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.

Contents

Suggested Citation

ANZDATA Registry. 40th 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 2016 there were 2823 new RRT patients, with an overall incidence rate of 117 per million population. This rate has now been stable for several years. In New Zealand there were 559 new patients (119 pmp). The rate in New Zealand is subject to more annual variation due to lower numbers.

In contrast to incident patients, the number of prevalent patients in each country continues to climb; in Australia at the end of 2016 there were 23840 (988 pmp) patients receiving RRT, and in New Zealand there were 4532 (966 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 (2016)[1] and Stats NZ (2016)[2].

Table 1.1 Stock and Flow 2012-2016 (pmp)

Country	Event	2012	2013	2014	2015	2016
Australia	**Total New Patients**	**2610 (115)**	**2619 (113)**	**2761 (118)**	**2728 (115)**	**2823 (117)**
	Total Transplants	**845 (37)**	**883 (38)**	**913 (39)**	**949 (40)**	**1091 (45)**
	Living Donor Transplants	238	253	267	242	264
	Subsequent Transplants	99	94	108	107	159
	Total Deaths	**1668**	**1811**	**1843**	**1930**	**1972**
	Dialysis Patients	1492	1572	1622	1688	1746
	Transplant Patients	176	239	221	242	226
	Total Prevalent	**20818 (916)**	**21529 (931)**	**22347 (953)**	**23064 (970)**	**23840 (988)**
	Dialysis Patients	11547 (508)	11864 (513)	12262 (523)	12556 (528)	12706 (527)
	Transplant Patients	9271 (408)	9665 (418)	10085 (430)	10508 (442)	11134 (461)
New Zealand	**Total New Patients**	**524 (119)**	**557 (125)**	**555 (123)**	**558 (121)**	**559 (119)**
	Total Transplants	**108 (25)**	**116 (26)**	**138 (31)**	**147 (32)**	**172 (37)**
	Living Donor Transplants	54	59	72	74	82
	Subsequent Transplants	9	5	12	14	17
	Total Deaths	**390**	**379**	**412**	**447**	**425**
	Dialysis Patients	358	347	368	407	378
	Transplant Patients	32	32	44	40	47
	Total Prevalent	**3996 (907)**	**4171 (939)**	**4311 (956)**	**4405 (958)**	**4532 (966)**
	Dialysis Patients	2475 (561)	2600 (585)	2688 (596)	2707 (589)	2750 (586)
	Transplant Patients	1521 (345)	1571 (354)	1623 (360)	1698 (369)	1782 (380)

Table 1.2 Stock and Flow by State and Country 2016 (pmp)

State	New Patients	Transplant Operations	Deaths Dialysis	Deaths Transplant	Dialysis Dependent	Functioning Transplants	Total Prevalent
QLD	495 (102)	199 (41)	351	42	2376 (490)	2087 (431)	4463 (921)
NSW	871 (113)	348 (45)	558	77	3987 (516)	3170 (410)	7157 (926)
ACT	66 (167)	0 (0)	29	3	287 (724)	267 (674)	554 (1398)
VIC	691 (114)	352 (58)	410	64	3040 (501)	3145 (518)	6185 (1019)
TAS	57 (110)	0 (0)	53	2	229 (441)	244 (470)	473 (911)
SA	227 (133)	95 (56)	116	24	806 (472)	1054 (617)	1860 (1089)
NT	81 (331)	0 (0)	44	0	636 (2597)	113 (461)	749 (3059)
WA	335 (128)	97 (37)	185	14	1345 (514)	1054 (403)	2399 (917)
Australia	**2823 (117)**	**1091 (45)**	**1746**	**226**	**12706 (527)**	**11134 (461)**	**23840 (988)**
New Zealand	**559 (119)**	**172 (37)**	**378**	**47**	**2750 (586)**	**1782 (380)**	**4532 (966)**

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

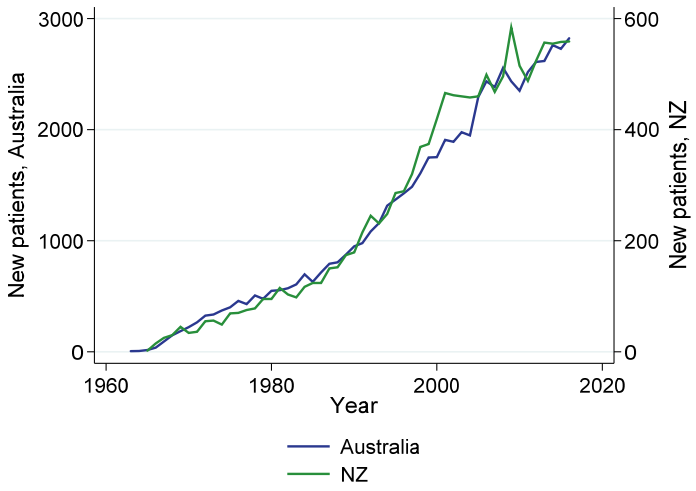


Figure 1.2 presents these data another way, showing the numbers of new patients and change in each country over the last 30 years.

