CHAPTER 5

Peritoneal Dialysis

Reporting the incidence, prevalence and survival of peritoneal dialysis patients in Australia and New Zealand; summarising dialysis fluids, laboratory results, and rates of technique survival and peritonitis.

Contents

Executive Summary

There were 2,427 people in Australia and 855 people in New Zealand receiving peritoneal dialysis at the time of the 31 December 2017 survey. The number of people commencing peritoneal dialysis during this survey period was 1,141 in Australia and 334 in New Zealand. The proportion of people receiving home dialysis on peritoneal dialysis was 70% in Australia and 66% in New Zealand and the total percentage of the dialysis population receiving peritoneal dialysis remained higher in New Zealand with 31% compared with Australia with 19%.

Overall peritoneal dialysis patient survival remained stable in Australia and improved slightly in New Zealand, with the proportion of people surviving at 3 years 79% in Australia and 76% in New Zealand. No improvement in patient technique survival was observed with 3-year rates remaining low at only 41% in Australia and 48% in New Zealand. The primary causes of technique failure were death at 32% in Australia and 50% in New Zealand and infective complications at 24% in Australia and 24% in New Zealand.

ANZDATA only reports on Australian peritoneal dialysis episodes of peritonitis, as New Zealand has a separate registry that is not currently linked to ANZDATA. In Australia, the overall peritonitis rate has dropped considerably, however there remains significant variation between individual states and treating hospitals. The distribution of organisms causing peritonitis was stable, although the proportion of culture negative infections is gradually increasing.

Peritoneal dialysis fluids showed the use of icodextrin has been stable in Australia, (used in 48% of the peritoneal dialysis population) and increased slightly in New Zealand to 67%.

Peritoneal dialysis modalities varied between Australia and New Zealand with automated peritoneal dialysis utilisation rates at 67% in Australia and 52% in New Zealand. The remainder received continuous ambulatory peritoneal dialysis.

Suggested citation

ANZDATA Registry. 41st Report, Chapter 5: Peritoneal dialysis. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2018. Available at: http://www.anzdata.org.au

Stock and Flow

Table 5.1 shows the proportion of all dialysis patients undergoing peritoneal dialysis (PD) in each state and country over 2013-2017. Table 5.2 shows the same data as a proportion of home dialysis patients. Overall around two-thirds of home dialysis patients undergo PD, although there is some variation between states.

The duration of time spent on PD by prevalent patients is shown in figure 5.1.

Table 5.1 Proportion (%) PD of all Dialysis Patients

State	2013	2014	2015	2016	2017
Queensland	20%	22%	20%	18%	18%
New South Wales	24%	25%	25%	24%	24%
Australian Capital Territory	10%	12%	8%	10%	8%
Victoria	18%	20%	20%	20%	19%
Tasmania	19%	17%	20%	22%	19%
South Australia	17%	16%	15%	16%	14%
Northern Territory	6%	5%	4%	4%	3%
Western Australia	19%	18%	17%	16%	16%
Australia	**19%**	**20%**	**20%**	**19%**	**19%**
New Zealand	**32%**	**31%**	**29%**	**30%**	**31%**

Table 5.2 Proportion (%) PD of all Home Dialysis Patients

State	2013	2014	2015	2016	2017
Queensland	62%	64%	64%	63%	66%
New South Wales	65%	67%	67%	68%	70%
Australian Capital Territory	48%	50%	42%	53%	56%
Victoria	72%	73%	74%	75%	76%
Tasmania	71%	63%	68%	74%	84%
South Australia	80%	79%	78%	81%	80%
Northern Territory	45%	38%	39%	38%	36%
Western Australia	77%	75%	71%	68%	70%
Australia	**67%**	**68%**	**68%**	**69%**	**70%**
New Zealand	**64%**	**63%**	**62%**	**64%**	**66%**

Figure 5.1.1 - Time on Peritoneal Dialysis - Prevalent PD Patients Australia 31 Dec 2017

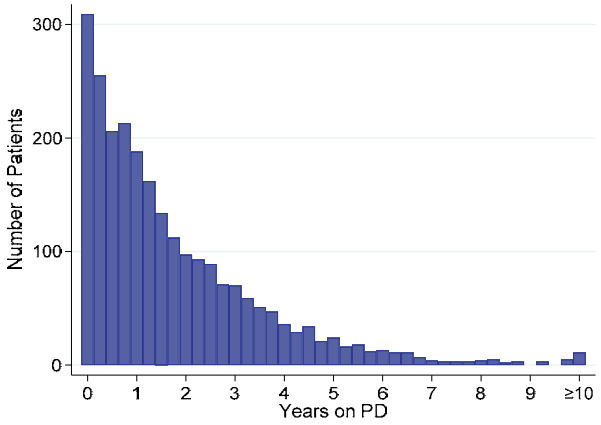


Figure 5.1.2 - Time on Peritoneal Dialysis - Prevalent PD Patients New Zealand 31 Dec 2017

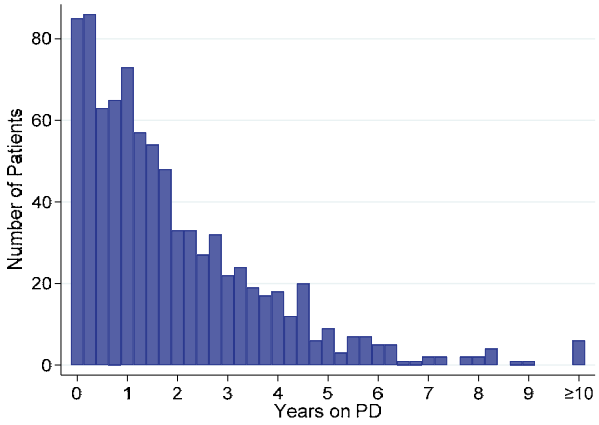


Table 5.3 shows the overall stock and flow of PD patients. Note that dialysis modality changes lasting less than 30 days are not included. The number of prevalent patients fell in 2017 in Australia but grew in New Zealand. Figure 5.2 presents some of these data graphically.

Table 5.3 Stock and Flow of Peritoneal Dialysis Patients 2013 - 2017

Country		2013	2014	2015	2016	2017
Australia	**All patients who commenced PD**					
	First dialysis treatment or returning after renal recovery	722	798	776	820	809
	Transfer from HD (no prior PD)	250	288	247	241	247
	Transfer from HD (prior PD)	51	44	48	33	43
	Failed Transplant (no prior PD)	18	17	25	17	22
	Failed Transplant (prior PD)	15	15	14	17	20
	Total	**1056**	**1162**	**1110**	**1128**	**1141**
	All patients who ceased PD					
	Received kidney transplant	241	231	272	320	320
	Transfer to HD	462	444	501	516	536
	Renal recovery	23	27	19	22	19
	Deaths	259	278	309	323	287
	Total	**985**	**980**	**1101**	**1181**	**1162**
	Total patients on PD at 31 December	**2317**	**2499**	**2510**	**2450**	**2427**
New Zealand	**All patients who commenced PD**					
	First dialysis treatment or returning after renal recovery	184	192	222	213	221
	Transfer from HD (no prior PD)	113	90	85	95	94
	Transfer from HD (prior PD)	16	18	12	15	17
	Failed Transplant (no prior PD)	2	2	4	4	1
	Failed Transplant (prior PD)	5	3	3	8	1
	Total	**320**	**305**	**326**	**335**	**334**
	All patients who ceased PD					
	Received kidney transplant	38	47	46	47	66
	Transfer to HD	101	119	160	138	107
	Renal recovery	6	2	10	6	5
	Deaths	121	146	134	114	126
	Total	**266**	**314**	**350**	**305**	**304**
	Total patients on PD at 31 December	**837**	**822**	**797**	**828**	**855**

Figure 5.2.1 - Stock and Flow of Peritoneal Dialysis Patients - Australia 2013-2017

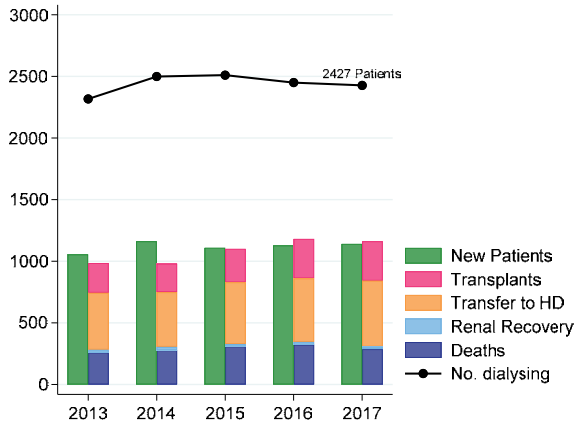
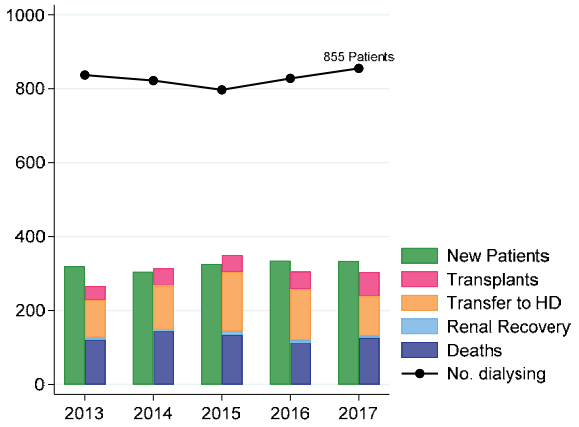


Figure 5.2.2 - Stock and Flow of Peritoneal Dialysis Patients - New Zealand 2013-2017



The age distributions of incident and prevalent PD patients are shown in figures 5.3 and 5.4 respectively.

