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Projections of the incidence of treated end-stage kidney disease in Australia

2010–2020

September 2011

Australian Institute of Health and Welfare
Canberra
Cat. no. PHE 150

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ISBN 978-1-74249-201-8

Suggested citation
Australian Institute of Health and Welfare 2011. Projections of the incidence of treated end-stage kidney disease in Australia Cat. no. PHE 150. Canberra: AIHW.

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Published by the Australian Institute of Health and Welfare

Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.

Contents

Acknowledgments

The first draft of this report was authored by Guangyu Zhang and updated and revised by Yanyan Gong of the National Centre for Monitoring Chronic Kidney Disease at the Australian Institute of Health and Welfare. Other members of the National Centre also made significant contributions including Frances Green, Simon O'Mahony and Claire Sparke.

This report was written under the guidance of Lynelle Moon, and statistical advice from Professor Robert Gibberd (Newcastle University), Professor Bruce Bacon (the Australian National University), and Teresa Dickinson is gratefully acknowledged.

Assistance with editing and data checking from Michael Bourchier, Simone Littlewood and Sanjeeva Ranasinha is greatly appreciated.

The advice of the Chronic Kidney Disease Monitoring Advisory Committee, chaired by Associate Professor Tim Mathew, is also acknowledged. Members of the committee at the time of preparation were: Professor Alan Cass, Professor Steven Chadban, Professor Jeremy Chapman, Ms Bettina Douglas, Professor Wendy Hoy, Associate Professor Stephen McDonald, Dr Lynelle Moon, Mr David Parker and Professor Tim Usherwood.

The report includes input from state/territory representatives and other individuals who attended the AIHW ESKD Projection Workshop held in Canberra in 2010: Associate Professor Rosemary Knight (Commonwealth Department of Health and Ageing), Dr Alison Latta (NSW), Ms Hirani Jayasinha (NSW), Ms Jenny Collins (Vic), Dr Helen Healy (Qld), Ms Margo O'Neill (WA), Ms Sigrid Pfaffle (SA), and Dr Yuejen Zhao (NT).

Funding from the Australian Government Department of Health and Ageing contributed to the production of this report.

Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ANZDATA	Australia and New Zealand Dialysis and Transplant Registry
CKD	chronic kidney disease
DoHA	Department of Health and Ageing
ESKD	end-stage kidney disease
KRT	kidney replacement therapy
NCMCKD	National Centre for Monitoring Chronic Kidney Disease
US	United States
USRDS	United States Renal Data System

Summary

This report presents projections of the incidence of end-stage kidney disease treated with dialysis or kidney transplantation (treated ESKD) for the period 2010 to 2020. This information is important for health service planning and resource allocation in the future. The projections are made by sex at national and state/territory levels, and for end-stage kidney disease (ESKD) patients with diabetes when commencing treatment.

It is important to note that projections are not intended to function as exact forecasts, but to give an indication of what might be expected if the stated assumptions were to apply over the projection time frame.

Overall picture

The incidence (number of new cases) of treated ESKD is projected to continue to rise over the next decade at the national and state/territory levels, for both sexes and across most of the age groups, and for those with diabetes.

Projections at the national level

- The incidence rate of treated ESKD is projected to increase by nearly 80%—from 11 per 100,000 population in 2009 to 19 per 100,000 population in 2020. The increase is projected to be mainly among patients aged 70 years and over.
- Diabetes is expected to contribute considerably to the increase in treated ESKD. The proportion of patients commencing treatment with diabetes is projected to increase to about 64% in 2020 from 45% in 2009.

Projections at the state/territory level

- The incidence rates are projected to increase in all jurisdictions from 2009 to 2020; however, the rate of increase differs slightly.
- The Northern Territory is projected to continue to have the highest incidence rate among all states and territories. However, its rate of increase (40%) is expected to be the smallest over the period 2009 to 2020.

1 Introduction

Background

Chronic kidney disease (CKD) is a common chronic disease in Australia. Clinically, CKD is classified into five stages—from kidney damage with no loss of kidney function, to severe loss of kidney function (National Kidney Foundation of America 2002). However, it is often not until kidney function has deteriorated into the fifth stage, known as end-stage kidney disease (ESKD), that a problem is detected. People with ESKD usually require kidney replacement therapy (KRT)—dialysis or transplant—to survive. The treatment of ESKD, in particular dialysis, is the most common reason for hospitalisation in Australia (AIHW 2010), and consequently is responsible for a large amount of health expenditure (AIHW 2009). Moreover, it greatly affects the quality of life of patients.

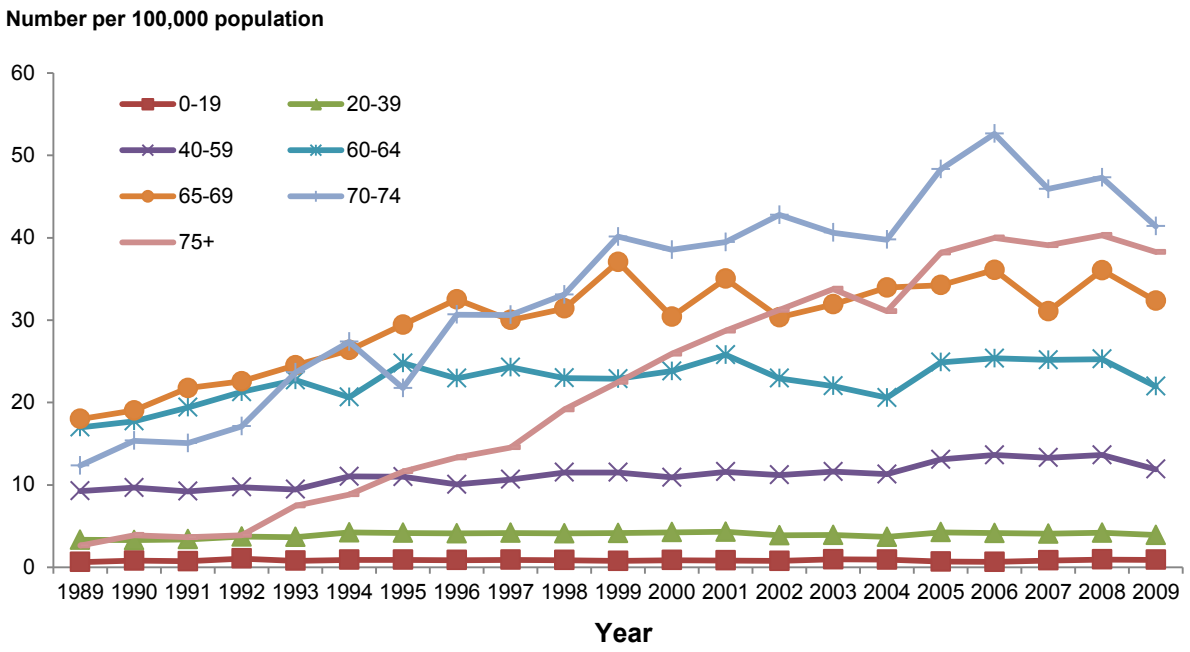
Incidence refers to the number of new cases occurring during a given period. In recent decades the incidence of ESKD cases receiving KRT treatment (referred to as 'treated ESKD' in this report) has increased rapidly. The number of new cases increased by 167% in the 20−year period from 1989 to 2009 (McDonald et al. 2010). Much of the increase in the incidence of treated ESKD occurred among people aged 65 years and over (AIHW 2009). Diabetes has become the leading cause of treated ESKD among registered ESKD cases in the Australia and New Zealand Dialysis and Transplant Registry (ANZDATA), overtaking glomerulonephritis since 2004 (McDonald et al. 2008).

It is anticipated that the incidence of treated ESKD will continue to increase over the next decade, and there are several contributing factors. First, the Australian population is ageing. According to the ABS population projections (B-series), the proportion of people aged 65 years and over, and 70 years and over, is expected to increase from 13% and 9% in 2006 to 17% and 11% in 2020, respectively. Second, the proportion of ESKD patients commencing treatment with a comorbidity of diabetes has increased over time (Villar et al. 2007), mirroring the trend of increasing incidence and prevalence of diabetes in Australia (AIHW 2008). Not all ESKD patients are treated with KRT, so it is important to note that the incidence of treated ESKD is not only determined by the incidence of the disease itself, but is also influenced by patient choice, the availability of funding and resources, and acceptance policies.

Key features of treated ESKD in Australia

There has been a continued and considerable increase in the number of incident cases of treated ESKD in Australia over the past two decades. For males, the number of new cases increased by 202% between 1989 and 2009, while for females it increased by 128% over the same period (Tables A1.1 and A1.2 in Appendix 1). During the same period, the population only increased by about 30% for both males and females.

Figure 1.1 shows the incidence rates of treated ESKD by age group in Australia from 1989 to 2009. For people under the age of 40 years, the incidence rates were very stable over time; for people between 40 and 64 years, the incidence rates were also relatively stable with a slight increase, but for the older age groups, larger increases were experienced. For example, there was a more than 13-fold increase in the incidence rate for those aged 75 years and over. However, a levelling off of or even decreasing rates among older patients in years 2007–2009 was observed.



Source: AIHW analysis of ANZDATA.

Figure 1.1: Age-specific incidence rates for treated ESKD, by age, Australia, 1989–2009

There was a considerable variation in the rate of growth in incidence rates from jurisdiction to jurisdiction during the period 1989 to 2009 after age distribution differences were taken into account (Table 1.1). The Northern Territory experienced a more substantial increase than other jurisdictions over this period, from 14 to 49 per 100,000 population. All other jurisdictions showed similar trends to the national trend. The proportion of ESKD patients who commenced treatment with diabetes as a comorbidity also increased over time. Villar et al. (2007) reported that there was an average 10% annual increase in the incidence rate of ESKD patients with Type 2 diabetes from 1991 to 2005. According to ANZDATA, the proportion of ESKD patients with a comorbidity of any diabetes increased from 35% in 2001 to 42% in 2007 (McDonald et al. 2008).

Treated ESKD is more common among Aboriginal and Torres Islander people and is important in the context of future trends in ESKD. Due to data issues surrounding Indigenous population data, projections of incidence rates of treated ESKD among Indigenous Australians will be presented in a separate working paper. However, it is important to note that the national and state-level projection results in this report include Indigenous treated ESKD cases.

Table 1.1: Age-standardised incidence rates of treated ESKD, by jurisdiction, 1989−2009

Year	Australia	NSW/ACT	Vic	Qld	WA	SA	Tas	NT
1989	5.6	6.2	4.7	5.8	5.6	5.3	5.7	13.9
1990	6.0	5.7	5.6	6.4	5.4	8.1	8.8	12.1
1991	6.0	6.1	5.7	5.9	5.4	6.8	8.8	16.1
1992	6.6	7.0	6.0	6.4	6.4	7.1	6.3	33.5
1993	6.9	7.1	6.3	7.1	7.6	5.1	9.2	30.1
1994	7.7	7.6	7.3	7.8	8.4	7.1	6.2	34.5
1995	7.9	8.0	7.2	7.8	8.9	6.3	9.2	35.9
1996	8.1	8.6	7.6	7.3	7.7	7.1	6.5	40.3
1997	8.3	8.2	7.9	8.5	8.4	6.4	7.2	52.0
1998	8.8	8.3	9.2	9.1	8.9	7.4	8.7	57.3
1999	9.4	8.7	9.3	9.2	11.6	9.3	8.2	39.6
2000	9.2	8.5	9.0	10.0	11.3	7.4	9.6	54.0
2001	9.8	9.2	10	9.6	10.5	9.4	12.3	64.9
2002	9.5	8.9	9.3	10.5	11.0	7.2	11.8	53.3
2003	9.8	9.3	8.7	11.3	10.7	9.1	11.6	48.0
2004	9.5	8.4	9.0	10.3	11.0	9.4	7.8	50.5
2005	10.9	10.5	10	11.6	11.8	10.0	9.8	73.9
2006	11.3	11.0	10.6	12.1	11.5	10.5	9.4	44.1
2007	10.8	10.6	9.8	11.1	12.1	9.6	11.6	57.5
2008	11.2	11.1	9.5	12.3	12.5	10.0	9.5	43.9
2009	10.1	9.5	9.4	10.8	10.3	10.4	9.4	49.3

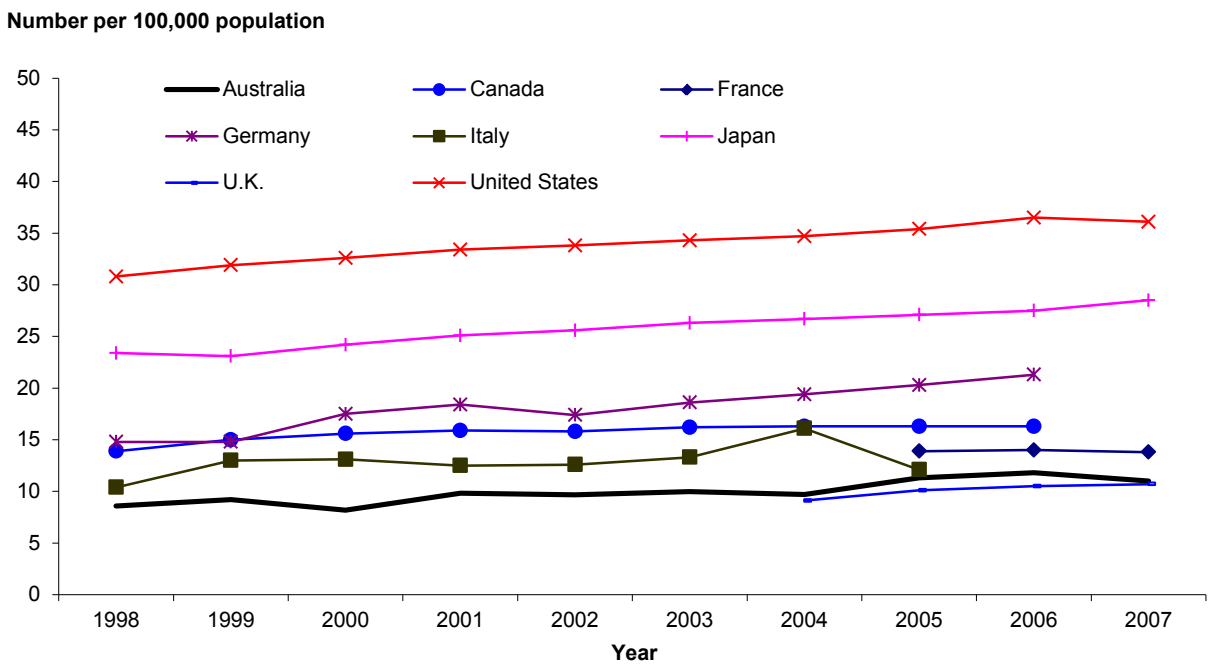
Note: ESKD per 100,000 population standardised to 2001 Australian population.

Source: AIHW analysis of ANZDATA.

Australia's experience in an international context

The United States Renal Data System (USRDS) publishes an annual data report on ESKD and chronic kidney disease in the United States (US), which also includes information on treated ESKD in other countries. The treated ESKD incidence rates between 1998 and 2007 in seven developed countries were selected from the USRDS Annual Report 2009 (US Renal Data System 2009) and presented together with the incidences rates in Australia (Figure 1.2). The incidence rate of treated ESKD in each country is greatly affected by health funding and economic circumstances, patients' choices and demographics.

Given the incidence rates reported by USRDS were unadjusted for age differences and the data collection was not consistent across countries, direct comparison cannot be made. In general, international comparisons of the data on ESKD patients and kidney replacement therapy may not be valid due to the differences in these aforementioned factors (Schena 2000). However, in broad terms, the treated incidence rate in Australia appeared to be at the lower end among this group of countries. Canada, which is similar to Australia in terms of level of development, presence of Indigenous people, and migration policy, reported an incidence rate consistently higher than that in Australia.



Source: USRDS Annual Report 2009 and ANZDATA.

Figure 1.2: Incidence rates of treated ESKD, selected developed countries, 1998–2007

The past two decades have seen a considerable increase in incidence rates of treated ESKD in Australia, in particular among older age groups (Figure 1.1). For example, in 1989, there were only 19 new cases of treated ESKD for people aged 75 years and over in Australia. This figure has increased exponentially to 520 in 2009. Nevertheless, an AIHW analysis suggests that there were a large number of cases of ESKD among the older age groups who did not receive KRT treatment between 2003 and 2007 (AIHW 2011). If many of these had received dialysis or transplant treatment, a larger and more rapid increase in the incidence rate of treated ESKD would be expected to occur than has been reported. If Australia follows international trends, it is possible that it will experience a large increase in the incidence of treated ESKD in the foreseeable future.

About this report

This report presents the projections of the incidence of ESKD patients who receive kidney replacement therapy (dialysis or transplant) in Australia (referred to as treated ESKD hereafter) for the period 2010 to 2020. Projections of treated ESKD are important for health service planning and resource allocation purposes.

The projections cover:

- the national picture
- the incidence of those commencing treatment for ESKD with diabetes as a comorbidity (referred to as treated ESKD with diabetes hereafter)
- state/territory differences.

The projections address the following questions:

- What is the projected annual incidence rate of treated ESKD in Australia over the next decade?
- What is the annual incidence rate of treated ESKD with diabetes projected to be over the next decade? What role will diabetes play in changes to incidence of treated ESKD?
- What is the annual incidence of treated ESKD in each state/territory projected to be over the next decade? Will these trends vary by jurisdictions?

Data sources

The ANZDATA collects information from all dialysis and transplant units in Australia and New Zealand on 31 December each year, and these data are published annually (see <www.anzdata.org.au>).

The ANZDATA includes the number of incident cases of ESKD for each calendar year, as well as demographic information such as age, sex, state/territory of first treatment, usual residence, treatment type, comorbidities, and Indigenous status. The annual age-sex-specific incidence rates of treated ESKD, both at population and sub-population levels were produced as the basis for the projections in this report. The date of first treatment, either dialysis or transplant, was used to calculate incidence.

The latest ABS population projection series (Australian Bureau of Statistics 2008) were used for producing incidence rates by sex and age group for the projection period 2010 to 2020. Traditionally, the ABS projections include three series (Series A, B, and C), which have been selected to provide a range of projections for analysis and discussion. Series B is the medium-variant projection, and is the one used in this analysis.

The ABS has also produced population projections for each state/territory (ABS 2008), which were used for projections of incident cases at the state/territory level.

Statistical methods

The projection of the incidence of treated ESKD essentially comprises two steps. The first step is to summarise the historical trends in the incidence rates reported by the ANZDATA, identify the most recent trend, and extrapolate it into the future. The second step is the projection of incidence rates using the ABS population projections.

Like other projections of disease incidence, the most important assumption in this report is that the most recent historical trend will continue into the future. An age-period modelling approach, which assumes disease incidence is a function of age (in age group) and period (in calendar year) effects, was applied to describe and extrapolate the historical trends of the incidence of treated ESKD. The advantage of this approach is that the age and period effects are treated as a proxy for the underlying causes of the disease incidence (Dyba et al. 1997), involving minimal subjective judgement.

The age-period model used in this analysis is a log-linear Poisson regression model (Osmond & Hardy 2004; Schaubel et al. 1998). This model assumes the incidence of treated ESKD, as a rare disease, followed a Poisson distribution, and the logarithmic transformed incident cases with the population as an offset is a function of age and period effects. More details are provided in Appendix 2. The extrapolated incidence rates display an exponential growth trend. For simplicity, this model is referred to as the Poisson model hereafter.

There are a number of factors that point to a continued increase in the incidence of treated ESKD in Australia. These include population growth and ageing, the increasing prevalence of diabetes, and the knowledge that there are currently many cases of ESKD not treated with KRT. For these reasons, a Poisson model was judged to be the most suitable for this situation.

Interpretations of these projections

The likely veracity of projections depends on three factors:

- the accuracy of the historical data available
- the assumptions made—for example about population size and composition over time—proving realistic, and
- the suitability of the model used as a representation of the underlying trends.

In this report the underlying data used is described earlier in this section, and the statistical methods in Appendix 2.

The assumptions made for these projections are as follows. Firstly, the recent historical trend in the incidence of treated ESKD will continue in the next decade. Secondly, the population will grow and age according to ABS population projections for the next decade. And, thirdly, the treatment options, patient choices, and availability of services remain unchanged in the projection years. These assumptions have to be taken into consideration when interpreting the projection results.

Our data also suggested potential overestimates for older patients; as a result, a more conservative approach was attempted assuming the incidence rates for older patients in the most recent years of base data would remain unchanged in the projection years. It should be noted that the projections at state/territory level may not add up to the projections at the national level as different age groupings were used, and for Tasmania and the Northern Territory males and females were combined due to the small number of cases.

Lastly, the projections for treated ESKD with and without diabetes are not equal to the total projected incident cases at national level due to the fast growing trend of this population in the base data. As a result, the projected proportion of treated ESKD cases with diabetes among all treated ESKD was benchmarked to the results of national projection.

Moreover, projection estimates have a level of uncertainty around them, meaning there is a statistical range in which the true value is likely to lie. In other words, the figures quoted in this report can be viewed as an 'average' of the actual value that might be expected assuming the assumptions made in this report prove realistic.

