



# CHAPTER 3

## Mortality in Kidney Failure with Replacement Therapy

Reporting the survival of patients on kidney replacement therapy in Australia and New Zealand and causes of death in this population

# CONTENTS

Summary and Highlights	3
Suggested Citation	3
Survival	4
Death Rates	5
Median Survival	7
Cause of Death	8
Withdrawal from Kidney Replacement Therapy	9
References	10

## SUMMARY AND HIGHLIGHTS

People on Kidney Replacement Therapy (KRT) continue to have an overall higher unadjusted mortality rate compared to the general population, with the gap in mortality rate with the general population reducing with increasing age. Overall, the survival rate is poorer for older people on KRT compared to younger people on KRT. Survival is also worse for those who have spent a longer period of time on dialysis.

The most frequent cause of death is different based on KRT modality. For people on dialysis, the most common cause of death was cardiovascular disease. For people with a kidney transplant, infections were the most common cause of death in both Australia and New Zealand. Deaths due to infections increased in 2022 compared to 2021, likely due to deaths from COVID-19. This will be explored further in an ANZDATA Special Report on the impact of COVID-19.

For people who withdrew from KRT, the most common reason was psychosocial. The number of people who withdrew from dialysis is greater for people who have had a longer period of KRT.

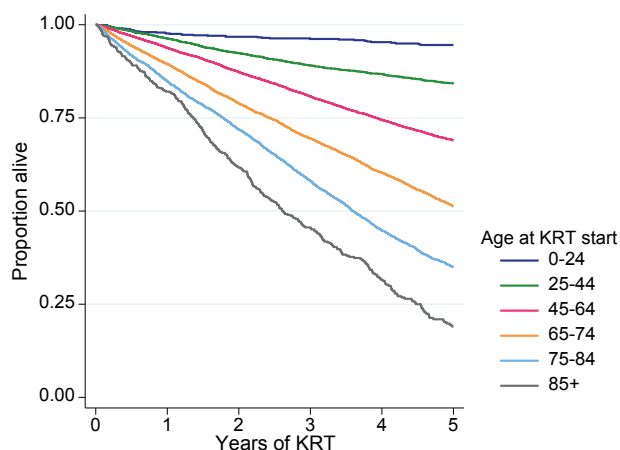
## SUGGESTED CITATION

E Au, C Davies, S Bateman, J Chen, K Hurst, G Irish, D Lee, H McCarthy, S McDonald, W Mulley, M Roberts, T Sun, P Clayton. 46th Report, Chapter 3: Mortality in Kidney Failure with Replacement Therapy. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2023. Available at: <http://www.anzdata.org.au>

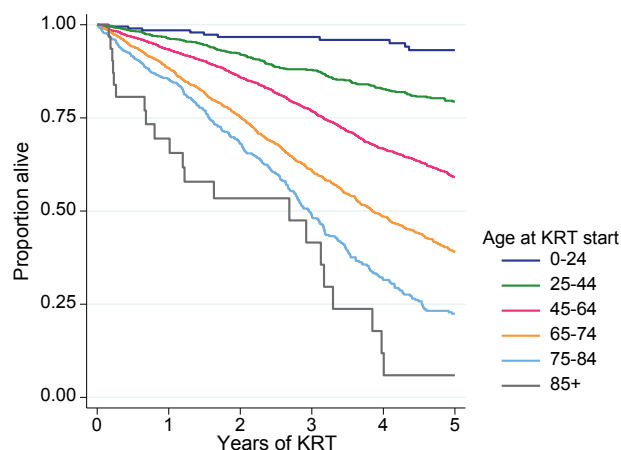
# SURVIVAL

Overall survival for patients who started kidney replacement therapy (KRT) in the period 2013-2022 is shown in figure 3.1 using the Kaplan-Meier method to calculate survival curves. Table 3.1 shows the survival at 1, 2 and 5 years for incident kidney replacement therapy patients by age group of the same period. These data are not censored at transplantation.

