



# CHAPTER 1

## Incidence of Renal Replacement Therapy for End Stage Kidney Disease

*Summarising the number of incident renal replacement therapy patients in Australia and New Zealand, the rate per million population and the demographic and clinical characteristics of incident patients.*

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## Suggested citation

ANZDATA Registry. 41st Report, Chapter 1: Incidence of End Stage Kidney Disease. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2018. Available at:  
<http://www.anzdata.org.au>

## Stock and Flow

Tables 1.1 and 1.2 show the stock and flow of renal replacement therapy (RRT) patients by country and by state as well as the incidence and prevalence rates per million population (pmp). In Australia in 2017 there were 3056 new RRT patients, with an overall incidence rate of 124 per million population. This rate has continued a long trend of increasing RRT incidence. In New Zealand there were 615 new patients (128 pmp). The rate in New Zealand is subject to more annual variation due to lower numbers.

The number of prevalent patients in each country also continues to climb; in Australia at the end of 2017 there were 24738 (1006 pmp) patients receiving RRT, and in New Zealand there were 4658 (972 pmp).

Population estimates for Australia and New Zealand used throughout this chapter for the calculation of incidence per million population were sourced from the Australian Bureau of Statistics (2017)<sup>1</sup> and Stats NZ (2017)<sup>2</sup>.

**Table 1.1 Stock and Flow 2013-2017 (pmp)**

Country	Event	2013	2014	2015	2016	2017
Australia	<b>Total New Patients</b>	<b>2624 (113)</b>	<b>2770 (118)</b>	<b>2751 (115)</b>	<b>2900 (120)</b>	<b>3056 (124)</b>
	<b>Total Transplants</b>	<b>883 (38)</b>	<b>913 (39)</b>	<b>949 (40)</b>	<b>1091 (45)</b>	<b>1109 (45)</b>
	Living Donor Transplants	253	267	242	264	271
	Subsequent Transplants	94	108	107	159	158
	<b>Total Deaths</b>	<b>1809</b>	<b>1845</b>	<b>1941</b>	<b>2062</b>	<b>2077</b>
	Dialysis Patients	1570	1622	1700	1812	1858
	Transplant Patients	239	223	241	250	219
	<b>Total Prevalent</b>	<b>21551 (931)</b>	<b>22373 (952)</b>	<b>23086 (968)</b>	<b>23818 (984)</b>	<b>24738 (1006)</b>
	Dialysis Patients	11883 (513)	12290 (523)	12596 (528)	12753 (527)	13051 (531)
	Transplant Patients	9668 (418)	10083 (429)	10490 (440)	11065 (457)	11687 (475)
New Zealand	<b>Total New Patients</b>	<b>556 (125)</b>	<b>557 (124)</b>	<b>562 (122)</b>	<b>572 (122)</b>	<b>615 (128)</b>
	<b>Total Transplants</b>	<b>116 (26)</b>	<b>138 (31)</b>	<b>147 (32)</b>	<b>172 (37)</b>	<b>187 (39)</b>
	Living Donor Transplants	59	72	74	82	69
	Subsequent Transplants	5	12	14	17	13
	<b>Total Deaths</b>	<b>382</b>	<b>413</b>	<b>448</b>	<b>445</b>	<b>469</b>
	Dialysis Patients	349	369	406	392	419
	Transplant Patients	33	44	42	53	50
	<b>Total Prevalent</b>	<b>4176 (940)</b>	<b>4318 (957)</b>	<b>4413 (960)</b>	<b>4535 (966)</b>	<b>4658 (972)</b>
	Dialysis Patients	2600 (585)	2689 (596)	2710 (590)	2754 (587)	2768 (577)
	Transplant Patients	1576 (355)	1629 (361)	1703 (371)	1781 (379)	1890 (394)

**Table 1.2 Stock and Flow by State and Country 2017**

State	New Patients	Transplant Operations	Deaths Dialysis	Deaths Transplant	Dialysis Dependent	Functioning Transplants	Total Prevalent
QLD	618 (125)	190 (39)	369	40	2524 (512)	2197 (446)	4721 (958)
NSW	889 (113)	367 (47)	597	79	3974 (506)	3319 (422)	7293 (928)
ACT	53 (129)	0 (0)	40	3	276 (673)	291 (709)	567 (1382)
VIC	768 (121)	364 (58)	445	55	3139 (496)	3322 (525)	6461 (1022)
TAS	55 (106)	0 (0)	40	9	216 (415)	263 (505)	479 (920)
SA	196 (114)	70 (41)	110	14	863 (501)	1065 (618)	1928 (1119)
NT	116 (471)	0 (0)	50	2	692 (2812)	111 (451)	803 (3263)
WA	361 (140)	118 (46)	207	17	1367 (530)	1119 (434)	2486 (963)
<b>Australia</b>	<b>3056 (124)</b>	<b>1109 (45)</b>	<b>1858</b>	<b>219</b>	<b>13051 (531)</b>	<b>11687 (475)</b>	<b>24738 (1006)</b>
<b>New Zealand</b>	<b>615 (128)</b>	<b>187 (39)</b>	<b>419</b>	<b>50</b>	<b>2768 (577)</b>	<b>1890 (394)</b>	<b>4658 (972)</b>

## Incident Patients

The total numbers of incident patients in Australia and New Zealand since the beginning of RRT are shown in figure 1.1.