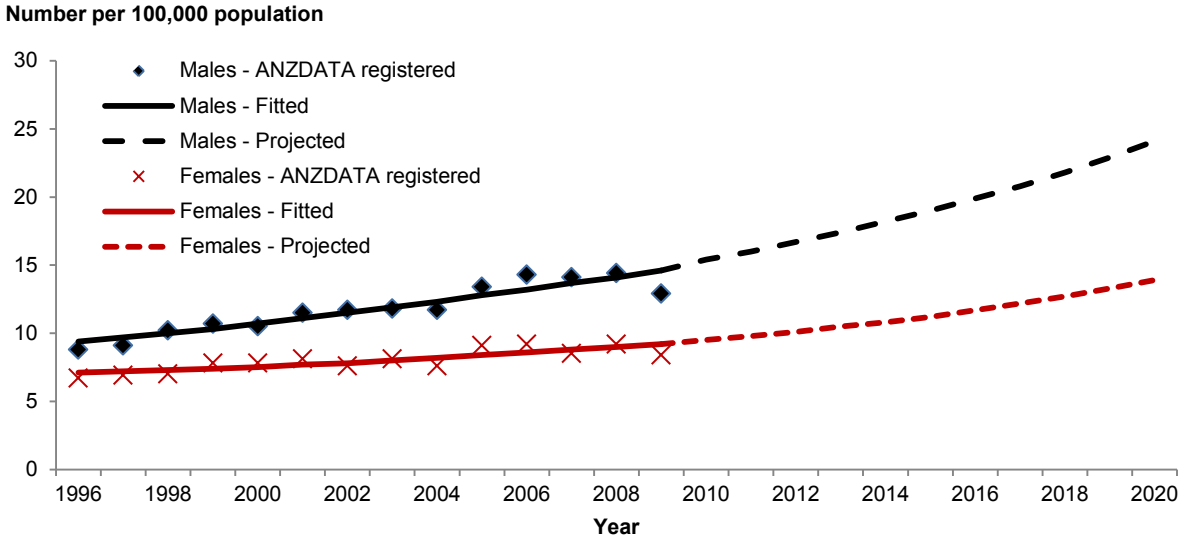
For these reasons, the projection results should be interpreted with caution and used with clear understanding and judgement—they cannot be considered an infallible representation of future ESKD incidence.

2 Projection results at the national level

There are two sets of projections presented at the national level— all ESKD cases, and ESKD patients with diabetes as a comorbidity when commencing treatment. The projected incidence rates of treated ESKD from the Poisson model for the period 2010 to 2020 are presented in the following sections. More detailed statistical tables and the projected age-specific incidence rates are provided in Appendix 1.

Projected incidence of treated ESKD in Australia

In 2009, the incidence of treated ESKD in Australia was 11 per 100,000 population; by 2020, the incidence rate is projected to increase by nearly 80% to 19 per 100,000 population. Figure 2.1 presents the incidence rates of registered and projected treated ESKD by sex from 1996 to 2020. For both sexes, the Poisson models predict the data very well. The gap in the incidence rates between males and females is expected to widen over time.



Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 2.1: Incidence rates of registered and projected treated ESKD by sex, Australia, 1996−2020

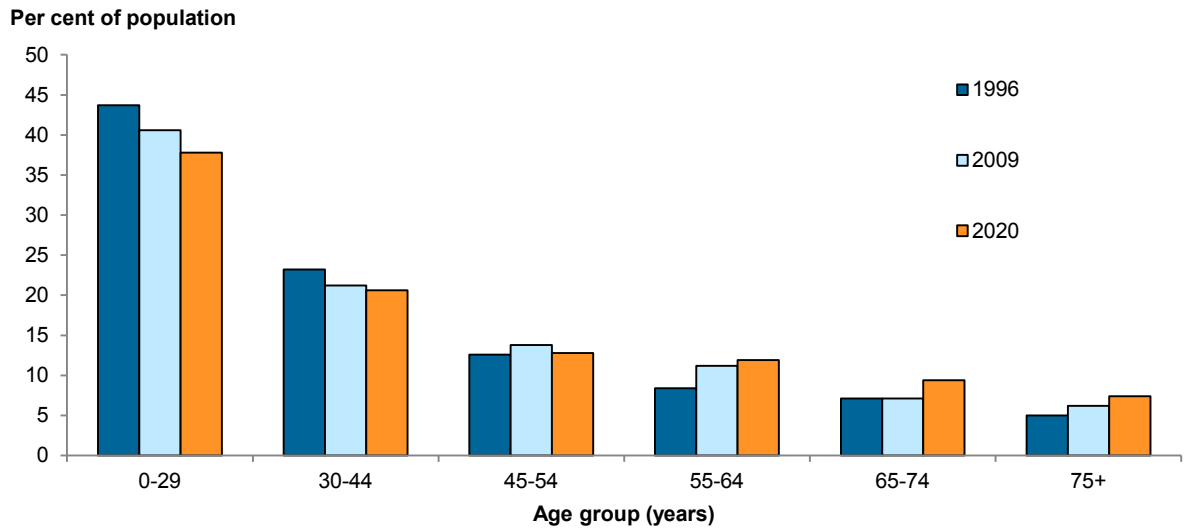
In 2020, the projected incidence rate for males is expected to be 24 per 100,000 population (Table 2.1), an 86% increase compared to the registered incidence rate of 13 per 100,000 population in 2009. The incidence rate for females is expected to increase by 66%, from 8 per 100,000 population in 2009 to 14 per 100,000 population in 2020.

Table 2.1: Projected incidence rates of treated ESKD by sex, Australia, 2010–2020

Sex	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
						Number per 100,000 population					
Males	15	16	17	17	18	19	20	21	22	23	24
Females	10	10	10	10	11	11	12	12	13	13	14
Total	**12**	**13**	**13**	**14**	**14**	**15**	**16**	**16**	**17**	**18**	**19**

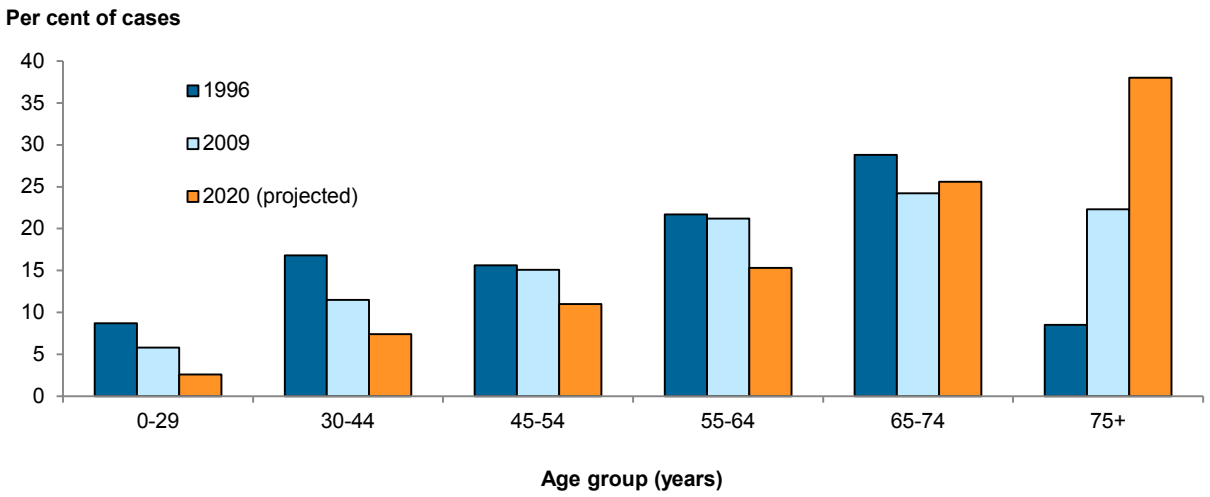
Source: AIHW projections based on ANZDATA .

Figure 2.2 shows the estimated and projected populations for the years 1996, 2009, and 2020. Though the population aged somewhat over time, the distribution was fairly consistent for the three years. Figure 2.3 shows the age-distribution of the registered and projected number of new cases of treated ESKD which presents a different picture. In 1996, patients 75 years and over made up under one-tenth of the total number of new cases of treated ESKD; in 2009, they made up more than one-fifth; and by 2020, it is projected that they will make up more than one-third of the number of new cases of treated ESKD (36% for males and 41% for females).



Source: ABS population estimates and projections

Figure 2.2: Age-distribution of population, by year, Australia



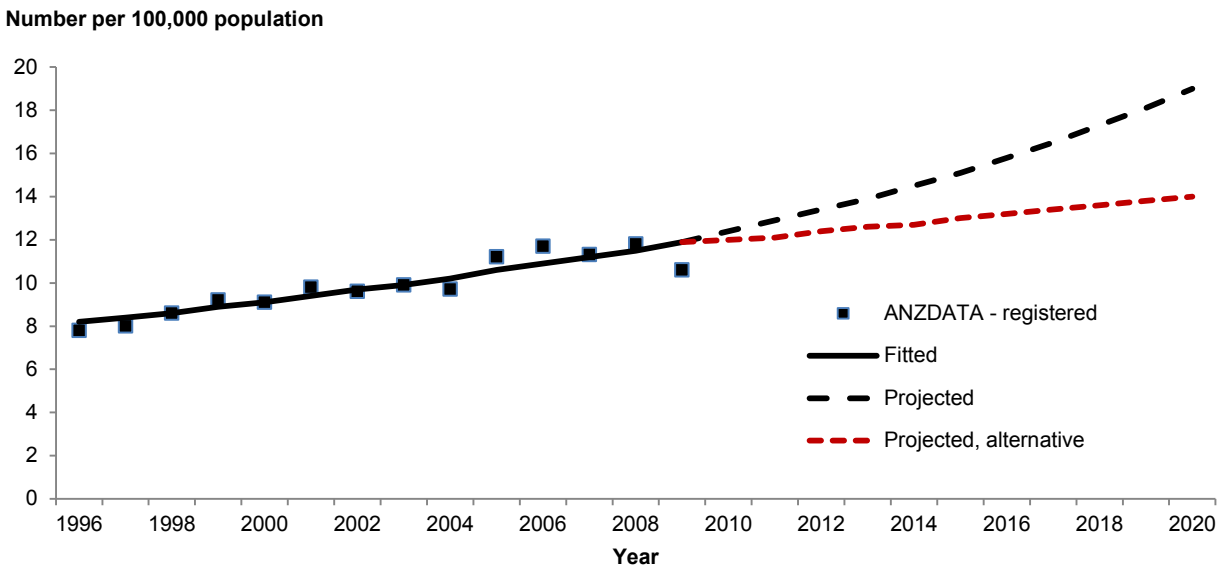
Source: Registered cases 1996 and 2009 from ANZDATA .

Figure 2.3: Age-distribution of registered and projected ESKD cases, by year, Australia

Alternative model

The model prediction plots (Figures A2.2—A2.23 in Appendix 2) indicate that the models fit well for most years; however, the incidence rates have levelled off in the most recent years, especially for older patients (Figure 1.1), so it is possible the number of new cases of treated ESKD for older patients may be overestimated. To assess the potential impact of this on the projection results, an alternative scenario was calculated. Assuming the average incidence rate for patients 70 years and over in years 2007–2009 remains constant in the projection years, by 2020, the projected incidence rate would be 26% lower than assuming continuous growth, that is, 14 per 100,000 population instead of 19 per 100,000 population (Figure 2.4). The higher dotted line represents the situation if the rate for older people were to continue at the same rate as it occurred between 1996 and 2009; the lower dotted line is the case where the rate for the older age group has no increase. During the same period, similar results were observed for both males and females. Comparing the alternative to the original approach, the projected incidence rate would be 25% lower for males and 28% lower for females.

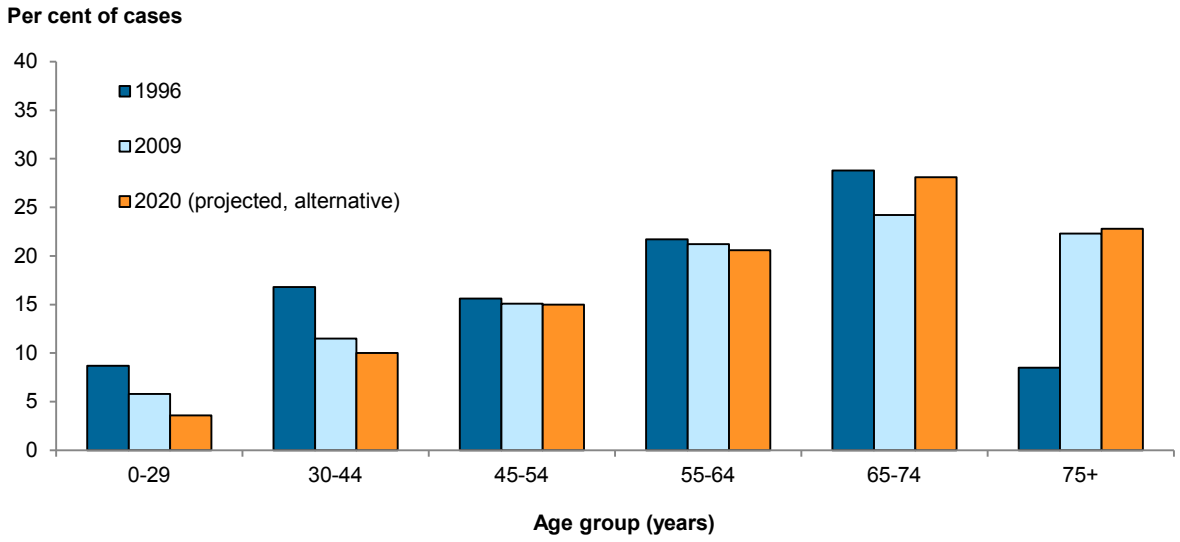
Figure 2.5 shows the age distribution of registered and projected treated ESKD cases after this adjustment (see Figure 2.3 for comparison). These two scenarios should not be interpreted as potential upper and lower bounds of projected treated ESKD incidence but rather alternative projections based on different assumptions.



Note: The alternative projection results (lower dotted line) are derived by holding the average of incidence rates for years 2007– 2009 for patients 70 years and over constant in projection years.

Source: Registered cases during 1996−2009 from ANZDATA .

Figure 2.4: Registered, projected and projected (alternative) incidence rates of treated ESKD, Australia, 1996−2020



Note: The alternative projection results are derived by holding the average of incidence rates for years 2007– 2009 for patients 70 years and over constant in projection years.

Source: Registered cases for 1996 and 2009 from ANZDATA .

Figure 2.5: Age-distribution of registered and projected (alternative) treated ESKD cases, by year, Australia

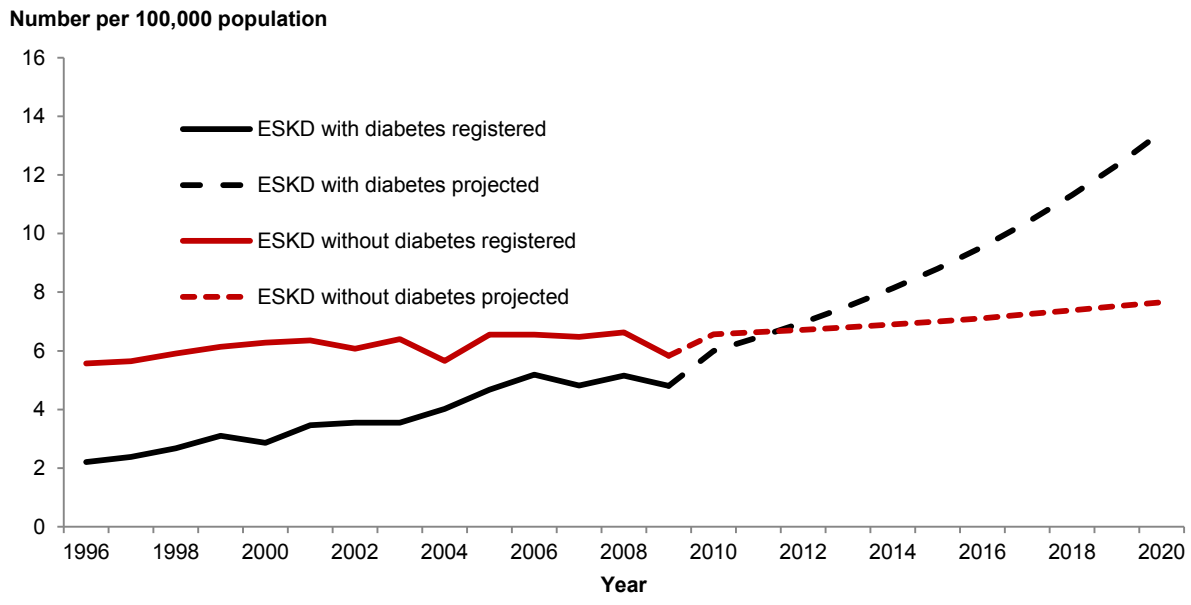
A number of factors contribute to the projected rate increase from 2009 to 2020, and they are illustrated in Table A1.15. Population increase alone from 2009–2020 accounts for a 14% increase in the projected incidence of treated ESKD, assuming the age-specific incidence rates of treated ESKD and the age-distribution of the population in 2020 remain the same as in 2009. If the age-specific incidence rates of treated ESKD in 2009 remain unchanged in the future, but the population ages, the projected incidence of treated ESKD will increase by another 13%. The remaining 73% increase is due to the projected increase in age-specific rates over time.

Projected incidence of treated ESKD patients with diabetes

Diabetes has been one of the most common causes of treated ESKD for many years, and the most common cause among treated ESKD cases in ANZDATA since 2004 (McDonald et al. 2008). Projections in this section are based on the number of people commencing treatment for ESKD with diabetes.

In order to assess the future incidence rates of treated ESKD with diabetes, projections were made separately for the number of new cases of treated ESKD with and without diabetes. It is important to note that as a result of differences in the historical trends for treated ESKD patients with and without diabetes and modelling using different age groups, the projected sum of new cases does not equal the total projected number of new cases of treated ESKD from the national model. Because of this, it was necessary to derive the projected proportion of ESKD patients with diabetes. The number of incident cases for treated ESKD with diabetes was obtained by applying the proportion of treated ESKD cases with diabetes to the projected total ESKD cases at the national level.

Figure 2.6 shows that between 1996 and 2009, the incidence rates of treated ESKD without diabetes remained fairly stable, while the incidence rates of treated ESKD with diabetes increased consistently. This increasing trend is projected to continue in future years (2010 to 2020).



Source: Registered cases during 1996–2009 from ANZDATA .

Figure 2.6: Incidence rates of registered and projected treated ESKD with and without diabetes, Australia, 1996–2020

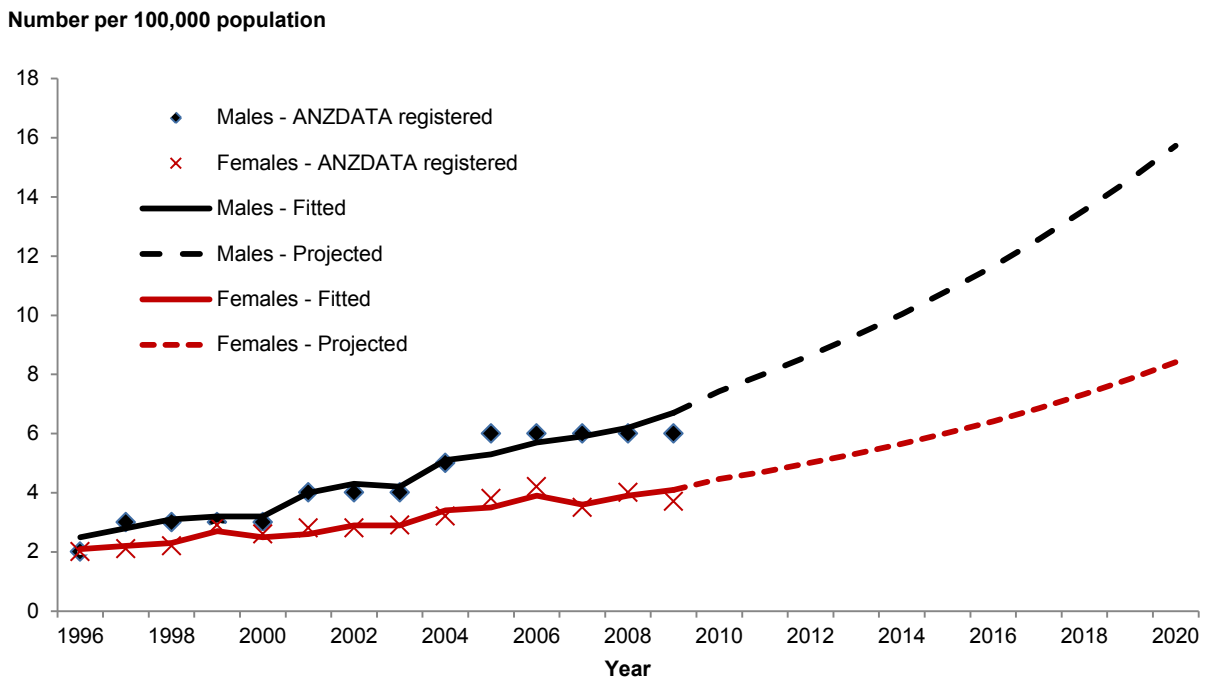
About 45% of new cases of treated ESKD (close to 1,050) in 2009 had diabetes as a comorbidity (McDonald et al. 2010). This proportion is projected to rise to 64% in 2020 (Table A1.7). The ANZDATA registered incidence rate of ESKD with diabetes was 5 per 100,000 population in 2009, and by 2020 it is projected that the incidence rate will increase to more than double that (Table 2.2).

Table 2.2: Projected incidence rates of treated ESKD with diabetes by sex, Australia, 2010–2020

Sex	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
					Number per 100,000 population						
Males	7	8	9	9	10	11	12	13	14	15	16
Females	4	5	5	5	6	6	6	7	7	8	8
Total	**6**	**6**	**7**	**7**	**8**	**8**	**9**	**10**	**10**	**11**	**12**

Source: AIHW projections based on the ANZDATA .