Figure 1.2.1 - New Patients and Change – Australia

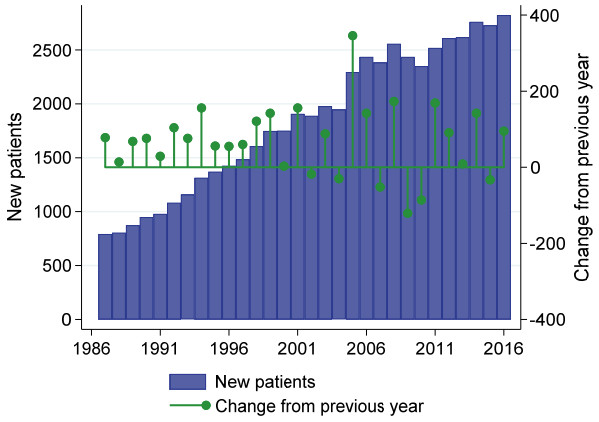


Figure 1.2.2 - New Patients and Change - New Zealand

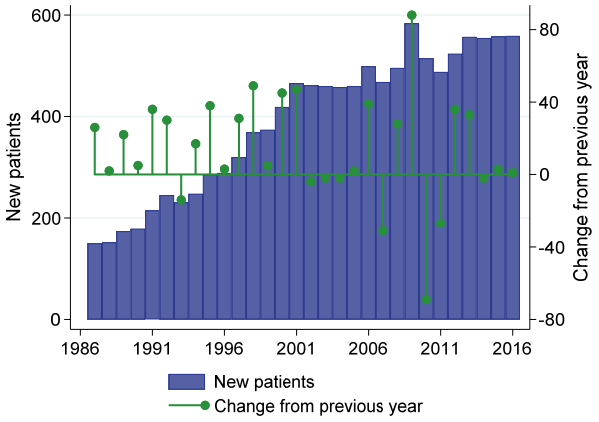


Table 1.3 shows the number of new patients (pmp) by state and country over 2012-2016. There is substantial variation in incidence rates between states, with the lowest rates in QLD (102 pmp in 2016) and the highest in NT (331 pmp in 2016).

Table 1.3 RRT Incidence (pmp) 2012-2016

State	2012	2013	2014	2015	2016
QLD	477 (104)	518 (111)	531 (113)	507 (106)	495 (102)
NSW	827 (113)	811 (109)	823 (110)	828 (109)	871 (113)
ACT	62 (165)	53 (139)	71 (184)	47 (120)	66 (167)
VIC	646 (115)	659 (115)	687 (118)	668 (112)	691 (114)
TAS	50 (98)	46 (90)	45 (87)	55 (106)	57 (110)
SA	202 (122)	165 (99)	180 (107)	188 (111)	227 (133)
NT	100 (424)	88 (363)	115 (473)	129 (528)	81 (331)
WA	246 (101)	279 (111)	309 (121)	306 (118)	335 (128)
Aust	**2610 (115)**	**2619 (113)**	**2761 (118)**	**2728 (115)**	**2823 (117)**
NZ	**524 (119)**	**557 (125)**	**555 (123)**	**558 (121)**	**559 (119)**