Figure 1.1 - New Patients - Australia and New Zealand

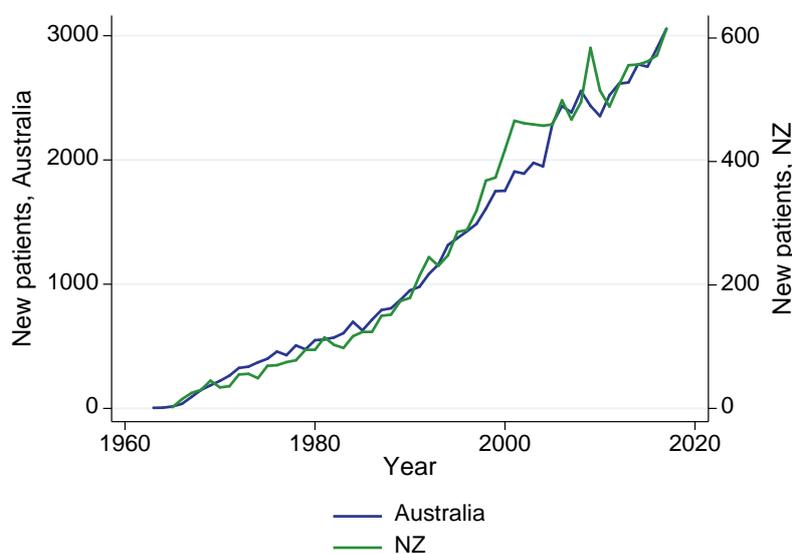


Figure 1.2 presents these data another way, showing the numbers of new patients and change in each country over the last 30 years.

Figure 1.2.1 - New Patients and Change - Australia

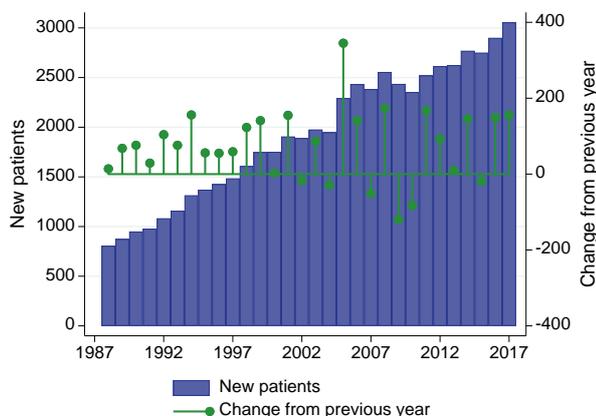


Figure 1.2.2 - New Patients and Change - New Zealand

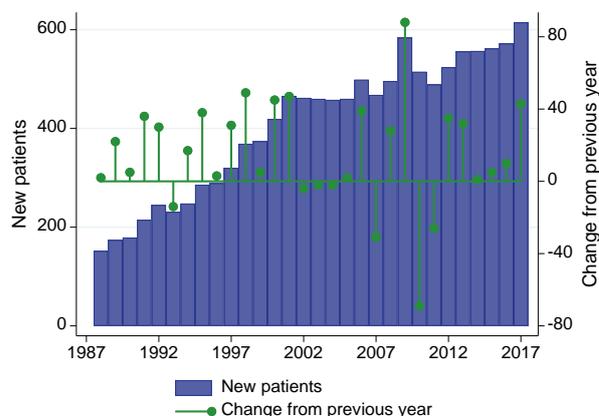


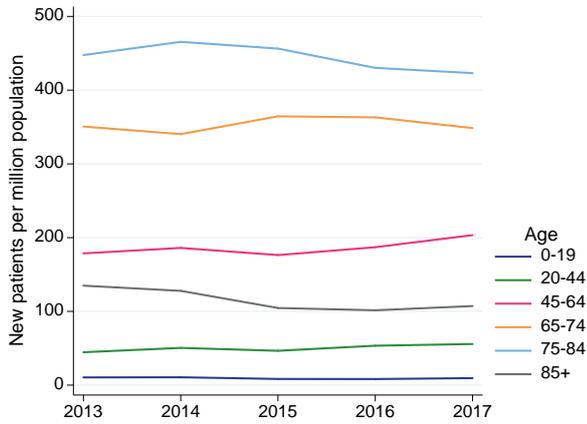
Table 1.3 shows the number of new patients (pmp) by state and country over 2013-2017. There is substantial variation in incidence rates between states, with the lowest rates in Tasmania (106 pmp in 2017) and the highest in the Northern Territory (471 pmp in 2017).

Table 1.3 RRT Incidence (pmp) 2013-2017

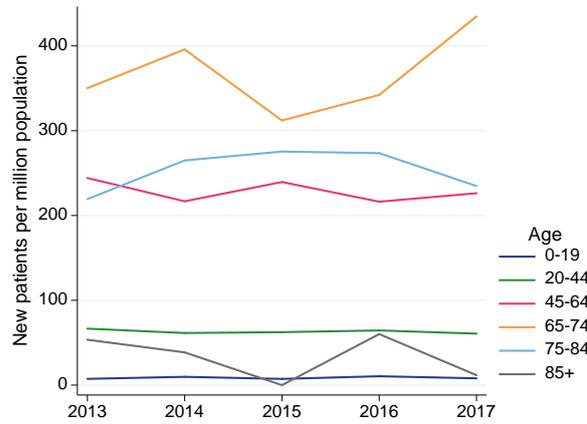
State	2013	2014	2015	2016	2017
QLD	521 (112)	537 (114)	516 (108)	523 (108)	618 (125)
NSW	810 (109)	824 (110)	835 (109)	881 (114)	889 (113)
ACT	53 (138)	72 (185)	47 (118)	69 (171)	53 (129)
VIC	661 (114)	688 (117)	674 (112)	727 (118)	768 (121)
TAS	46 (90)	45 (88)	55 (107)	57 (110)	55 (106)
SA	165 (99)	180 (107)	188 (110)	227 (133)	196 (114)
NT	88 (363)	115 (472)	130 (531)	81 (330)	116 (471)
WA	280 (112)	309 (122)	306 (120)	335 (131)	361 (140)
<b>Australia</b>	<b>2624 (113)</b>	<b>2770 (118)</b>	<b>2751 (115)</b>	<b>2900 (120)</b>	<b>3056 (124)</b>
<b>New Zealand</b>	<b>556 (125)</b>	<b>557 (124)</b>	<b>562 (122)</b>	<b>572 (122)</b>	<b>615 (128)</b>

Figure 1.3 shows incidence rates by age group, and figure 1.4 shows them by age group and state; the bars represent 95% confidence intervals. Note the different y axes for each state.