**Figure 3.1.1**  
**Survival on Kidney Replacement Therapy - Australia 2013-2022**



**Figure 3.1.2**  
**Survival on Kidney Replacement Therapy - New Zealand 2013-2022**



**Table 3.1**  
**Survival [95% CI] Among People Who Commenced Kidney Replacement Therapy 2013-2022**

Age at KRT start	Years	Australia	New Zealand
0-24	1	98 [96, 98]	99 [95, 100]
	2	97 [95, 98]	97 [93, 99]
	5	95 [93, 96]	93 [87, 96]
25-44	1	96 [96, 97]	96 [95, 97]
	2	92 [91, 93]	92 [90, 94]
	5	84 [83, 86]	79 [76, 82]
45-64	1	94 [93, 94]	93 [92, 94]
	2	87 [87, 88]	86 [84, 87]
	5	69 [68, 70]	59 [57, 61]
65-74	1	89 [89, 90]	88 [87, 90]
	2	79 [78, 80]	75 [73, 78]
	5	51 [50, 53]	39 [36, 42]
75-84	1	85 [84, 86]	85 [82, 88]
	2	72 [71, 73]	68 [64, 72]
	5	35 [33, 37]	22 [18, 27]
85+	1	82 [79, 85]	69 [49, 83]
	2	62 [57, 66]	53 [33, 70]
	5	19 [15, 23]	6 [0, 23]

## DEATH RATES

Unadjusted death rates for dialysis and transplantation during 2022 are shown in table 3.2 for various groups. This table includes all episodes of dialysis and transplantation (i.e. analyses are not censored at first transplant date), and deaths are attributed to the modality in use at the time of death. For this table, episodes of treatment include all people treated in 2022, regardless of year of first treatment.

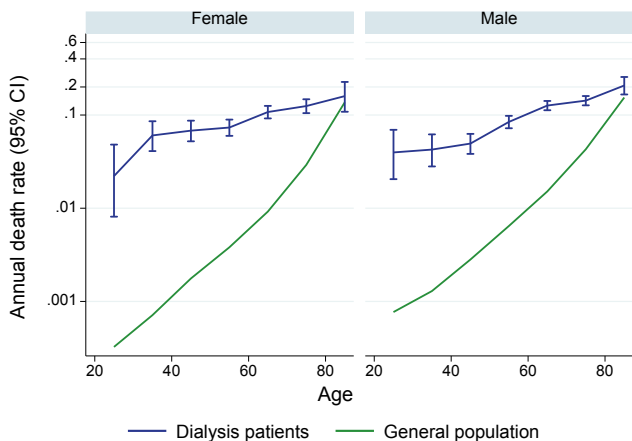
Comparisons of mortality rates with the general population (stratified by gender) are shown in figures 3.2 and 3.3. Transplant survival is described in more detail in the Kidney Transplantation chapter of the Report.

Population and death estimates for Australia and New Zealand used for the calculation of mortality rates in this chapter were sourced from the Australian Bureau of Statistics (2022)<sup>1,2</sup> and Stats NZ (2022)<sup>3,4</sup>.

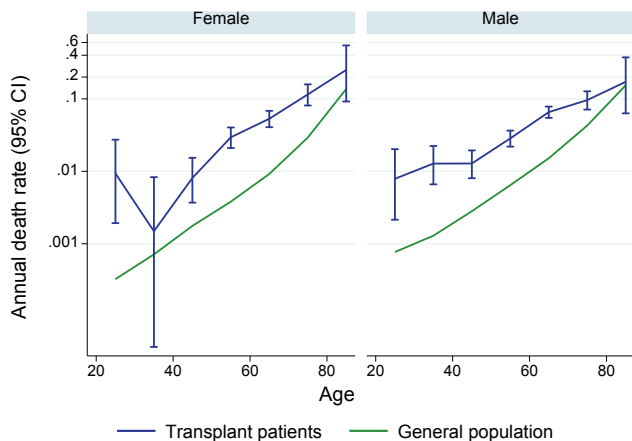
**Table 3.2**  
**Death Rates [95% CI] per 100 patient-years during Kidney Replacement Therapy - 2022**

Category	Level	Dialysis	Transplant
Country	Australia	9.8 [9.3, 10.3]	3.3 [3.0, 3.6]
	New Zealand	11.8 [10.7, 13.1]	4.2 [3.4, 5.2]
Age	<25	1.7 [0.6, 4.0]	0.6 [0.2, 1.6]
	25-44	5.1 [4.2, 6.1]	0.8 [0.5, 1.2]
	45-64	7.8 [7.1, 8.5]	2.4 [2.0, 2.8]
	65-84	13.1 [12.3, 13.9]	7.2 [6.4, 8.0]
	85+	19.4 [16.1, 23.1]	18.2 [9.4, 31.9]
Diabetes status	Non-diabetic	7.1 [6.5, 7.7]	2.5 [2.2, 2.8]
	Type 1 diabetes	11.9 [9.6, 14.6]	3.4 [2.3, 4.8]
	Type 2 diabetes	12.8 [12, 13.5]	6.1 [5.4, 6.9]
Coronary disease	No	7.4 [6.9, 7.9]	2.5 [2.2, 2.7]
	Yes	14.3 [13.4, 15.2]	7.2 [6.3, 8.1]