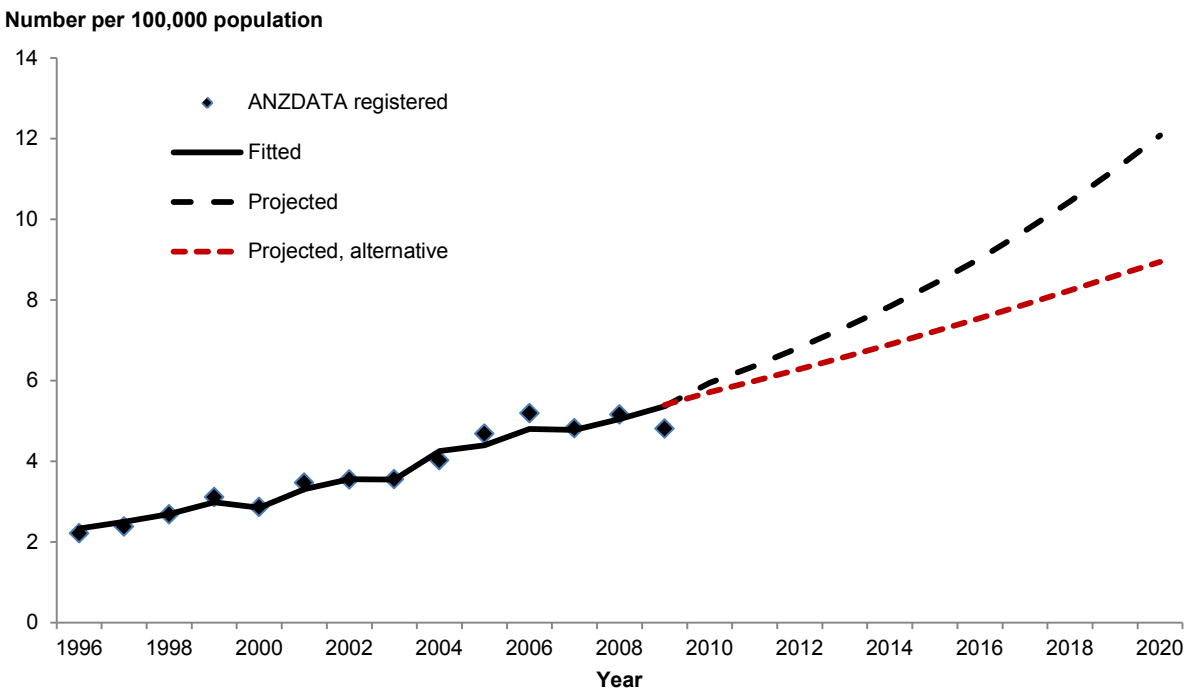
The incidence rates of those commencing treatment for ESKD with diabetes are projected to increase for both males and females. Since the mid-1990s, an increasingly higher incidence rate has been reported for males than for females. This trend is projected to continue into the future, with the male rate increasing by 166% between 2009 and 2020 and female rate increasing by 126% (Figure 2.7).



Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 2.7: Incidence rates of registered and projected treated ESKD with diabetes as a comorbidity, by sex, Australia, 1996–2020

The model does not fit as well for older ages as for the younger ones, which indicates the model may overestimate the increase. The plots of registered and predicted incidence rates of ESKD with diabetes for patients 70 years and over showed that the incidence rates in 2007–2009 were in fact decreasing (not shown), hence an alternative model was fitted. Assuming the incidence rates for older patients (70 years and over) remained the same in the projection years as the average incidence rates in 2007–2009, the incidence rate in 2020 is projected to be 9 per 100,000 population instead of 12 per 100,000 population under the original assumption of increasing rates in the older age groups (Figure 2.8).



Note: Alternative projection results (lower dotted line) are derived by holding the average incidence rates in 2007–2009 for patients 70 years and over constant in projection years.

Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 2.8: Registered and projected (alternative) incident rates of treated ESKD with diabetes, Australia, 1996−2020

3 Projection results at the state/territory level

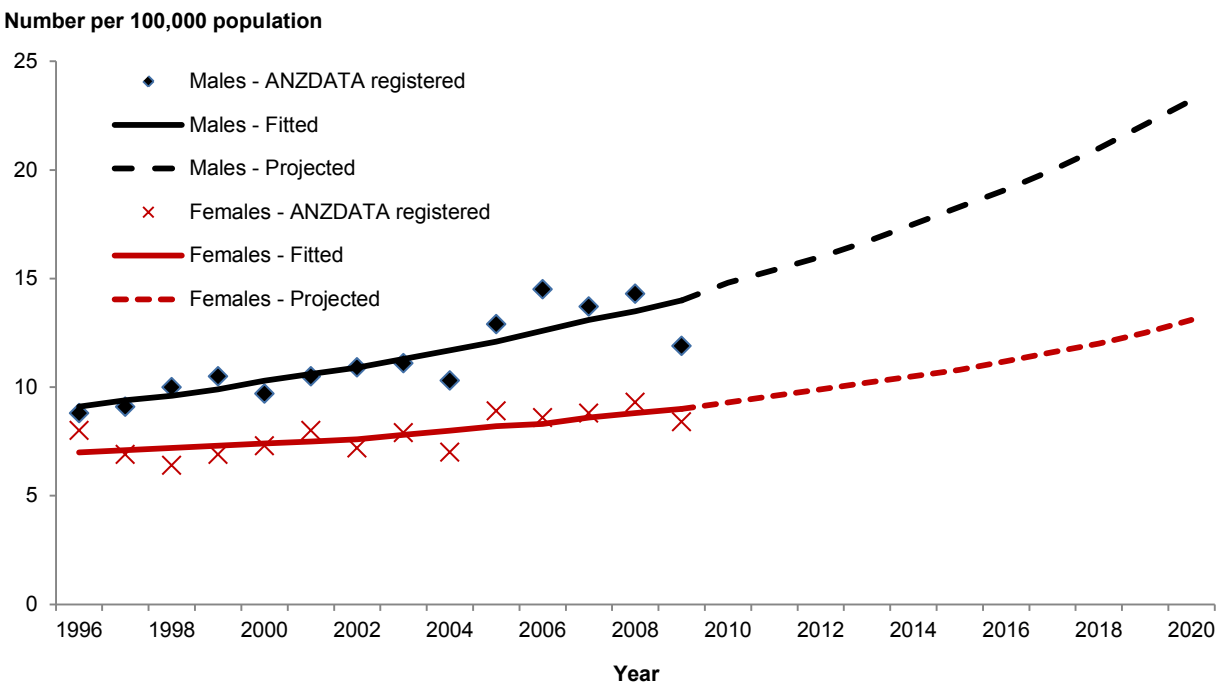
The projections of treated ESKD at the state and territory level are presented in the following sections. To ensure sufficient number of cases for projections, New South Wales and Australian Capital Territory (NSW/ACT) cases were grouped together. Different age groupings were also used for some jurisdictions. For larger states including NSW/ACT, Victoria and Queensland, projections were made by sex by five age groups (less than 30 years, 30−44 years, 45−59 years, 60−74 years and 75 years and over). For South Australia and Western Australia, projections were made by sex by three larger age groups, namely, less than 40 years, 40−59 years and 60 years and over. Projections were made for persons only for Tasmania and the Northern Territory using three larger age groups, owing to a very small number of cases.

It is important to note that as a result of rounding, and using different age groups, the summed total of the projected number of incident cases at the state and territory level is not necessarily equal to the number projected at the national level.

Projected incidence of treated ESKD in NSW/ACT

The incidence of treated ESKD in NSW/ACT is projected to rise consistently over the next 11 years.

Figure 3.1 presents the registered and projected incidence rates by sex between 1996 and 2020. The increase in the incidence rates is projected to be greater for males than females between 2009 and 2020, nearly doubling for males (from 12 per 100,000 population in 2009 to 23 per 100,000 in 2020) and by 60% for females (from 8 per 100,000 population to 13 per 100,000 population). As a result, the difference between the incidence rates for males and females is expected to widen over time.



Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA .

Figure 3.1: Incidence rates for registered and projected treated ESKD, NSW/ACT, by sex, 1996–2020

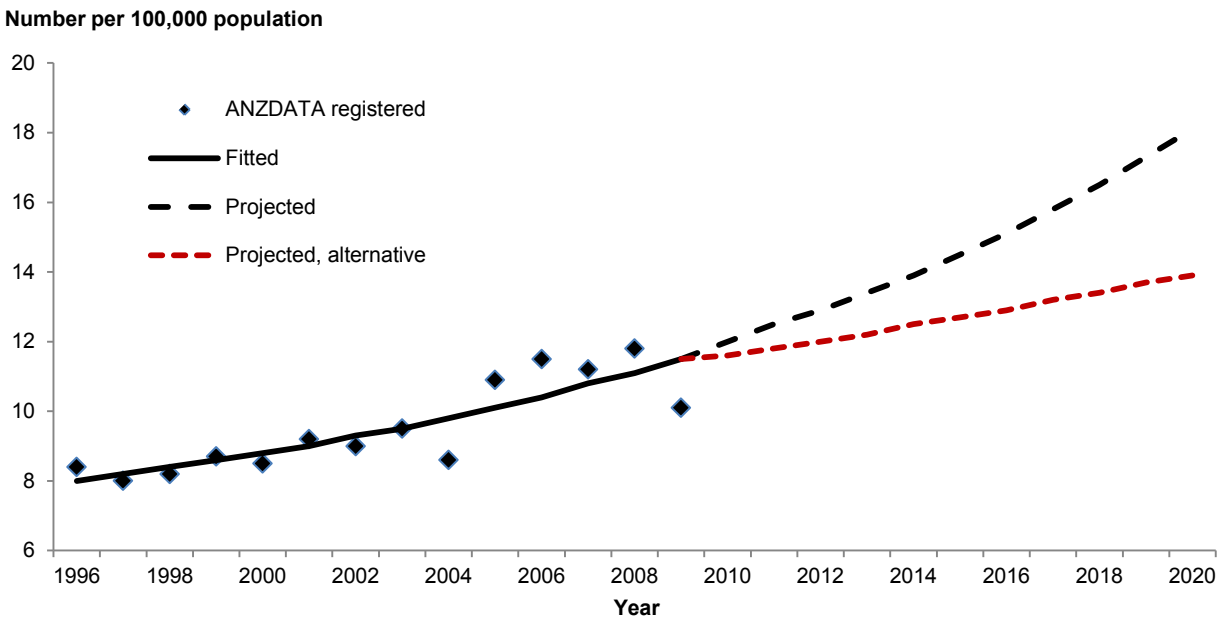
In 2009, the total incidence rate of registered treated ESKD in NSW/ACT was 10 per 100,000 population, expected to increase by about 80% to 18 per 100,000 population in 2020 (Table 3.1). The projected number of new cases in NSW/ACT comprises about one-third of total national projected cases in 2020.

Table 3.1: Projected incidence rates of treated ESKD, NSW/ACT, by sex, 2010–2020

Sex	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
						Number per 100,000 population					
Males	15	15	16	17	17	18	19	20	21	22	23
Females	9	10	10	10	10	11	11	12	12	13	13
Total	**12**	**12**	**13**	**13**	**14**	**15**	**15**	**16**	**16**	**17**	**18**

Source: AIHW projections based on ANZDATA .

Similar to projection results at the national level, the model did not fit as well for older ages in the most recent three years, so may overestimate future trends. An alternative and conservative approach was also calculated. If the incidence rates for older patients (75 years and over) remain the same as the average of 2007–2009 rates, the incidence rate increase is projected to be slower. By 2020, the incidence rate would be 14 per 100,000 population instead of 18 per 100,000 population (Figure 3.2).



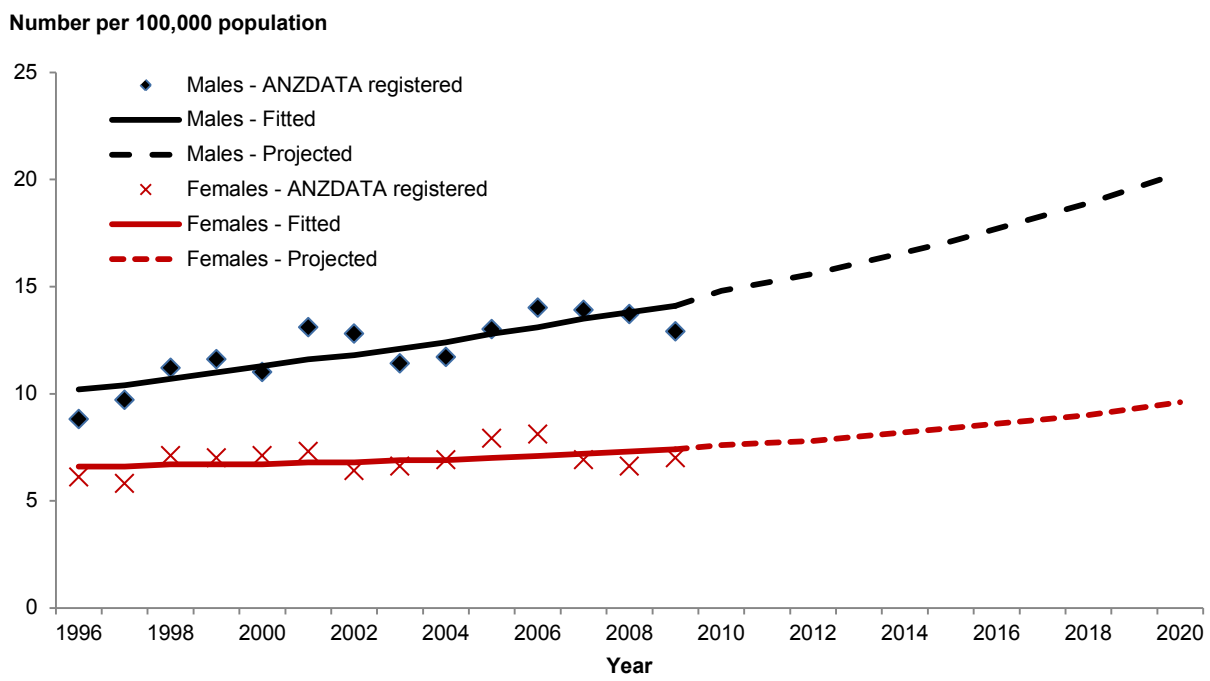
Note: Alternative projection results (lower dotted line) are derived by holding the average incidence rates in 2007– 2009 for patients 75 years and over constant in projection years.

Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.2: Registered and projected (alternative) incidence rates of treated ESKD, NSW/ACT, 1996–2020

Projected incidence of treated ESKD in Victoria

During the past two decades, Victoria reported slightly lower incidence rates of treated ESKD than other jurisdictions. Figure 3.3 demonstrates that males had higher incidence rates and a faster increasing trend between 1996 and 2009. It is projected that the incidence rate increase will continue to be larger for males (57%) than for females (38%).



Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA .

Figure 3.3: Incidence rates for registered and projected treated ESKD, Victoria, by sex, 1996–2020

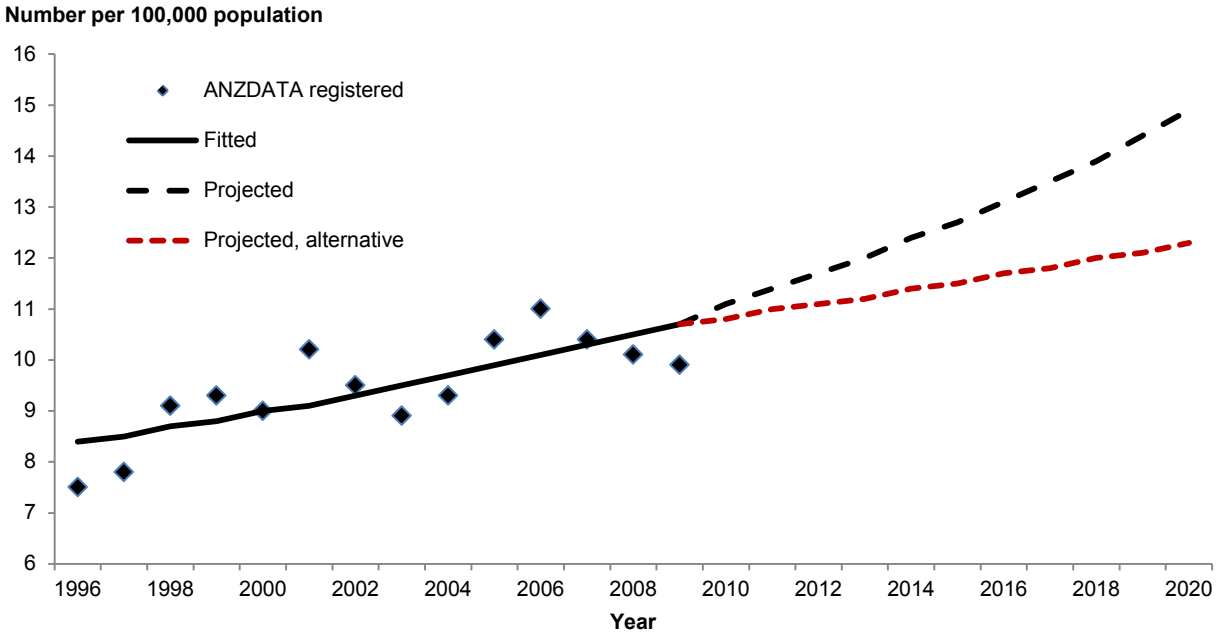
Overall, the incidence rate of treated ESKD in Victoria is projected to increase to 15 per 100,000 population by 2020 (Table 3.2), which translates to a 50% rate increase compared to 10 per 100,000 population in 2009. By 2020, the incidence rate for males is projected to be twice as high as that for females in Victoria.

Table 3.2: Projected incidence rates of treated ESKD by sex, Victoria, 2010–2020

Sex	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Number per 100,000 population										
Males	15	15	16	16	17	17	18	18	19	20	20
Females	8	8	8	8	8	8	9	9	9	9	10
Total	**11**	**11**	**12**	**12**	**12**	**13**	**13**	**14**	**14**	**14**	**15**

Source: AIHW projections based on ANZDATA .

Plots of registered and predicted incidence rates for those aged 75 years and over indicate the model did not fit as well as for younger ages in recent years, meaning the projected incidence rates for the older age group may be slightly overestimated. When the average incidence rates for 2007–2009 were held constant for this age group in the projection years, the incidence rate was 17% lower than in the model with increasing rates—12 per 100,000 population instead of 15 per 100,000 population (Figure 3.4).



Note: Alternative projection results (lower dotted line) are derived by holding the average incidence rates of 2007– 2009 for patients 75 years and over constant in projection years.

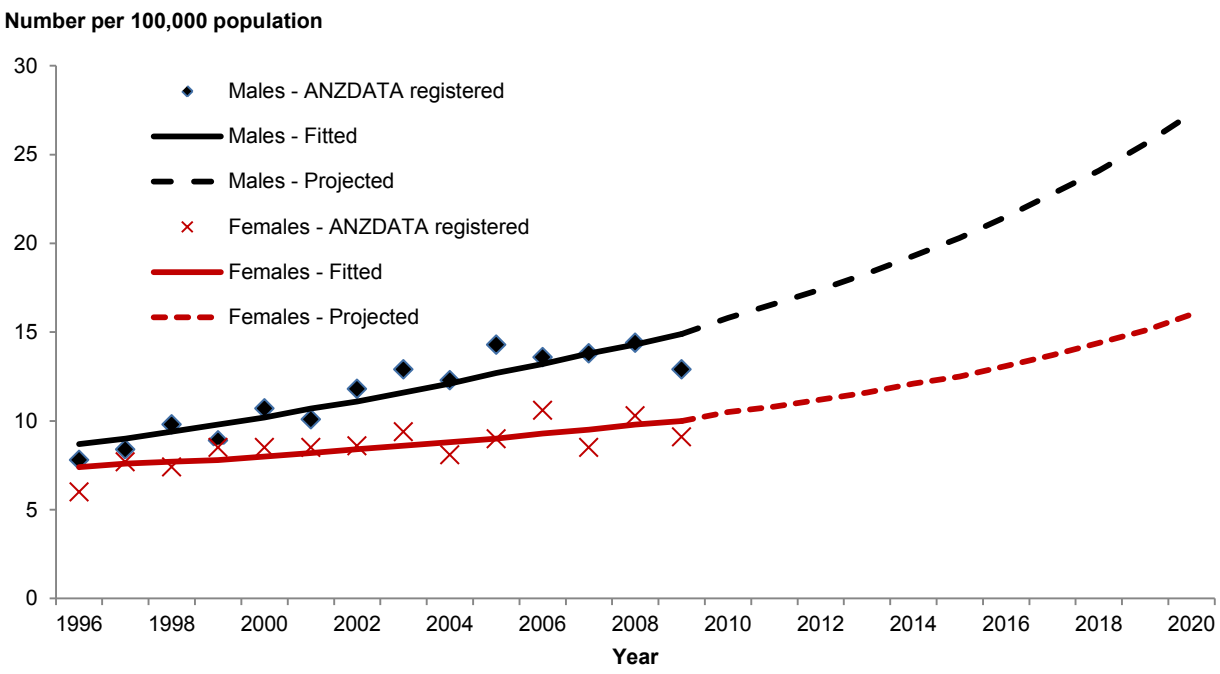
Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.4: Registered and projected (alternative) incidence rates of treated ESKD, Victoria, 1996−2020

Projected incidence of treated ESKD in Queensland

Between 1989 and 2009, there was a threefold increase in the number of incident cases of treated ESKD in Queensland. The incidence rates of treated ESKD in Queensland are projected to continue to increase over the period of 2010 and 2020 (Table 3.3).

This rate increase is projected to be more substantial for males than for females (112% compared with 76%). As a result, the gap between male incidence rates and female incidence rates is projected to continue to increase between 2009 and 2020 (Figure 3.5).



Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.5: Incidence rates for registered and projected treated ESKD, Queensland, by sex, 1996−2020

From 2009 to 2020, the incidence rate of treated ESKD in Queensland is expected to double, from 11 per 100,000 population to 22 per 100,000 population. By 2020, the male incidence rate is projected to be about 70% higher than the female incidence rate (Table 3.3).