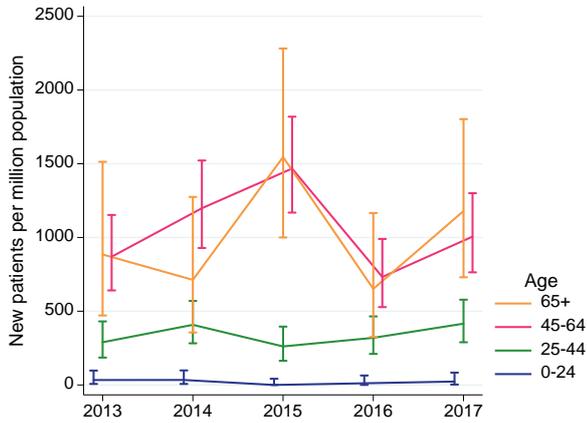
**Figure 1.3.1 - New Patients - Age Specific Rates - Australia**



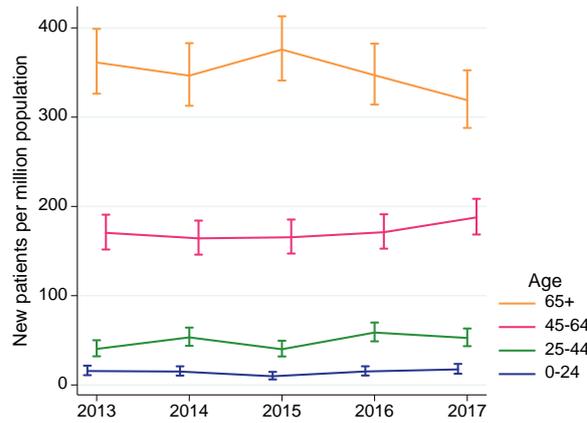
**Figure 1.3.2 - New Patients - Age Specific Rates - New Zealand**



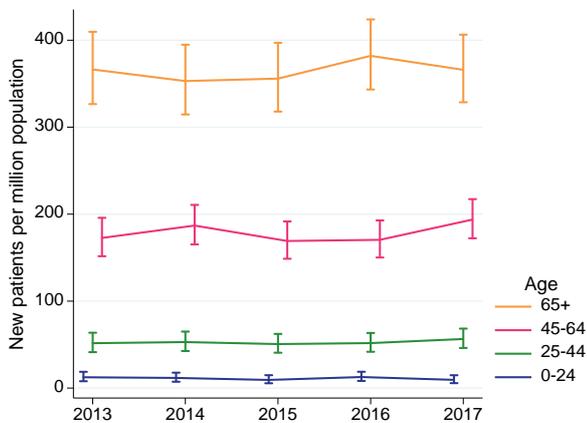
**Figure 1.4.1 - New Patients by Age Group - NT**