Figure 5.3.1 - Age (%) of New Peritoneal Dialysis Patients - Australia 2017

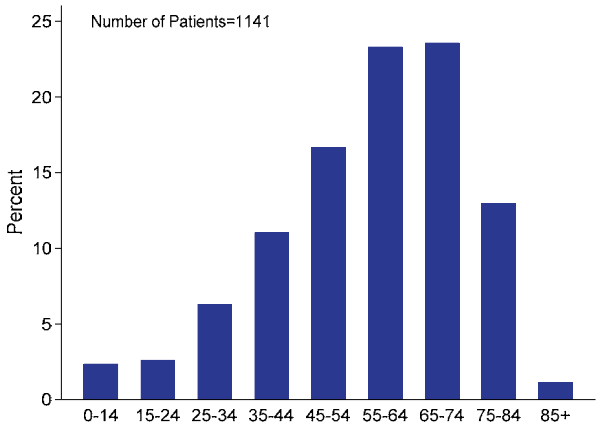


Figure 5.3.2 - Age (%) of New Peritoneal Dialysis Patients - New Zealand 2017

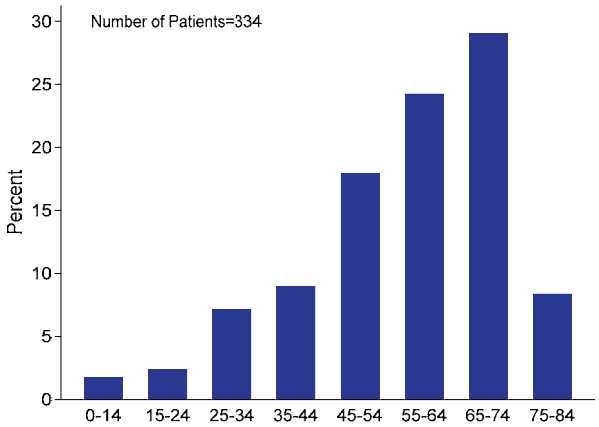


Figure 5.4.1 - Age (%) of Current Peritoneal Dialysis Patients - Australia 2017

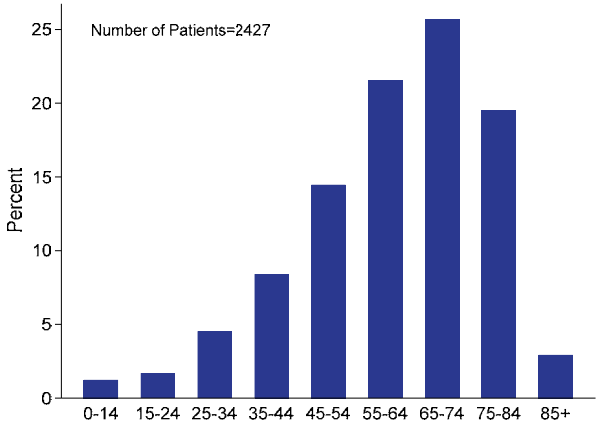


Figure 5.4.2 - Age (%) of Current Peritoneal Dialysis Patients - New Zealand 2017

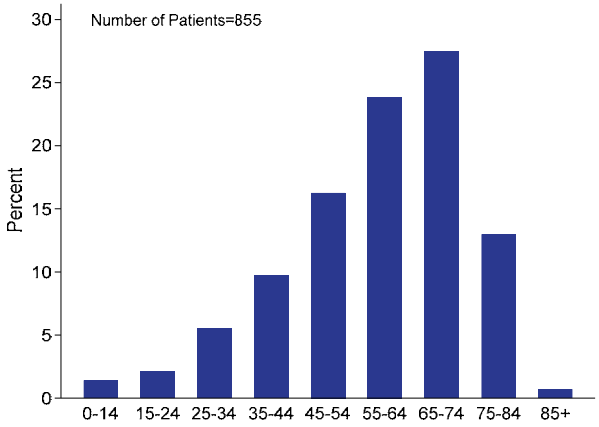


Table 5.4 presents the number and proportion of incident and prevalent peritoneal dialysis patients by age group.

Table 5.4.1 Incident and Prevalent PD patients by Age Group - Australia

Category	Age group	2013	2014	2015	2016	2017
Incident Patients	**0-14**	23 (2%)	27 (2%)	21 (2%)	22 (2%)	27 (2%)
	15-24	30 (3%)	34 (3%)	30 (3%)	42 (4%)	30 (3%)
	25-34	73 (7%)	56 (5%)	76 (7%)	59 (5%)	72 (6%)
	35-44	100 (9%)	131 (11%)	94 (8%)	122 (11%)	126 (11%)
	45-54	177 (17%)	195 (17%)	180 (16%)	202 (18%)	190 (17%)
	55-64	237 (22%)	252 (22%)	244 (22%)	245 (22%)	266 (23%)
	65-74	264 (25%)	291 (25%)	291 (26%)	274 (24%)	269 (24%)
	75-84	135 (13%)	160 (14%)	166 (15%)	150 (13%)	148 (13%)
	85+	17 (2%)	16 (1%)	8 (1%)	12 (1%)	13 (1%)
	Total	**1056**	**1162**	**1110**	**1128**	**1141**
Prevalent Patients	**0-14**	26 (1%)	31 (1%)	28 (1%)	30 (1%)	30 (1%)
	15-24	46 (2%)	38 (2%)	42 (2%)	47 (2%)	41 (2%)
	25-34	105 (5%)	97 (4%)	110 (4%)	106 (4%)	110 (5%)
	35-44	199 (9%)	221 (9%)	199 (8%)	186 (8%)	204 (8%)
	45-54	331 (14%)	348 (14%)	334 (13%)	341 (14%)	351 (14%)
	55-64	515 (22%)	553 (22%)	539 (21%)	518 (21%)	523 (22%)
	65-74	597 (26%)	693 (28%)	719 (29%)	681 (28%)	623 (26%)
	75-84	440 (19%)	458 (18%)	472 (19%)	475 (19%)	474 (20%)
	85+	58 (3%)	60 (2%)	67 (3%)	66 (3%)	71 (3%)
	Total	**2317**	**2499**	**2510**	**2450**	**2427**

Table 5.4.2 Incident and Prevalent PD patients by Age Group - New Zealand

Category	Age group	2013	2014	2015	2016	2017
Incident Patients	0-14	3 (1%)	6 (2%)	3 (1%)	9 (3%)	6 (2%)
	15-24	7 (2%)	14 (5%)	10 (3%)	11 (3%)	8 (2%)
	25-34	20 (6%)	21 (7%)	17 (5%)	18 (5%)	24 (7%)
	35-44	26 (8%)	32 (10%)	40 (12%)	38 (11%)	30 (9%)
	45-54	65 (20%)	54 (18%)	59 (18%)	62 (19%)	60 (18%)
	55-64	90 (28%)	71 (23%)	88 (27%)	79 (24%)	81 (24%)
	65-74	83 (26%)	76 (25%)	75 (23%)	77 (23%)	97 (29%)
	75-84	24 (8%)	27 (9%)	34 (10%)	39 (12%)	28 (8%)
	85+	2 (1%)	4 (1%)	0 (0%)	2 (1%)	0 (0%)
	Total	**320**	**305**	**326**	**335**	**334**
Prevalent Patients	0-14	4 (0%)	7 (1%)	4 (1%)	10 (1%)	12 (1%)
	15-24	21 (3%)	23 (3%)	15 (2%)	19 (2%)	18 (2%)
	25-34	36 (4%)	34 (4%)	36 (5%)	37 (4%)	47 (5%)
	35-44	65 (8%)	64 (8%)	71 (9%)	83 (10%)	83 (10%)
	45-54	146 (17%)	140 (17%)	129 (16%)	141 (17%)	139 (16%)
	55-64	248 (30%)	226 (27%)	218 (27%)	202 (24%)	204 (24%)
	65-74	223 (27%)	223 (27%)	213 (27%)	221 (27%)	235 (27%)
	75-84	88 (11%)	93 (11%)	103 (13%)	107 (13%)	111 (13%)
	85+	6 (1%)	12 (1%)	8 (1%)	8 (1%)	6 (1%)
	Total	**837**	**822**	**797**	**828**	**855**

Table 5.5 presents the number and proportion of incident peritoneal dialysis patients by primary renal disease.

