates were around 1.59 times the male rates (64.0 compared with 40.2 per 100,000 population, respectively). This pattern is likely due to the higher proportion (48%) of Indigenous Australians living in *Very remote* areas.

Table 7.2: New cases of treated-ESKD by geographical location of first treatment, 2007–2009

	Major cities		Inner regional		Outer regional		Remote		Very remote	
	Number	Rate[(a)]	Number	Rate[(a)]	Number	Rate[(a)]	Number	Rate[(a)]	Number	Rate[(a)]
Male	2,930	13.8	851	12.0	432	12.8	106	21.2	103	40.2
Female	1,791	7.5	487	6.4	311	9.3	98	21.8	137	64.0
Persons	4,721	10.4	1,338	9.0	743	11.0	204	21.4	240	51.0

(a) Treated-ESKD patients per 100,000 population, directly age-standardised to the 2001 Australian population.

Source: AIHW analysis of ANZDATA Registry data.



Note: Directly age-standardised to the 2001 Australian population.

Source: AIHW analysis of ANZDATA Registry data.

Figure 7.5: Rate of new cases of treated-ESKD by sex and geographical location of residence at first treatment, 2007–2009

The rate of new cases of treated-ESKD increased with age in *Major cities, Inner regional* and *Outer regional* areas, peaking in the oldest age group (70 and over). In *Remote* and *Very remote* areas, the rate of new cases of treated-ESKD also increased with age, but peaked in the 60–64 age group. The difference in age-related trends in *Remote* and *Very remote* areas compared with other areas is likely due to the high proportion of Indigenous Australians in these areas, as Indigenous Australians tend to start treatment for ESKD at an earlier age than non-Indigenous Australians (McDonald & Russ 2003).

Treatment rates

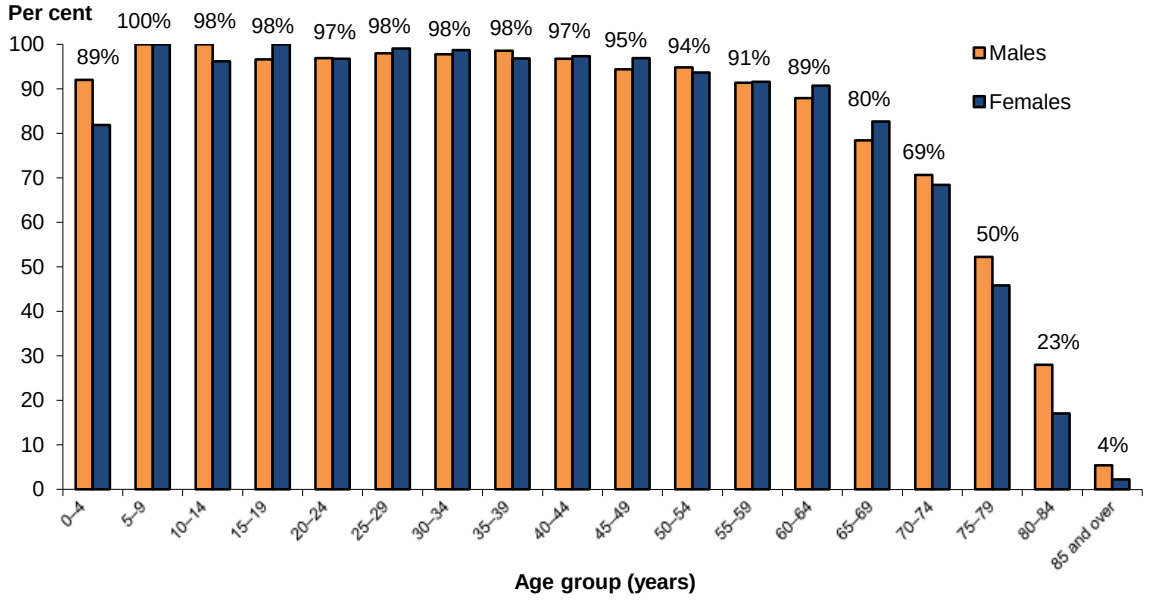
Traditionally, the incidence of ESKD in Australia has been available only for those treated with KRT, with virtually all of these cases recorded on the ANZDATA Registry. As not all people will be suitable candidates, and some others may choose not to take it up, this method of measuring the incidence of ESKD underestimates the total incidence in the community (AIHW 2005). In order to make more accurate total estimates, AIHW devised a method which uses data linkage to estimate the number of new cases of ESKD that are not treated with KRT (AIHW 2011b).