**Figure 1.4.2 - New Patients by Age Group - NSW**



**Figure 1.4.3 - New Patients by Age Group - VIC**



**Figure 1.4.4 - New Patients by Age Group - QLD**

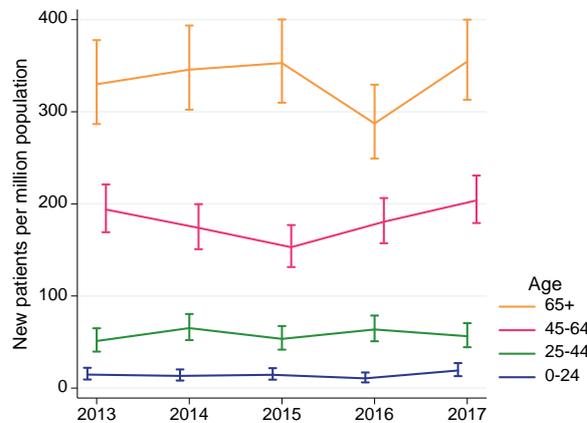


Figure 1.4.5 - New Patients by Age Group - SA

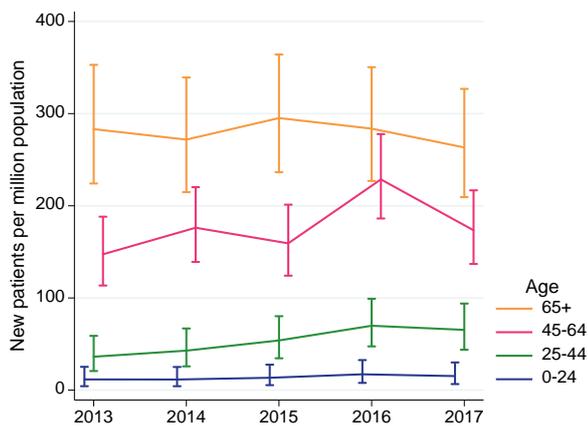


Figure 1.4.6 - New Patients by Age Group - WA

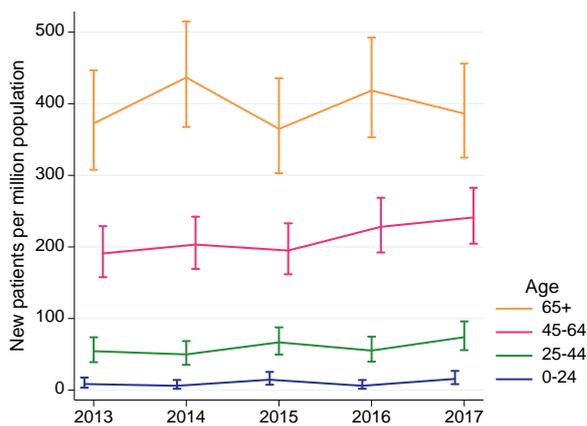


Figure 1.4.7 - New Patients by Age Group - TAS

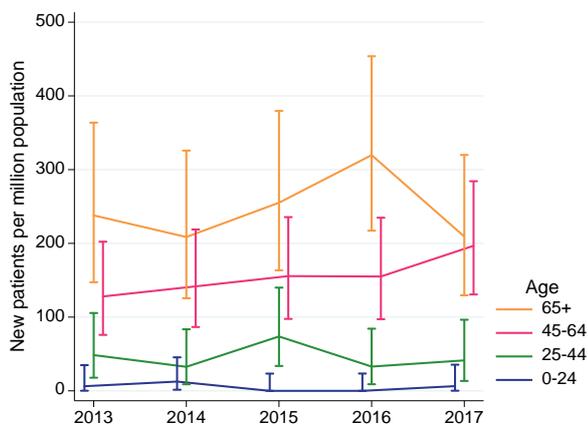
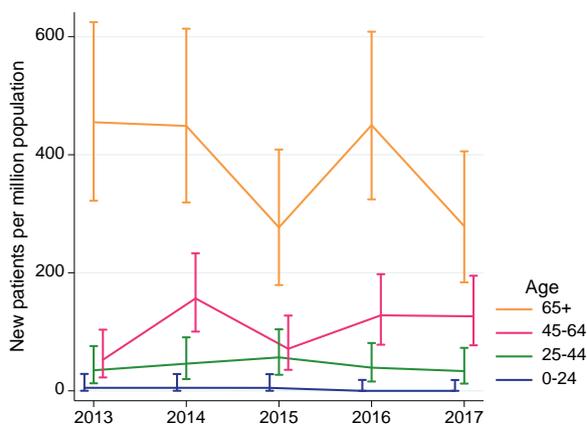


Figure 1.4.8 - New Patients by Age Group - ACT



The rates in older patients are shown in table 1.4. Incidence rates for older patients tend to be lower in New Zealand than in Australia. Finally, table 1.5 further categorises the 2017 data by gender.

Table 1.4 Incidence (pmp) of ESKD in Older Patients 2013-2017

Country	Age	2013	2014	2015	2016	2017
Australia	60-64	329 (264)	338 (267)	327 (255)	346 (265)	373 (280)
	65-69	329 (305)	347 (310)	397 (343)	405 (339)	376 (314)
	70-74	323 (414)	311 (382)	335 (394)	352 (395)	375 (391)
	75-79	270 (459)	306 (503)	311 (493)	297 (456)	333 (491)
	80-84	193 (433)	186 (415)	182 (405)	179 (393)	152 (324)
	85+	59 (135)	58 (128)	49 (105)	49 (102)	53 (107)
New Zealand	60-64	80 (332)	78 (318)	84 (336)	84 (327)	71 (268)
	65-69	79 (384)	89 (412)	67 (297)	82 (351)	111 (472)
	70-74	47 (305)	60 (375)	55 (333)	56 (329)	70 (386)
	75-79	34 (311)	39 (343)	43 (358)	42 (328)	44 (325)
	80-84	8 (97)	13 (157)	13 (156)	16 (190)	8 (93)
	85+	4 (54)	3 (39)	0 (0)	5 (60)	1 (12)

**Table 1.5 Age and Sex of New Patients 2017**

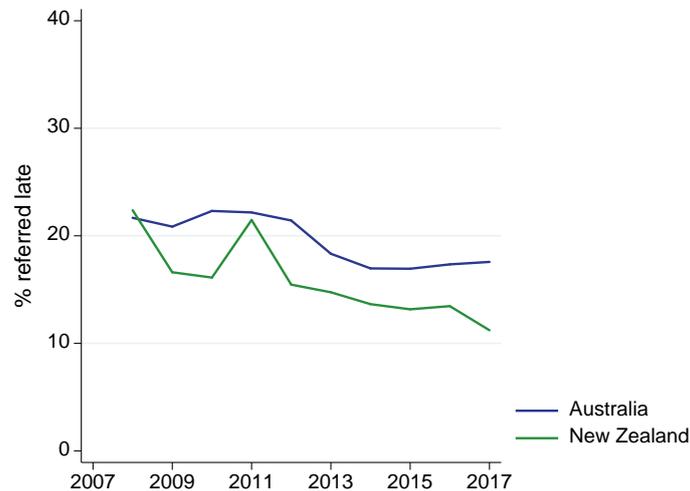
Country	Sex	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	Total	Mean	Median
Australia	F	2	15	31	71	122	204	261	265	169	17	1157	57.6	60
Australia	M	5	15	48	84	148	288	473	486	316	36	1899	59.9	62
New Zealand	F	1	3	7	16	28	59	61	58	15	1	249	54.5	56
New Zealand	M	2	2	9	23	17	74	79	123	37	0	366	58.3	61

## Late Referral

The following figures and tables examine late referral, defined as <3 months between referral to and review by a nephrologist and RRT start. Figure 1.5 shows the overall proportion of new patients referred late in Australia and New Zealand over the last 10 years. The percentage of patients referred late has been stable in Australia since 2014, whereas in New Zealand there is a downward trend. In 2017, among those with referral timing reported, 18% of Australian and 11% of New Zealand new patients were referred late. Figure 1.6 shows the variation in late referral rates across Australian states and figure 1.7 shows late referral rates by age for Australia and New Zealand.