Table 5.5.1 Incident PD Patients by Primary Disease - Australia

Primary Renal Disease	2013	2014	2015	2016	2017
Diabetic Nephropathy	338 (32%)	380 (33%)	356 (32%)	363 (32%)	388 (34%)
Glomerulonephritis	271 (26%)	294 (25%)	264 (24%)	280 (25%)	259 (23%)
Hypertension	152 (14%)	168 (14%)	162 (15%)	162 (14%)	136 (12%)
Polycystic Disease	57 (5%)	69 (6%)	68 (6%)	63 (6%)	79 (7%)
Reflux Nephropathy	28 (3%)	35 (3%)	25 (2%)	36 (3%)	48 (4%)
Other	139 (13%)	143 (12%)	147 (13%)	138 (12%)	128 (11%)
Uncertain	62 (6%)	54 (5%)	58 (5%)	56 (5%)	80 (7%)
Not reported	9 (1%)	19 (2%)	30 (3%)	30 (3%)	23 (2%)
Total	**1056**	**1162**	**1110**	**1128**	**1141**

Table 5.5.2 Incident PD Patients by Primary Disease - New Zealand

Primary Renal Disease	2013	2014	2015	2016	2017
Diabetic Nephropathy	138 (43%)	134 (44%)	154 (47%)	143 (43%)	159 (48%)
Glomerulonephritis	77 (24%)	70 (23%)	74 (23%)	80 (24%)	73 (22%)
Hypertension	31 (10%)	29 (10%)	29 (9%)	38 (11%)	33 (10%)
Polycystic Disease	20 (6%)	14 (5%)	12 (4%)	15 (4%)	13 (4%)
Reflux Nephropathy	12 (4%)	12 (4%)	10 (3%)	10 (3%)	4 (1%)
Other	32 (10%)	37 (12%)	34 (10%)	38 (11%)	34 (10%)
Uncertain	9 (3%)	8 (3%)	12 (4%)	10 (3%)	13 (4%)
Not reported	1 (0%)	1 (0%)	1 (0%)	1 (0%)	5 (1%)
Total	**320**	**305**	**326**	**335**	**334**

Figure 5.5 shows the proportion of dialysis patients using PD as their modality by age. In both Australia and New Zealand PD is the predominant modality for paediatric patients, but HD is the predominant modality for adult patients.

Figure 5.5.1 - PD Patients (%) of all Prevalent Dialysis - Australia 2017

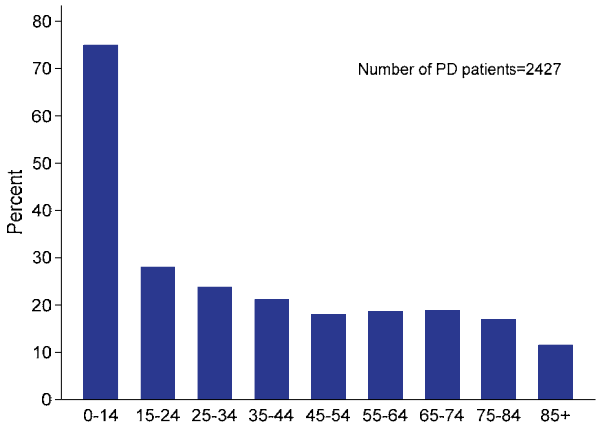


Figure 5.5.2 - PD Patients (%) of all Prevalent Dialysis - New Zealand 2017

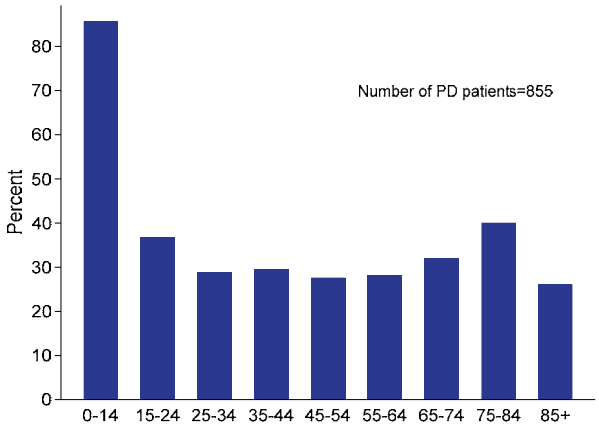


Table 5.6 shows the number of prevalent PD patients, and number per million population, according to PD type.

Population estimates for Australia and New Zealand used for the calculation of prevalence per million population were sourced from the Australian Bureau of Statistics (2017)[1] and Stats NZ (2017)[2].

Table 5.6.1 Number (per Million) of Prevalent PD Patients, Australia 2013-2017

	2013	2014	2015	2016	2017
Total	**2317 (100)**	**2499 (106)**	**2510 (105)**	**2450 (101)**	**2427 (99)**
APD	1481 (64)	1625 (69)	1687 (71)	1666 (69)	1625 (66)
CAPD	836 (36)	874 (37)	823 (35)	784 (32)	802 (33)

Table 5.6.2 Number (per Million) of Prevalent PD Patients, New Zealand 2013-2017

	2013	2014	2015	2016	2017
Total	**837 (188)**	**822 (182)**	**797 (173)**	**828 (176)**	**855 (178)**
APD	393 (88)	394 (87)	418 (91)	430 (92)	448 (93)
CAPD	444 (100)	428 (95)	379 (82)	398 (85)	407 (85)

Peritoneal Dialysis Fluids

Table 5.7 shows the use of icodextrin by country and PD type at the end of 2017. Figure 5.6 shows the trends in icodextrin use over the last three years. Finally, figure 5.7 shows icodextrin use by state and PD type at the end of 2017.

Table 5.7 Icodextrin Usage by Modality Type - December 2017

PD Type		Australia				New Zealand			
		No	Yes	Not Reported	Total	No	Yes	Not Reported	Total
CAPD	n	423	345	34	802	153	244	10	407
	%	**53%**	**43%**	**4%**		**38%**	**60%**	**2%**	
APD	n	750	832	43	1625	117	330	1	448
	%	**46%**	**51%**	**3%**		**26%**	**74%**	**0%**	
Total	n	1173	1177	77	2427	270	574	11	855
	%	**48%**	**48%**	**3%**		**32%**	**67%**	**1%**	

Figure 5.6.1 - Icodextrin Use by Modality - Prevalent Patients December 2015 - 2017 Australia

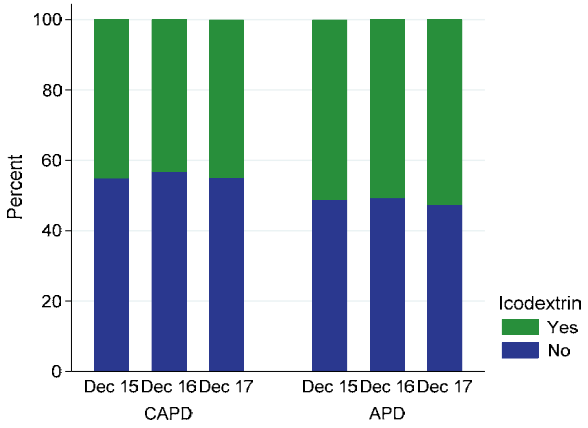


Figure 5.6.2 - Icodextrin Use by Modality - Prevalent Patients December 2015 - 2017 New Zealand

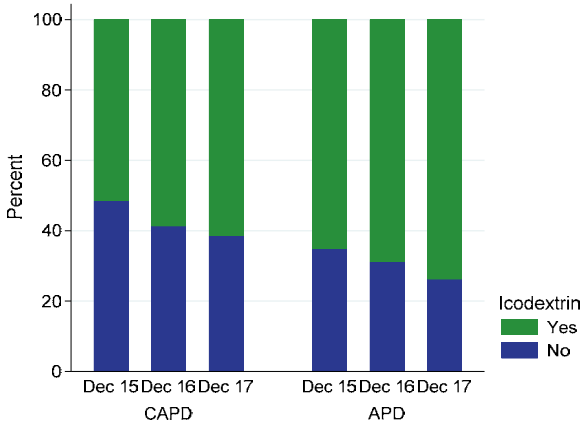


Figure 5.7 - Icodextrin Use by State and Country - Prevalent Patients December 2017

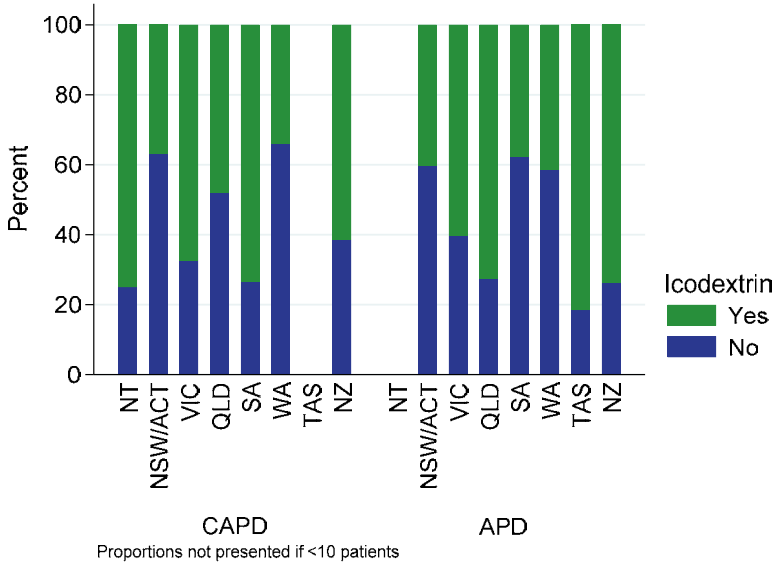


Table 5.8 and figures 5.8 and 5.9 present similar data for low GDP PD solutions. The use of these PD solutions is more common in Australia than in New Zealand and varies considerably by Australian state.