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

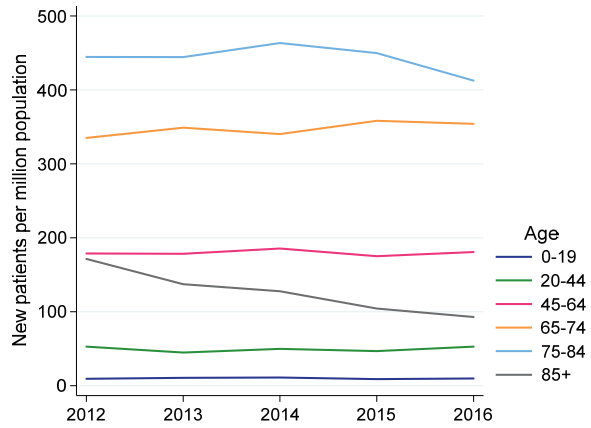


Figure 1.3.2 - New patients - Age specific rates - New Zealand

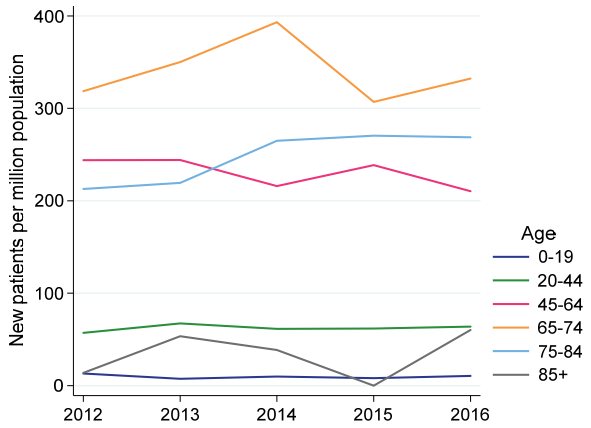


Figure 1.4.1 - New patients by age group – NT

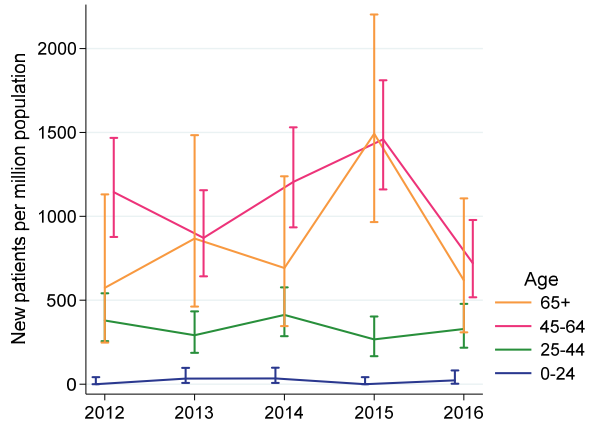


Figure 1.4.2 - New patients by age group – NSW

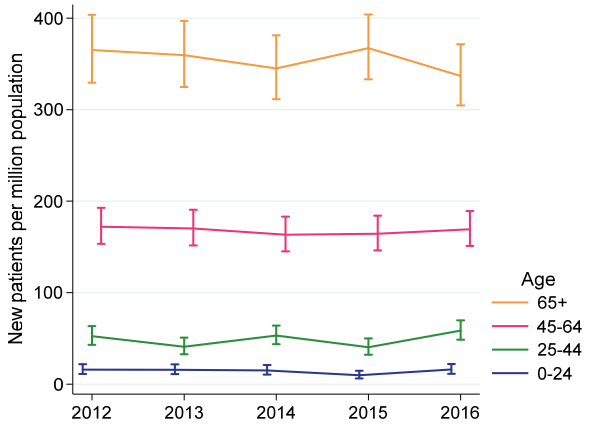


Figure 1.4.3 - New patients by age group – VIC

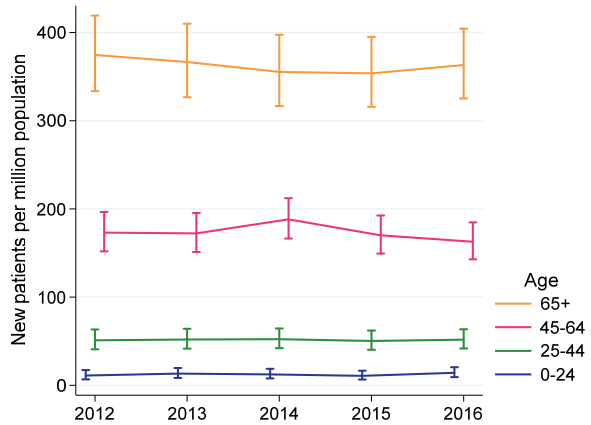


Figure 1.4.4 - New patients by age group – QLD

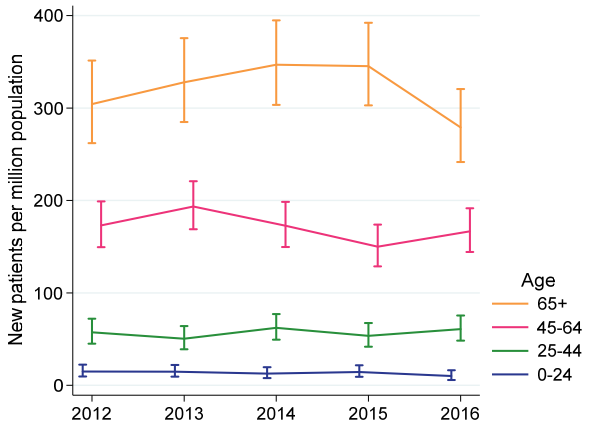


Figure 1.4.5 - New patients by age group – SA

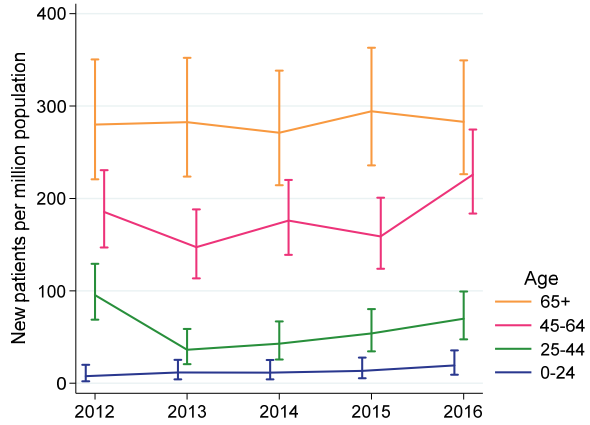


Figure 1.4.6 - New patients by age group – WA

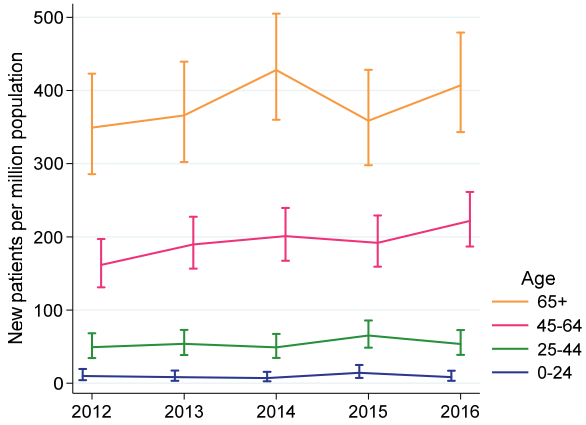


Figure 1.4.7 - New patients by age group – TAS

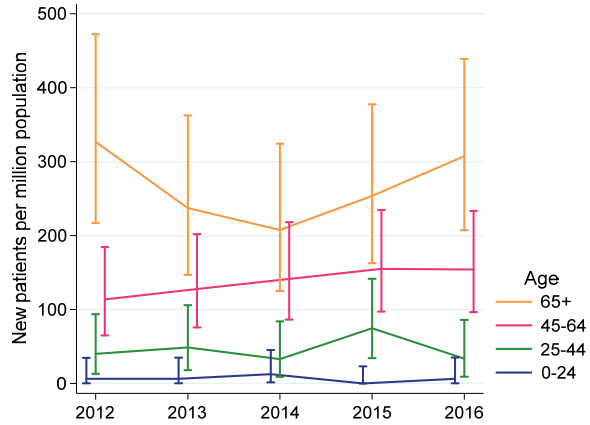
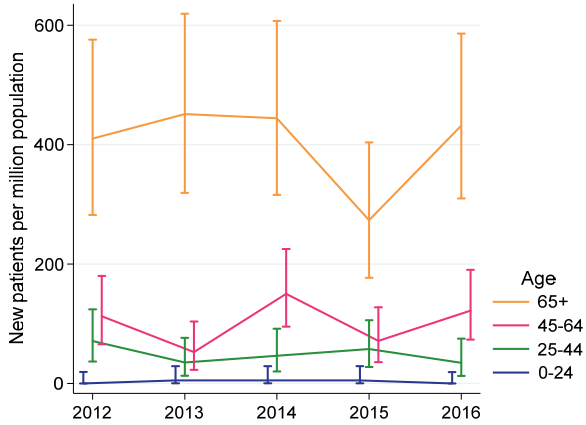


Figure 1.4.8 - New patients by age group – ACT



The rates in older patients are shown in table 1.4. Incidence rates for patients over the age of 70 years tend to be lower in New Zealand than in Australia. Finally, table 1.5 further categorises the 2016 data by gender.

Table 1.4 Incidence (pmp) of ESKD in Older Patients 2012-2016

Country	Age	2012	2013	2014	2015	2016
Australia	**60-64**	323 (264)	327 (263)	335 (265)	324 (252)	343 (261)
	65-69	297 (290)	328 (303)	348 (311)	390 (338)	395 (333)