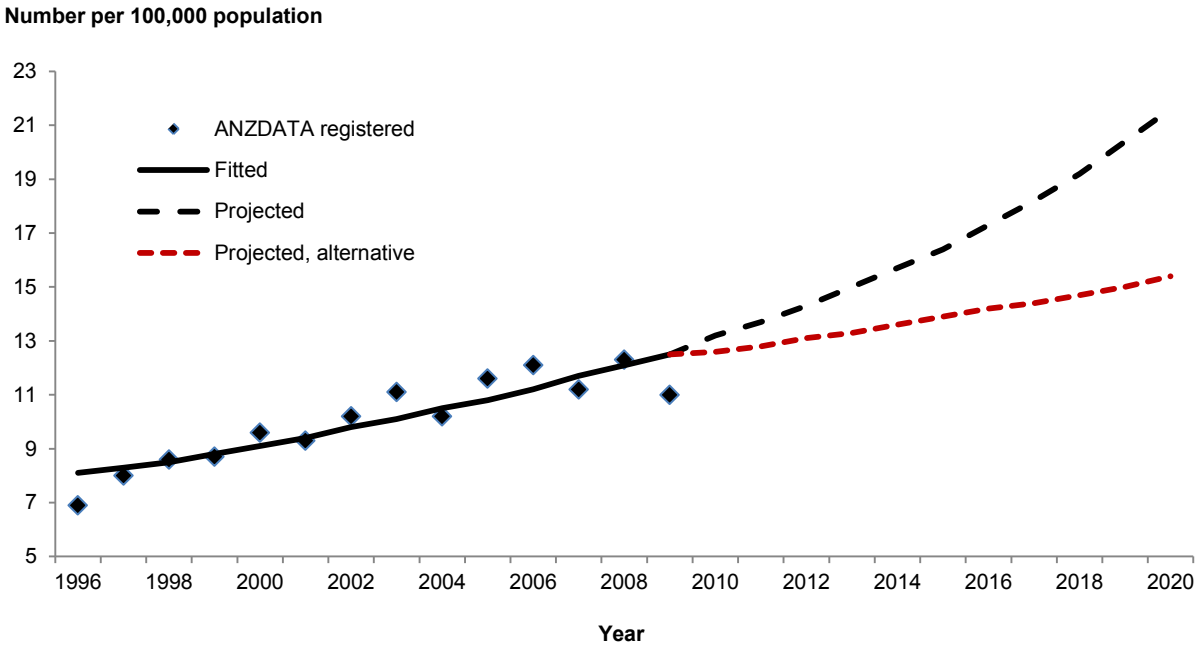
Table 3.3: Projected incidence rates of treated ESKD, Queensland, by sex, 2010−2020

Sex	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
					Number per 100,000 population						
Males	16	17	17	18	19	20	21	23	24	26	27
Females	10	11	11	12	12	13	13	14	14	15	16
Total	**13**	**14**	**14**	**15**	**16**	**16**	**17**	**18**	**19**	**20**	**22**

Source: AIHW projections based on ANZDATA .

Based on the incidence of treated ESKD from ANZDATA, incidence rates seem to have levelled off in the most recent years. The model fitting plots also indicate the model did not fit as well for older patients in the most recent years. An alternative approach was used by holding the

incidence rates for 2007–2009 constant for older patients (75 years and over). This resulted in a projected incidence rate of 15 per 100,000 population in 2020 rather than 22 per 100,000 population (Figure 3.6).



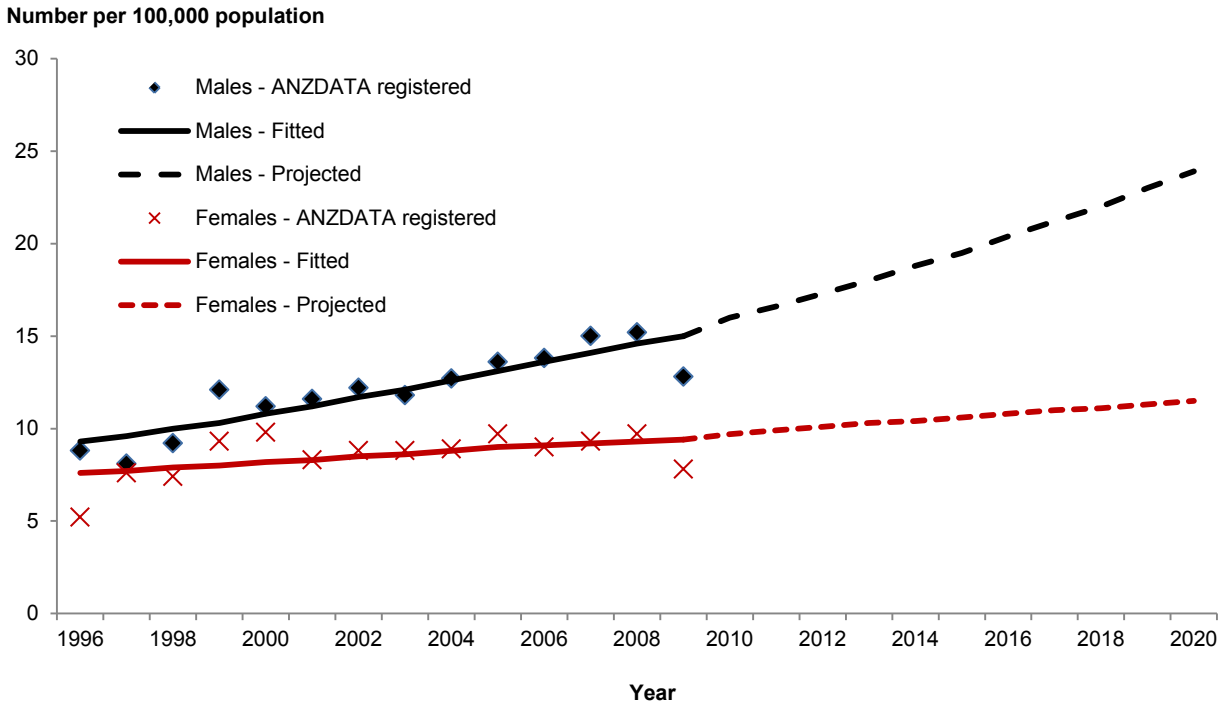
Note: Alternative projection results (lower dotted line) are derived by holding the average incidence rates of 2007– 2009 for patients 75 years and over constant in projection years.

Source: Registered cases during 1996– 2009 used for calculating incidence rates from ANZDATA .

Figure 3.6: Registered and projected (alternative) incidence rates of treated ESKD, Queensland, 1996–2020

Projected incidence of treated ESKD in Western Australia

Figure 3.7 shows the registered and projected incidence rates of treated ESKD in Western Australia between 1996 and 2020. The registered incidence rates for males were consistently higher than those for females, and they increased at a faster rate between 1996 and 2009. The faster growing trend for males is projected to continue from 2010 to 2020.



Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.7: Incidence rates for registered and projected treated ESKD by sex, Western Australia, 1996−2020

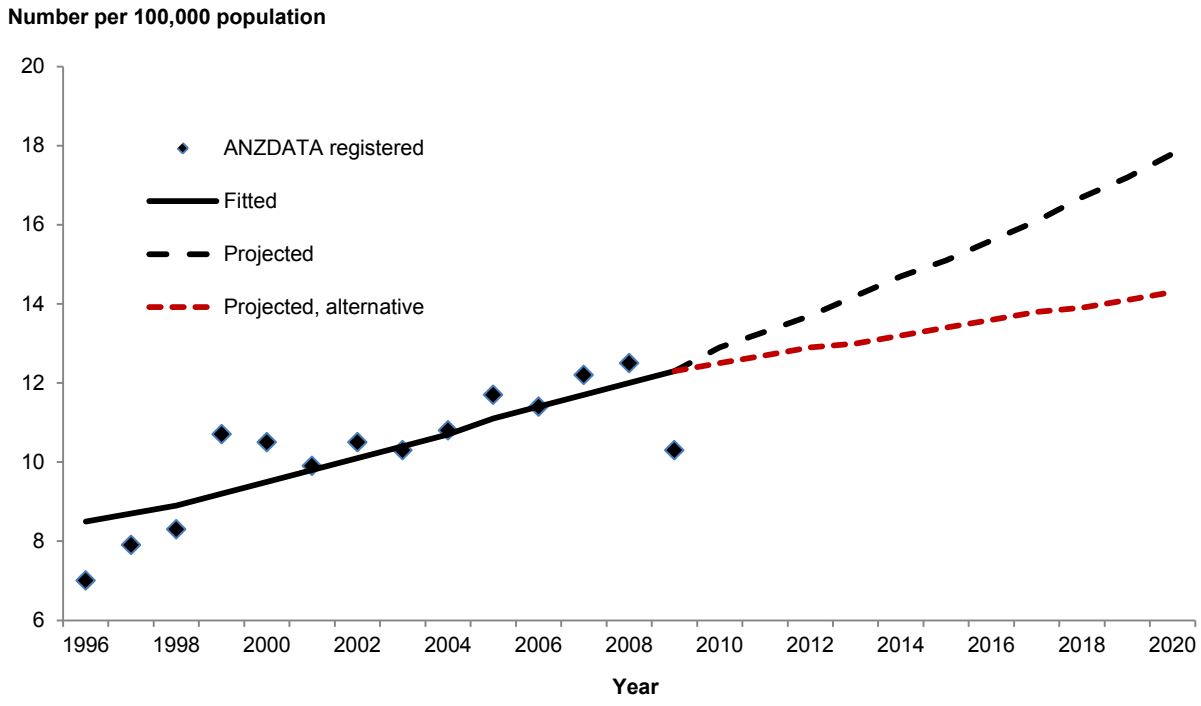
In 2009, the registered incidence rate of treated ESKD in Western Australia was 10 per 100,000 population, and it is expected to increase by 72% to 18 per 100,000 population in 2020. The incidence rate for females is expected to increase by 49% between 2009 and 2020, much less than the 87% increase expected for males. By 2020, the male incidence rate is projected to double the female incidence rate (Table 3.4).

Table 3.4: Projected incidence rates of treated ESKD by sex, Western Australia, 2010−2020

Sex	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
						Number per 100,000 population					
Males	16	17	17	18	19	20	20	21	22	23	24
Females	10	10	10	10	10	11	11	11	11	11	12
Total	**13**	**13**	**14**	**14**	**15**	**15**	**16**	**16**	**17**	**17**	**18**

Source: AIHW projections based on ANZDATA .

The incidence rate for treated ESKD in Western Australia for those aged 60 years and over seemed to be decreasing in the most recent years (2007–2009). Similar to other states, the model did not fit as well for older patients in the most recent years and may overestimate the future rates. The same approach was used to create an alternative projection. Holding the average incidence rate for older patients (60 years and over) in years 2007–2009 constant resulted in a 20% lower projected incidence rate than the original projection (14 per 100,000 population compared with 18 per 100,0000—Figure 3.8).



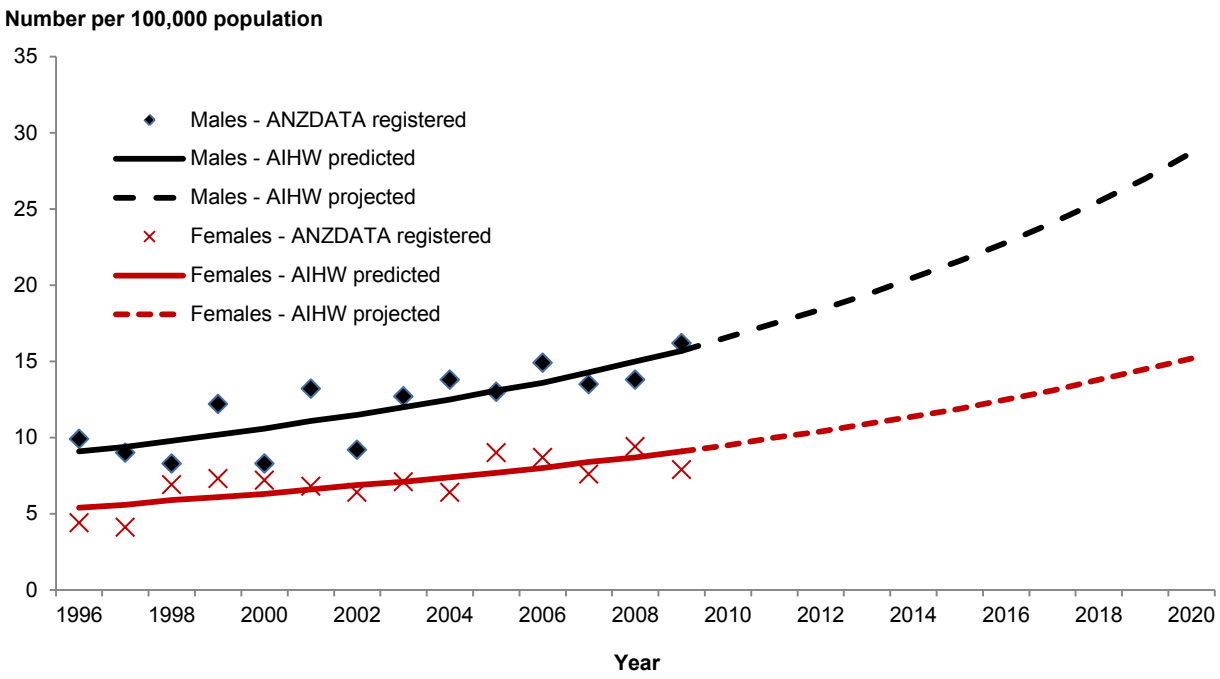
Note: Alternative projection results (lower dotted line) are derived by holding the average incidence rates of 2007–2009 for patients 60 years and over constant in projection years.

Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.8: Registered and projected (alternative) incident cases of treated ESKD, Western Australia, 1996−2020

Projected incidence of treated ESKD in South Australia

Despite fluctuations in the incidence rates of treated ESKD in South Australia between 1996 and 2009, in particular for males, the overall trend was an increase of around 82% over this period (Figure 3.9). These trends are projected to continue from 2010 to 2020.



Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA .

Figure 3.9: Incidence rates for registered and projected treated ESKD by sex, South Australia, 1996–2020

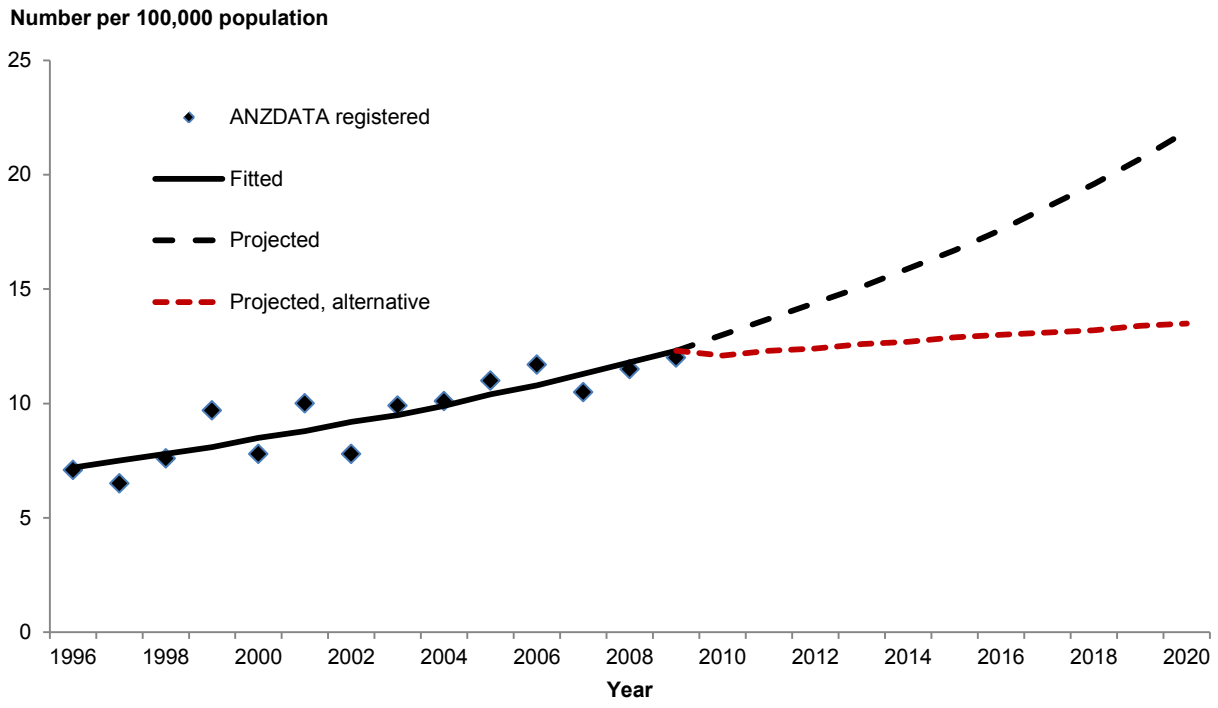
The registered incidence rates of treated ESKD in South Australia are projected to increase by just over 80% between 2009 and 2020, from 12 to 22 per 100,000 population. Over the same period, the male incidence rate is expected to increase from 16 to 29 per 100,000 population, and the female rate from 8 to 15 per 100,000 population (Table 3.5).

Table 3.5: Projected incident rates of treated ESKD by sex, South Australia, 2010–2020

Sex	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
						Number per 100,000 population					
Males	17	17	18	19	20	22	23	24	26	27	29
Females	10	10	10	11	11	12	13	13	14	14	15
Total	**13**	**14**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**

Source: AIHW projections based on ANZDATA .

Treated ESKD incidence rates fluctuated in the late 1990s until 2003, with rates appearing to stabilise in more recent years. Again the model did not fit the data as well for older patients, therefore an alternative scenario was calculated assuming the incidence rates for patients 60 years and over remain constant at the average rate of 2007–2009. As a result, by 2020, the projected incidence rate would be 38% lower than the original projections (14 per 100,000 population compared with 22 per 100,000 (Figure 3.10).



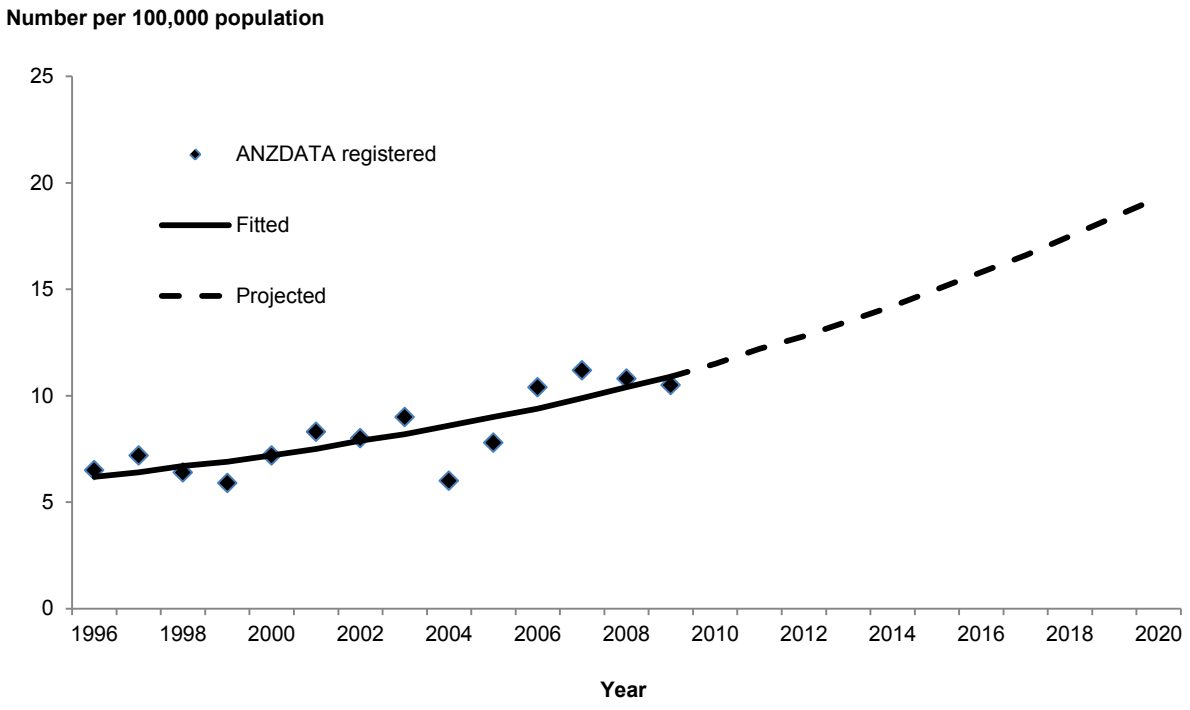
Note: Alternative projection results (lower dotted line) are derived by holding the average incidence rates of 2007–2009 for patients 60 years and over constant in projection years.

Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.10: Registered and projected (alternative) incident cases of treated ESKD, South Australia, 1996−2020

Projected incidence of treated ESKD in Tasmania

Due to the small number of incident cases of treated ESKD in Tasmania, projections were made for persons only. In 1996 there were 31 incident registered cases, increasing to 53 in 2009. The incident rate of treated ESKD in Tasmania fluctuated over time, but an overall increasing trend is projected to continue between 2010 and 2020 (Figure 3.11).



Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.11: Incidence rates for registered and projected treated ESKD, Tasmania, 1996−2020

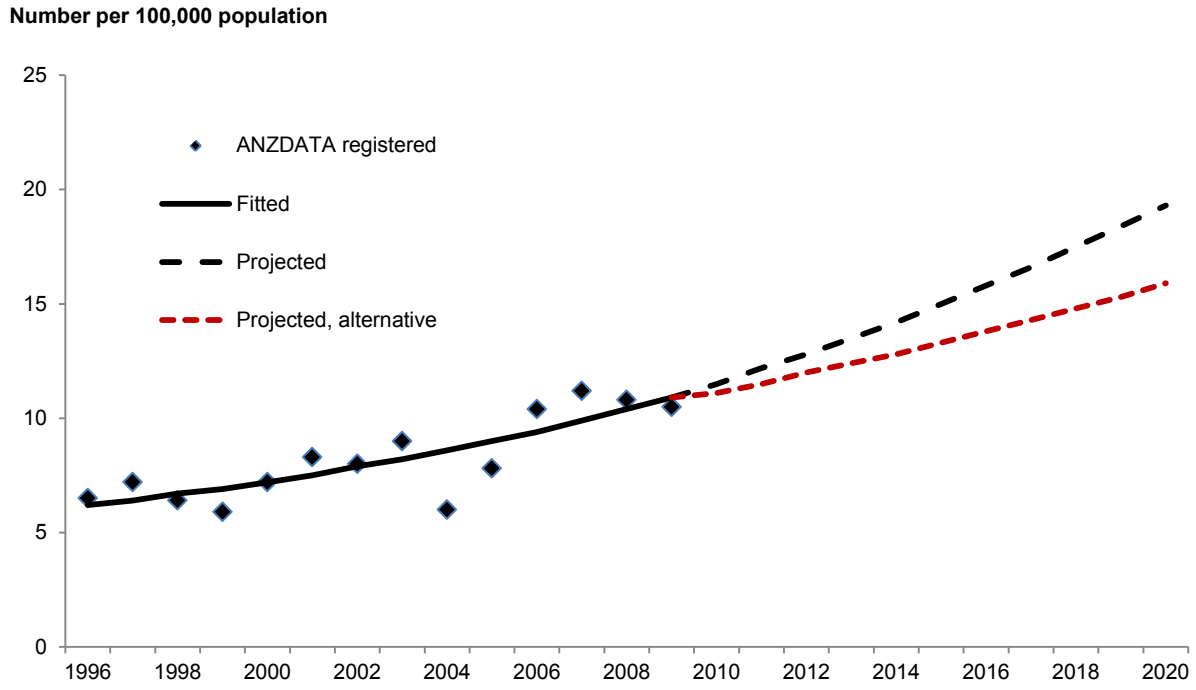
The incidence rate of treated ESKD in Tasmania is projected to be 19 per 100,000 population in 2020 (Table 3.6), an increase of 84% from 11 per 100,000 population in 2009.