Table 5.8 Low GDP Usage by Modality Type - December 2017

PD Type		Australia				New Zealand			
		No	Yes	Not Reported	Total	No	Yes	Not Reported	Total
CAPD	n	438	333	31	802	363	34	10	407
	%	**55%**	**42%**	**4%**		**89%**	**8%**	**2%**	
APD	n	1276	306	43	1625	423	24	1	448
	%	**79%**	**19%**	**3%**		**94%**	**5%**	**0%**	
Total	n	1714	639	74	2427	786	58	11	855
	%	**71%**	**26%**	**3%**		**92%**	**7%**	**1%**	

Figure 5.8.1 - Low GDP Use by Modality - Prevalent Patients December 2015 - 2017 Australia

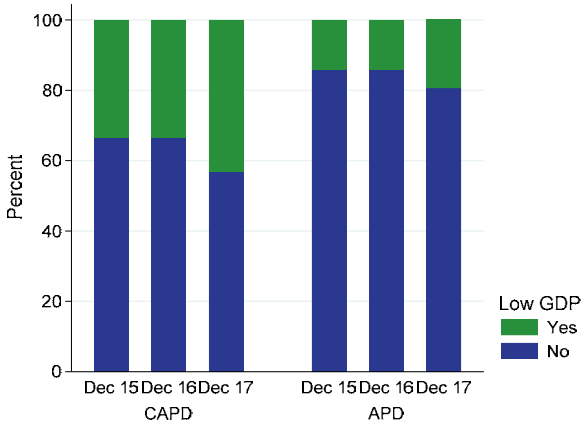


Figure 5.8.2 - Low GDP Use by Modality - Prevalent Patients December 2015 - 2017 New Zealand

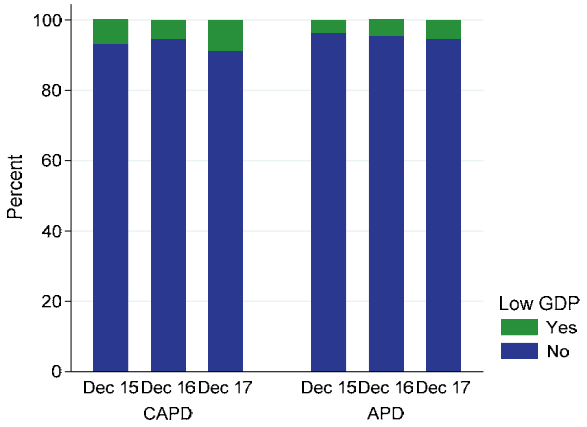
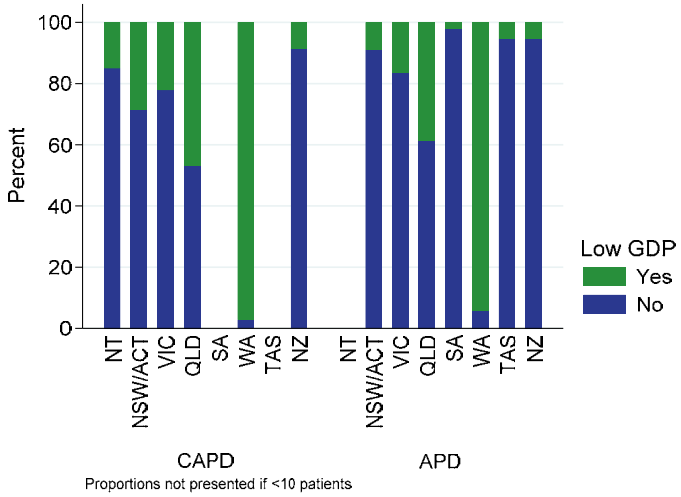


Figure 5.9 - Low GDP Use by State and Country - Prevalent Patients December 2017



Patient Survival

The next section examines PD patient survival. Survival time is for those on PD at day 90, from day 90, and censored at transplantation.

Table 5.9 and figure 5.10 show patient survival by era.

Table 5.9 Patient Survival by Era - Peritoneal Dialysis at 90 Days - Censored for Transplant 2006-2017; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 years	5 years
Australia	**2006 - 2008**	2165	98[97,99]	93[92,94]	73[71,75]	58[56,60]
	2009 - 2011	1880	98[97,98]	94[93,95]	77[75,79]	61[59,63]
	2012 - 2014	2339	99[98,99]	96[95,97]	79[77,81]	64[62,66]
	2015 - 2017	2566	98[98,99]	95[94,96]	79[76,81]	-
New Zealand	**2006 - 2008**	616	98[96,99]	93[90,94]	74[70,77]	53[49,56]
	2009 - 2011	656	99[98,100]	94[92,95]	70[67,74]	48[44,52]
	2012 - 2014	622	99[97,99]	96[94,97]	73[69,76]	53[48,58]
	2015 - 2017	727	99[98,99]	95[93,97]	76[70,80]	-

Figure 5.10.1 - Patient Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - Australia

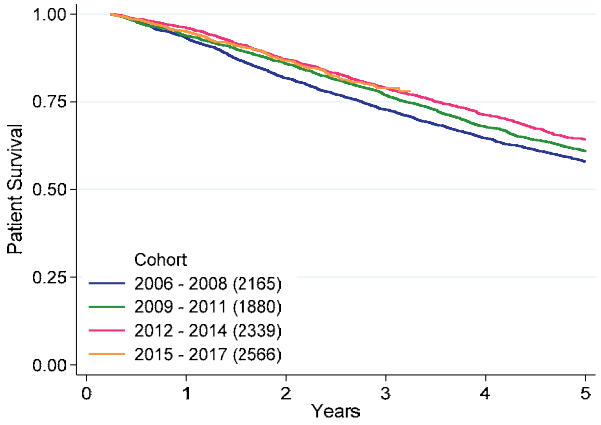


Figure 5.10.2 - Patient Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - New Zealand

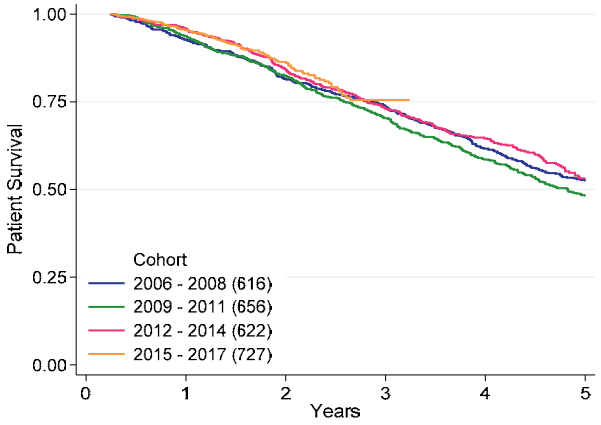


Table 5.10 and figure 5.11 demonstrate the strong association between patient age and survival.