	70-74	299 (396)	322 (412)	311 (380)	330 (385)	343 (382)
	75-79	261 (456)	270 (457)	306 (500)	309 (487)	286 (437)
	80-84	192 (431)	191 (427)	186 (414)	180 (397)	174 (378)
	85+	72 (171)	60 (137)	58 (128)	49 (104)	45 (93)
New Zealand	**60-64**	83 (347)	80 (332)	78 (318)	83 (332)	83 (323)
	65-69	64 (335)	79 (384)	89 (412)	66 (292)	81 (347)
	70-74	45 (298)	47 (305)	59 (368)	54 (327)	53 (312)
	75-79	27 (254)	34 (311)	39 (343)	42 (350)	42 (328)
	80-84	13 (159)	8 (97)	13 (157)	13 (156)	15 (178)
	85+	1 (14)	4 (54)	3 (39)	0 (0)	5 (60)

Table 1.5 Age and sex new patients 2016

	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**	7	6	29	55	1133	179	233	258	142	10	**1032**	578	61
	M	13	12	34	83	154	289	373	480	318	35	**1791**	601	63
New Zealand	**F**	0	2	3	18	21	39	57	54	23	0	**217**	569	60
	M	4	4	8	18	35	65	89	80	34	5	**342**	565	59

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. After several years of steady decline, the percentage of patients referred late increased slightly in 2016 for both Australia and New Zealand. In 2016 18% of Australian and 14% 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 2012-2016 by ethnicity and primary renal disease. Rates vary substantially between primary renal disease categories; for example, in Australia 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 2007 – 2016

