



# 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*

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## Summary and Highlights

The survival of people on Kidney Replacement Therapy (KRT) continues to vary widely based on age at commencement. Even so, the mortality rate for people on KRT is greater than the general population across all age groups.

The overall unadjusted mortality rate is 3-5 times higher in those on dialysis compared to kidney transplantation, though this difference decreases with advancing age. Both vascular disease and diabetes mellitus are associated with shorter median survival than those without these comorbidities.

The most frequent cause of death varied based on KRT modality. For those on dialysis in Australia, the most common cause of death was cardiovascular disease. In New Zealand, the most common cause of death was the other category. For those with a Kidney Transplant, the most common cause of death in Australia was other and in New Zealand it was cancer. For people who withdrew from KRT, the most common reasons were psychosocial. Of the people who withdrew in Australia, most people had been on dialysis for greater than five years and in New Zealand greater than 2 years.

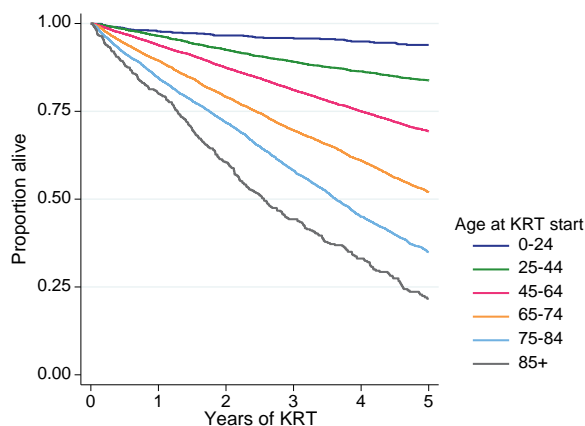
## Suggested Citation

ANZDATA Registry. 45th Report, Chapter 3: Mortality in Kidney Failure with Replacement Therapy. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2022. Available at: <http://www.anzdata.org.au>

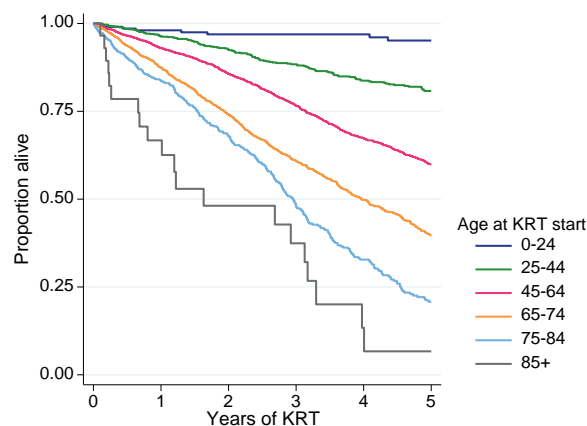
## Survival

Overall survival for patients who started kidney replacement therapy (KRT) in the period 2012-2021 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 2012-2021**



**Figure 3.1.2 - Survival on Kidney Replacement Therapy - New Zealand 2012-2021**



**Table 3.1 Survival (95% CI) Among People Who Commenced Kidney Replacement Therapy 2012-2021**

Age at KRT start	Years	Australia	New Zealand
0-24	1	98 (97, 99)	98 (95, 99)
	2	97 (95, 98)	97 (93, 99)
	5	94 (92, 95)	95 (90, 98)
25-44	1	96 (96, 97)	96 (95, 97)
	2	93 (92, 93)	93 (90, 94)
	5	84 (82, 85)	81 (77, 84)
45-64	1	94 (93, 94)	93 (92, 94)
	2	87 (87, 88)	86 (84, 87)
	5	69 (68, 70)	60 (58, 62)
65-74	1	89 (89, 90)	87 (86, 89)
	2	79 (78, 80)	74 (72, 76)
	5	52 (51, 53)	40 (36, 43)
75-84	1	84 (83, 85)	84 (80, 87)
	2	72 (70, 73)	68 (63, 72)
	5	35 (33, 37)	21 (16, 26)
85+	1	80 (77, 83)	67 (46, 81)
	2	60 (56, 65)	48 (27, 66)
	5	22 (17, 26)	7 (0, 25)

## Death Rates

Unadjusted death rates for dialysis and transplantation during 2021 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 2021, regardless of year of first treatment.