Table 5.10 Patient Survival by Age Group - Peritoneal Dialysis at 90 Days - Censored for Transplant 2006-2017; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**<40**	1345	99[99,100]	99[98,99]	95[93,96]	92[90,93]
	40-59	2832	99[99,99]	97[96,97]	85[83,86]	74[72,76]
	60-74	3267	98[97,98]	94[93,94]	72[71,74]	53[51,55]
	≥75	1506	97[96,98]	89[88,91]	55[53,58]	29[27,32]
New Zealand	**<40**	328	99[98,100]	99[97,100]	92[88,95]	84[79,89]
	40-59	977	99[98,99]	96[94,97]	79[76,81]	61[57,64]
	60-74	1062	98[98,99]	92[91,94]	67[64,70]	42[38,45]
	≥75	254	98[95,99]	91[86,94]	50[43,57]	19[13,26]

Figure 5.11.1 - Patient Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - Australia

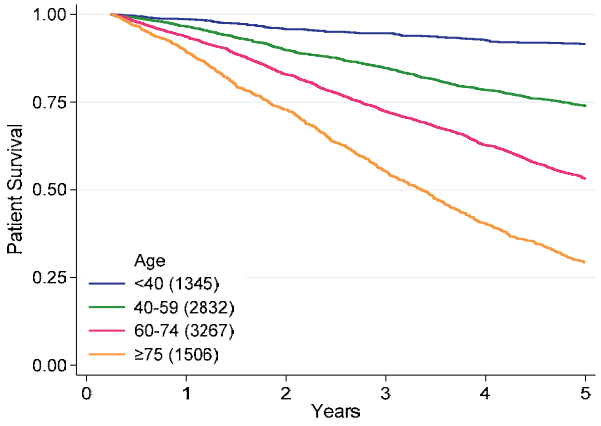


Figure 5.11.2 - Patient Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - New Zealand

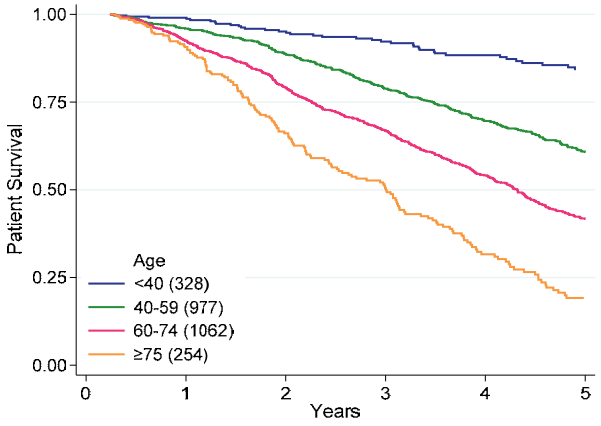


Table 5.11 and figure 5.12 present these data by diabetic status.

Table 5.11 Patient Survival by Diabetic Status - Peritoneal Dialysis at 90 Days - Censored for Transplant 2006-2017; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**Non-diabetic**	4978	99[98,99]	96[95,96]	82[81,84]	71[69,72]
	Diabetic	3937	98[97,98]	93[92,94]	69[68,71]	49[47,51]
New Zealand	**Non-diabetic**	1267	99[98,99]	96[94,97]	81[78,83]	65[62,68]
	Diabetic	1353	99[98,99]	93[92,95]	65[62,68]	38[35,42]

Figure 5.12.1 - Patient Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - Australia

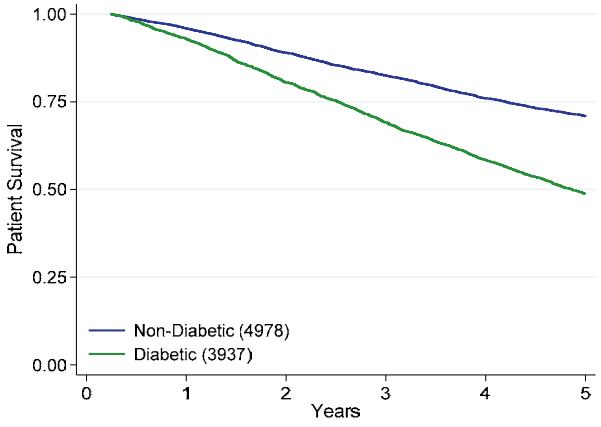
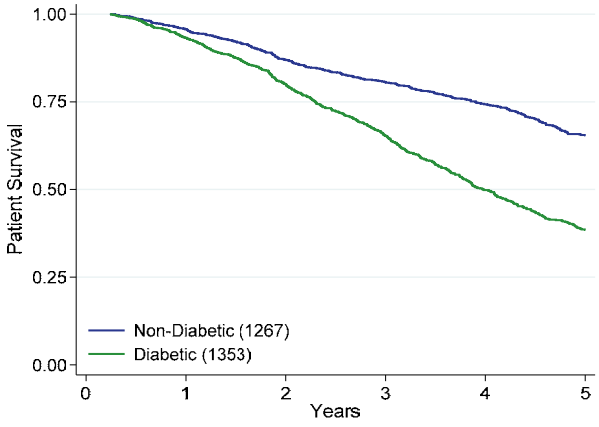


Figure 5.12.2 - Patient Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - New Zealand



Technique Survival

This section examines PD technique survival, defined as the number of days the patient spent on PD before transferring to HD for at least 30 days or dying (either on PD or within 30 days of transfer to HD). Survival time is calculated from day 90 and censored at transplantation. Survival is shown for the same categories reported for patient survival above. As with patient survival, technique survival is adversely affected by older age and diabetic status.

Table 5.12 and figure 5.13 show technique survival by era; there is no clear improvement over time.

Table 5.12 Technique Survival by Era - Peritoneal Dialysis at 90 Days - Censored for Transplant 2006-2017; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**2006 - 2008**	2165	93[92,94]	78[77,80]	39[36,41]	18[16,20]
	2009 - 2011	1880	92[91,93]	80[78,82]	41[39,44]	19[17,21]
	2012 - 2014	2339	94[93,95]	83[81,84]	42[40,45]	17[15,20]
	2015 - 2017	2566	94[93,95]	83[82,85]	41[37,45]	-
New Zealand	**2006 - 2008**	616	95[93,96]	84[81,87]	47[43,51]	22[18,25]
	2009 - 2011	656	96[94,97]	85[82,88]	46[42,50]	19[15,22]
	2012 - 2014	622	95[93,96]	86[83,89]	46[42,50]	19[14,23]
	2015 - 2017	727	95[93,97]	84[81,87]	48[42,55]	-

Figure 5.13.1 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - Australia

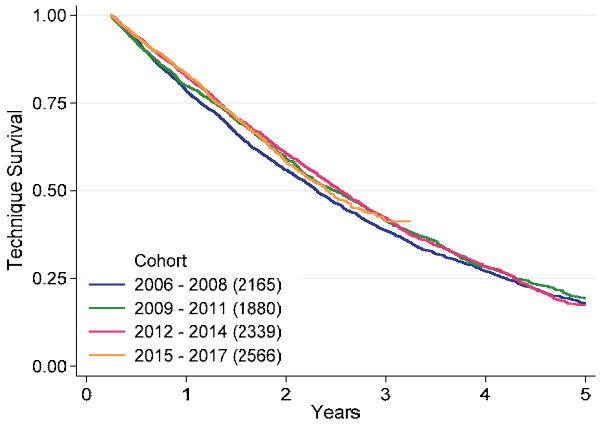


Figure 5.13.2 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - New Zealand

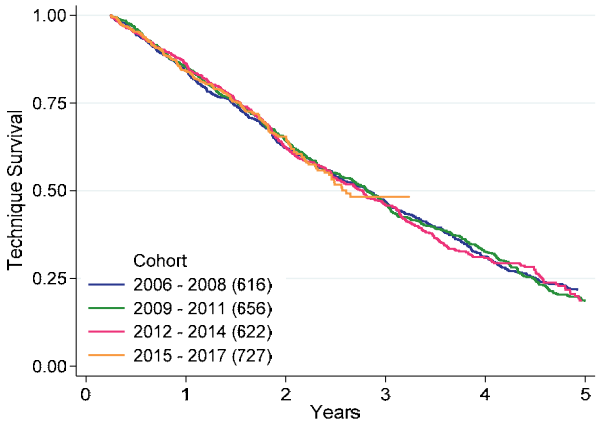


Table 5.13 and figure 5.14 show the association between patient age and technique survival. In general, younger patients have higher technique survival.

Table 5.13 Technique Survival by Age Group - Peritoneal Dialysis at 90 Days - Censored for Transplant 2006-2017; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	<40	1345	95[93,96]	81[78,83]	48[44,52]	29[24,34]
	40-59	2832	94[93,95]	83[82,84]	44[41,46]	21[19,24]
	60-74	3267	93[92,94]	81[80,82]	41[39,43]	19[17,21]
	≥75	1506	92[91,93]	78[76,80]	33[31,36]	11[9,13]
New Zealand	<40	328	96[93,97]	86[81,89]	50[42,57]	31[23,40]
	40-59	977	95[94,96]	86[84,88]	48[44,52]	22[19,26]
	60-74	1062	96[94,97]	84[82,86]	46[43,50]	19[16,22]
	≥75	254	94[90,96]	84[79,88]	36[29,42]	8[4,14]

Figure 5.14.1 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - Australia

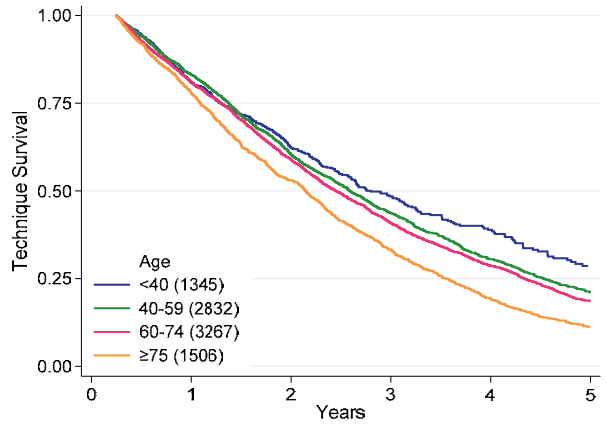


Figure 5.14.2 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - New Zealand

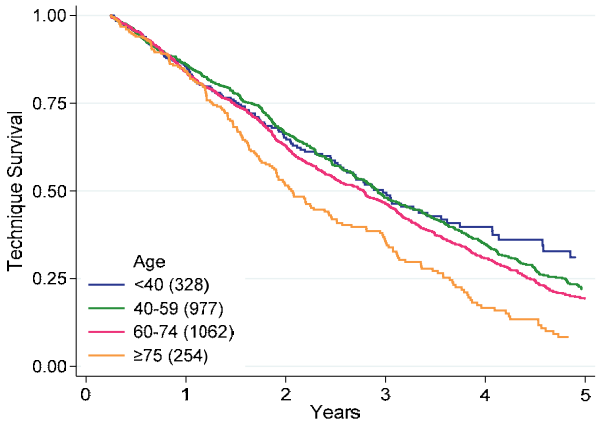


Table 5.14 and figure 5.15 present these data by diabetic status; technique survival is worse in diabetic patients.