Table 3.6: Projected incidence rates of treated ESKD, Tasmania, 2010−2020

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
					Number per 100,000 population						
Total	12	12	13	14	14	15	16	17	17	18	19

Source: AIHW projections based on the ANZDATA .

Based on ANZDATA, the incidence rates of treated ESKD in Tasmania for patients 60 years and over decreased in the most recent 3 years, especially in 2009. This resulted in the model not fitting as well for older patients in these years. As an alternative, the average incidence rate in 2007–2009 for patients 60 years and over was held constant in the projection years. Under this assumption, the projected incidence rate in 2020 would be 16 per 100,000 population rather than the 19 per 100,000 population in the original projection (Figure 3.12).



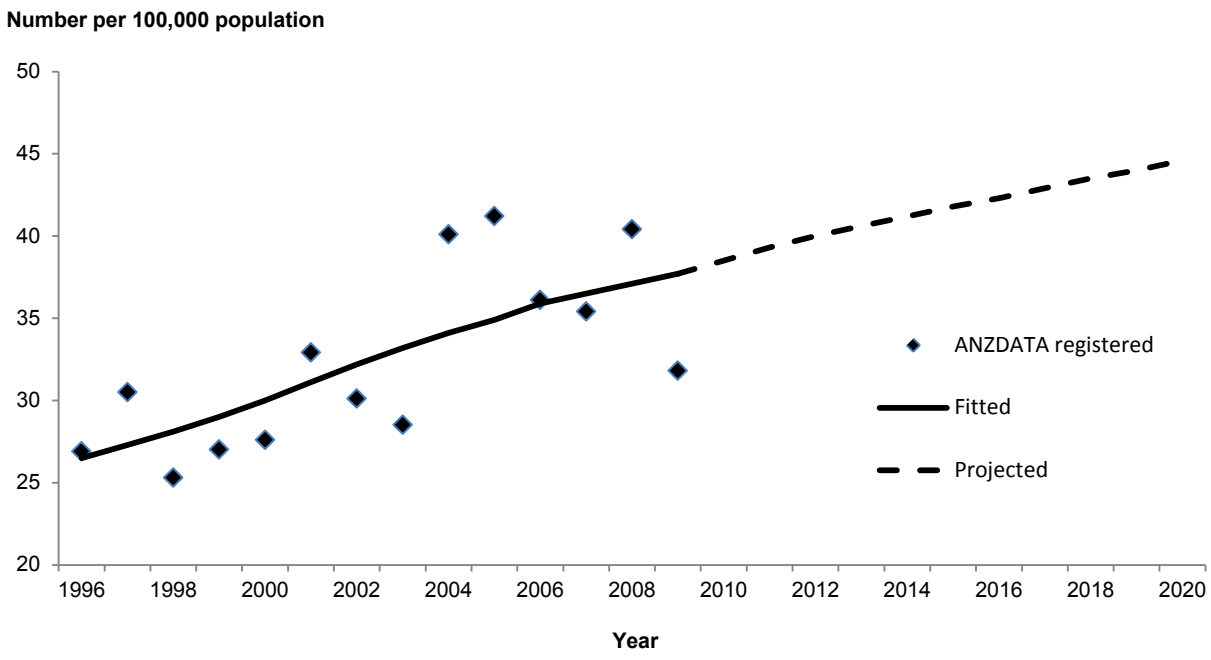
Note: Alternative projection results (lower dotted line) are derived by holding the average incidence rate of 2007–2009 for patients 60 years and over constant in projection years.

Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.12: Registered and projected (alternative) incidence rates of treated ESKD, Tasmania, 1996−2020

Projected incidence of treated ESKD in the Northern Territory

Over the past two decades there has been a rapid increase in the incidence of treated ESKD in the Northern Territory. In the early 1990s, the incidence rates were under 10 per 100,000 population; with the rates stabilising at around 27 per 100,000 population from 1996, increasing to a peak of 40 per 100,000 population in 2008. In 2009, however, it dropped to 32 per 100,000 population. Despite these fluctuations between 1996 and 2009, there was an identifiable increasing trend (Figure 3.13).



Source: Registered cases during 1996−2009 used for calculating incidence rates from ANZDATA .

Figure 3.13: Incidence rates for registered and projected treated ESKD, Northern Territory, 1996−2020

In 2009, the registered incidence rate of treated ESKD was 32 per 100,000 population, and the rate is projected to reach 45 per 100,000 population in 2020 (Table 3.7). The potential over-estimate issues for older ages that occurred with other jurisdictions were not found in the Northern Territory; therefore, no alternative analysis was conducted.

Table 3.7: Projected incidence rates of treated ESKD, Northern Territory, 2010−2020

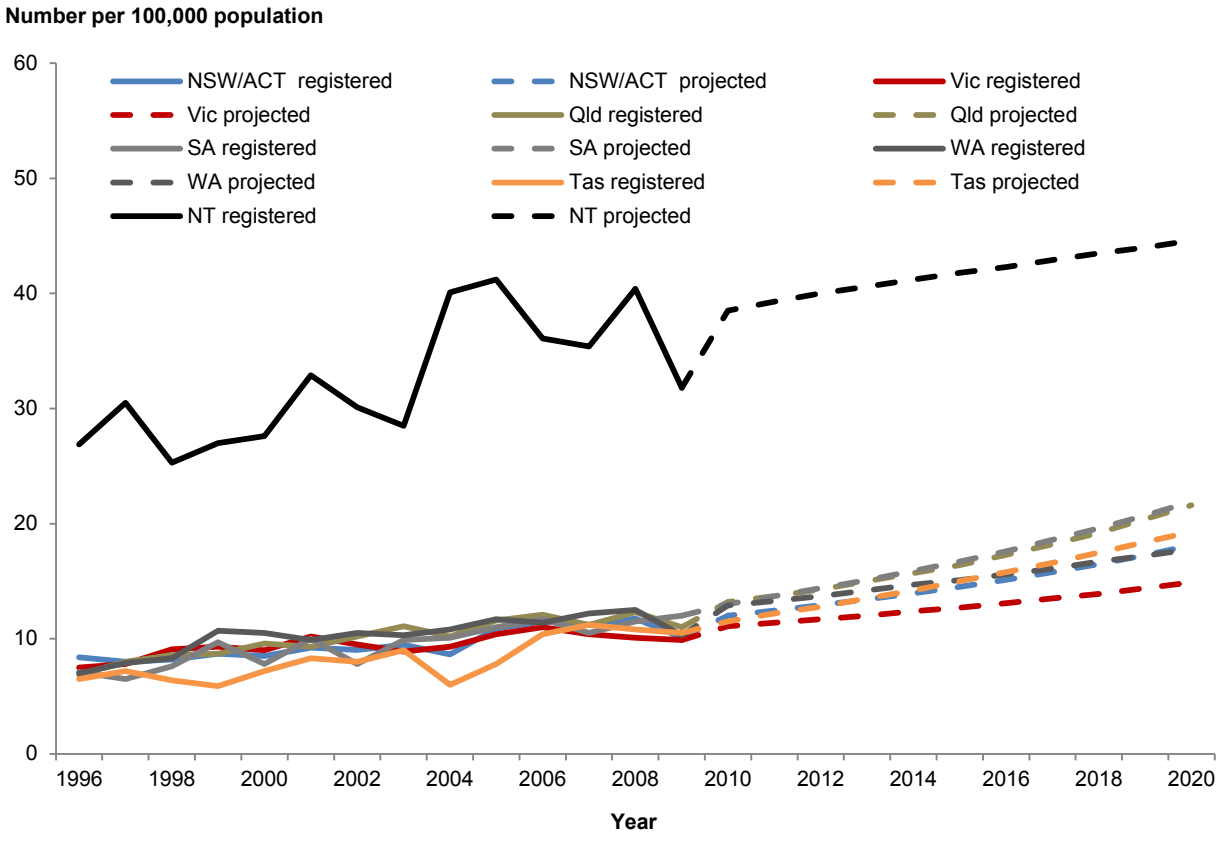
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Number per 100,000 population										
Total	39	39	40	41	41	42	42	43	43	44	45

Source: AIHW projections based on the ANZDATA .

Variations in the incidence rates of treated ESKD by state/territory

Figure 3.14 shows the projection results for the states and territories presented earlier in this chapter.

Overall, the Northern Territory has the highest projected rates among all states and territories; however, the rate of increase from 2009 to 2020 was not as substantial as that in other states and territories. Victoria appears to have the lowest projected incidence rates, with only slight variation in the projected incidence rates and rate of increase among the other jurisdictions.



Source: Registered cases during 1996–2008 from ANZDATA .

Figure 3.14: Registered and projected incidence rates of treated ESKD, by state/territory, 1996–2020

4 Discussion

Key results

The continued increase in treated ESKD

From 2009 to 2020, the incidence rates of treated ESKD are projected to increase at the national and state/territory levels, and for patients commencing treatment with a comorbidity of diabetes. The increase is also expected for both sexes and among patients in most of the age groups. However, the incidence rates for the youngest age groups in all states/territories are projected to be either stable or decrease slightly.

Between 1989 and 2009, the incidence rate of registered ESKD in Australia doubled, with similar increases in all states/territories. In the Northern Territory, the rate increased more than fivefold (Table A1.3). For the base year period between 1996 and 2009, the majority of treated ESKD cases in the Northern Territory were Indigenous Australians (86% for both sexes). This may explain the fast growing trends observed in the projection years.

A greater increase in the incidence rates of treated ESKD is projected among patients 70 years and over. It was only in the late 1980s that people aged 75 and over with ESKD were considered suitable for KRT, and the incidence among this age group has risen sharply over the past two decades. Compared to 2009, it is projected that by 2020 the incidence rate of treated ESKD among all Australians aged 75 and over will increase by 141% for males (from 56 per 100,000 population in 2009 to 134 per 100,000 population in 2020) and by 164% for females (26 per 100,000 population in 2009 to 69 per 100,000 population in 2020) (Tables A1.5 and A1.6).

There are a number of contributing factors to the projected rate increase, with each contributing independently to the overall increase. First of all, the population increase between 2009 and 2020 is expected to be responsible for 14% of the increase; population ageing for a further 13%; and the remaining increase is due to the projected increase in the age-specific rates (Table A1.15).

The role of increasing prevalence of diabetes

There has been a rapid increase in the prevalence of diabetes in Australia since 1989–90 (AIHW 2008), which is likely to continue into the future. International experience has shown that the increasing prevalence of diabetes is a major driving force for the increase in CKD and treated ESKD (US Renal Data System 2009). Our projections confirm that this is also the case in Australia.

The incidence rates of treated ESKD with diabetes have been lower than those of treated ESKD without diabetes during the past 14 years (1996–2009); however, these two groups showed very different rates of change. For patients without diabetes, the incidence rates increased only slightly; but for patients with diabetes, the incidence rate increased rapidly. The projections for this group indicate that the incidence rate for ESKD with diabetes is expected to overtake that of patients without diabetes by 2012 and increase further thereafter.

Our analyses show that increasingly more patients commencing KRT for ESKD will have diabetes. It is important to note that these projections are based on new cases of treated ESKD with diabetes listed as a comorbidity rather than as the cause of ESKD. In 2009, about 45% of new cases of treated ESKD had diabetes. This is expected to increase to 64% by 2020—65% for males and 61% for females. This clearly shows that the increasing prevalence of diabetes will

make a significant contribution to the increase in the incidence of treated ESKD over the next decade.

State/territory differences in the incidence of treated ESKD

In the past two decades, the incidence rates (both crude and age-standardised) appeared very similar across all states and territories except the Northern Territory. The much higher rates seen in the Northern Territory are likely due to the large proportion of Aboriginal and Torres Strait Islander people in that population (31.6% of the population versus 2.5% of the total Australian population (ABS & AIHW 2008)).

Between 1996 and 2009, the rate of increase ranged from 18% in the Northern Territory to 69% in South Australia (Table 1.1 and Table A1.3). All states and territories are projected to experience an increase in incidence rates over the 11– year period from 2010 to 2020. However, the rate of growth varies between jurisdictions.

Following the historical trends, the Northern Territory has the highest projected incidence rates of treated ESKD over the 11– year period; however it also had the smallest rate of change. Victoria has lower projected incidence rates than the other jurisdictions, and there expected to be small variations in the projected incidence rates and rates of change among the remaining jurisdictions.

Alternative model

While the model fitted adequately overall, the Poisson models did not fit older patients as well as for other age groups due to some levelling-off of rates in recent years (Figures A2.11, A2.12, A2.22, and A2.23, state-level figures not shown), and thus there may be some overestimation of the rate increases for these age groups. Alternative analyses were performed to evaluate the impact of this at both national level and state/territory level by assuming no rate increase among older patients, that is, in projection years, the incidence rates for older patients are held constant at the average incidence rate for years 2007–2009. Under this more conservative scenario, in 2020, the projected incidence rate at the national level is 26% lower for all Australians and for treated ESKD cases with diabetes compared with the original projections. At the state/territory level, with the exception of the Northern Territory where no alternative model was required, the alternative incidence rate ranged from 18% lower in Victoria and Tasmania to 38% lower in South Australia when compared with the original projections.

The issue of untreated ESKD

The ANZDATA includes information only for ESKD patients receiving KRT, however, it is recognised that not all people with ESKD will receive such treatment. There are a number of reasons for this, such as individuals not being suitable for treatment or personal choice. Recent analyses by the AIHW has provided the first estimates of the total incidence of ESKD, including both cases treated with KRT and those who do not receive this treatment (AIHW 2011). It was found that between 2003 and 2007, among the estimated total of 21,370 incident cases of ESKD, nearly half of the patients did not receive KRT. While more than 80% of those who did not receive these treatments were aged over 70 years, it is clear that there is a significant proportion of ESKD patients who do not receive KRT. If a greater proportion of ESKD patients receive KRT treatment in the future, it is possible that there could be an even greater increase in the incidence of treated ESKD than projected in this report.

Interpretation of these projections

Projections are, by nature, estimates about what might reasonably be expected in the future. A number of statistical modelling approaches have been developed and widely applied in recent decades. While the choice of a good modelling approach can enable the best estimates based on historical trends and other information available, there is no guarantee of their realisation in the future.

There are some specific limitations in the projections presented in this report. The first is the projections for ESKD patients with diabetes. The sum of the projected number of ESKD cases with and without diabetes is not equal to the total projected ESKD incident cases. To ensure consistency, the projection results were benchmarked to national projections, and caution is therefore required in their interpretation.

Another limitation is the projections at the state/territory level. In order to ensure sufficient number of cases for each set of projections, larger age groups were used for several states and territories, including South Australia, Western Australia, Tasmania and the Northern Territory. For the latter two, projections could only be made for persons rather than males and females separately. As a result, the summed total of the projected incident cases at the state/territory level do not necessarily equal the incident cases at the national level.

Lastly, these projections are made using the ABS projected population figures, which means that all the assumptions and uncertainties in their projections were accepted.

Appendix 1 Statistical tables

Table A1.1: Number of registered incident cases of treated ESKD, males, by age group, Australia, 1989–2009

Age group (years)	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0–19	12	26	19	35	17	30	32	29	27	32	27	26	22	24	30	27	22	19	28	29	30
20–29	55	42	51	55	50	63	53	45	55	45	49	56	46	47	48	43	54	45	45	42	45
30–39	50	65	64	76	70	80	86	86	66	101	86	83	99	78	84	92	83	103	83	109	93
40–44	45	57	53	34	42	63	53	48	74	67	62	50	67	56	75	64	75	85	85	66	67
45–49	30	51	46	52	47	47	75	70	71	79	84	78	76	90	79	82	98	109	110	106	82
50–54	44	54	47	62	55	76	86	67	77	90	83	94	97	97	104	108	121	114	139	132	109
55–59	53	47	72	70	64	58	73	83	75	91	96	91	104	122	110	124	150	155	135	166	154
60–64	66	59	68	74	85	75	97	77	87	84	84	106	117	117	116	107	132	149	173	182	163
65–69	65	66	80	83	81	102	104	115	108	129	139	109	138	126	123	138	145	171	155	171	186
70–74	34	49	45	53	84	102	75	107	112	109	151	133	157	159	149	144	188	199	188	199	171
75 and over	15	18	21	22	42	53	62	79	87	123	146	169	189	223	246	245	291	322	334	333	315
Total	**469**	**534**	**566**	**616**	**637**	**749**	**796**	**806**	**839**	**950**	**1,007**	**995**	**1,112**	**1,139**	**1,164**	**1,174**	**1,359**	**1,471**	**1,475**	**1,535**	**1,415**

Source: AIHW analysis of ANZDATA .

Table A1.2: Number of registered incident cases of treated ESKD, females, by age group, Australia, 1989–2009

Age group (years)	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0–19	21	16	19	20	23	17	15	16	20	13	13	20	22	17	22	23	16	17	18	24	21
20–29	27	36	31	26	35	45	48	33	46	45	35	38	37	29	32	27	34	33	38	34	39
30–39	48	38	42	52	52	52	50	71	71	43	66	64	62	67	60	50	76	64	79	73	71
40–44	33	23	16	32	32	34	43	35	42	43	48	56	42	38	46	43	52	63	56	47	37
45–49	23	33	31	23	34	55	48	35	47	46	58	59	63	55	72	60	53	72	61	88	73
50–54	51	47	37	54	49	60	43	50	49	62	70	55	71	69	56	63	79	73	77	85	90
55–59	62	54	57	63	66	74	58	64	58	69	61	64	77	64	85	78	103	101	96	96	84
60–64	59	72	75	81	78	72	79	86	89	87	92	84	95	77	75	79	103	102	95	103	94
65–69	52	60	66	70	87	79	99	110	99	86	113	97	101	86	106	113	116	111	96	129	95
70–74	25	26	32	38	47	57	54	78	75	96	101	111	95	113	107	105	114	133	109	115	113
75 and over	4	11	7	9	19	21	39	42	51	66	85	108	131	136	154	133	186	190	178	205	205
Total	**405**	**416**	**413**	**468**	**522**	**566**	**576**	**620**	**647**	**656**	**742**	**756**	**796**	**751**	**815**	**774**	**932**	**959**	**903**	**999**	**922**

Source: AIHW analysis of ANZDATA .

Table A1.3: Registered incidence rates of treated ESKD, by jurisdiction, 1989 – 2009

Year	Australia	NSW/ACT	Vic	Qld	WA	SA	Tas	NT
				Number per 100,000 population				
1989	5.2	5.9	4.4	5.2	4.9	4.7	4.8	5.0
1990	5.6	5.4	5.3	5.8	4.6	7.5	5.8	7.3
1991	5.7	5.9	5.4	5.4	4.8	6.8	6.0	6.6
1992	6.2	6.7	5.7	5.9	5.9	6.4	6.2	8.3
1993	6.6	6.9	6.0	6.6	6.7	5.2	6.4	19.9
1994	7.4	7.3	7.1	7.2	7.6	6.9	5.9	23.6
1995	7.6	7.7	7.1	7.3	8.1	6.4	9.1	21.4
1996	7.8	8.4	7.5	6.9	7.0	7.1	6.5	26.9
1997	8.0	8.0	7.8	8.0	7.9	6.5	7.2	30.5
1998	8.6	8.2	9.1	8.6	8.3	7.6	6.4	25.3
1999	9.2	8.7	9.3	8.7	10.7	9.7	5.9	27.0
2000	9.1	8.5	9.0	9.6	10.5	7.8	7.2	27.6
2001	9.8	9.2	10.2	9.3	9.9	10.0	8.3	32.9
2002	9.6	9.0	9.5	10.2	10.5	7.8	8.0	30.1
2003	9.9	9.5	8.9	11.1	10.3	9.9	9.0	28.5
2004	9.7	8.6	9.3	10.2	10.8	10.1	6.0	40.1
2005	11.2	10.9	10.4	11.6	11.7	11.0	7.8	41.2
2006	11.7	11.5	11.0	12.1	11.4	11.7	10.4	36.1
2007	11.3	11.2	10.4	11.2	12.2	10.5	11.2	35.4
2008	11.8	11.8	10.1	12.3	12.5	11.5	10.8	40.4
2009	10.6	10.1	9.9	11.0	10.3	12.0	10.5	31.8

Source: AIHW analysis of ANZDATA .