The number of non-KRT-treated cases is estimated using a defined set of cause of death codes in the national mortality data, with the aim of counting people who died with ESKD in the study period. This number can then be added to the already available number of dialysis and transplant cases recorded in the ANZDATA registry. Data linkage is used to ensure that people treated with dialysis or transplant who die during the study period are only counted once.

For the period 2003–2007, there was about one new case of ESKD that did not receive KRT for each case that did. The vast majority (80%) of the new cases of ESKD that did not receive KRT were among those aged over 70.

The actual treatment rates (proportion of all cases who receive KRT-treatment) differed by age group (Figure 7.6). Up to the age of 64, around 90% of all new cases of ESKD were treated with KRT, with a sharp drop in treatment rates among the oldest age groups. Little difference was seen in the treatment rates for males and females in most age groups, although treatment rates were higher for males in the oldest groups.

There are various reasons why some patients do not receive KRT treatment for their ESKD, including medical reasons (such as suitability for KRT), accessibility of services, and personal choice. KRT is a complex treatment, and individual patients must make choices about its pros and cons in their particular circumstances.



Note: Proportions above bars relate to the proportion of people (males and females) who are KRT-treated in that age group.

Source: Linked ANZDATA Registry, AIHW National Mortality Database and National Death Index.

Figure 7.6: Proportion of all new cases of ESKD who are KRT-treated, by age group at ESKD onset and sex, 2003–2007

8 The cost of KRT treatment

Key points

The treatment of ESKD places a large cost on the Australian health-care system.

The total cost of dialysis treatment in Australia in 2004–05 was more than $593 million.

In 2007–08 the greatest per patient expenditure for dialysis in NSW was for hospital in-centre based treatment.

Dialysis performed in-centre and in satellite clinics in NSW was more expensive in rural compared with metropolitan areas.

The treatment of ESKD places a large burden on the Australian health-care system, particularly dialysis treatment which often involves frequent and regular hospitalisations. ESKD also has broader costs as KRT patients are more than twice as likely as the general population to be hospitalised with non-renal principal diagnoses (such as infectious diagnoses and for circulatory and respiratory diseases) (McDonald & Tong 2011).

AIHW Disease Expenditure Database

In 2004–05, according to the AIHW Disease Expenditure Database, expenditure on treatment of ESKD was more than $760 million, or nearly 85% of total CKD expenditure (AIHW 2009c). As at 2004–05, the total cost of dialysis treatment in Australia accounted for more than $593 million. Nearly all of this was spent on hospital services for both admitted and non-admitted patients.

Three-quarters of the expenditure was on haemodialysis in hospitals and satellite centres with the other quarter being on home haemodialysis and peritoneal dialysis. Excluding nephrologists costs of $12.5 million, the total hospital, out-of-hospital, and general pharmaceutical cost for all patients who received a kidney transplant in 2004–05 was $21.7 million. The majority of this ($20.1 million) was on admitted patient hospital services. In addition, $132.4 million was spent on highly specialised drugs for people who had a kidney transplant in 2004–05 and for people with a functioning kidney transplant done in a previous year.

NSW dialysis costing study

A recent costing study funded by the NSW Ministry of Health estimated the costs associated with the different types and locations of dialysis treatment in NSW. Unlike estimates from the AIHW Disease Expenditure Database, these also include other related costs, such as for GP and specialist doctor visits and pharmaceuticals.