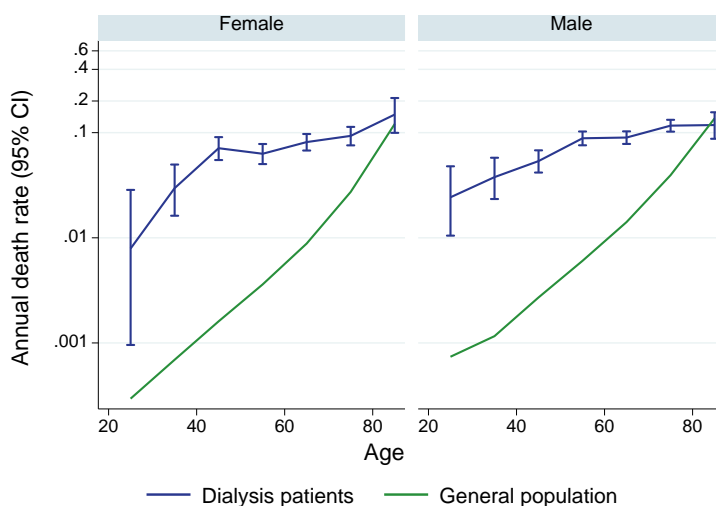
Comparisons of mortality rates with the general population (stratified by gender) are shown in figures 3.2 and 3.3. Transplant survival is described in more detail in the Kidney Transplantation chapter of the Report.

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 (2021)<sup>1,2</sup> and Stats NZ (2021)<sup>3,4</sup>.

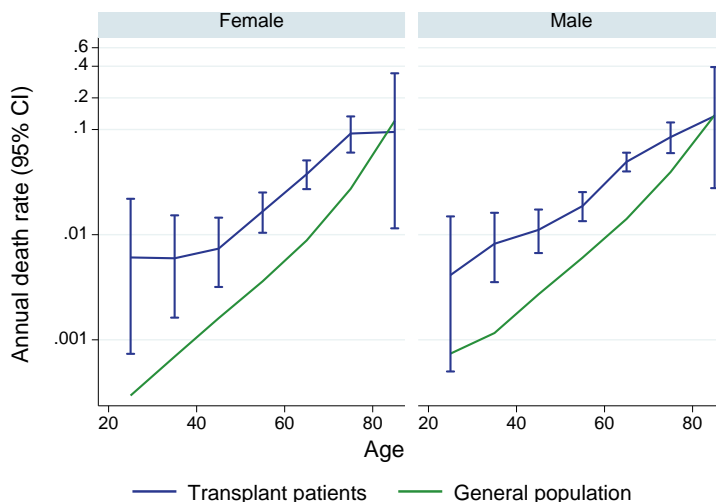
**Table 3.2 Death Rates per 100 patient-years during Kidney Replacement Therapy - 2021**

Category	Level	Dialysis			Transplant		
		Rate	Lower CI	Upper CI	Rate	Lower CI	Upper CI
Country	Australia	8.0	7.5	8.4	2.4	2.1	2.7
	New Zealand	10.3	9.2	11.5	2.1	1.5	2.8
Age	<25	2.3	0.8	4.9	0.3	0.0	1.1
	25-44	3.1	2.4	3.9	0.6	0.3	0.9
	45-64	7.6	6.9	8.2	1.4	1.1	1.7
	65-84	10.3	9.6	11.0	5.4	4.7	6.1
	85+	12.9	10.2	16.0	12.2	4.5	26.6
Diabetes status	Non-diabetic	6.0	5.5	6.6	1.7	1.4	1.9
	Type 1 diabetes	10.6	8.4	13.2	2.5	1.6	3.8
	Type 2 diabetes	10.3	9.7	11.0	4.1	3.5	4.8
Coronary disease	No	5.6	5.2	6.1	1.6	1.4	1.9
	Yes	12.3	11.5	13.1	5.0	4.3	5.9

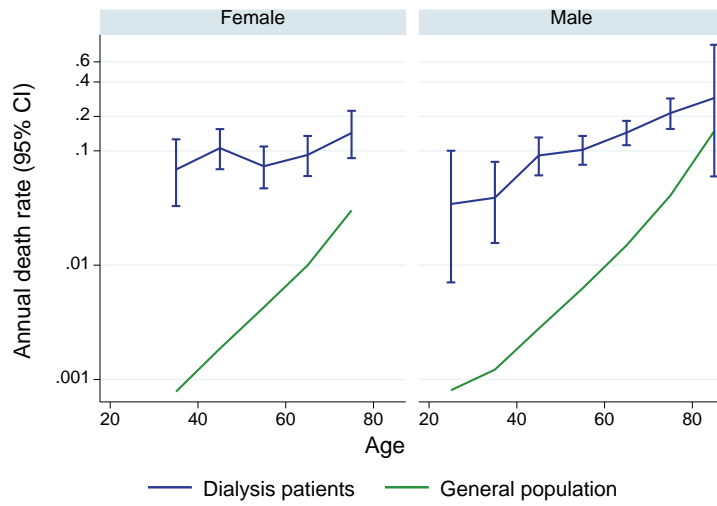
**Figure 3.2.1 - Prevalent Dialysis Mortality - Australian Patients vs General Population**