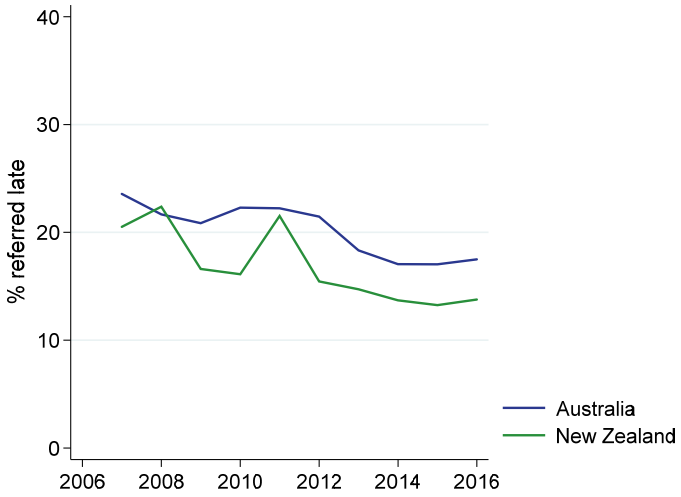


Figure 1.6 - Late Referral Rates by State - Australia 2007 – 2016

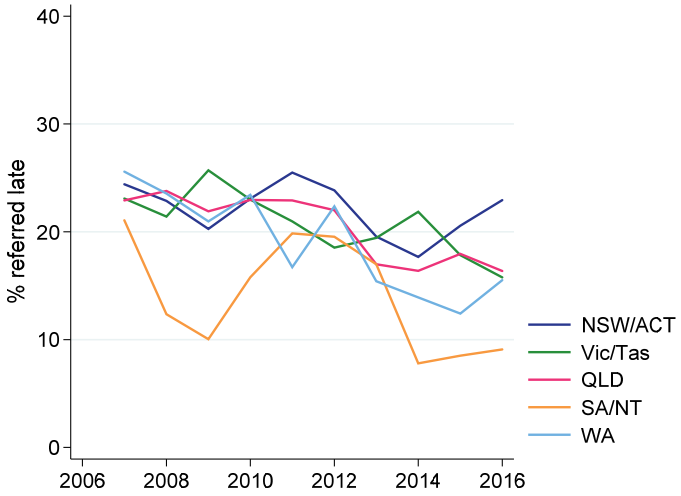


Figure 1.7.1 - Late referral rates by age - Australia 2007 – 2016

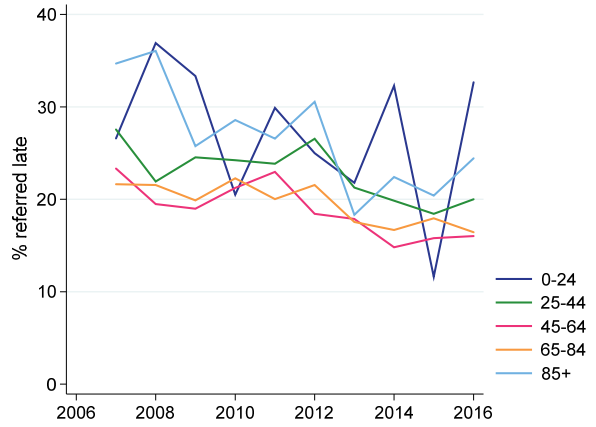


Figure 1.7.2 - Late referral rates by age - New Zealand 2007 – 2016

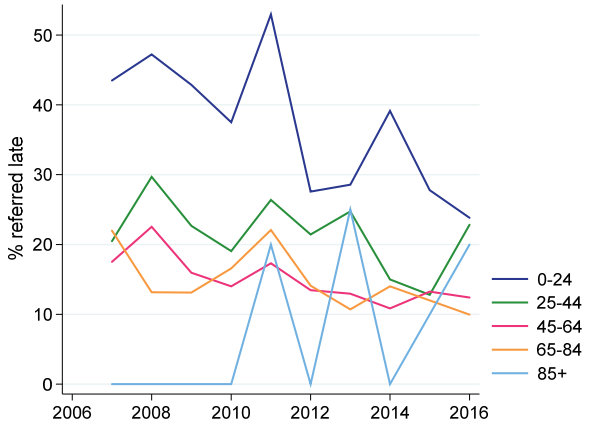


Table 1.6 Late Referral by Country and Ethnicity 2012-2016

Country	Ethnicity	Late	Not Late	Not Reported	Total
Australia	**Caucasian**	1623 (18%)	7387 (80%)	174 (2%)	**9184**
	Aboriginal/Torres Strait Islander	242 (17%)	1107 (79%)	55 (4%)	**1404**
	Asian	266 (20%)	1060 (78%)	25 (2%)	**1351**
	Māori	42 (28%)	105 (70%)	4 (3%)	**151**
	Pacific	92 (25%)	265 (73%)	4 (1%)	**361**
	Other	143 (21%)	526 (77%)	16 (2%)	**685**
	Not reported	62 (15%)	208 (51%)	135 (33%)	**405**
	Total	**2470 (18%)**	**10658 (79%)**	**413 (3%)**	**13541**
New Zealand	**Caucasian**	141 (14%)	872 (85%)	9 (1%)	**1022**
	Aboriginal/Torres Strait Islander	0 (0%)	2 (100%)	0 (0%)	**2**
	Asian	24 (11%)	195 (89%)	0 (0%)	**219**
	Māori	115 (13%)	717 (84%)	24 (3%)	**856**
	Pacific	102 (18%)	469 (82%)	4 (1%)	**575**
	Other	8 (13%)	53 (87%)	0 (0%)	**61**
	Not reported	0 (0%)	10 (56%)	8 (44%)	**18**
	Total	**390 (14%)**	**2318 (84%)**	**45 (2%)**	**2753**