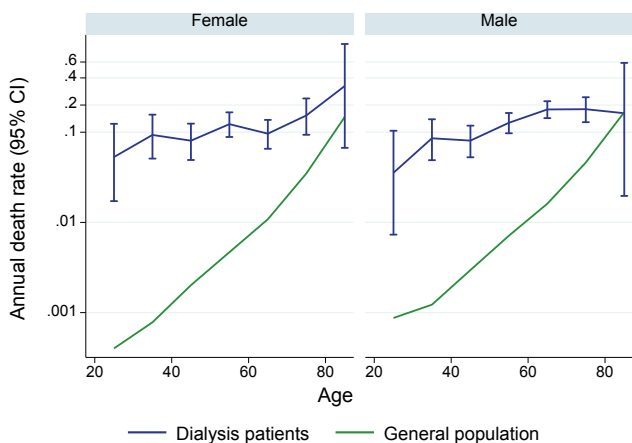
**Figure 3.2.1**  
**Prevalent Dialysis Mortality 2022 - Australian Patients vs General Population**



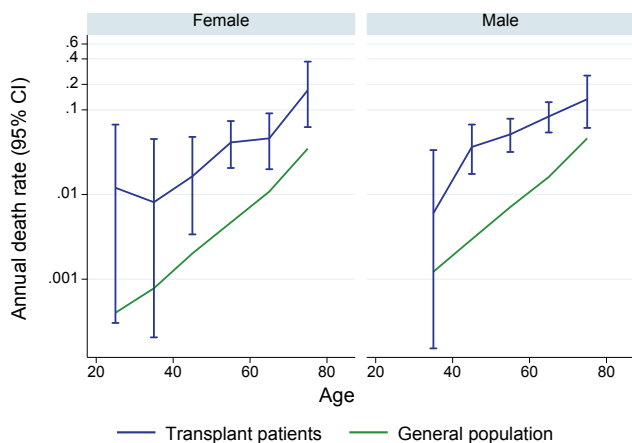
**Figure 3.2.2**  
**Prevalent Transplant Mortality 2022 - Australian Patients vs General Population**



**Figure 3.3.1**  
**Prevalent Dialysis Mortality 2022 - New Zealand Patients vs General Population**

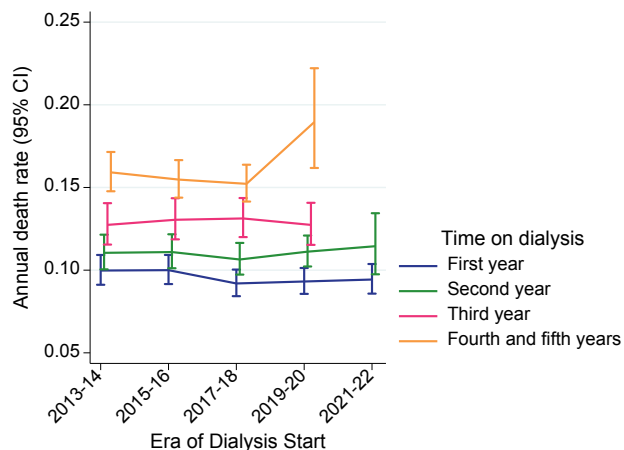


**Figure 3.3.2**  
**Prevalent Transplant Mortality 2022 - New Zealand Patients vs General Population**

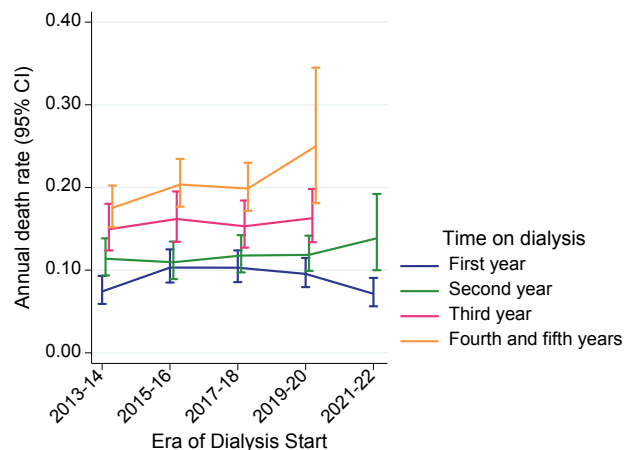


The evolution of dialysis mortality rates over time is shown in figure 3.4.