Table A1.4: Number of registered incident cases of treated ESKD, by sex and jurisdiction, 1989 – 2009

	NSW/ACT			Victoria			Queensland			Western Australia		
Year	Males	Females	Persons	Males	Females	Persons	Males	Females	Persons	Males	Females	Persons
1989	201	158	359	108	84	192	74	74	148	32	46	78
1990	165	164	329	151	82	233	87	81	168	46	28	74
1991	198	165	363	152	88	240	85	75	160	46	33	79
1992	232	187	419	149	104	253	94	85	179	58	39	97
1993	223	209	432	154	116	270	107	97	204	63	50	113
1994	260	207	467	198	121	319	116	113	229	79	51	130
1995	289	209	498	192	127	319	132	107	239	77	64	141
1996	284	263	547	199	141	340	130	100	230	78	46	124
1997	298	230	528	221	136	357	142	130	272	73	68	141
1998	329	216	545	257	166	423	169	127	296	84	67	151
1999	350	235	585	269	167	436	156	149	305	112	86	198
2000	329	250	579	258	171	429	190	151	341	105	92	197
2001	360	277	637	311	178	489	183	155	338	110	79	189
2002	375	252	627	306	158	464	219	161	380	118	85	203
2003	386	277	663	276	164	440	244	179	423	116	86	202
2004	360	248	608	287	175	462	239	159	398	127	88	215
2005	453	320	773	324	201	525	284	180	464	138	97	235
2006	514	309	823	355	210	565	278	218	496	143	92	235
2007	490	323	813	360	182	542	290	178	468	160	97	257
2008	522	344	866	361	176	537	309	222	531	168	104	272
2009	441	317	758	350	191	541	285	201	486	146	86	232

Table A1.4 (Continued): Number of registered incident cases of treated ESKD, by sex and jurisdiction, 1989 – 2009

	South Australia			Tasmania			Northern Territory		
Year	Males	Females	Persons	Males	Females	Persons	Males	Females	Persons
1989	39	28	67	11	11	22	4	4	8
1990	64	43	107	15	12	27	6	6	12
1991	64	34	98	16	12	28	5	6	11
1992	57	36	93	19	10	29	7	7	14
1993	45	31	76	23	7	30	22	12	34
1994	64	37	101	17	11	28	15	26	41
1995	55	39	94	32	11	43	19	19	38
1996	72	33	105	20	11	31	23	26	49
1997	66	31	97	19	15	34	20	37	57
1998	61	52	113	21	9	30	29	19	48
1999	90	55	145	15	13	28	15	37	52
2000	62	55	117	23	11	34	28	26	54
2001	99	52	151	20	19	39	29	36	65
2002	69	49	118	22	16	38	30	30	60
2003	96	55	151	28	15	43	18	39	57
2004	105	50	155	14	15	29	42	39	81
2005	100	71	171	24	14	38	36	49	85
2006	115	69	184	30	21	51	36	40	76
2007	106	61	167	33	22	55	36	40	76
2008	109	76	185	30	24	54	36	53	89
2009	130	65	195	30	23	53	33	39	72

Source: AIHW analysis of ANZDATA .

Table A1.5: Age-specific projected incidence rates of treated ESKD and 95% confidence intervals, males, Australia, 2010–2020

Age group (years)	2010	2015	2020
		Number per 100,000 population	
0–19	0.9	0.8	0.8
	(0.4 - 2.0)	(0.3 - 2.2)	(0.2 - 2.5)
20–29	2.9	2.6	2.4
	(1.5 - 5.6)	(1.2 - 6.0)	(0.9 - 6.3)
30–39	6.3	6.6	6.8
	(3.6 - 11.3)	(3.2 - 13.3)	(3.0 - 15.7)
40–44	9.9	10.5	11.1
	(5.3 - 18.4)	(4.9 - 22.4)	(4.5 - 27.2)
45–49	13.5	14.5	15.4
	(7.6 - 24.3)	(7.1 - 29.5)	(6.6 - 35.8)
50–54	18.9	21.4	24.1
	(10.7 - 33.5)	(10.6 - 42.9)	(10.6 - 54.9)
55–59	25.0	28.0	31.3
	(14.3 - 43.8)	(14.1 - 55.3)	(14.0 - 69.9)
60–64	32.0	36.2	41.1
	(18.4 - 55.6)	(18.5 - 71.2)	(18.5 - 91.1)
65–69	42.8	46.2	49.9
	(25.1 - 72.9)	(24.1 - 88.5)	(23.1 - 107.4)
70–74	65.1	77.0	91.1
	(38.4 - 110.3)	(40.5 - 146.5)	(42.6 - 194.5)
75 and over	71.7	98.0	133.8
	(58.1 - 88.6)	(75.7 - 126.7)	(98.7 - 181.2)
Total	**15.4**	**19.0**	**24.1**

Source: AIHW projection based on ANZDATA.

Table A1.6: Age-specific projected incidence rates of treated ESKD and 95% confidence intervals, females, Australia, 2010–2020

Age group (years)	2010	2015	2020
		Number per 100,000 population	
0–19	0.8	0.8	0.9
	(0.3 - 2.1)	(0.3 - 2.8)	(0.2 - 3.8)
20–29	2.2	2.0	1.9
	(1.0 - 5.0)	(0.8 - 5.5)	(0.6 - 6.0)
30–39	4.6	4.7	4.9
	(2.2 - 9.4)	(2.0 - 11.4)	(1.7 - 13.8)
40–44	6.4	6.6	6.7
	(3.0 - 13.9)	(2.5 - 16.9)	(2.2 - 20.6)
45–49	10.1	11.4	12.9
	(4.8 - 21.1)	(4.6 - 28.1)	(4.5 - 37.4)
50–54	11.7	12.6	13.5
	(5.7 - 24.1)	(5.2 - 30.3)	(4.8 - 38.1)
55–59	14.5	14.4	14.4
	(7.2 - 29.2)	(6.1 - 34.0)	(5.2 - 39.6)
60–64	16.7	14.5	12.6
	(8.5 - 32.7)	(6.4 - 33.1)	(4.8 - 33.5)
65–69	25.9	24.7	23.5
	(13.4 - 50.2)	(11.0 - 55.3)	(9.1 - 60.9)
70–74	37.3	42	47.2
	(19.2 - 72.4)	(18.7 - 94.4)	(18.1 - 122.9)
75 and over	31.8	46.6	68.5
	(24.2 - 41.7)	(33.4 - 65.0)	(46.3 - 101.4)
Total	**9.5**	**11.2**	**13.9**

Source: AIHW projection based on ANZDATA.

Table A1.7: Proportion of projected treated ESKD with diabetes as a comorbidity, Australia, 2010–2020

Sex	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Males (%)	48.4	50.1	51.8	53.5	55.3	57.0	58.7	60.3	62.0	63.7	65.4
Females (%)	46.7	48.1	49.4	50.8	52.1	53.5	54.9	56.3	57.7	59.1	60.6
Total (%)	**47.8**	**49.3**	**50.9**	**52.5**	**54.1**	**55.7**	**57.3**	**58.9**	**60.5**	**62.1**	**63.7**

Source: AIHW projection based on ANZDATA.

Table A1.8: Projected incidence rates (95% confidence intervals) of treated ESKD, by sex and age group, New South Wales/Australian Capital Territory, 2010–2020

Age group (years)	2010	2015	2020
		Number per 100,000 population	
Males			
0–29	1.7	1.6	1.6
	(0.6 - 4.7)	(0.5 - 5.7)	(0.4 - 6.9)
30–44	6.1	5.9	5.8
	(2.5 - 15.0)	(2.0 - 17.8)	(1.6 - 21.2)
45–59	16.6	18	19.5
	(7.3 - 38.1)	(6.6 - 49.4)	(5.9 - 64.1)
60–74	43.4	49.2	55.9
	(19.5 - 96.2)	(18.6 - 130.1)	(17.8 - 175.8)
75 and over	70.9	99	138.1
	(49.4 - 101.8)	(63.7 - 153.7)	(82.2 - 232.1)
Total	**14.8**	**18.3**	**23.2**
Females			
0–29	1.3	1.3	1.2
	(0.4 - 4.4)	(0.3 - 5.6)	(0.2 - 7.1)
30–44	4.4	4.6	4.9
	(1.4 - 13.3)	(1.2 - 18.0)	(1.0 - 24.3)
45–59	10.6	11.4	12.2
	(3.8 - 29.1)	(3.3 - 39.1)	(2.8 - 52.6)
60–74	25.7	24.6	23.6
	(9.9 - 66.7)	(7.7 - 78.9)	(6.0 - 93.4)
75 and over	32.0	45.6	65.2
	(20.6 - 49.7)	(26.7 - 78.1)	(34.6 - 122.7)
Total	**9.3**	**10.8**	**13.1**

Source: AIHW projection based on ANZDATA .

Table A1.9: Projected incidence rates (95% confidence intervals) of treated ESKD, by sex and age group, Victoria, 2010– 2020

Age group (years)	2010	2015	2020
		Number per 100,000	
Males			
0–29	1.4	1.2	1.1
	(0.4 - 4.7)	(0.3 - 5.5)	(0.2 - 6.5)
30–44	7.6	8.2	8.9
	(2.6 - 21.8)	(2.3 - 30.0)	(1.9 - 41.3)
45–59	18.5	20.5	22.6
	(7.0 - 48.9)	(6.3 - 66.8)	(5.6 - 91.3)
60–74	43.5	45.1	46.8
	(17.2 - 109.9)	(14.5 - 139.9)	(12.3 - 178.1)
75 and over	62.5	80.4	103.5
	(40.8 - 95.6)	(47.9 - 135.0)	(56.1 - 190.8)
Total	**14.8**	**18.3**	**23.2**
Females			
0–29	1.1	1.0	0.9
	(0.2 - 5.5)	(0.1 - 6.9)	(0.1 - 8.5)
30–44	3.9	3.7	3.5
	(0.9 - 16.7)	(0.6 - 21.9)	(0.4 - 28.8)
45–59	9.5	9.5	9.5
	(2.4 - 37.5)	(1.8 - 50.7)	(1.3 - 68.5)
60–74	21.0	20.2	19.4
	(5.6 - 79.3)	(4.0 - 102.0)	(2.9 - 131.3)
75 and over	22.4	31.7	45.0
	(12.1 - 41.5)	(14.9 - 67.4)	(18.5 - 109.3)
Total	**7.6**	**8.4**	**9.6**

Source: AIHW projection based on ANZDATA.

Table A1.10: Projected incidence rates (95% confidence intervals) of treated ESKD, by sex and age group, Queensland, 2010–2020

Age group (years)	2010	2015	2020
	Number per 100,000 population		
Males			
0–29	1.7	1.7	1.6
	(0.5 - 6.6)	(0.3 - 8.6)	(0.2 - 11.2)
30–44	7.7	8.5	9.3
	(2.3 - 25.4)	(2.0 - 36.5)	(1.7 - 52.4)
45–59	19.8	22.9	26.5
	(6.7 - 58.7)	(6.1 - 86.0)	(5.6 - 126.1)
60–74	40.4	44.7	49.6
	(14.0- 116.5)	(12.3 - 162.6)	(10.8 - 226.9)
75 and over	92.8	137.8	204.8
	(57.7 - 149.1)	(77.4 - 245.5)	(103.8 - 404.1)
Total	**15.8**	**20.3**	**27.3**
Females			
0–29	1.5	1.6	1.7
	(0.3 - 7.4)	(0.2 - 11.2)	(0.2 - 17.1)
30–44	5.3	5.5	5.6
	(1.3 - 21.5)	(1.0 - 30.0)	(0.8 - 41.7)
45–59	13.0	14.7	16.6
	(3.5 - 47.6)	(3.0 - 71.4)	(2.6 - 107.4)
60–74	25.4	23.2	21.2
	(7.4 - 87.3)	(5.2 - 104.6)	(3.6 - 125.3)
75 and over	46.3	69.9	105.6
	(26.3 - 81.4)	(35.2 - 138.9)	(47.0 - 236.9)
Total	**10.5**	**12.5**	**16.0**

Source: AIHW projection based on ANZDATA.

Table A1.11: Projected incidence rates (95% confidence intervals) of treated ESKD, by sex and age group, Western Australia, 2010–2020

Age group (years)	2010	2015	2020
		Number per 100,000 population	
Males			
0–39	2.9	2.8	2.7
	(0.9 - 9.1)	(0.7 - 11.5)	(0.5 - 14.6)
40–59	17.6	19.9	22.6
	(6.6 - 47.0)	(6.0 - 66.1)	(5.5 - 93.1)
60 and over	56.4	68.1	82.1
	(38.6 - 82.5)	(42.8 - 108.1)	(47.5 - 141.8)
Total	**16.0**	**19.5**	**23.9**
Females			
0–39	2.2	2.1	2.0
	(0.6 - 8.6)	(0.4 - 11.1)	(0.3 - 14.5)
40–59	12.2	12.8	13.5
	(3.8 - 38.6)	(3.1 - 52.8)	(2.5 - 72.3)
60 and over	27.6	29.4	31.4
	(17.6 - 43.5)	(16.9 - 51.3)	(16.3 - 60.5)
Total	**9.7**	**10.6**	**11.5**

Source: AIHW projection based on ANZDATA.

Table A1.12: Projected incidence rates (95% confidence intervals) of treated ESKD, by sex and age group, South Australia, 2010–2020

Age group (years)	2010	2015	2020
		Number per 100,000 population	
Males			
0–39	3.3	3.2	3.2
	(0.9 - 12.0)	(0.6 - 15.9)	(0.5 - 21.0)
40–59	15.3	16.2	17.0
	(5.0 - 47.3)	(4.1 - 63.9)	(3.3 - 86.5)
60 and over	53.0	71.3	95.8
	(34.3 - 82.0)	(41.8 - 121.4)	(51.1 - 179.6)
Total	**16.6**	**21.6**	**28.7**
Females			
0–39	2.3	2.4	2.5
	(0.4 - 12.1)	(0.3 - 18.1)	(0.2 - 27.3)
40–59	9.3	10.0	10.7
	(2.2 - 39.3)	(1.7 - 58.3)	(1.3 - 86.3)
60 and over	25.0	32.5	42.1
	(14.4 - 43.7)	(16.5 - 64.0)	(18.9 - 93.9)
Total	**9.5**	**11.9**	**15.2**

Source: AIHW projection based on ANZDATA.

Table A1.13: Projected incidence rates (95% confidence intervals) of treated ESKD, by age group, Tasmania, 2010–2020

Age group (years)	2010	2015	2020
		Number per 100,000 population	
0–39	1.8	1.5	1.3
	(0.3 - 12.3)	(0.1 - 15.9)	(0.1 - 20.6)
40–59	15.4	22.2	32.1
	(2.7 - 86.9)	(2.7 - 183.8)	(2.6 - 388.7)
60 and over	28.7	33.7	39.6
	(15.1 - 54.5)	(15.4 - 73.9)	(15.6 - 100.1)
Total	**11.5**	**15.0**	**19.3**

Source: AIHW projection based on ANZDATA.

Table A1.14: Projected incidence rates (95% confidence intervals) of treated ESKD, by age group, Northern Territory, 2010–2020

Age group (years)	2010	2015	2020
		Number per 100,000 population	
0–39	10.9	13.2	16.1
	(1.6 - 72.9)	(1.3 - 135.9)	(1.0 - 253.5)
40–59	85.7	91.5	97.8
	(16.6 - 441.9)	(12.3 - 682.6)	(9.1 – 1,054.4)
60 and over	94.4	86.7	79.6
	(44.4 - 200.7)	(34.4 - 218.3)	(26.7 - 237.5)
Total	**38.5**	**41.8**	**44.6**

Source: AIHW projection based on ANZDATA.

Table A1.15: Factors contributing to the increase in the projected incidence

Factors	Description	Contributing per cent (%)
Population increase	Increase in cases purely from population growth	14
Population ageing	Increase (over and above population increase) due to the ageing of population (population structure change)	13
Increase in rate	Increase (over and above population increase and population ageing) due to our projected increase in age-specific rates	73
Total		**100**

Note: Rate increase in 2020 compared to 2009.

Appendix 2 Statistical methods

Age-period model in prediction of disease incidence

When projecting the disease incidence, it is common to apply a statistical modelling approach to first summarise past trends and then extrapolate them into the future. The advantage is that prior detailed knowledge of the underlying causes of the specific diseases is not necessary and time (period) is used as a surrogate (Dyba et al. 1997). The extrapolation is based on the historical patterns of disease incidence, while minimal subjective judgement is involved.

In order to summarise past trends accurately, the factors from age, period, and cohort effects must be taken into account. Age is a common risk factor in most chronic diseases, and many diseases including ESKD are closely related to age. Period is the year in which a patient starts to receive treatment, which may capture the developments in prevention and treatment. Meanwhile, cohort is a group of patients born in the same period, which may capture the generational risk exposures.

However, it is difficult to separate the age-period-cohort effects, as any one is linearly dependent on the other two; for example, cohort=period-age. This is a well-known problem of lack of identifiability in statistical modelling. As a result, some models manage to treat the age-period-cohort effects simultaneously with imposed constraints (Holford 1991; Robertson & Boyle 1998), while others choose to focus on two main factors, that is, age-period or age-cohort factors.

The Poisson regression model

The main statistical model used in these projections is the age-period log-linear Poisson regression model, which falls into the Generalised Linear Model family (McCullagh & Nelder 1989). It has been used commonly in epidemiology in predictions of disease incidence, because the incident counts of many chronic diseases in general follow a Poisson distribution (Clayton & Schifflers 1987; Frome & Checkoway 1985). It has been used specifically to project ESKD incidence in Canada (Schaubel et al. 1998). Empirical projections and simulations also confirm that the model with the assumption of a Poisson distribution performs better than models with other distribution assumptions (Dyba & Hakulinen 2000).

The Poisson regression model assumes that the number of incident cases in an age group at a given time period follows a Poisson distribution, and then the expected logarithm rate is a linear function of age and period effects. With derived age and period parameters, the regression model can extrapolate the age-specific rates into the future.

In age group x and period t, let the incident case be $ESKD_{xt}$, the population at risk be P_{xt}, and the incidence rate be I_{xt} ($I_{xt}=ESKD_{xt}/P_{xt}$). It was assumed that the number of incident cases of treated ESKD, $ESKD_{xt,}$ follows a Poisson distribution as a rare event.

Thus, the model is written as follows:

$$\log (ESKD_{xt}) = \log (P_{xt}) + \alpha_x + \beta_t \quad (1)$$

or

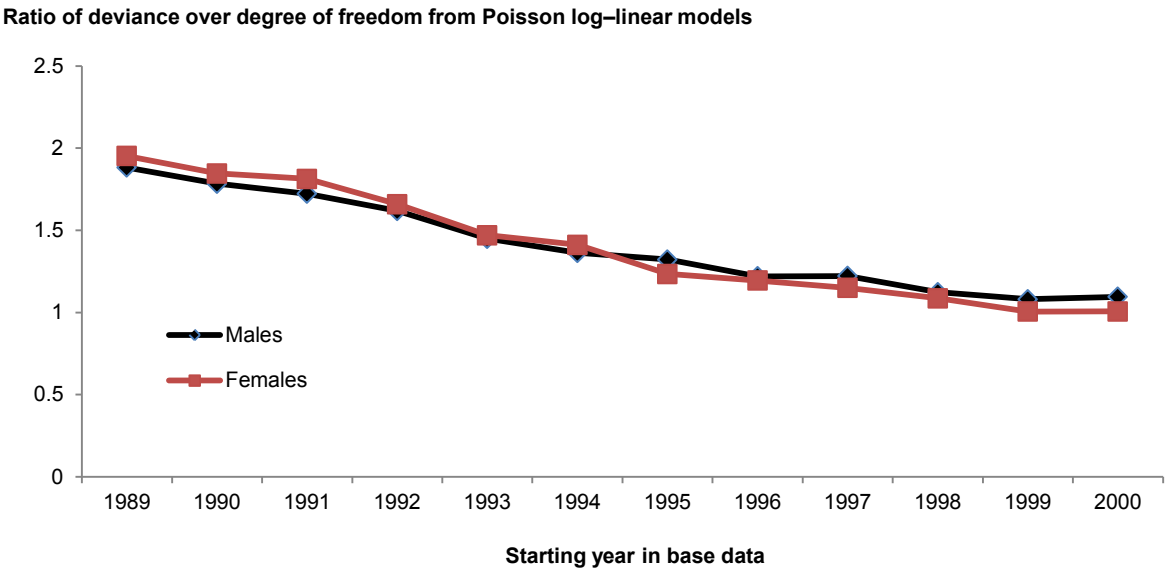
$$\log (ESKD_{xt}/P_{xt}) = \alpha_x + \beta_t \quad (2)$$

where the α_x and β_t represents the modelled age and period effects respectively. The product of exp (α_x) and exp (β_t) is the estimate of age- and period-specific incidence rates (Osmond & Hardy 2004: 128).

Selection of starting year of base data

The choice of starting year for the modelling process can be quite influential on the outcome of the projections. A number of factors were examined to help determine the best starting year, including the number of cases, break-point in the time series, and the stability of the models.

Treated ESKD cases in ANZDATA from 1989–2009 were examined, along with the distribution of cases by age group and sex. This showed that from 1989 until the early 1990s, the number of cases were very small for some age groups, particularly at the state/territory level. However, the number of cases became stable from the mid-1990s (Tables A1.1 and A1.2). Joinpoint regression technique (Joinpoint Regression Program April 2010) was used to identify historical trends, specifically the most recent trends (figures not shown), and the findings further confirmed the most recent trends started from the mid-1990s. In addition, Poisson log-linear regression analyses with an age and period interaction term were performed using different starting years in the model to evaluate the goodness-of-fit (Figure A2.1). Taking into consideration these factors, and the aim to use more extensive historical data where possible, 1996 was chosen as the starting year in base data.