Table 5.14 Technique Survival by Diabetic Status - Peritoneal Dialysis at 90 Days - Censored for Transplant 2006-2017; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	Non-diabetic	4978	94[93,94]	82[81,84]	46[44,47]	23[22,25]
	Diabetic	3937	93[92,94]	79[78,81]	36[34,38]	13[12,15]
New Zealand	Non-diabetic	1267	95[94,96]	87[85,88]	53[50,56]	27[24,31]
	Diabetic	1353	95[94,96]	84[81,85]	41[38,44]	15[12,17]

Figure 5.15.1 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - Australia

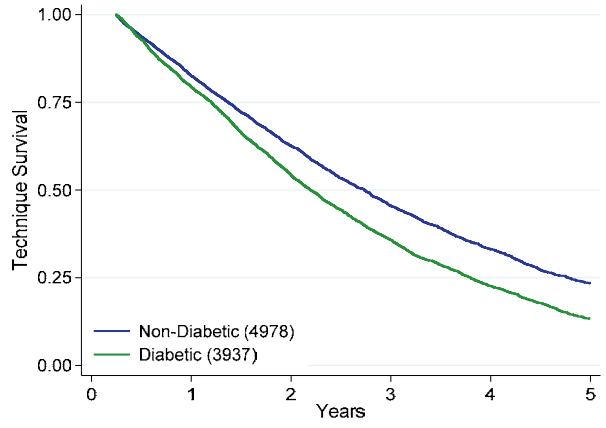


Figure 5.15.2 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Transplant - New Zealand

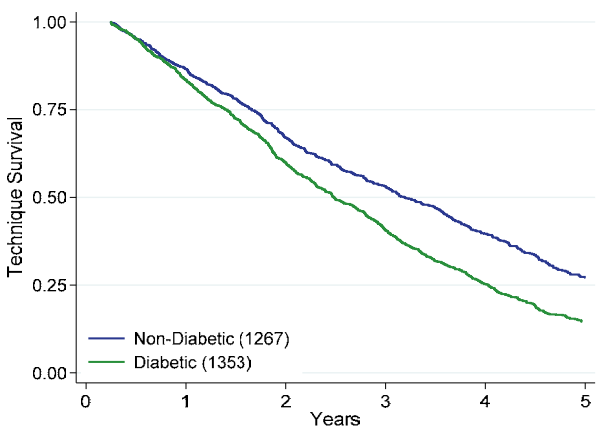


Table 5.15 and figure 5.16 show death-censored technique survival by era; there is no clear improvement over time.

Table 5.15 Technique Survival by Era - Peritoneal Dialysis at 90 Days - Censored for Death and Transplant 2006-2017; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**2006 - 2008**	2165	95[94,96]	84[83,86]	56[53,58]	38[35,41]
	2009 - 2011	1880	94[93,95]	85[84,87]	56[54,59]	38[35,41]
	2012 - 2014	2339	95[94,96]	86[85,88]	57[55,60]	36[33,40]
	2015 - 2017	2566	95[95,96]	87[86,89]	55[51,60]	-
New Zealand	**2006 - 2008**	616	96[95,98]	90[88,93]	66[61,70]	48[43,53]
	2009 - 2011	656	97[95,98]	91[88,93]	69[65,73]	48[42,53]
	2012 - 2014	622	96[94,97]	90[88,92]	65[60,69]	45[39,51]
	2015 - 2017	727	96[95,98]	89[86,91]	69[63,75]	-

Figure 5.16.1 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Death and Transplant - Australia

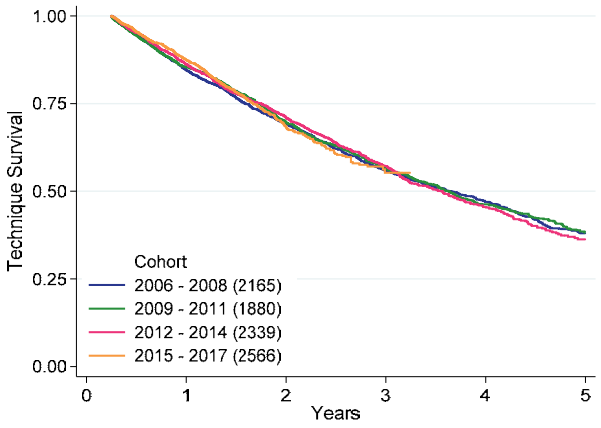


Figure 5.16.2 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Death and Transplant - New Zealand

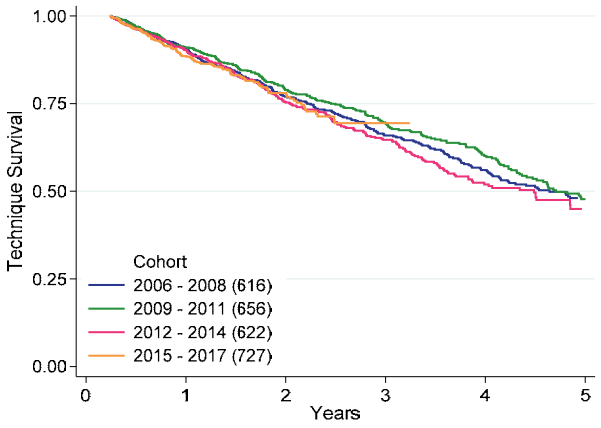


Table 5.16 and figure 5.17 show the association between patient age and death-censored technique survival. In contrast to overall technique survival, older patients receiving PD have higher death-censored technique survival.

Table 5.16 Technique Survival by Age Group - Peritoneal Dialysis at 90 Days - Censored for Death and Transplant 2006-2017; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**<40**	1345	95[94,96]	82[80,84]	51[47,55]	32[27,38]
	40-59	2832	95[94,96]	86[85,87]	53[50,55]	32[29,35]
	60-74	3267	95[94,95]	86[85,88]	58[56,60]	40[37,43]
	≥75	1506	95[94,96]	88[86,89]	63[60,66]	46[41,50]
New Zealand	**<40**	328	96[93,98]	86[82,90]	56[48,63]	40[30,49]
	40-59	977	96[95,97]	90[87,91]	63[59,67]	40[35,45]
	60-74	1062	97[96,98]	91[89,93]	71[68,75]	54[49,58]
	≥75	254	96[93,98]	93[89,96]	74[66,80]	62[51,71]

Figure 5.17.1 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Death and Transplant - Australia

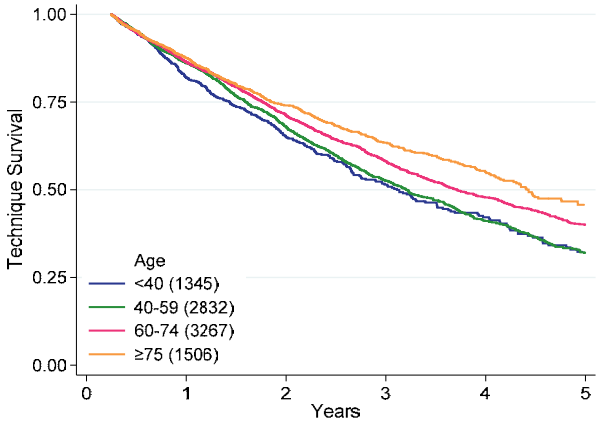


Figure 5.17.2 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Death and Transplant - New Zealand

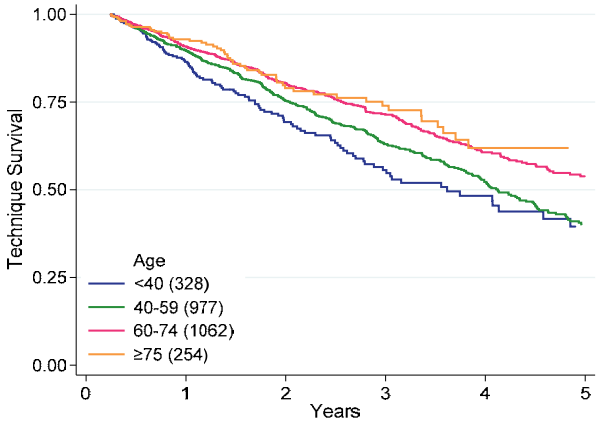


Table 5.17 and figure 5.18 present these data by diabetic status; death-censored technique survival is slightly worse in diabetic patients after the first year.