In 2007–08 in NSW the greatest estimated expenditure per patient was hospital in-centre treatment at $76,900 per year. Treatment in a satellite based centre was around $63,500, and home haemodialysis and home peritoneal dialysis were $47,800 and $51,600 per year, respectively (Table 8.1). Dialysis performed in-centre and in satellite clinics was more expensive in the rural settings compared with metropolitan centres. The per-patient expenditure for in-centre and satellite centre based dialysis treatment was much less in metropolitan areas compared with rural areas. This is likely due to several reasons, including

economies of scale, and the fact that some rural dialysis centres identified as in-centre clinics were more characteristic of satellite centres in metropolitan areas.

Table 8.1: Estimated total expenditure per person, per year, by dialysis modality and location of treatment, 2007–08

	In-centre	Satellite	Home haemodialysis	Home peritoneal dialysis
	Per patient per year			
All services($)	76,881	63,505	47,775	51,640
Metropolitan services($)	74,797	63,256	48,011	52,271
Rural services($)	80,260	77,120	48,393	50,988

Source: NSW dialysis costing study 2008.

Appendix A: Supplementary tables

Table A1: Treated-ESKD cases, by sex and state/territory of treatment, 2009

	Male		Female		Persons	
State/territory	Number	Rate[(a)]	Number	Rate[(a)]	Number	Rate[(a)]
NSW/ACT	3,629	94.7	2,415	58.3	6,044	75.6
Vic	2,836	102.3	1,705	57.0	4,541	78.5
Qld	2,059	92.3	1,452	62.2	3,511	76.8
WA	1,064	93.6	706	60.7	1,770	76.6
SA	963	109.6	568	60.3	1,531	83.6
Tas	232	85.9	152	52.3	384	68.3
NT	225	224.4	261	262.1	486	241.0
Australia	11,008	95.3	7,259	59.4	18,267	76.6

(a) Number per 100,000 population directly age-standardised to the 2001 Australian population.

Note: The Australian age-standardised treated-ESKD rates were calculated using the same age-groupings as the state/territory age-standardised rates. These age groupings result in slightly different Australian age-standardised rates than the ones reported elsewhere (Table 3.1).

Source: AIHW analysis of ANZDATA Registry data.

Table A2: Hospitalisations for regular dialysis, by state/territory of residence, 2009–10

	Male		Female		Persons	
State/territory	Number	Rate[(a)]	Number	Rate[(a)]	Number	Rate[(a)]
NSW/ACT	202,906	5,338	136,974	3,207	339,880	4,173
Vic	186,630	6,783	102,783	3,314	289,413	4,903
Qld	115,473	5,345	86,195	3,660	201,668	4,445
WA	91,424	8,364	61,960	5,290	153,384	6,741
SA	50,332	5,714	30,839	3,055	81,171	4,258
Tas	8,972	3,275	6,086	1,999	15,058	2,592
NT	17,608	16,918	24,675	25,074	42,283	20,753
Australia	673,331	6,097	449,506	3,667	1,122,837	4,781

(a) Hospitalisations per 100,000 population directly age-standardised to the 2001 Australian population.

Notes

1 The Australian age-standardised hospitalisation rates of new cases of treated-ESKD rates were calculated using the same age-groupings as the state/territory age-standardised rates. These age groupings result in slightly different Australian age-standardised rates than the ones reported elsewhere (Table 6.1).

2 Numbers exclude 2,196 hospitalisations where the state/territory of the patient could not be assigned due to missing data, non-Australian residency etc.

Source: AIHW NHMD.

Table A3: Hospitalisations for regular dialysis by geographical location of residence, 2009–10

	Male		Female		Persons	
Geographical location	**Number**	**Rate[(a)]**	**Number**	**Rate[(a)]**	**Number**	**Rate[(a)]**
Major cities	477,558	6,662	297,591	3,675	775,149	5,035
Inner regional	115,661	4,702	74,045	2,813	189,706	3,710
Outer regional	56,406	4,868	48,921	4,353	105,327	4,597
Remote	12,226	6,805	15,099	9,764	27,325	8,127
Very remote	11,570	13,462	13,821	19,656	25,391	16,214

(a) Hospitalisations per 100,000 population directly age-standardised to the 2001 Australian population.