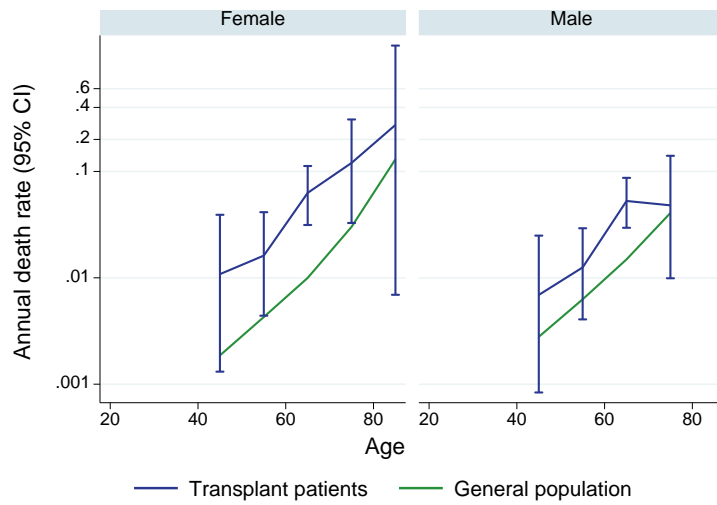
**Figure 3.2.2 - Prevalent Transplant Mortality - Australian Patients vs General Population**



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

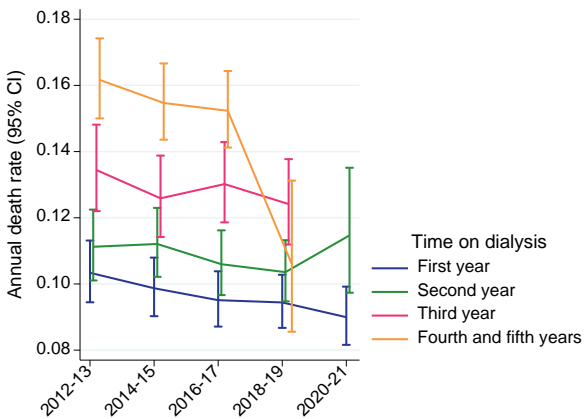


**Figure 3.3.2 - Prevalent Transplant Mortality - New Zealand Patients vs General Population**

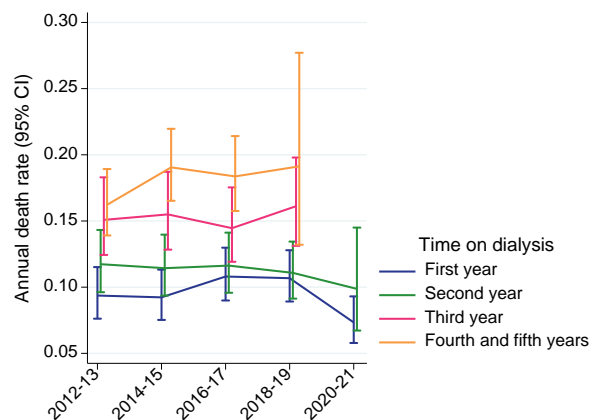


The evolution of mortality rates over time is shown in figure 3.4.

**Figure 3.4.1 - Dialysis Mortality Rates in Australia - 2012-2021**



**Figure 3.4.2 - Dialysis Mortality Rates in New Zealand - 2012-2021**



## 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 2012-2021. 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 2012-2021**

Country	Age at start	Median (25th and 75th centiles), years
Australia	0-24	* (6.8, *)
	25-44	8.9 (5.0, *)
	45-64	6.4 (3.3, *)
	65-74	4.8 (2.3, 7.8)
	75-84	3.6 (1.8, 6.2)
	85+	2.6 (1.3, 4.6)
New Zealand	0-24	9.5 (9.0, 9.5)
	25-44	8.9 (4.9, *)
	45-64	5.2 (2.9, 8.3)
	65-74	3.8 (1.9, 6.5)
	75-84	3.0 (1.5, 4.5)
	85+	1.6 (0.7, 3.3)

**Table 3.4 Survival on Dialysis by Age and Comorbidity Amongst Older People; Years (Median, 25th and 75th centiles) 2012-2021**