**Figure 3.4.1**  
**Dialysis Mortality Rates in Australia - 2013-2022**



**Figure 3.4.2**  
**Dialysis Mortality Rates in New Zealand - 2013-2022**



## MEDIAN SURVIVAL

Another perspective on survival during dialysis is presented in table 3.3. Median survival is the time to which 50% of people can expect to survive. Median survival is not presented for transplant recipients as it is not possible to estimate due to the low mortality rates. Table 3.4 shows the median survival of older people who started dialysis treatment, by various categories. These survival data are censored at the time of transplantation, and include those who started dialysis in the period 2013-2022. In addition to the median, the 25th and 75th centiles are included to give an indication of the range of observed survivals. Some figures are not observed - for example if half of a cohort have not yet died it is not possible to observe a median survival. These occurrences are indicated by \* in the tables. The survival times amongst younger people are likely to be strongly affected by the selection bias (fitter people will be progressively transplanted and not be included in the analysis from that point).

**Table 3.3**  
**Median Survival on Dialysis by Age 2013-2022**

Country	Age at start	Median (25th and 75th centiles), years
Australia	0-24	9.2 (6.8, *)
	25-44	9.1 (5.2, *)
	45-64	6.4 (3.3, 10.0)
	65-74	4.8 (2.3, 7.6)
	75-84	3.6 (1.8, 6.1)
	85+	2.6 (1.4, 4.5)
New Zealand	0-24	*(6.8, *)
	25-44	8.0 (4.4, *)
	45-64	5.1 (2.9, 8.1)
	65-74	3.7 (1.9, 6.2)
	75-84	3.0 (1.5, 4.5)
	85+	2.7 (0.7, 3.3)

**Table 3.4**  
**Survival on Dialysis by Age and Comorbidity Amongst Older People; Years (Median, 25th and 75th centiles) 2013-2022**

Age at start	Any Vascular Disease	Diabetes	Australia	New Zealand
65-69	No	No	5.9 (3.2, 8.5)	5.6 (2.6, 9.2)
	No	Yes	5.4 (2.9, 7.8)	4.4 (2.5, *)
	Yes	No	4.4 (1.7, 7.3)	4.0 (1.9, 7.6)
	Yes	Yes	4.2 (2.1, 6.8)	3.3 (1.7, 5.7)
70-74	No	No	5.8 (3.0, 9.6)	4.4 (2.3, 6.1)
	No	Yes	5.4 (2.7, 8.4)	4.8 (2.5, 7.9)
	Yes	No	4.7 (2.1, 7.4)	2.7 (1.5, 4.8)
75-79	Yes	Yes	3.7 (1.8, 6.4)	3.0 (1.5, 5.5)
	No	No	4.6 (2.6, 7.6)	3.5 (2.2, 4.6)
	No	Yes	4.4 (2.2, 7.2)	3.5 (2.6, 6.5)
	Yes	No	3.6 (1.7, 6.6)	2.7 (1.3, 4.6)
80-84	Yes	Yes	3.1 (1.5, 5.4)	2.8 (1.5, 3.8)
	No	No	3.7 (1.9, 6.2)	4.1 (1.7, 5.2)
	No	Yes	3.9 (2.0, 5.3)	2.8 (1.4, 6.5)
	Yes	No	3.3 (1.5, 5.9)	2.1 (1.1, 3.9)
85+	Yes	Yes	3.0 (1.3, 4.7)	1.6 (1.2, 3.5)
	No	No	3.2 (1.7, 4.6)	4.0 (0.2, 4.0)
	No	Yes	3.7 (1.8, 5.9)	1.0 (0.7, 1.6)
	Yes	No	2.4 (1.2, 4.6)	2.9 (0.7, 3.2)
	Yes	Yes	2.3 (1.4, 4.0)	2.7 (0.3, 3.8)