Note: Numbers exclude 2,155 hospitalisations where geographic location of residence could not be assigned due to missing data, non-Australian residency etc.

Source: AIHW NHMD.

Table A4: New cases of treated-ESKD, by sex and state/territory of treatment, 2008–2009

	Male		Female		Persons	
State/territory	**Number**	**Rate[(a)]**	**Number**	**Rate[(a)]**	**Number**	**Rate[(a)]**
NSW/ACT	963	12.9	661	8.2	1,624	10.4
Vic	711	13.1	367	6.4	1,078	9.6
Qld	594	14.1	423	9.4	1,017	11.6
WA	314	14.6	190	8.5	504	11.4
SA	239	13.8	141	7.3	380	10.4
Tas	60	11.3	47	8.2	107	9.6
NT	69	34.1	92	48.5	161	40.5
Australia	2,950	13.6	1,921	8.3	4,871	10.8

(a) Number per 100,000 population directly age-standardised to the 2001 Australian population.

Note: The Australian age-standardised rate of new cases of treated-ESKD rates were calculated using the same age-groupings as the state/territory age-standardised rates. These age groupings result in slightly different Australian age-standardised rates than the ones reported elsewhere (Table 7.1).

Source: AIHW analysis of ANZDATA Registry data.

Appendix B: Methods

Age-specific rates

Age-specific rates are calculated by dividing the number of cases occurring in each specified age group by the corresponding population in the same age group, expressed as a rate (for example, number per 100,000 persons). Information on the populations used in this report is provided in the section on populations below.

Age-standardised rates

Age-standardisation is a technique used to eliminate the effect of differences in population age structures when comparing rates for different periods of time, geographical areas, and/or population groups. Definitions are included in the *National health data dictionary* (Health Data Standards AIHW: Health Data Standards Committee 2006).

There are two methods of age-standardisation, direct and indirect. The method used in this report is direct age-standardisation.

Direct age-standardisation

Direct age-standardisation applies the age-specific rates to a standard population in order to determine the rate that would have occurred in the standard population. This allows direct comparison of different rates applied to the same standard population. When selecting the standard population to use in age-standardisation, it is necessary to consider the population at risk. For the vast majority of rates which are age-standardised, such as the hospitalisation rates presented in this report, the total population is at risk. For these types of rates, the Australian population as at 30 June 2001 has been used as the standard.

The method used for the calculation of age-standardised rates consists of three steps:

Step 1: Calculate the age-specific rate for each age group.

Step 2: Calculate the expected number of cases in each age group by multiplying the age-specific rate by the corresponding standard population to get the expected number of cases.

Step 3: Find the sum of the expected number of cases in each age group, divide by the total of the standard population and multiply by 100,000. This gives the age-standardised rate.

In general, the age-standardised rates presented in this report have been calculated using 5-year age groups to over 75. Rates calculated using small numbers (less than five events in the numerator) can be unstable, show considerable fluctuation from year to year, and exhibit wide confidence intervals. In some cases, it has been necessary to combine younger age groups (0–29) to prevent this from occurring.

Significance testing

Time series analyses presented throughout this report have used linear regression analysis to determine whether there have been significant increases or decreases in the observed rates for the period. Comments in this report have been made on significant increases or decreases only.

Populations used in this report

Population data are used throughout this report to calculate rates. The population data used are estimated resident populations (ERPs) derived from the Australian Bureau of Statistics (ABS) Census of Population and Housing. ERPs adjust Census data to add people missed by the Census and people overseas on census night, and to remove overseas visitors. In between census years, the ERPs are updated using indicators of population change such as deaths, births and net migration. The ERPs used in this report are based on the 2006 Census.