Table 1.7 Late Referral by Country and Primary Renal Disease 2012-2016

Country	Primary Renal Disease	Late	Not late	Not Reported	Total
Australia	Diabetic Nephropathy	759 (15%)	4109 (83%)	83 (2%)	**4951**
	Glomerulonephritis	477 (18%)	2092 (80%)	54 (2%)	**2623**
	Hypertension	339 (18%)	1481 (80%)	32 (2%)	**1852**
	Polycystic Disease	61 (7%)	739 (89%)	26 (3%)	**826**
	Reflux Nephropathy	24 (8%)	257 (89%)	8 (3%)	**289**
	Other	558 (29%)	1363 (70%)	35 (2%)	**1956**
	Uncertain	171 (27%)	451 (71%)	9 (1%)	**631**
	Not reported	81 (20%)	166 (40%)	166 (40%)	**413**
	Total	**2470 (18%)**	**10658 (79%)**	**413 (3%)**	**13541**
New Zealand	Diabetic Nephropathy	148 (11%)	1190 (88%)	21 (2%)	**1359**
	Glomerulonephritis	97 (18%)	439 (81%)	7 (1%)	**543**
	Hypertension	39 (15%)	213 (83%)	5 (2%)	**257**
	Polycystic Disease	2 (2%)	123 (96%)	3 (2%)	**128**
	Reflux Nephropathy	5 (8%)	60 (92%)	0 (0%)	**65**
	Other	77 (26%)	221 (74%)	2 (1%)	**300**
	Uncertain	15 (19%)	61 (78%)	2 (3%)	**78**
	Not reported	7 (30%)	11 (48%)	5 (22%)	**23**
	Total	**390 (14%)**	**2318 (84%)**	**45 (2%)**	**2753**

Co-morbidities

Tables 1.8-1.10 show the co-morbidities at RRT entry of new patients in 2016. 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, there has been a steady decline in the proportion of incident RRT patients with coronary artery disease over the last few years.

Table 1.8 Co-morbidities of New Patients 2016

Country	Status at RRT Entry	Coronary Artery Disease	Peripheral Vascular Disease	Cerebrovascular Disease	Chronic Lung Disease
Australia	No	1871 (66%)	2155 (76%)	2404 (85%)	2345 (83%)
	Suspected	117 (4%)	146 (5%)	60 (2%)	84 (3%)
	Yes	722 (26%)	408 (14%)	247 (9%)	279 (10%)
	Not reported	113 (4%)	114 (4%)	112 (4%)	115 (4%)
New Zealand	No	380 (68%)	463 (83%)	496 (89%)	452 (81%)
	Suspected	38 (7%)	28 (5%)	10 (2%)	22 (4%)
	Yes	140 (25%)	67 (12%)	50 (9%)	84 (15%)
	Not reported	1 (0%)	1 (0%)	3 (1%)	1 (0%)

Table 1.9 Smoking Status of New Patients 2016

Country	Status at RRT Entry	Smoking
Australia	Current	309 (11%)
	Former	1007 (36%)
	Never	1306 (46%)
	Not reported	201 (7%)
New Zealand	Current	73 (13%)
	Former	239 (43%)
	Never	240 (43%)
	Not reported	7 (1%)

Table 1.10 Diabetic Status of New Patients 2016

Country	Status at RRT Entry	Diabetes
Australia	No	1343 (48%)
	Not reported	103 (4%)
	Type 1	147 (5%)
	Type 2	1230 (44%)
New Zealand	No	240 (43%)
	Not reported	2 (0%)
	Type 1	24 (4%)
	Type 2	293 (52%)