Tables 1.6 and 1.7 show late referral rates for new patients over 2013-2017 by ethnicity and primary renal disease. Rates vary substantially between primary renal disease categories; for example, in Australia among those with referral timing reported, 7% of patients with polycystic kidney disease were referred late, compared with 15% of patients with diabetic nephropathy and 29% of patients with “other” diseases.

**Figure 1.5 - Late Referral Rates - All Incident Patients 2008 – 2017**



**Figure 1.6 - Late Referral Rates by State - Australia 2008 – 2017**

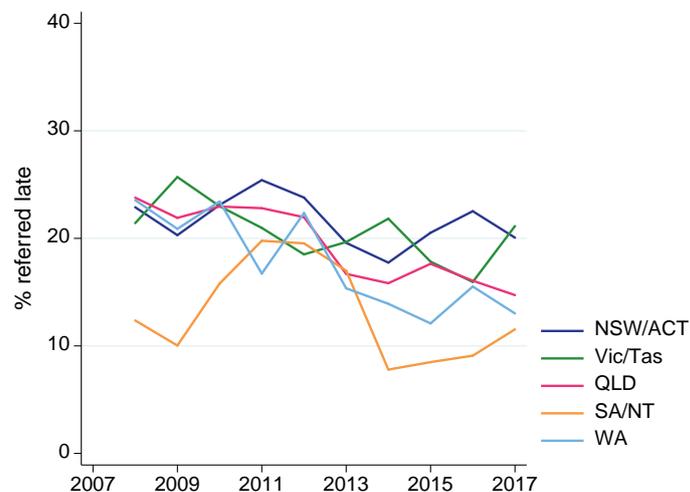


Figure 1.7.1 - Late Referral Rates by Age - Australia 2008 -2017

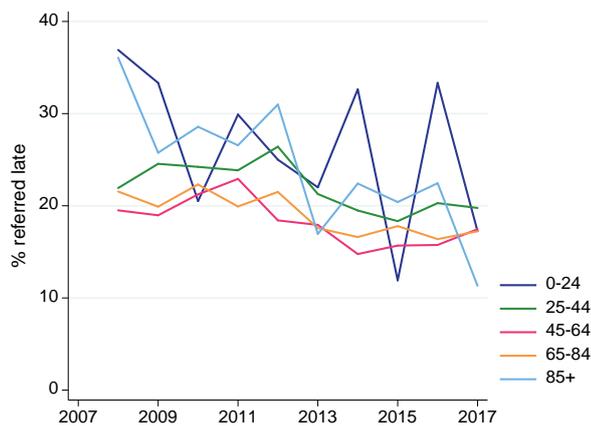


Figure 1.7.2 - Late Referral Rates by Age - New Zealand 2008 - 2017

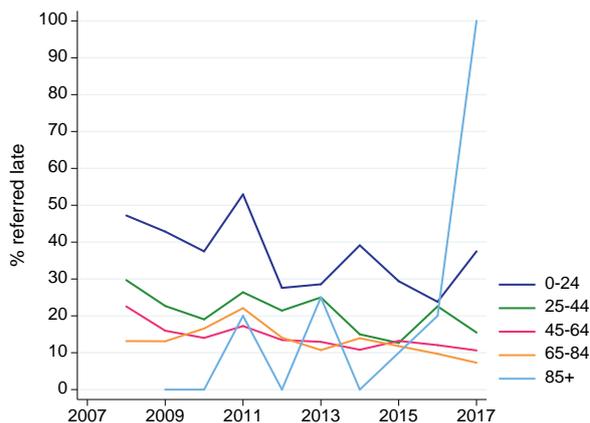


Table 1.6 Late Referral by Country and Ethnicity 2013-2017

Country	Ethnicity	Late	Not Late	Not Reported	Total
Australia	Caucasian	1593 (17%)	7513 (81%)	169 (2%)	9275
	Aboriginal/Torres Strait Islander	237 (15%)	1237 (80%)	63 (4%)	1537
	Asian	248 (17%)	1144 (81%)	26 (2%)	1418
	Māori	42 (28%)	105 (70%)	4 (3%)	151
	Pacific	98 (24%)	299 (74%)	8 (2%)	405
	Other	167 (21%)	597 (77%)	14 (2%)	778
	Not reported	72 (13%)	303 (56%)	162 (30%)	537
	<b>Total</b>	<b>2457 (17%)</b>	<b>11198 (79%)</b>	<b>446 (3%)</b>	<b>14101</b>
New Zealand	Caucasian	138 (13%)	889 (86%)	10 (1%)	1037
	Aboriginal/Torres Strait Islander	0 (0%)	3 (100%)	0 (0%)	3
	Asian	20 (9%)	212 (91%)	0 (0%)	232
	Māori	112 (13%)	746 (85%)	23 (3%)	881
	Pacific	99 (16%)	523 (84%)	4 (1%)	626
	Other	8 (12%)	58 (88%)	0 (0%)	66
	Not reported	1 (6%)	8 (47%)	8 (47%)	17
	<b>Total</b>	<b>378 (13%)</b>	<b>2439 (85%)</b>	<b>45 (2%)</b>	<b>2862</b>