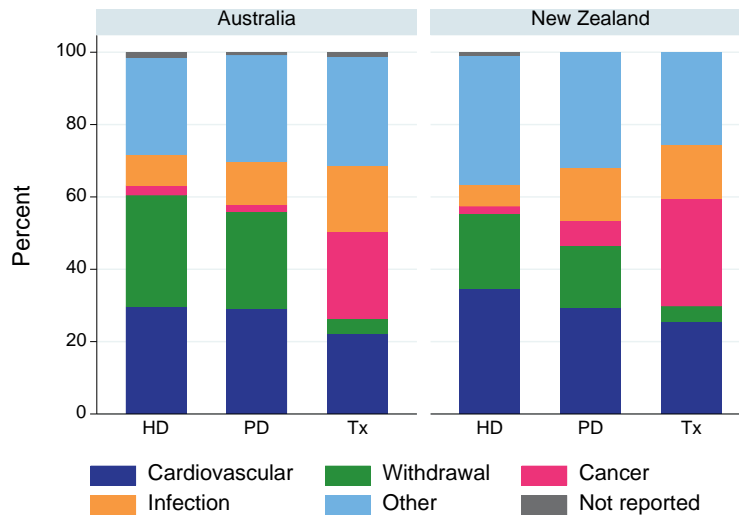
Age at Start	Any Vascular Disease	Diabetes	Australia	New Zealand
65-69	No	No	6.0 (3.3, *)	6.1 (2.6, *)
	No	Yes	5.5 (3.1, 8.2)	4.6 (2.4, 7.4)
	Yes	No	4.4 (1.6, 7.6)	4.3 (1.8, *)
	Yes	Yes	4.2 (2.1, 6.9)	3.3 (1.7, 5.8)
70-74	No	No	6.2 (2.9, *)	4.4 (2.1, 6.7)
	No	Yes	5.5 (2.7, 8.0)	4.8 (2.3, 8.0)
	Yes	No	4.7 (2.1, 7.8)	2.6 (1.5, 4.8)
	Yes	Yes	3.8 (1.8, 6.7)	3.2 (1.5, 5.5)
75-79	No	No	4.7 (2.6, 7.2)	3.6 (2.3, 5.7)
	No	Yes	4.5 (2.2, 7.0)	3.5 (2.6, 6.5)
	Yes	No	3.7 (1.7, 6.5)	3.0 (1.3, 4.6)
	Yes	Yes	3.2 (1.4, 5.4)	2.8 (1.4, 3.8)
80-84	No	No	3.6 (1.8, 5.9)	4.1 (1.2, 5.0)
	No	Yes	3.6 (1.8, 5.3)	2.4 (0.7, 6.5)
	Yes	No	3.5 (1.5, 6.2)	2.4 (1.4, 4.2)
	Yes	Yes	3.0 (1.4, 4.8)	1.6 (0.6, 3.1)
85+	No	No	2.9 (1.6, 6.0)	4.0 (0.2, 4.0)
	No	Yes	3.7 (1.9, 5.6)	1.0 (0.7, 1.6)
	Yes	No	2.4 (1.0, 4.7)	1.2 (0.7, 3.1)
	Yes	Yes	2.2 (1.2, 4.4)	2.7 (0.3, 5.0)

## Cause of Death

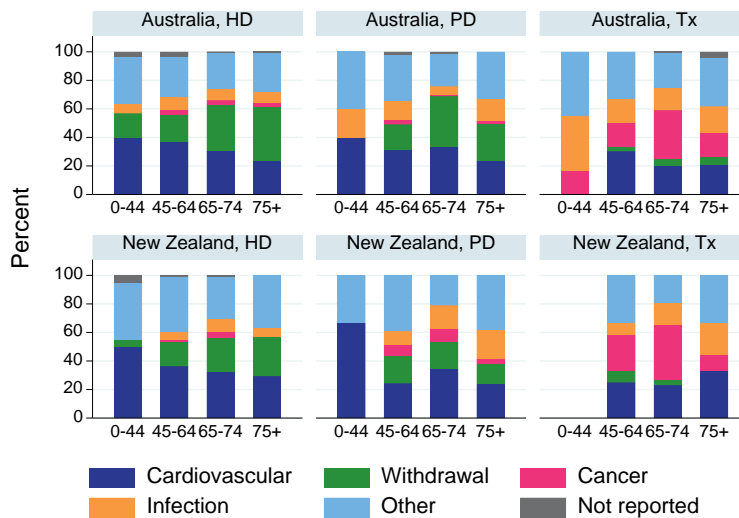
The focus of this section is on deaths reported during 2021. The cause of death reported to ANZDATA is not necessarily the same as that reported on the death certificate<sup>5</sup>. ANZDATA specifically records a range of reasons for “withdrawal from treatment”. The cause of death in these instances 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 2021**