Table 5.17 Technique Survival by Diabetic Status - Peritoneal Dialysis at 90 Days - Censored for Death and Transplant 2006-2017; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**Non-diabetic**	4978	95[94,96]	86[85,87]	58[57,60]	40[38,42]
	Diabetic	3937	95[94,96]	86[84,87]	54[52,56]	34[32,37]
New Zealand	**Non-diabetic**	1267	96[95,97]	91[89,92]	69[65,72]	49[45,54]
	Diabetic	1353	97[96,98]	90[88,91]	65[61,68]	44[40,49]

Figure 5.18.1 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Death and Transplant - Australia

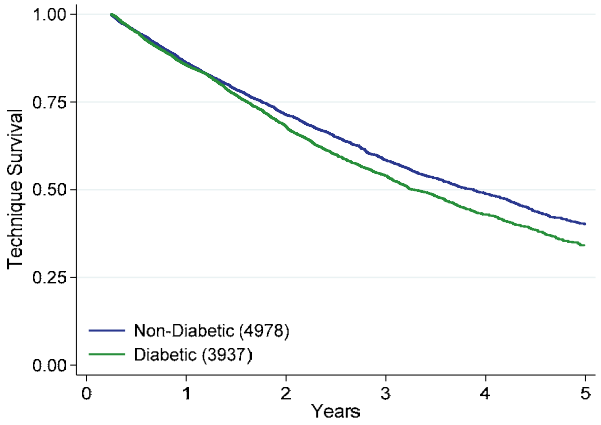
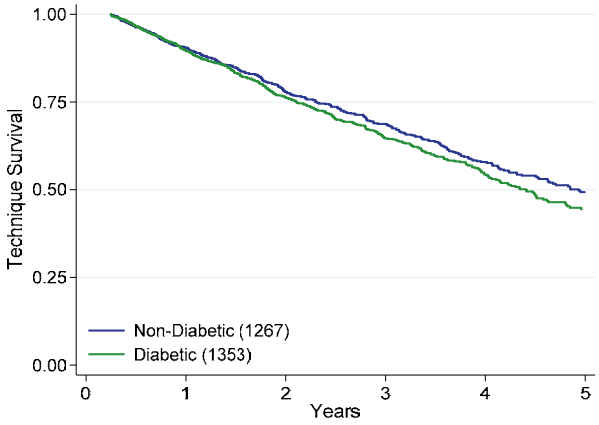


Figure 5.18.2 - Technique Survival - Peritoneal Dialysis at 90 days - 2006 - 2017 Censored for Death and Transplant - New Zealand



The causes of PD technique failure in 2017 are shown in table 5.18. After death, infection is the most common cause of technique failure in both countries.

Table 5.18 Reasons for Technique Failure 2017

Category	Cause of Technique Failure	Australia	New Zealand
Infection	Recurrent/Persistent Peritonitis	69	24
	Acute Peritonitis	107	19
	Tunnel/Exit Site Infection	21	17
	Diverticulitis	4	0
	Abdominal Abscess	2	0
	Total	**203 (24%)**	**60 (24%)**
Inadequate Dialysis	Inadequate Solute Clearance	89	11
	Inadequate Fluid Ultrafiltration	45	7
	Excessive Fluid Ultrafiltration	2	0
	Poor Nutrition	0	1
	Total	**136 (16%)**	**19 (8%)**
Mechanical	Dialysate Leak	17	5
	Catheter Block	15	0
	Catheter Fell Out	0	1
	Hernia	13	4
	Abdominal Pain	2	0
	Abdominal Surgery	17	4
	Multiple Adhesions	2	2
	Pleural Effusion	5	1
	Other Surgery	6	0
	Hydrothorax	1	1
	Total	**78 (9%)**	**18 (7%)**
Social	Geography	1	0
	Patient Preference	31	1
	Unable to Manage Self-Care	45	11
	Total	**77 (9%)**	**12 (5%)**
Other	Cardiovascular	2	0
	Transfer Outside Australia or NZ	0	1
	Planned Transfer After Acute PD Start	2	0
	Planned Transfer After Acute HD Start	1	0
	Other (Specify)	32	4
	Total	**37 (4%)**	**5 (2%)**
Death	**Total**	**276 (32%)**	**125 (50%)**
Not reported	**Total**	**46 (5%)**	**9 (4%)**

Figure 5.19 and table 5.19 show the cumulative incidence of patients returning to PD after a technique failure during 2013-2017. These data are censored at transplantation, and death is treated as a competing risk. Return to PD was common after a mechanical failure but rare after technique failure due to inadequate dialysis or social reasons.

Figure 5.19.1 - Time to Restarting PD after Technique Failure - Australia 2013-2017

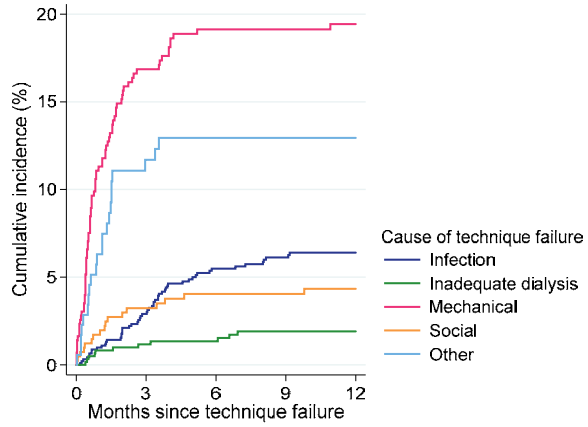


Figure 5.19.2 - Time to Restarting PD after Technique Failure - New Zealand 2013-2017

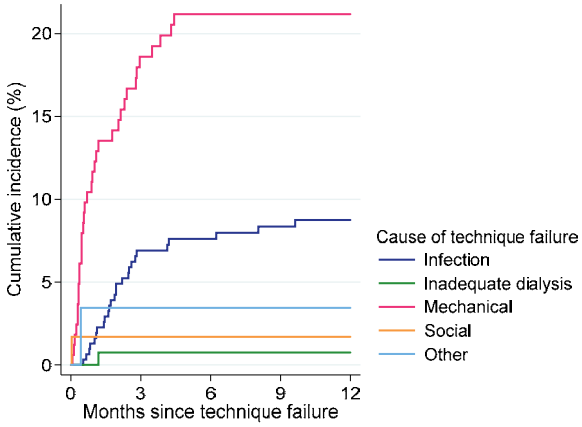


Table 5.19.1 Return to PD (Cumulative Incidence and 95% CI) by Cause of Technique Failure, Australia 2013-2017

Cause of technique failure	3 months	6 months	9 months	12 months
Infection	2.9 (1.9, 4.2)	5.5 (4.1, 7.1)	6.1 (4.7, 7.9)	6.4 (4.9, 8.2)
Inadequate dialysis	1.2 (0.5, 2.3)	1.3 (0.6, 2.5)	1.9 (1.0, 3.3)	1.9 (1.0, 3.3)
Mechanical	16.9 (13.5, 20.6)	19.1 (15.5, 23.0)	19.1 (15.5, 23.0)	19.4 (15.8, 23.4)
Social	3.2 (1.8, 5.3)	4.0 (2.4, 6.3)	4.0 (2.4, 6.3)	4.3 (2.6, 6.7)
Other	11.7 (7.4, 17.0)	12.9 (8.4, 18.5)	12.9 (8.4, 18.5)	12.9 (8.4, 18.5)

Table 5.19.2 Return to PD (Cumulative Incidence and 95% CI) by Cause of Technique Failure, New Zealand 2013-2017

Cause of technique failure	3 months	6 months	9 months	12 months
Infection	6.9 (4.4, 10.1)	7.6 (5.0, 11.0)	8.4 (5.6, 11.8)	8.7 (5.9, 12.3)
Inadequate dialysis	0.7 (0.1, 3.7)	0.7 (0.1, 3.7)	0.7 (0.1, 3.7)	0.7 (0.1, 3.7)
Mechanical	18.6 (13.0, 25.0)	21.2 (15.2, 27.8)	21.2 (15.2, 27.8)	21.2 (15.2, 27.8)
Social	1.7 (0.1, 8.0)	1.7 (0.1, 8.0)	1.7 (0.1, 8.0)	1.7 (0.1, 8.0)
Other	3.4 (0.3, 14.9)	3.4 (0.3, 14.9)	3.4 (0.3, 14.9)	3.4 (0.3, 14.9)

Peritonitis

Table 5.20 and figure 5.20 present the time to first peritonitis over 2013-2017 by age at PD start. Peritonitis is more common in children, but otherwise there is little association between age and time to first peritonitis.