Table 1.7 Late Referral by Country and Primary Renal Disease 2013-2017

Country	Primary renal disease	Late	Not Late	Not Reported	Total
Australia	Diabetic Nephropathy	765 (15%)	4357 (84%)	88 (2%)	5210
	Glomerulonephritis	454 (17%)	2128 (81%)	47 (2%)	2629
	Hypertension	330 (17%)	1557 (81%)	32 (2%)	1919
	Polycystic Disease	61 (7%)	804 (90%)	24 (3%)	889
	Reflux Nephropathy	17 (6%)	272 (92%)	8 (3%)	297
	Other	553 (28%)	1371 (70%)	36 (2%)	1960
	Uncertain	194 (28%)	502 (71%)	9 (1%)	705
	Not reported	83 (17%)	207 (42%)	202 (41%)	492
	<b>Total</b>	<b>2457 (17%)</b>	<b>11198 (79%)</b>	<b>446 (3%)</b>	<b>14101</b>
New Zealand	Diabetic Nephropathy	142 (10%)	1265 (89%)	19 (1%)	1426
	Glomerulonephritis	99 (17%)	464 (81%)	7 (1%)	570
	Hypertension	36 (14%)	220 (85%)	4 (2%)	260
	Polycystic Disease	1 (1%)	126 (97%)	3 (2%)	130
	Reflux Nephropathy	5 (8%)	59 (92%)	0 (0%)	64
	Other	73 (24%)	231 (75%)	3 (1%)	307
	Uncertain	16 (20%)	64 (78%)	2 (2%)	82
	Not reported	6 (26%)	10 (43%)	7 (30%)	23
	<b>Total</b>	<b>378 (13%)</b>	<b>2439 (85%)</b>	<b>45 (2%)</b>	<b>2862</b>

## Co-morbidities

Tables 1.8-1.10 show the co-morbidities at RRT entry of new patients in 2017. Notably, patients who have never smoked are in the minority in both countries, and non-diabetics are now also in the minority in both countries. Trends in the prevalence of these co-morbidities at RRT entry are shown in figures 1.8-1.9, with the bars representing 95% confidence intervals. In Australia, the beginning of the decade saw a steady fall in most co-morbidities which now appears to have plateaued.

**Table 1.8 Co-morbidities of New Patients 2017**

Country	Status at RRT Entry	Coronary Artery Disease	Peripheral Vascular Disease	Cerebrovascular Disease	Chronic Lung Disease
Australia	No	1964 (64%)	2374 (78%)	2700 (88%)	2586 (85%)
	Suspected	126 (4%)	169 (6%)	53 (2%)	89 (3%)
	Yes	900 (29%)	442 (14%)	234 (8%)	313 (10%)
	Not reported	66 (2%)	71 (2%)	69 (2%)	68 (2%)
New Zealand	No	408 (66%)	503 (82%)	547 (89%)	477 (78%)
	Suspected	61 (10%)	44 (7%)	14 (2%)	29 (5%)
	Yes	143 (23%)	66 (11%)	52 (8%)	107 (17%)
	Not reported	3 (0%)	2 (0%)	2 (0%)	2 (0%)

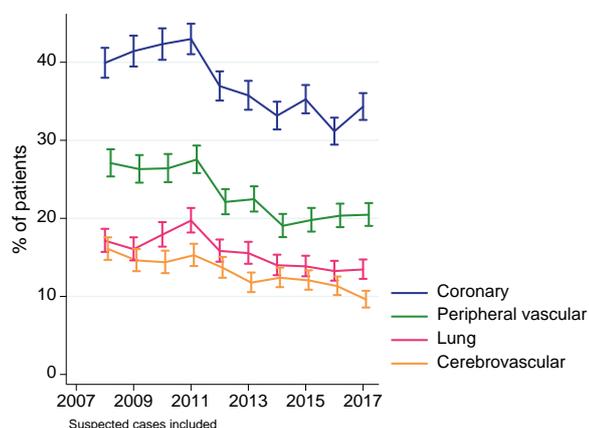
**Table 1.9 Smoking Status of New Patients 2017**

Country	Status at RRT Entry	Smoking
Australia	Current	326 (11%)
	Former	1085 (36%)
	Never	1508 (49%)
	Not reported	137 (4%)
New Zealand	Current	98 (16%)
	Former	246 (40%)
	Never	266 (43%)
	Not reported	5 (1%)

**Table 1.10 Diabetic Status of New Patients 2017**

Country	Status at RRT Entry	Diabetes
Australia	No	1467 (48%)
	Not reported	53 (2%)
	Type 1	179 (6%)
	Type 2	1357 (44%)
New Zealand	No	256 (42%)
	Not reported	1 (0%)
	Type 1	35 (6%)
	Type 2	323 (53%)