Figure 1.8.1 - Comorbid conditions at RRT entry – Australia

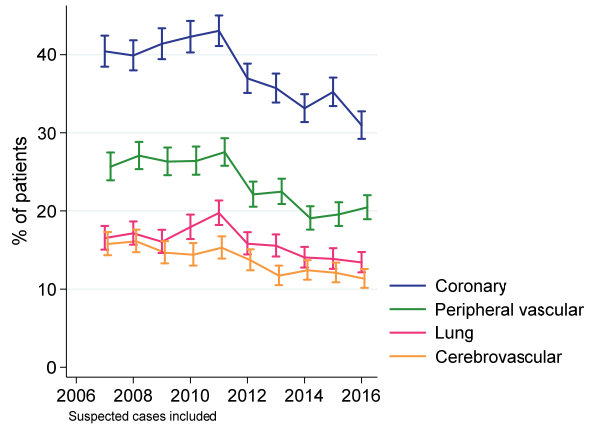


Figure 1.8.2 - Comorbid conditions at RRT entry - New Zealand

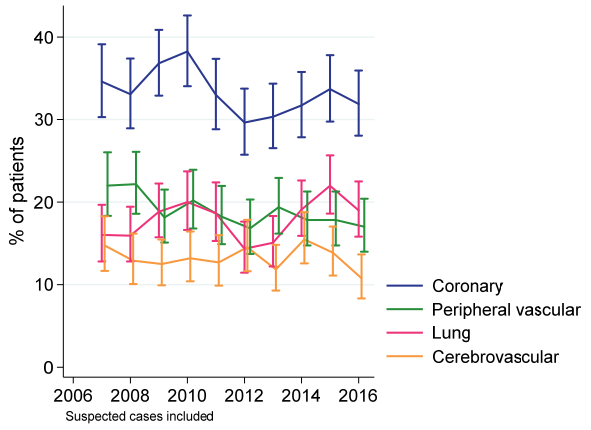
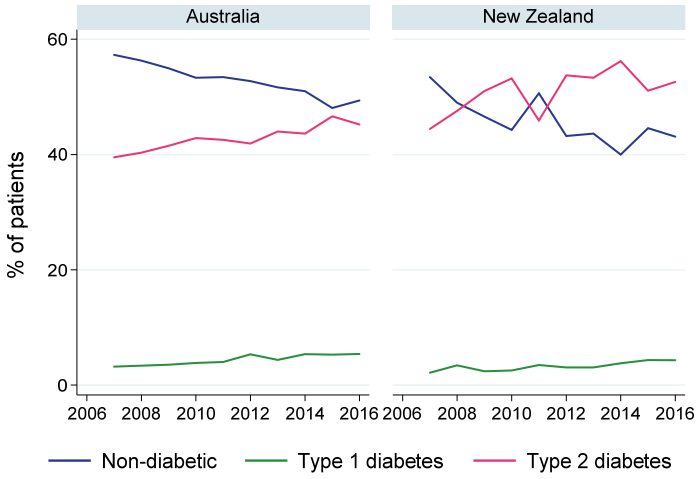


Figure 1.9 - Diabetes Status at RRT Entry



Primary Renal Disease

The primary renal disease of new patients over 2013-2016 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 figures 1.10.1 and 1.10.2.

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.

Table 1.11 Primary Renal Disease of New Patients 2016

Country	Primary Renal Disease	2013	2014	2015	2016
Australia	**Diabetic Nephropathy**	947 (36%)	1027 (37%)	1018 (37%)	991 (35%)
	Glomerulonephritis	512 (20%)	565 (20%)	489 (18%)	520 (18%)
	Hypertension	382 (15%)	375 (14%)	375 (14%)	382 (14%)
	Polycystic Disease	167 (6%)	183 (7%)	165 (6%)	168 (6%)
	Reflux Nephropathy	50 (2%)	62 (2%)	49 (2%)	62 (2%)
	Other	403 (15%)	358 (13%)	378 (14%)	398 (14%)
	Uncertain	129 (5%)	125 (5%)	127 (5%)	130 (5%)
	Not reported	29 (1%)	66 (2%)	127 (5%)	172 (6%)
	Total	**2619**	**2761**	**2728**	**2823**
New Zealand	**Diabetic Nephropathy**	270 (48%)	293 (53%)	269 (48%)	269 (48%)
	Glomerulonephritis	121 (22%)	94 (17%)	113 (20%)	108 (19%)
	Hypertension	53 (10%)	51 (9%)	51 (9%)	54 (10%)
	Polycystic Disease	30 (5%)	20 (4%)	24 (4%)	26 (5%)
	Reflux Nephropathy	14 (3%)	19 (3%)	16 (3%)	8 (1%)
	Other	54 (10%)	57 (10%)	65 (12%)	70 (13%)
	Uncertain	14 (3%)	14 (3%)	18 (3%)	17 (3%)
	Not reported	1 (<1%)	7 (1%)	2 (<1%)	7 (1%)
	Total	**557**	**555**	**558**	**559**

Table 1.12 Glomerulonephritis as Primary Renal Disease 2016

Primary Renal Disease	Australia	New Zealand
Advanced GN (unclassified=end stage)	8	3
Extra and intra capillary GN (rapidly progressive)	5	2
Familial GN (including Alports)	14	4
Focal and segmental proliferative GN	25	5
Focal sclerosing GN (including hyalinosis)	34	3
GN other (specify)	33	4
GN with systemic disease (specify)	6	0
Goodpastures with linear IgG and lung haemorrhage	10	2
Henoch-Schonlein purpura	1	0
Membranous GN	29	5
Mesangial proliferative (IgA+)	125	25
Mesangial proliferative (IgA-)	9	0
Mesangial proliferative (no if studies)	2	0
Mesangiocapillary GN (dense deposit disease)	5	0
Mesangiocapillary GN (double contour)	8	2
Microscopic polyarteritis	7	1
Presumed GN (no biopsy)	80	28
Primary focal sclerosing GN or focal glomerular sclerosis	61	12
Proliferative GN with linear IgG and no lung haemorrhage	4	1
S.L.E.	26	4
Scleroderma	5	1
Secondary focal sclerosing GN	13	3
Wegeners granulomatosis	10	3
Total	**520**	**108**