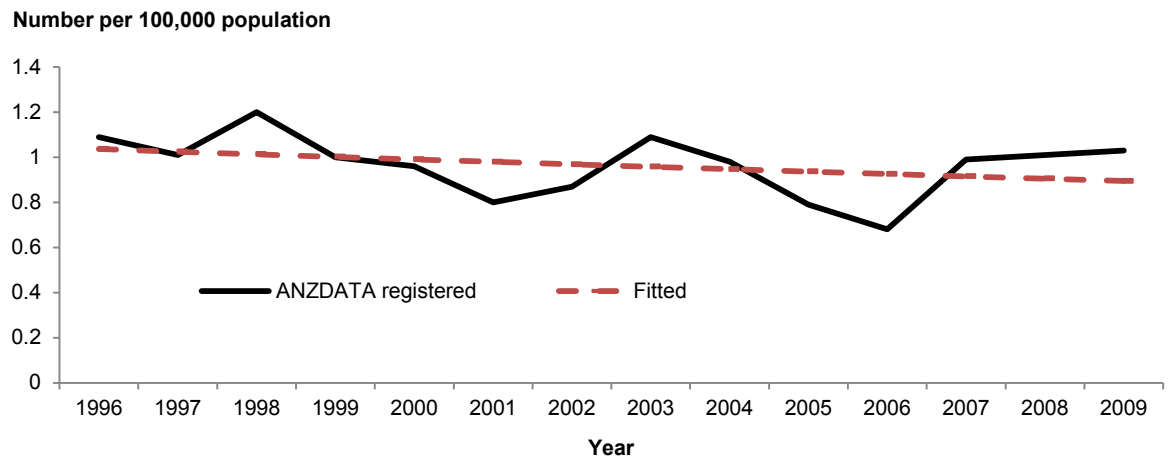
Source: Registered cases during 1989–2009 used for model fitting from ANZDATA.

Figure A2.1: Poisson log-linear regression model goodness of fit, by starting year of base data, Australia

Model fitting

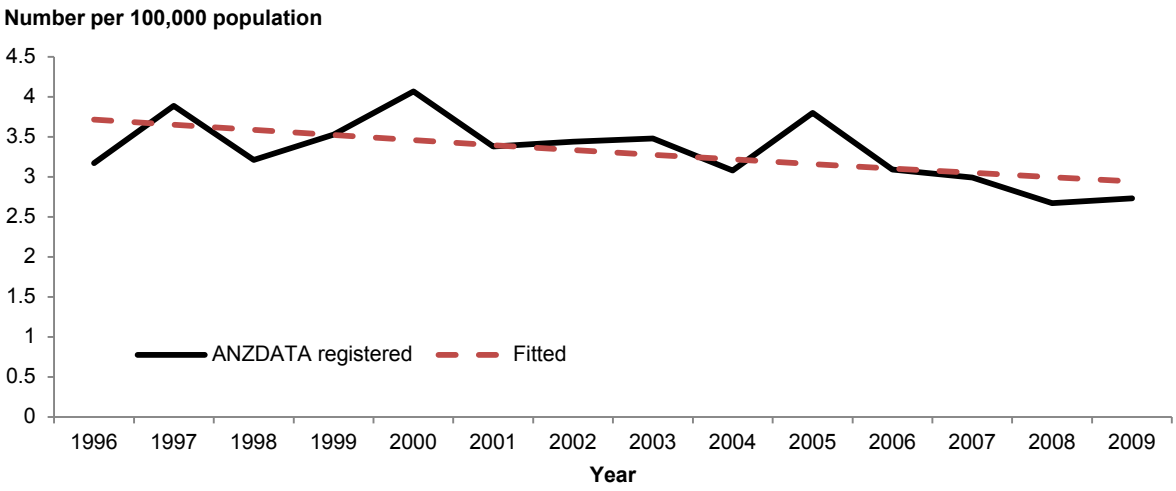
Poisson log-linear regression models with and without age and year interaction terms were run to test whether there is an age and period interaction. The results confirm that there is a significant interaction between age and period over time. Therefore, it is more appropriate to include the interaction term in the models.

Overall, the Poisson models with age and period interaction term fit well as indicated by the ratio of deviance over degree of freedom (criteria for goodness-of-fit), which is 1.2 for both males and females. The figures A2.2 to A2.23 present how the models predict the treated ESKD incidence rates for males and females using ANZDATA. As shown by these figures, the models predict the incidence rates very well in most of the younger age groups. However, for older patients of both sexes, especially patients 70 years and over, the graphs show the incidence rates levelled off or decreased in recent years, while models predicted they would continue to increase. This could lead to overestimates of the incidence rates if the levelling off, in fact, continues. As a result, alternative projections based on the assumption that the incidence rates for older patients remain constant are also shown in this report.



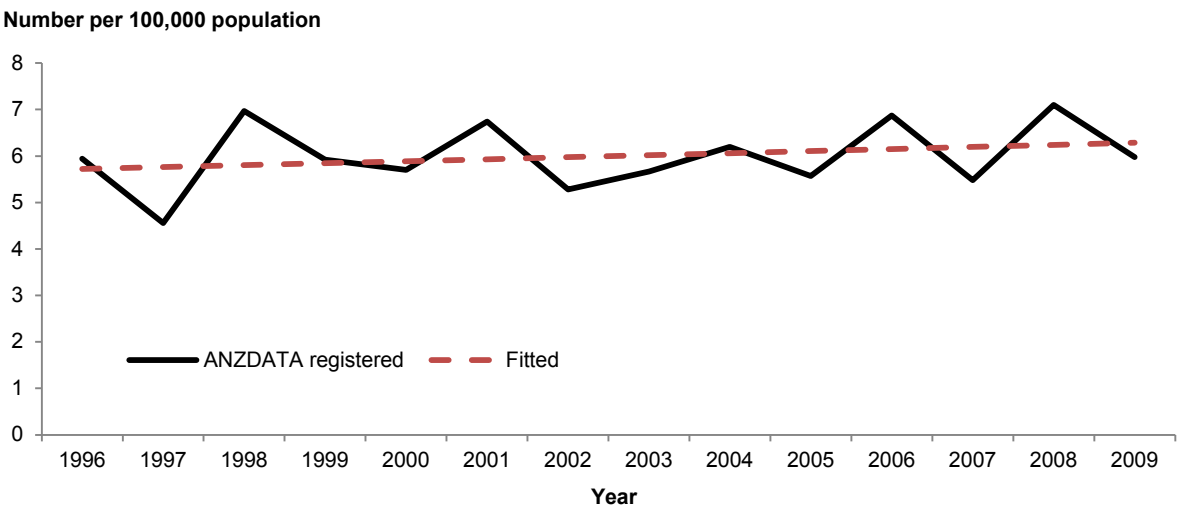
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.2: Incidence rates of registered and predicted treated ESKD, males, 0–19 years, Australia, 1996–2009



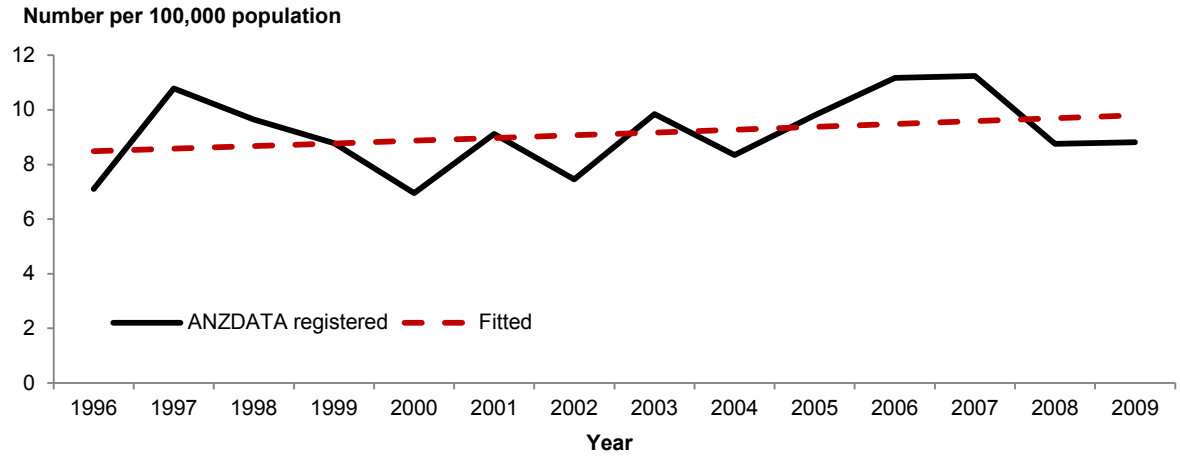
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.3: Incidence rates of registered and predicted treated ESKD, males, 20–29 years, Australia, 1996–2009



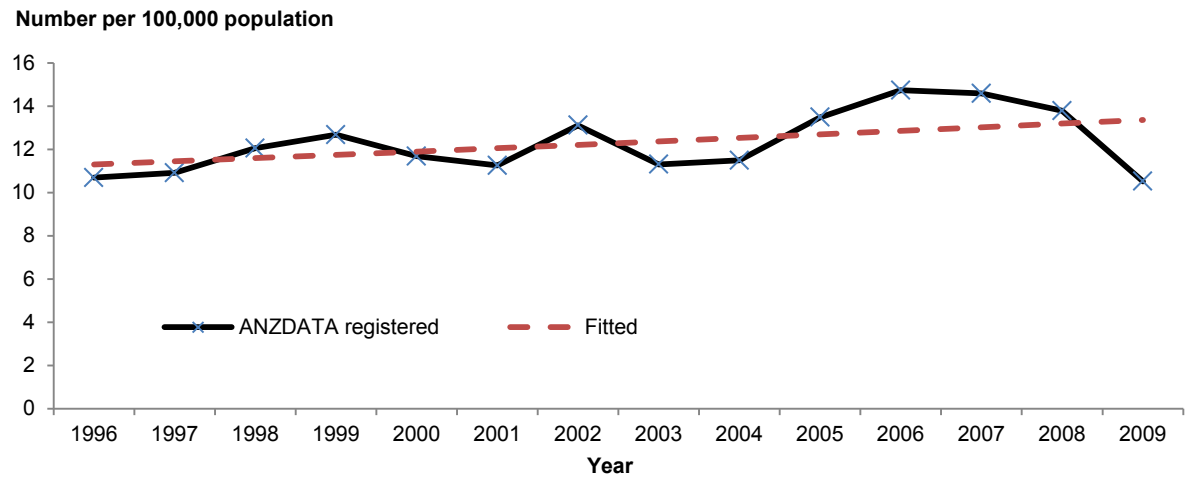
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.4: Incidence rates of registered and predicted treated ESKD, males, 30–39 years, Australia, 1996–2009



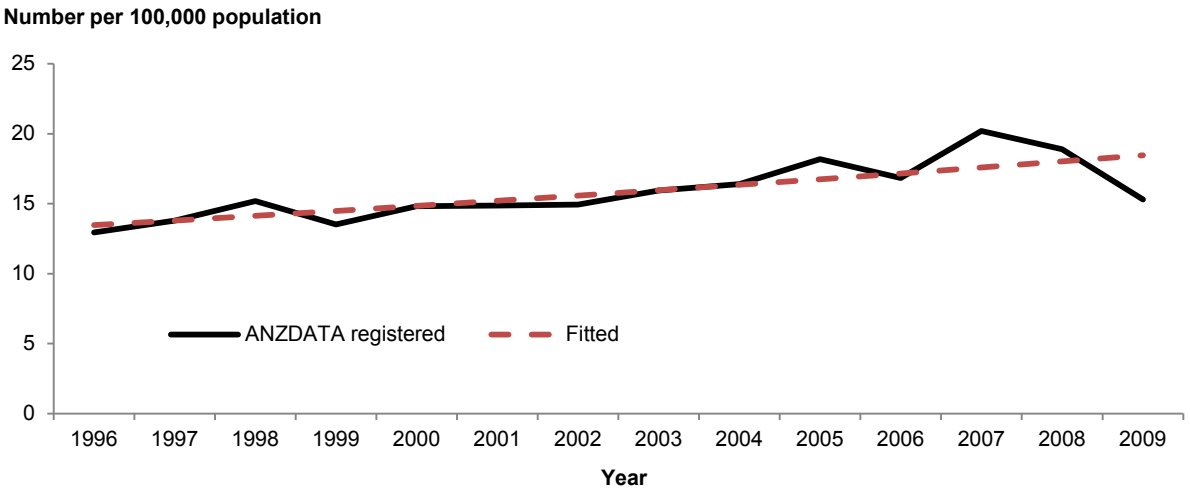
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.5: Incidence rates of registered and predicted treated ESKD, males, 40–44 years, Australia, 1996–2009



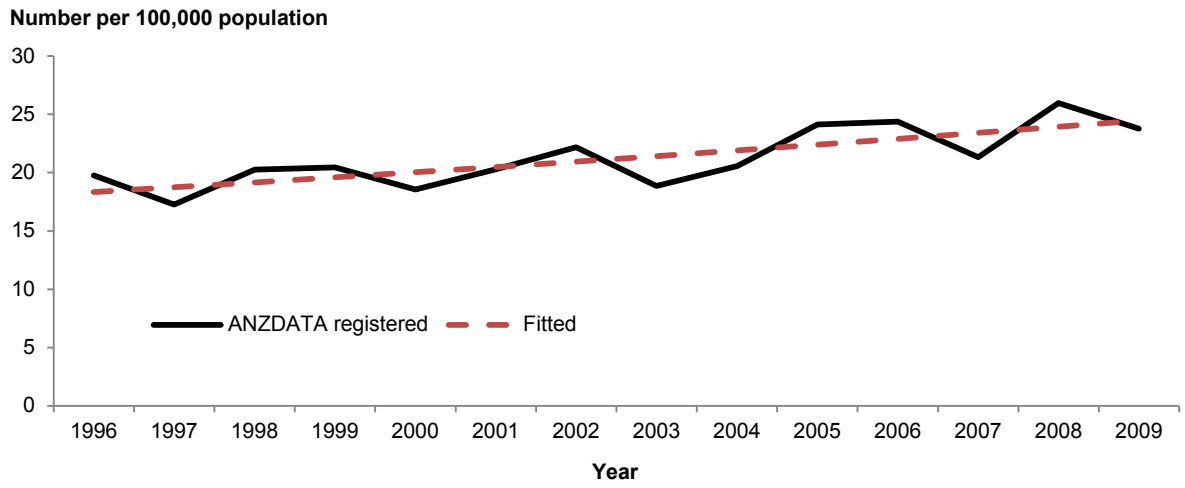
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.6: Incidence rates of registered and predicted treated ESKD, males, 45–49 years, Australia, 1996–2009



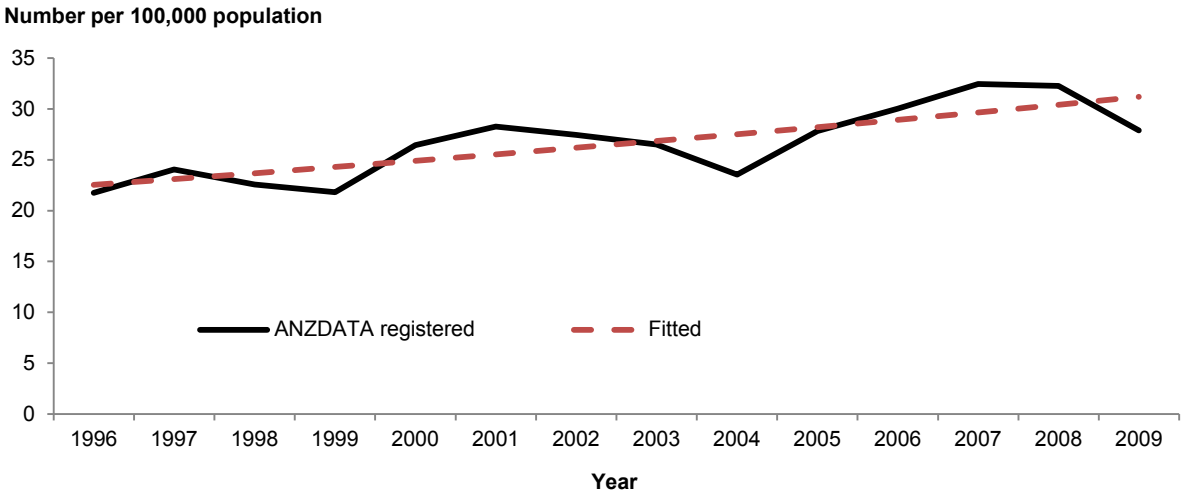
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.7: Incidence rates of registered and predicted treated ESKD, males, 50–54 years, Australia, 1996–2009



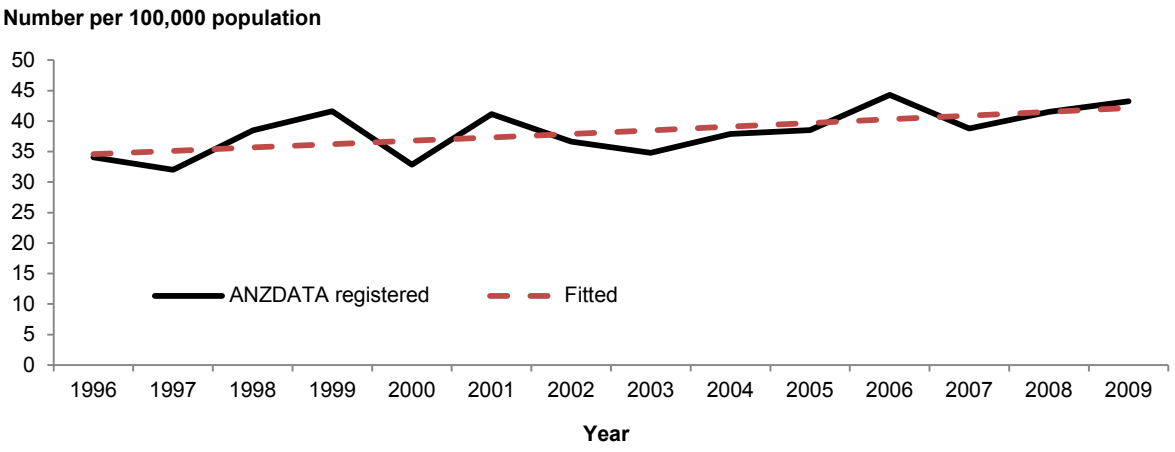
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.8: Incidence rates of registered and predicted treated ESKD, males, 55–59 years, Australia, 1996–2009



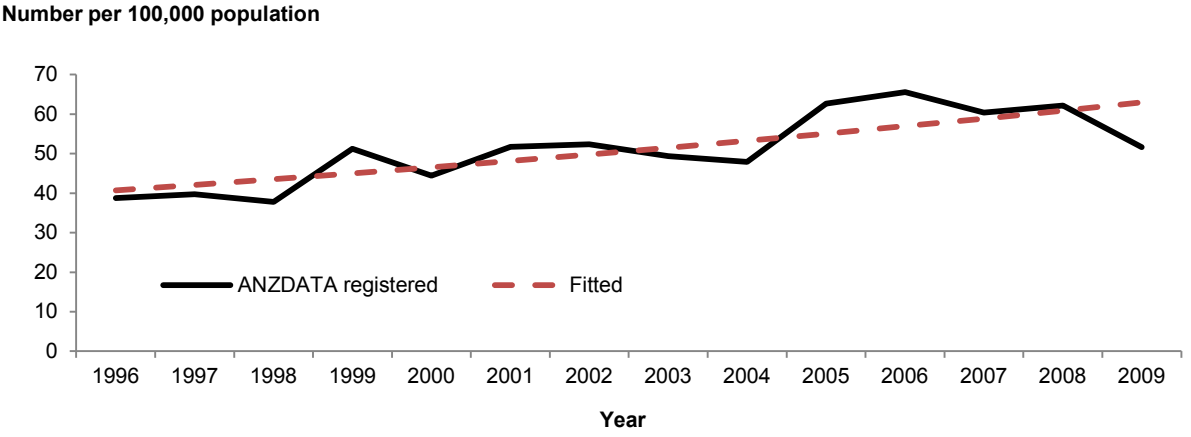
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA .

Figure A2.9: Incidence rates of registered and predicted treated ESKD, males, 60–64 years, Australia, 1996–2009



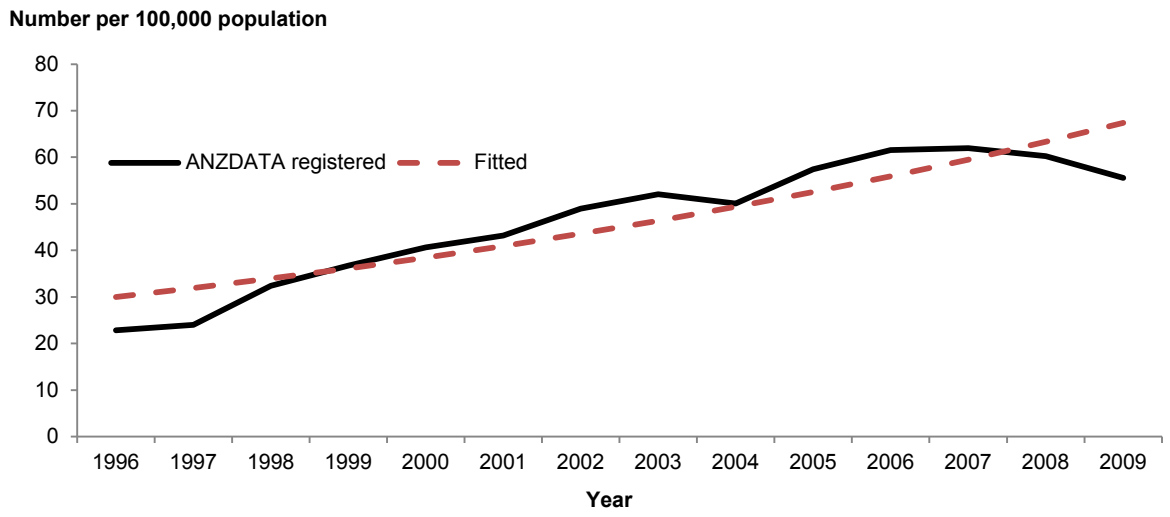
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA .

Figure A2.10: Incidence rates of registered and predicted treated ESKD, males, 65–69 years, Australia, 1996–2009



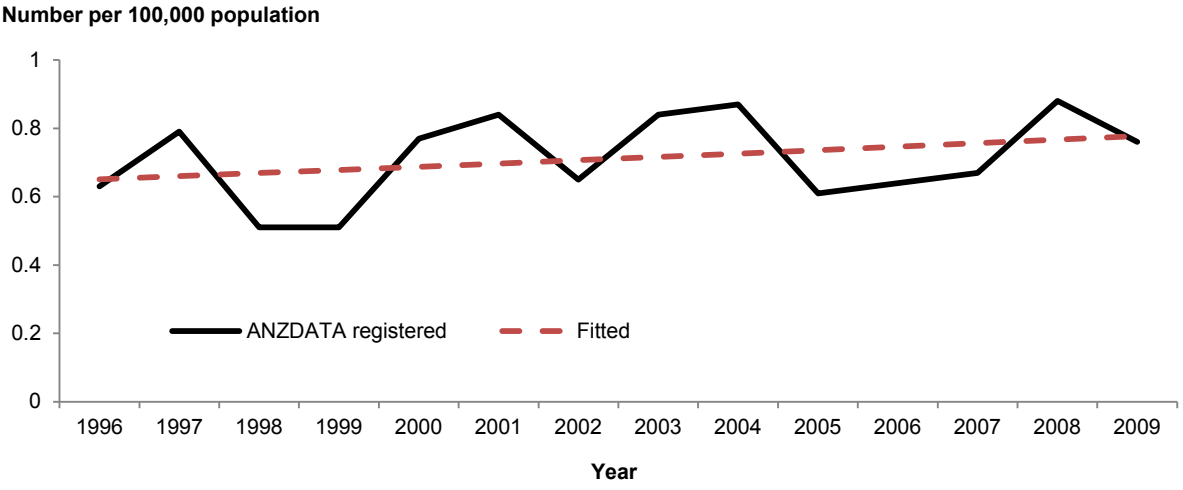
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.11: Incidence rates of registered and predicted treated ESKD, males, 70–74 years, Australia, 1996–2009



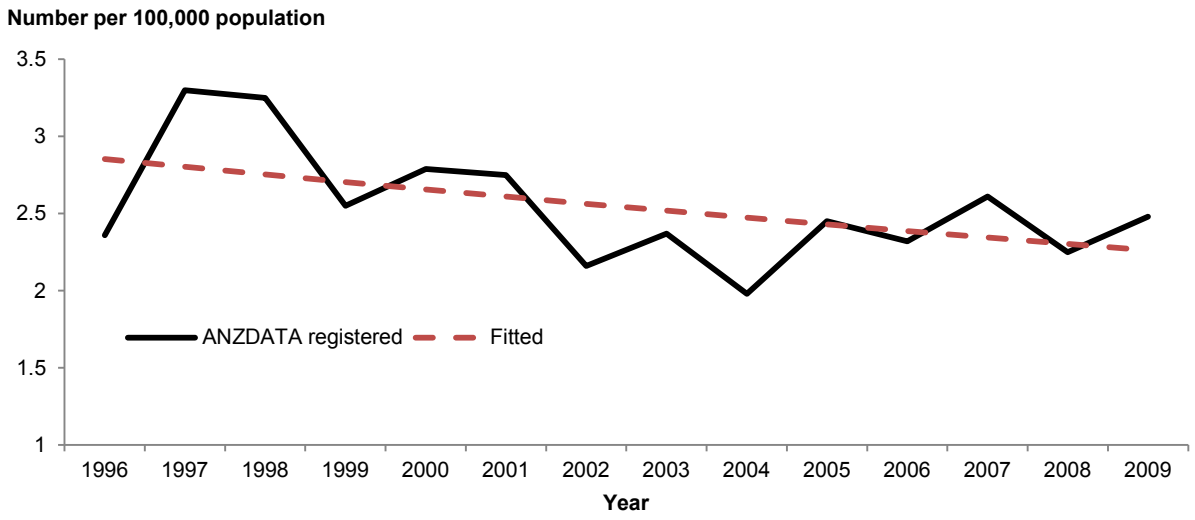
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.12: Incidence rates of registered and predicted treated ESKD, males, 75 years and over, Australia, 1996–2009



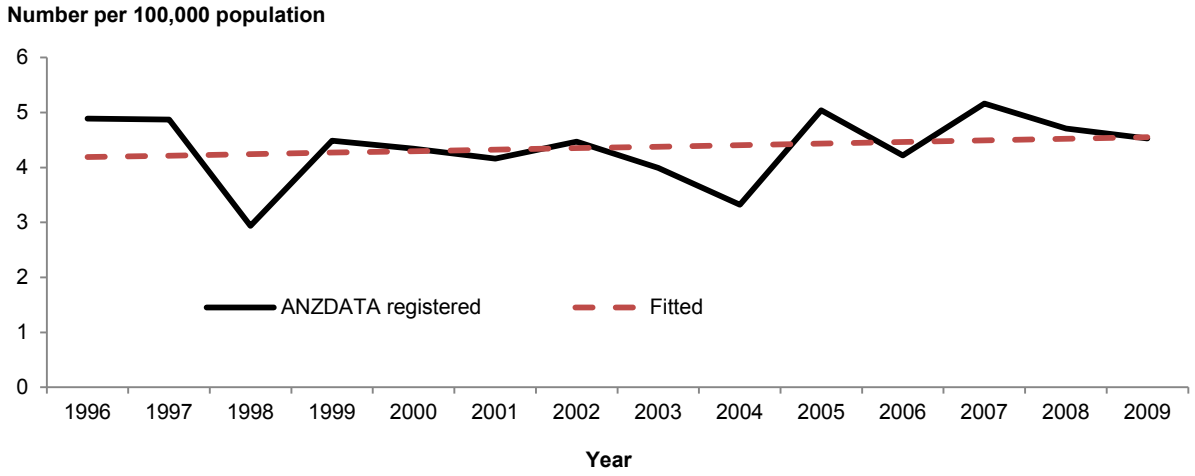
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.13: Incidence rates of registered and predicted treated ESKD, females, 0–19 years, Australia, 1996–2009



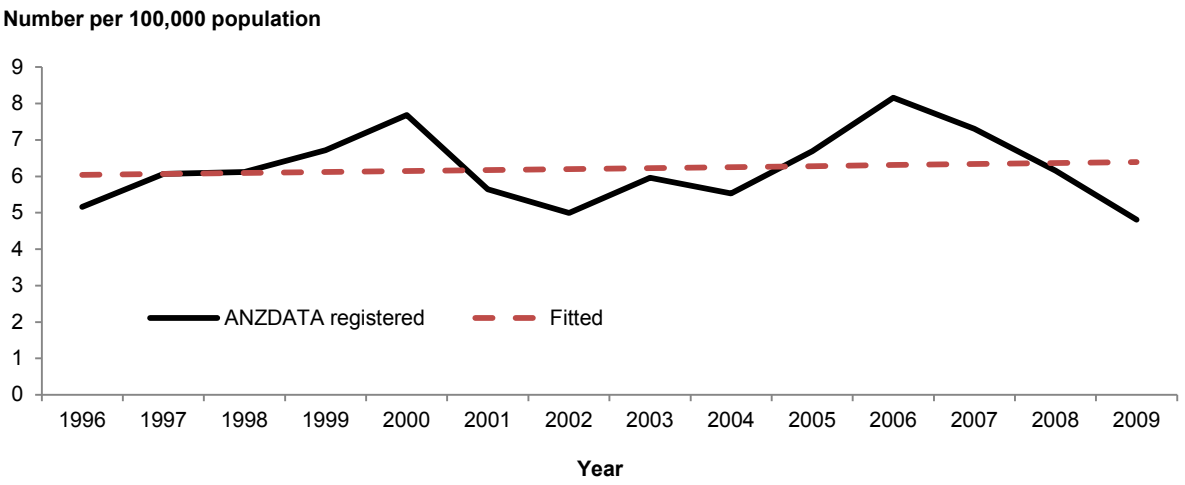
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.14: Incidence rates of registered and predicted treated ESKD, females, 20–29 years, Australia, 1996–2009



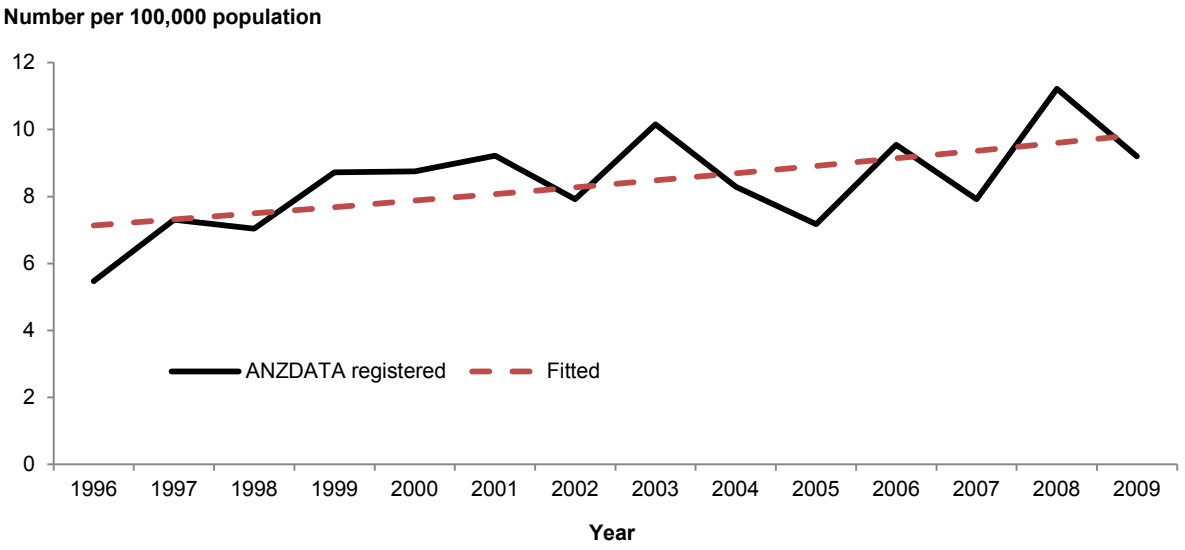
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.15: Incidence rates of registered and predicted treated ESKD, females, 30–39 years, Australia, 1996–2009



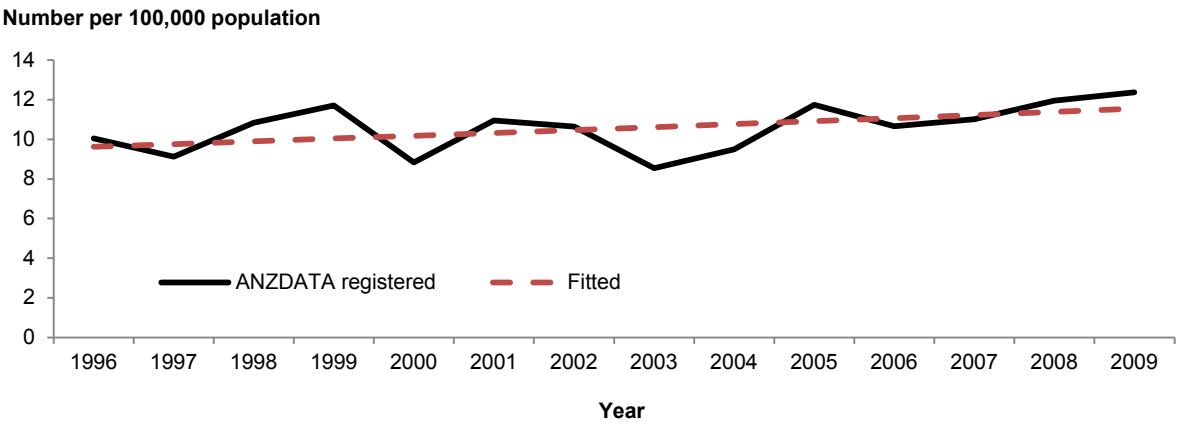
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.16: Incidence rates of registered and predicted treated ESKD, females, 40–44 years, Australia, 1996–2009



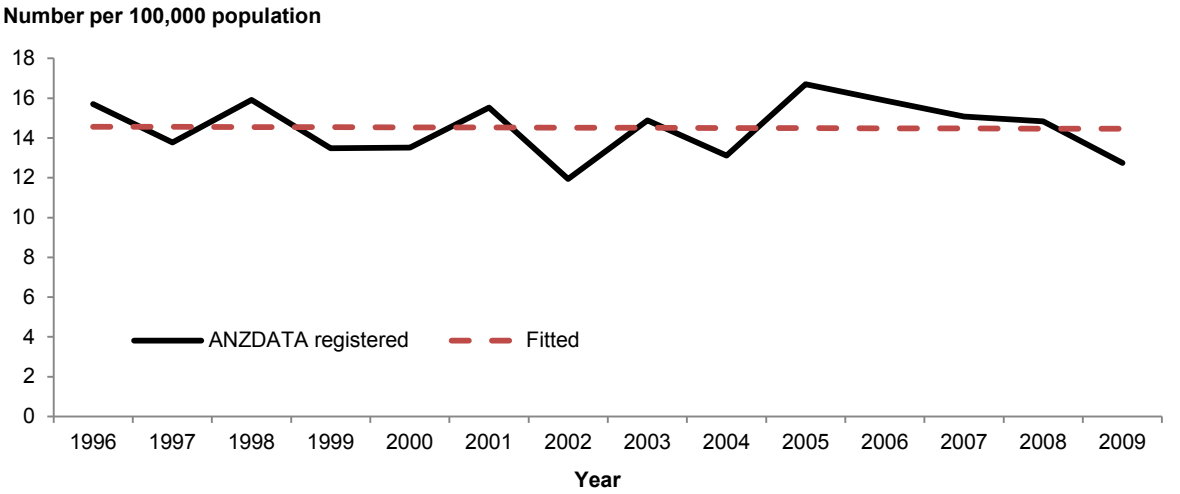
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.17: Incidence rates of registered and predicted treated ESKD, females, 45–49 years, Australia, 1996–2009



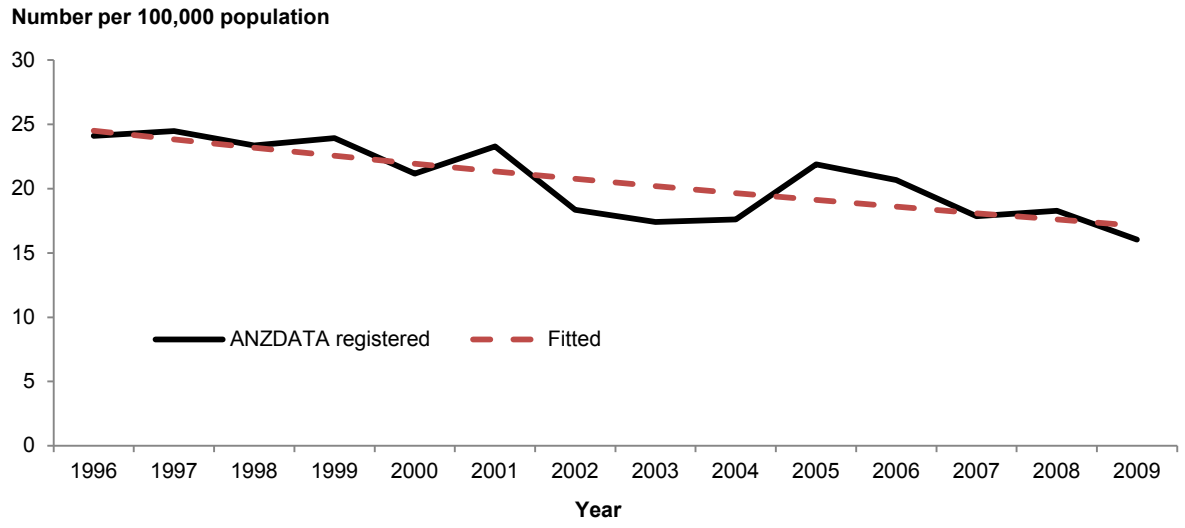
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.18: Incidence rates of registered and predicted treated ESKD, females, 50–54 years, Australia, 1996–2009



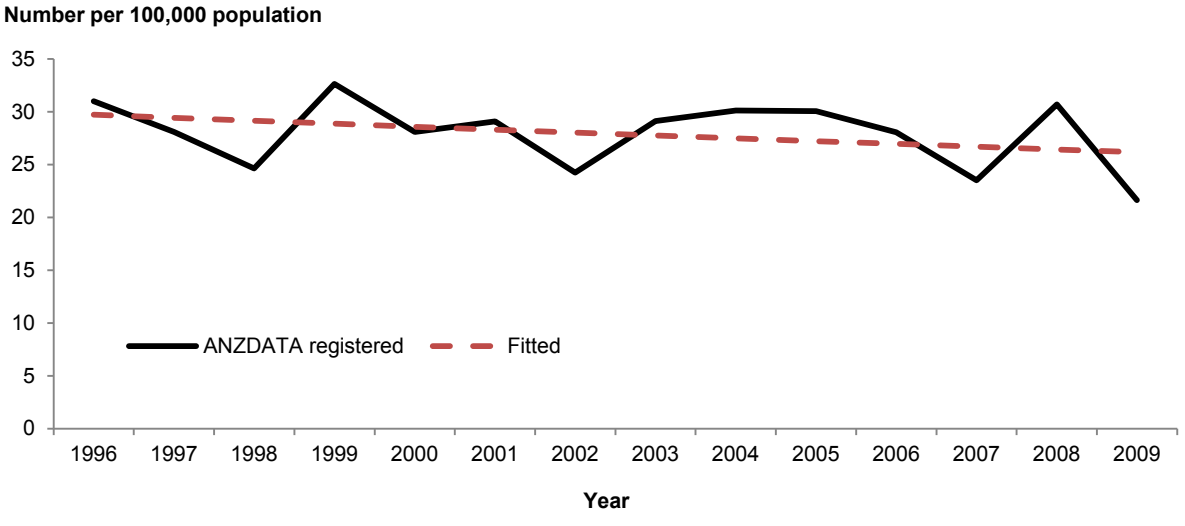
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.19: Incidence rates of registered and predicted treated ESKD, females, 55–59 years, Australia, 1996–2009



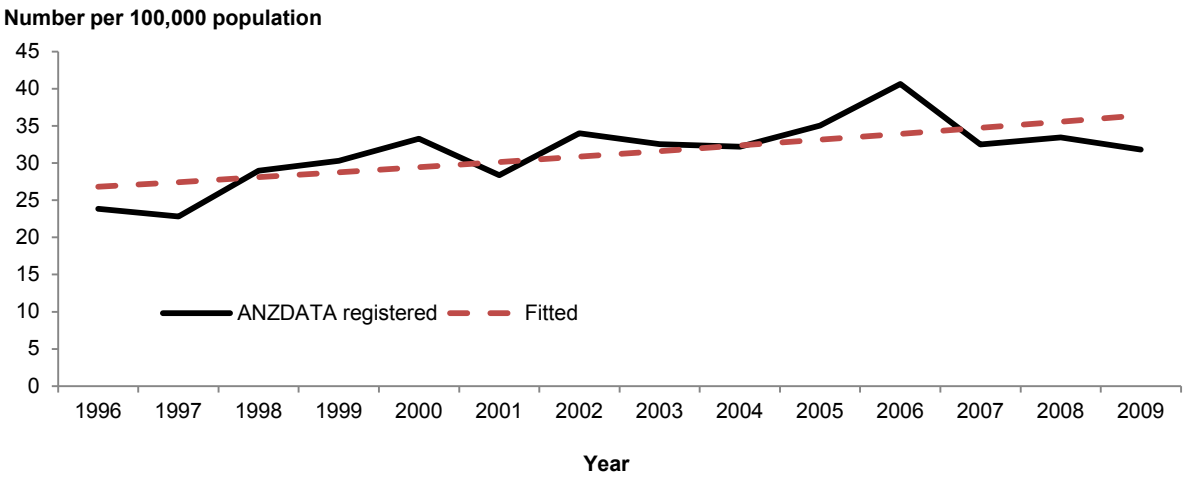
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.20: Incidence rates of registered and predicted treated ESKD, females, 60–64 years, Australia, 1996–2009



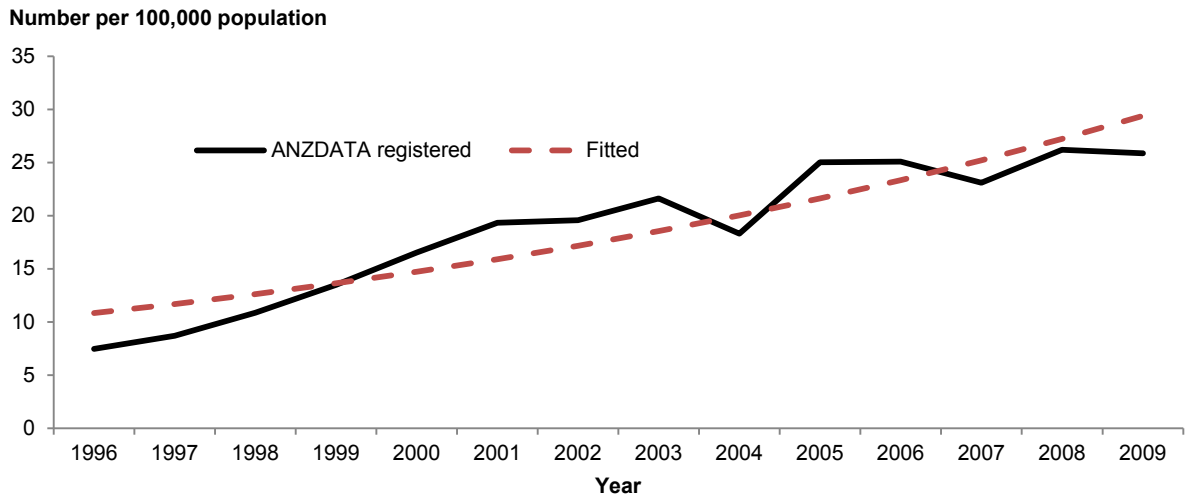
Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.21: Incidence rates of registered and predicted treated ESKD, females, 65–69 years, Australia, 1996–2009



Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.22: Incidence rates of registered and predicted treated ESKD, females, 70–74 years, Australia, 1996–2009



Source: Registered cases during 1996–2009 used for calculating incidence rates from ANZDATA.

Figure A2.23: Incidence rates of registered and predicted treated ESKD, females, 75 years and over, Australia, 1996–2009

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List of tables

List of figures