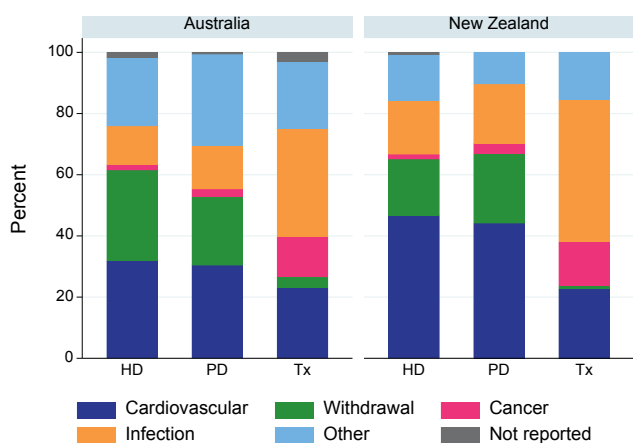
[BACK TO CONTENTS](#)

# CAUSE OF DEATH

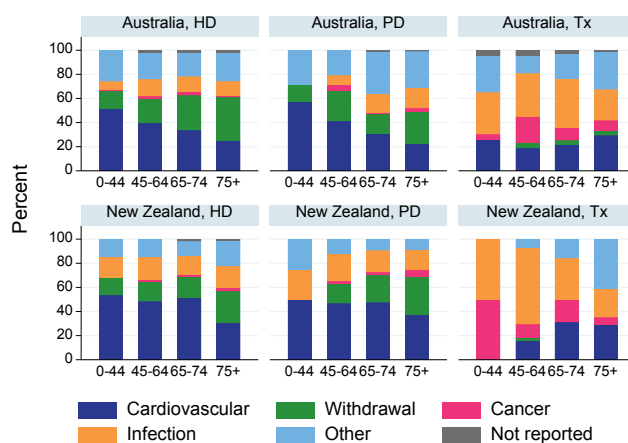
The focus of this section is on deaths reported during 2022. The cause of death reported to ANZDATA is not necessarily the same as that reported on the death certificate<sup>5</sup>. ANZDATA specifically records a range of reasons for “withdrawal from treatment”. The cause of death in these instances is a person’s underlying kidney failure, however, these data help to understand the reasons why individuals choose to cease kidney replacement therapy. This often relates to an underlying comorbidity and is further explored in table 3.6.

For the purposes of these analyses, deaths were attributed to the modality in use at the time of death (figure 3.5). Figure 3.6 and table 3.5 show the relationship between cause of death and age at death.

**Figure 3.5**  
**Cause of Death by Modality - Deaths Occurring During 2022**



**Figure 3.6**  
**Cause of Death by Modality and Age at Death - Deaths Occurring During 2022**



**Table 3.5**  
**Cause of Death by Modality and Age at Death - Deaths Occurring During 2022**

Country	Cause of Death	Haemodialysis					Peritoneal Dialysis					Transplant				
		0-44	45-54	65-74	75+	Total	0-44	45-54	65-74	75+	Total	0-44	45-54	65-74	75+	Total
Australia	Cardiovascular	38	189	197	232	656	8	26	33	33	100	6	25	40	31	102
	Withdrawal	11	96	169	328	604	2	16	17	39	74	0	6	6	4	16
	Cancer	1	10	18	9	38	0	3	1	4	8	1	28	19	9	57
	Infection	5	67	73	112	257	0	5	17	25	47	8	48	73	27	156
	Other	19	105	116	217	457	4	13	37	44	98	7	19	38	33	97
	Not reported	0	9	10	17	36	0	0	1	1	2	1	6	5	1	13
	<b>Total</b>	<b>74</b>	<b>476</b>	<b>583</b>	<b>915</b>	<b>2048</b>	<b>14</b>	<b>63</b>	<b>106</b>	<b>146</b>	<b>329</b>	<b>23</b>	<b>132</b>	<b>181</b>	<b>105</b>	<b>441</b>
New Zealand	Cardiovascular	22	69	65	22	178	2	23	21	18	64	0	7	10	5	22
	Withdrawal	6	23	22	19	70	0	8	10	15	33	0	1	0	0	1
	Cancer	0	2	2	2	6	0	1	1	3	5	2	5	6	1	14
	Infection	7	27	20	13	67	1	11	8	8	28	2	28	11	4	45
	Other	6	21	15	15	57	1	6	4	4	15	0	3	5	7	15
	Not reported	0	0	2	1	3	0	0	0	0	0	0	0	0	0	0
	<b>Total</b>	<b>41</b>	<b>142</b>	<b>126</b>	<b>72</b>	<b>381</b>	<b>4</b>	<b>49</b>	<b>44</b>	<b>48</b>	<b>145</b>	<b>4</b>	<b>44</b>	<b>32</b>	<b>17</b>	<b>97</b>