Where a rate is calculated for a calendar year (for example, with the ANZDATA Registry incidence data), the population used is the ERP as reported at 30 June of that year. Where a rate is calculated for a financial year, as with hospitalisation data, the population used is as at 31 December. For example, to calculate the hospitalisation rate of the 2008–09 financial year, the ERP at 31 December 2008 would be used.

Throughout this report, rates are age-standardised. In these cases, the standard population used to calculate the age-standardised rate is the Australian ERP as at 30 June 2001.

Reporting data by remoteness

Comparisons of region in this report use the Australian Standard Geographical Classification (ASGC). The ASGC is a classification system developed by the ABS to group Australian regions into six areas, called remoteness areas, based on their distance from major population centres and services. The six remoteness areas are:

- *Major cities*
- *Inner regional*
- *Outer regional*
- *Remote*
- *Very remote*
- *Migratory.*

Data from *Migratory* areas are not analysed in this report. The boundaries of the different remoteness areas are re-drawn after each Census to account for changes to available services and population change. The remoteness areas used in this report are based on the 2006 Census.

Reporting hospital and ANZDATA Registry data by state/territory

Because of difficulties in separating cases from the ACT and the surrounding regions of NSW data from these jurisdictions have been combined. Data have also been combined because there is only one hospital in the ACT that provides dialysis treatment, meaning that ACT hospital data and ANZDATA Registry data may reflect performance outcome measurements for this hospital. NSW and ACT hospitalisation data were combined for consistency with the State/Territory level ANZDATA Registry data.

NHMD methods

Hospitalisations for regular dialysis

A regular dialysis hospitalisation is defined in this publication as a hospitalisation with a principal diagnosis of ICD–10–AM code Z49.1 (haemodialysis) or Z49.2 (peritoneal dialysis).

For a hospitalisation to record a principal diagnosis of ICD–10–AM codes Z49.1 or Z49.2, the intent for admission must be same day and the patient discharged on the same or next day of admission. In cases where the intent of a regular dialysis admission was same day, but was extended due to some other condition or complication of treatment, the condition responsible for extending the patient's length of stay is coded as the principal diagnosis, and regular dialysis (Z49.1 or Z49.2) is coded as an additional diagnosis.

The data in this report were extracted from the AIHW NHMD in February 2012 and small changes may have occurred since this time.

Hospitalisations for the removal of kidneys and kidney transplant

Procedures to remove (living) donor kidneys were identified in the NHMD using the procedure codes 3516–04 (Laparoscopic donation) and 3516–05 (no laparoscopic donation).

Kidney transplantation procedures were identified using the procedure code 36503–00.

Glossary

Diabetes	A chronic condition in which blood glucose levels become too high. The body produces little or no insulin—the glucose regulating molecule—or cannot use it properly.
Diabetic nephropathy	Disease of the capillaries of the glomeruli resulting from diabetes.
Glomerulonephritis	Inflammation of the glomeruli, which are a component of the basic filtering unit in the kidney.
Graft failure	Refers to both kidney transplant failure (i.e. patient survival but a return to dialysis) and patient death (with kidney transplant function).
Haemodialysis	A method of removing waste products and water from the blood, as well as regulating the levels of circulating chemicals. A machine is connected to a person's bloodstream to filter the blood externally to the body.
Incidence	The number of new cases (of an illness, disease or event) occurring during a given period.
Kidney replacement therapy (KRT)	Includes having a functional kidney transplant or receiving regular dialysis.
Peritoneal dialysis	A solution is pumped into the abdominal cavity where the body's own peritoneum membrane acts as a dialysis filter to remove waste products and water.
Prevalence	The number or proportion (of cases, instances) present in a population at a given time.
Primary kidney transplant	A kidney transplant performed on a first time recipient.
Satellite dialysis	Dialysis performed in centres that are usually located away from their parent hospital so as to decrease the travel burden sometimes associated with accessing certain dialysis services.

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List of tables

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