**Figure 1.8.1 - Comorbid Conditions at RRT Entry - Australia**



**Figure 1.8.2 - Comorbid Conditions at RRT Entry - New Zealand**

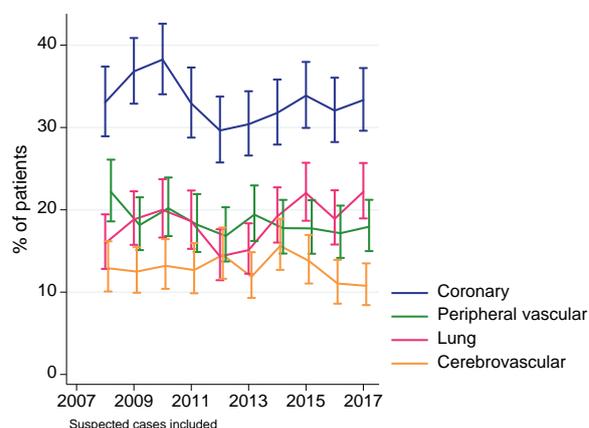
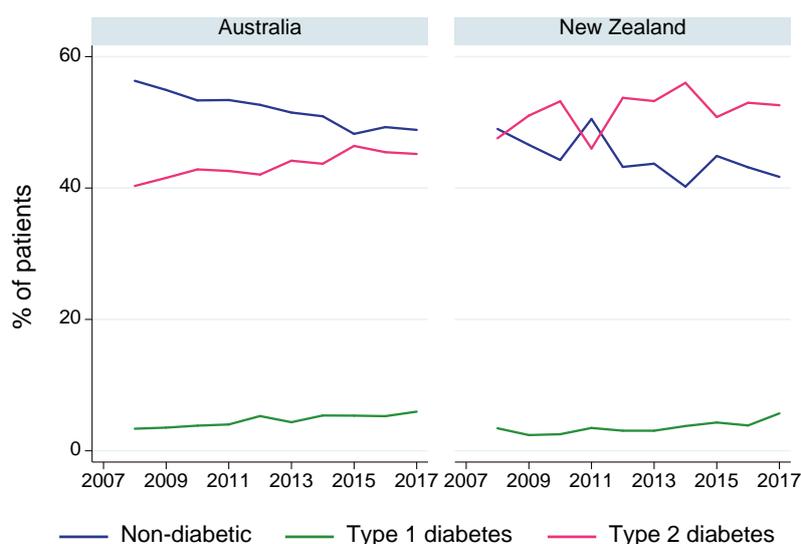


Figure 1.9 - Diabetes Status at RRT Entry



## Primary Renal Disease

The primary renal disease of new patients over 2014-2017 are shown in table 1.11. Diabetes continues to be the leading cause of ESKD in both countries, followed by glomerulonephritis. Details of the type of glomerulonephritis reported are shown in table 1.12. Rates of biopsy confirmation of glomerulonephritis and diabetic nephropathy are shown in figure 1.11; biopsy confirmation of glomerulonephritis is increasingly common in Australia.

The “other” causes from table 1.11 are shown in detail in table 1.13. There has been a trend towards missing data for primary disease in Australia; the Registry is actively seeking to address this problem with some success in 2017 (see also Appendix D of this Report).

Table 1.11 Primary Renal Disease of New Patients 2014 - 2017

Country	Primary renal disease	2014	2015	2016	2017
Australia	Diabetic Nephropathy	1033 (37%)	1035 (38%)	1029 (35%)	1159 (38%)
	Glomerulonephritis	568 (21%)	494 (18%)	532 (18%)	523 (17%)
	Hypertension	373 (13%)	380 (14%)	402 (14%)	380 (12%)
	Polycystic Disease	182 (7%)	166 (6%)	172 (6%)	203 (7%)
	Reflux Nephropathy	62 (2%)	49 (2%)	64 (2%)	72 (2%)
	Other	361 (13%)	381 (14%)	403 (14%)	413 (14%)
	Uncertain	123 (4%)	126 (5%)	136 (5%)	192 (6%)
	Not reported	68 (2%)	120 (4%)	162 (6%)	114 (4%)
	<b>Total</b>		<b>2770</b>	<b>2751</b>	<b>2900</b>
New Zealand	Diabetic Nephropathy	293 (53%)	270 (48%)	276 (48%)	318 (52%)
	Glomerulonephritis	95 (17%)	113 (20%)	112 (20%)	129 (21%)
	Hypertension	51 (9%)	51 (9%)	54 (9%)	51 (8%)
	Polycystic Disease	20 (4%)	25 (4%)	26 (5%)	29 (5%)
	Reflux Nephropathy	19 (3%)	16 (3%)	9 (2%)	6 (1%)
	Other	57 (10%)	65 (12%)	72 (13%)	59 (10%)
	Uncertain	15 (3%)	19 (3%)	17 (3%)	17 (3%)
	Not reported	7 (1%)	3 (1%)	6 (1%)	6 (1%)
	<b>Total</b>		<b>557</b>	<b>562</b>	<b>572</b>

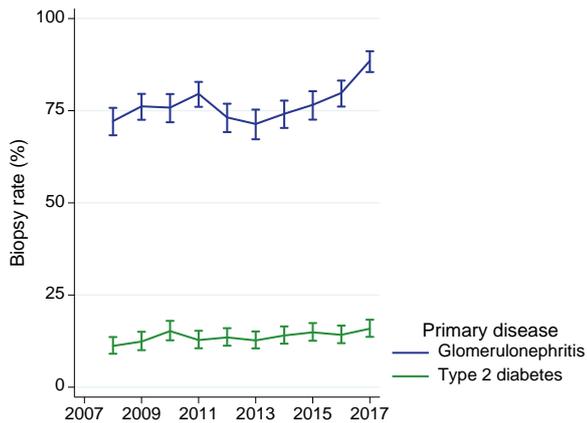
**Table 1.12 Glomerulonephritis as Primary Renal Disease 2017**

Primary renal disease	Australia	New Zealand
Advanced GN (unclassified=end stage)	12	7
Extra and intra capillary GN (rapidly progressive)	2	0
Familial GN (including Alports)	18	2
Focal and segmental proliferative GN	19	9
Focal sclerosing GN (including hyalinosis)	24	3
GN other (specify)	37	8
GN with systemic disease (specify)	5	2
Goodpastures with linear IgG and lung haemorrhage	15	3
Henoch-Schonlein purpura	3	0
Membranous GN	37	8
Mesangial proliferative (IgA+)	158	25
Mesangial proliferative (IgA-)	5	5
Mesangial proliferative (no if studies)	5	0
Mesangiocapillary GN (dense deposit disease)	2	2
Mesangiocapillary GN (double contour)	7	5
Microscopic polyarteritis	5	4
Presumed GN (no biopsy)	43	18
Primary focal sclerosing GN or focal glomerular sclerosis	65	12
Proliferative GN with linear IgG and no lung haemorrhage	6	1
S.L.E.	30	7
Secondary focal sclerosing GN	14	4
Wegeners granulomatosis	11	4
<b>Total</b>	<b>523</b>	<b>129</b>