[BACK TO CONTENTS](#)



## WITHDRAWAL FROM KIDNEY REPLACEMENT THERAPY

During 2022 there were 694 deaths in Australia and 104 in New Zealand attributed to withdrawal from kidney replacement therapy (table 3.6). The vast majority of these were among patients receiving dialysis therapy. “Psychosocial” reasons were the most cited reasons for withdrawal. However, the coding of these categories is clearly somewhat subjective. Table 3.7 shows a breakdown of patients who withdrew and died in 2022 by age and duration of KRT.

**Table 3.6**  
**Reason for Withdrawal from Kidney Replacement Therapy - 2022**

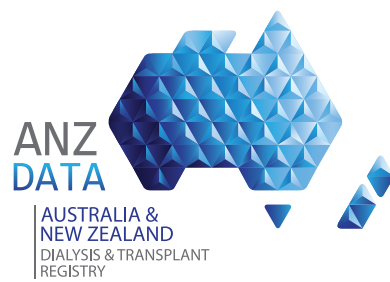
Country	Reason for withdrawal	HD	PD	Tx
Australia	Psychosocial	234	30	3
	Declined further treatment	12	4	3
	Cardiovascular comorbidity	164	19	1
	Cerebrovascular comorbidity	50	5	3
	Peripheral vascular comorbidity	51	8	0
	Malignancy	76	8	6
	Dialysis access difficulties	17	0	0
New Zealand	Psychosocial	22	11	0
	Declined further treatment	2	0	1
	Cardiovascular comorbidity	20	5	0
	Cerebrovascular comorbidity	1	5	0
	Peripheral vascular comorbidity	15	9	0
	Malignancy	10	3	0
	Dialysis access difficulties	0	0	0

**Table 3.7**  
**Time from Kidney Replacement Therapy Start to Death, in Patients Who Withdrew and Died in 2022**

Time from first KRT (years)	Australia					New Zealand				
	0-44	45-54	65-74	75+	Total	0-44	45-54	65-74	75+	Total
<1 year	3	11	31	37	82	0	5	2	1	8
1-2 years	2	25	24	38	89	1	2	8	8	19
2-5 years	2	40	56	122	220	3	11	11	14	39
5+ years	6	42	81	174	303	2	14	11	11	38
<b>Total</b>	<b>13</b>	<b>118</b>	<b>192</b>	<b>371</b>	<b>694</b>	<b>6</b>	<b>32</b>	<b>32</b>	<b>34</b>	<b>104</b>

## REFERENCES

1. Australian Bureau of Statistics, 2022, Quarterly Population Estimates (ERP), by State/Territory, Sex and Age, Jun 2022, viewed 20 Dec 2022, <https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/jun-2022>
2. Australian Bureau of Statistics, 2022, Deaths, Australia 2022, viewed 27 Sep 2023, <https://www.abs.gov.au/statistics/people/population/deaths-australia/2022>
3. This work is based on/includes Stats NZ's data which are licensed by Stats NZ for re-use under the Creative Commons Attribution 4.0 International licence. Stats NZ, 2022, Estimated Resident Population by Age and Sex (1991+) (Annual-Jun), NZ Infoshare, viewed 20 Dec 2022, <http://infoshare.stats.govt.nz/>
4. This work is based on/includes Stats NZ's data which are licensed by Stats NZ for re-use under the Creative Commons Attribution 4.0 International licence. Stats NZ, 2022, Deaths by Age and Sex (Annual-Dec), NZ Infoshare, viewed 27 Sep 2023, <http://infoshare.stats.govt.nz/>
5. Sypek MP, Dansie KB, Clayton P, Webster AC, McDonald S. Comparison of cause of death between ANZDATA and the Australian National Death Index. Nephrology. 2018 Mar 1. doi: 10.1111/nep.13250.



# CHAPTER 3

Mortality in Kidney Failure with  
Replacement Therapy