Table 1.13 Miscellaneous Primary Renal Diseases 2016

Primary Renal Disease	Australia	New Zealand
Analgesic Nephropathy	9	3
Balkan Nephropathy	1	0
Calcineurin Inhibitor Toxicity	5	1
Gout	0	1
Interstitial Nephritis	37	14
Lead Nephropathy	1	0
Lithium Toxicity	16	4
Loss of Single Kidney (Trauma-Surgery)	10	1
Oxalosis	4	0
Post-Partum Nephropathy	2	0
Pyelonephritis	3	0
Sarcoidosis	0	1
Bladder Neck Obstruction (Incl. Prostatiomegaly)	2	0
Congenital Renal Hypoplasia and Dysplasia	14	2
Megaureter	1	0
Neuropathic Bladder	5	2
Non-Obstructed Dilated Bladder (Megacystitis-Megaureter)	1	0
Obstructed Megaureter	1	0
Obstructive Nephropathy	25	5
Other Lower Urinary Tract Abnormalities (With Secondary Reflux)	3	0
Pelvi-Ureteric Junction Obstruction	2	0
Posterior Urethral Valves	6	1
Spina Bifida or Myelomeningocoele	3	0
Ureteric Obstructive Nephropathy	2	1
Calculi	13	2
Medullary Cystic Disease	6	0
Cortical Necrosis	2	2
Haemolytic Uraemic Syndrome	10	1
Amyloid Disease	13	4
Paraproteinaemia (Including Multiple Myeloma)	31	1
Renal Cell Carcinoma (Grawitz)	18	2
Transitional Cell Carcinoma Urinary Tract	3	1
Other (Specify)	149	21

Figure 1.10.1 - Biopsy rates – Australia

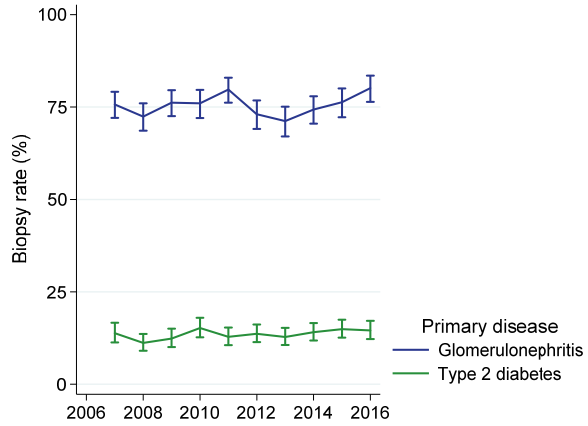
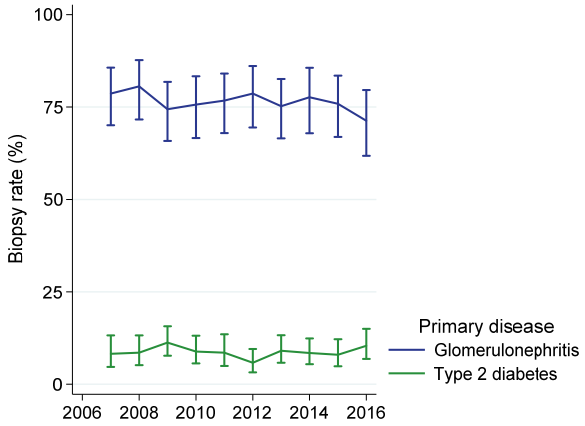


Figure 1.10.2 - Biopsy rates - New Zealand



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 2016 this was, 7.3mL/min/1.73m^2 in Australia and 6.2mL/min/1.73m^2 in New Zealand.

Figure 1.11.1 - eGFR at RRT start – Australia

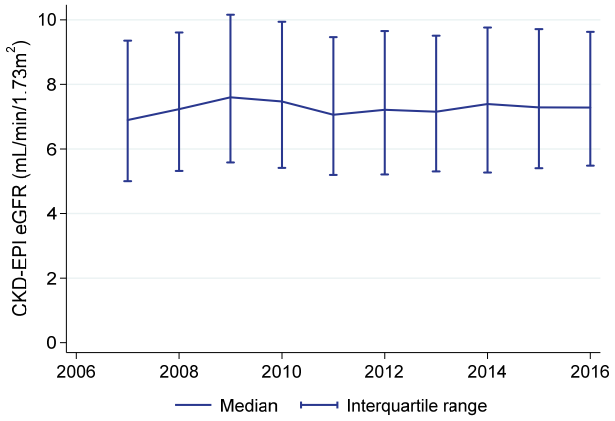
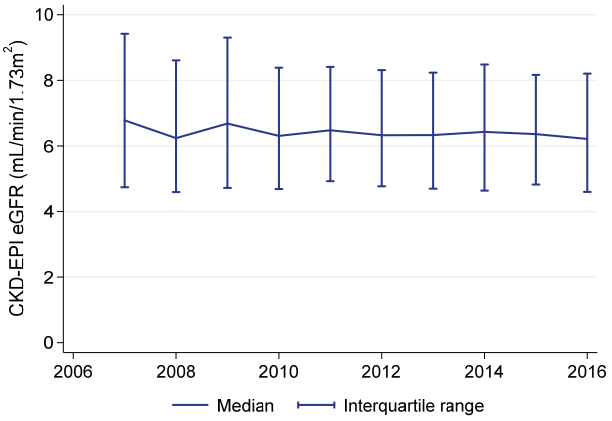


Figure 1.11.2 - eGFR at RRT start – New Zealand



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[1] *Australian Bureau of Statistics, 2016, Australian Demographic Statistics, Jun 2016, time series spreadsheets, cat. no. 3101.0, viewed 15 Dec 2016,* <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202016?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, 2016, Estimated Resident Population by Age and Sex (1991+) (Annual-Jun), NZ Infoshare, viewed 15 Dec 2016,*
<http://archive.stats.govt.nz/infoshare/SelectVariables.aspx?pxID=196ee2ff-a77e-49ef-9c25-7919d2347857>