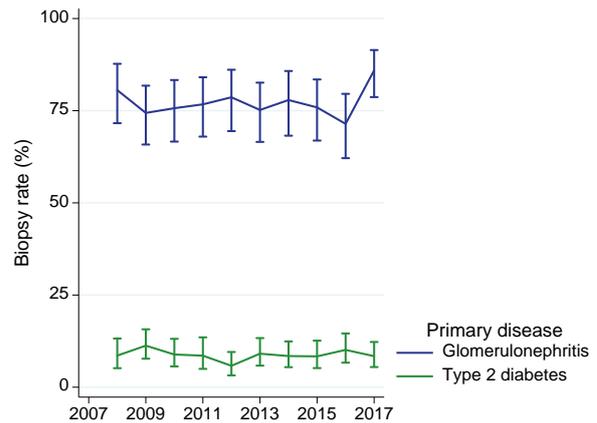
**Table 1.13 Miscellaneous Primary Renal Diseases 2017**

Primary renal disease	Australia	New Zealand
Analgesic Nephropathy	20	1
Cadmium Toxicity	1	0
Calcineurin Inhibitor Toxicity	9	0
Cystinosis	1	0
Gout	3	2
Interstitial Nephritis	33	5
Lead Nephropathy	5	1
Lithium Toxicity	28	3
Loss Of Single Kidney (Trauma-Surgery)	6	0
Oxalosis	2	2
Pyelonephritis	8	0
Renal Tuberculosis	3	0
Sarcoidosis	1	0
Bladder Neck Obstruction (Incl. Prostatomegaly)	8	0
Congenital Renal Hypoplasia And Dysplasia	28	3
Neuropathic Bladder	1	0
Obstructive Nephropathy	24	5
Other Lower Urinary Tract Abnormalities (With Secondary Reflux)	6	0
Pelvi-Ureteric Junction Obstruction	3	1
Posterior Urethral Valves	5	2
Spina Bifida Or Myelomeningocele	1	0
Ureteric Obstructive Nephropathy	15	2
Calculi	9	3
Medullary Cystic Disease	9	2
Cortical Necrosis	5	1
Haemolytic Uraemic Syndrome	7	0
Amyloid Disease	14	0
Light Chain Nephropathy (Not Malignant)	11	2
Paraproteinaemia (Including Multiple Myeloma)	34	6
Renal Cell Carcinoma (Grawitz)	38	2
Transitional Cell Carcinoma Urinary Tract	3	1
Other (Specify)	72	15

**Figure 1.10.1 - Biopsy Rates - Australia**



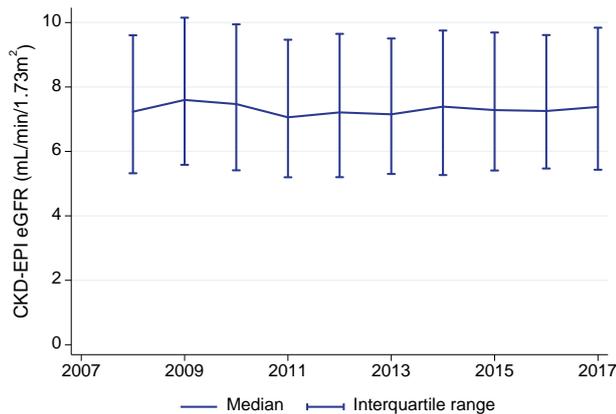
**Figure 1.10.2 - Biopsy Rates - New Zealand**



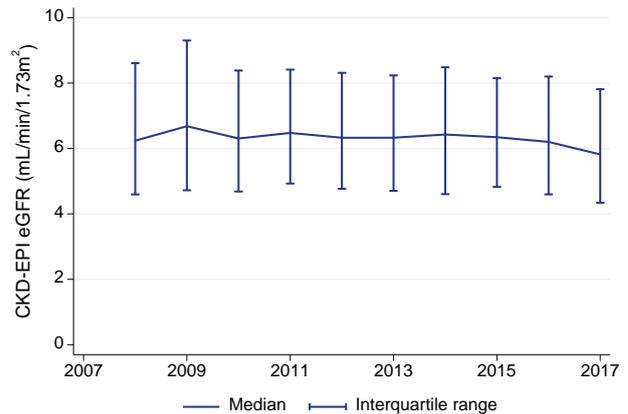
## Timing of RRT Start

The median eGFR for adult patients (calculated using the CKD-EPI formula) at RRT start over time is shown in figure 1.11. The median eGFR has remained stable for several years in both Australia and New Zealand, in 2017 this was 7.4mL/min/1.73m<sup>2</sup> in Australia and 5.8mL/min/1.73m<sup>2</sup> in New Zealand.

**Figure 1.11.1 - eGFR at RRT Start - Australia**



**Figure 1.11.2 - eGFR at RRT Start - New Zealand**



## References

- 1 Australian Bureau of Statistics, 2017, Australian Demographic Statistics, Jun 2017, time series spreadsheets, cat. no. 3101.0, viewed 27 Dec 2017, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202017?OpenDocument>
- 2 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, 2017, Estimated Resident Population by Age and Sex (1991+) (Annual-Jun), NZ Infoshare, viewed 27 Dec 2017, <http://archive.stats.govt.nz/infoshare/>