**Figure 3.6 - Cause of Death by Modality and Age at Death - Deaths Occurring During 2021**





**Table 3.5 Cause of Death by Modality and Age at Death - Deaths Occurring During 2021**

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	23	174	150	170	517	2	19	29	24	74	0	27	27	16	70
	Withdrawal	10	89	158	276	533	0	11	31	26	68	0	3	6	4	13
	Cancer	0	14	16	18	48	0	2	1	2	5	3	15	45	13	76
	Infection	4	43	40	59	146	1	8	5	16	30	7	15	21	14	57
	Other	19	132	123	193	467	2	20	20	33	75	8	29	32	26	95
	Not reported	2	15	3	6	26	0	1	1	0	2	0	0	1	3	4
	<b>Total</b>		58	467	490	722	1737	5	61	87	101	254	18	89	132	76
New Zealand	Cardiovascular	10	44	29	20	103	2	10	15	7	34	0	3	6	3	12
	Withdrawal	1	21	21	19	62	0	8	8	4	20	0	1	1	0	2
	Cancer	0	2	4	0	6	0	3	4	1	8	0	3	10	1	14
	Infection	0	6	8	4	18	0	4	7	6	17	0	1	4	2	7
	Other	8	47	26	25	106	1	16	9	11	37	0	4	5	3	12
	Not reported	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0
	<b>Total</b>		20	121	89	68	298	3	41	43	29	116	0	12	26	9

### Withdrawal from Kidney Replacement Therapy

During 2021 there were 614 deaths in Australia and 84 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 2021 by age and duration of KRT.

**Table 3.6 Reason for Withdrawal from Kidney Replacement Therapy - 2021**

Country	Reason for withdrawal	HD	PD	Graft
Australia	Withdrawal-Psycho Social Reasons	196	23	4
	Patient Refused Treatment (Specify)	15	1	1
	Withdrawal-Cardiovascular Comorbid Conditions	138	15	1
	Withdrawal-Cerebrovascular Comorbid Conditions	35	7	0
	Withdrawal-Peripheral Vascular Comorbid Conditions	35	12	1
	Withdrawal-Malignancy	100	9	6
	Withdrawal-Dialysis Access Difficulties	14	1	0
New Zealand	Withdrawal-Psycho Social Reasons	18	5	1
	Patient Refused Treatment (Specify)	0	0	0
	Withdrawal-Cardiovascular Comorbid Conditions	18	2	0
	Withdrawal-Cerebrovascular Comorbid Conditions	8	1	0
	Withdrawal-Peripheral Vascular Comorbid Conditions	11	8	0
	Withdrawal-Malignancy	6	4	1
	Withdrawal-Dialysis Access Difficulties	1	0	0

**Table 3.7 Time from Kidney Replacement Therapy Start to Death, in Patients Who Withdrew and Died in 2021**

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	4	19	28	37	<b>88</b>	0	8	4	1	<b>13</b>
1-2 years	0	16	33	38	<b>87</b>	0	4	5	4	<b>13</b>
2-5 years	3	26	49	89	<b>167</b>	0	12	12	10	<b>34</b>
5+ years	3	42	85	142	<b>272</b>	1	6	9	8	<b>24</b>
<b>Total</b>	<b>10</b>	<b>103</b>	<b>195</b>	<b>306</b>	<b>614</b>	<b>1</b>	<b>30</b>	<b>30</b>	<b>23</b>	<b>84</b>

## References

<sup>1</sup> Australian Bureau of Statistics, 2021, Quarterly Population Estimates (ERP), by State/Territory, Sex and Age, Jun 2021, viewed 22 Dec 2021, <https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/jun-2021>

<sup>2</sup> Australian Bureau of Statistics, 2021, Deaths, Australia 2021, viewed 13 Oct 2022, <https://www.abs.gov.au/statistics/people/population/deaths-australia/2021>

<sup>3</sup> 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, 2021, Estimated Resident Population by Age and Sex (1991+) (Annual-Jun), NZ Infoshare, viewed 5 Jan 2022, <http://infoshare.stats.govt.nz/>

<sup>4</sup> 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, 2021, Deaths by Age and Sex (Annual-Dec), NZ Infoshare, viewed 14 Oct 2022, <http://infoshare.stats.govt.nz/>

<sup>5</sup> 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.