Table 5.20 First PD Treatment to First Episode of Peritonitis By Age at Entry 01-Jan-2013 to 31-Dec-2017 % Survival [95% Confidence Interval]

Survival	Age Groups						
	00-14	15-34	35-54	55-64	65-74	≥75	All
Australia	**(n=111)**	**(n=454)**	**(n=1400)**	**(n=1163)**	**(n=1319)**	**(n=784)**	**(n=5231)**
3 months	81 [72,87]	92 [89,94]	91 [89,93]	93 [91,94]	93 [91,94]	93 [91,95]	**92 [91,93]**
6 months	71 [61,79]	85 [82,89]	85 [83,87]	87 [85,89]	88 [85,89]	89 [86,91]	**86 [85,87]**
9 months	61 [50,70]	80 [75,84]	78 [76,81]	81 [78,83]	82 [80,84]	82 [79,85]	**80 [79,81]**
1 year	61 [50,70]	75 [70,79]	74 [71,76]	76 [73,79]	78 [76,81]	77 [73,80]	**76 [74,77]**
2 years	48 [34,62]	62 [55,68]	57 [53,61]	57 [53,61]	61 [57,64]	62 [57,66]	**59 [57,61]**
3 years	32 [9,59]	51 [41,61]	43 [38,48]	44 [39,49]	46 [42,51]	47 [41,53]	**45 [43,48]**
New Zealand	**(n=25)**	**(n=134)**	**(n=426)**	**(n=384)**	**(n=384)**	**(n=151)**	**(n=1504)**
3 months	79 [57,91]	97 [92,99]	93 [90,95]	91 [88,94]	92 [89,94]	94 [88,97]	**93 [91,94]**
6 months	70 [46,84]	90 [82,94]	88 [84,91]	83 [79,87]	84 [80,88]	88 [82,93]	**86 [84,87]**
9 months	65 [41,81]	81 [71,87]	82 [77,86]	79 [74,83]	82 [77,86]	85 [77,90]	**81 [79,83]**
1 year	57 [33,76]	78 [68,85]	77 [72,81]	68 [62,73]	78 [73,82]	79 [70,85]	**75 [72,77]**
2 years	-	67 [55,77]	56 [49,63]	45 [38,52]	58 [51,65]	61 [50,70]	**55 [51,58]**
3 years	-	46 [29,62]	40 [30,49]	37 [30,45]	47 [38,55]	46 [33,58]	**42 [38,47]**

Figure 5.20.1 - First PD Treatment to First Peritonitis - By Age at First PD Australia 2013 - 2017

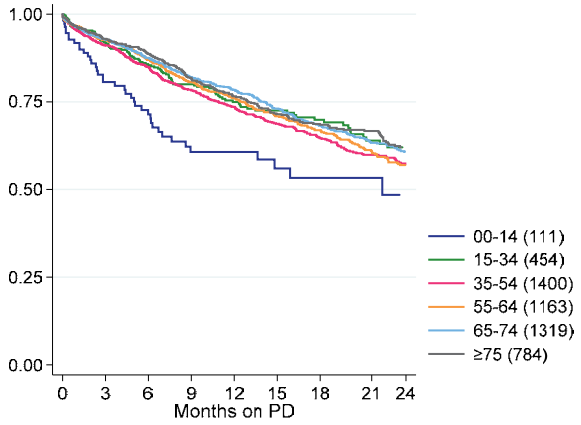
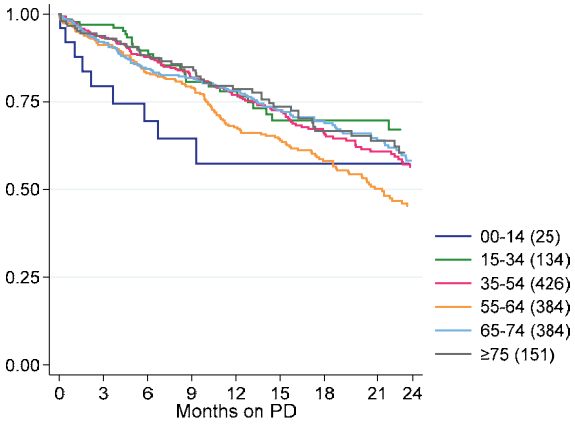


Figure 5.20.2 - First PD Treatment to First Peritonitis - By Age at First PD New Zealand 2013 - 2017



In Australia peritonitis is more common in Indigenous patients and less common in Asian patients. In New Zealand a similar but less pronounced pattern is seen (figure 5.21).

Figure 5.21.1 - First PD Treatment to First Peritonitis - By Ethnicity Australia 2013 - 2017

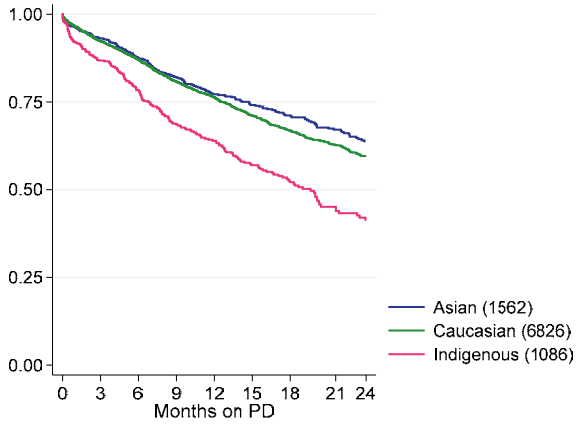
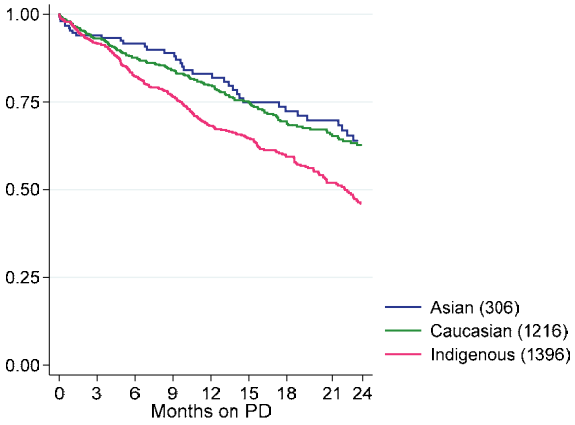


Figure 5.21.2 - First PD Treatment to First Peritonitis - By Ethnicity New Zealand 2013 - 2017



Diabetes is associated with a shorter time to first peritonitis in both countries, but in Australia this difference only appears around 12 months into PD treatment (figure 5.22).

Figure 5.22.1 - First PD Treatment to First Peritonitis - By Diabetic Status at RRT entry Australia 2013 - 2017

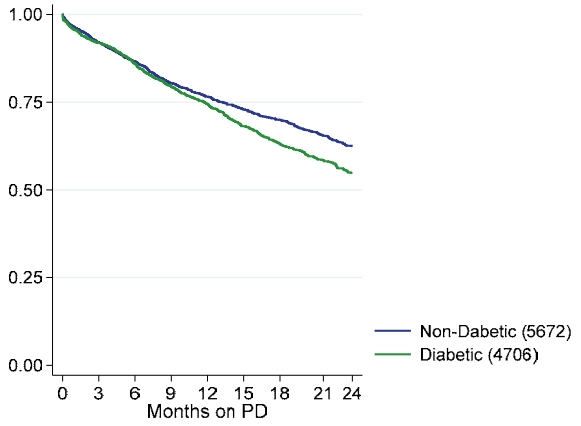
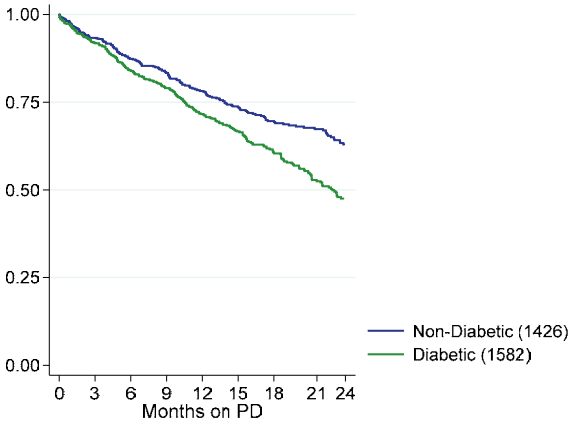


Figure 5.22.2 - First PD Treatment to First Peritonitis - By Diabetic Status at RRT entry New Zealand 2013 - 2017



Australian Peritonitis Registry

Since October 2003 ANZDATA has collected detailed information on PD peritonitis episodes in Australian patients. A selection of those data is reported here. New Zealand has a separate PD registry which is not currently linked with ANZDATA.

Table 5.21 and Figures 5.23-5.27 report the peritonitis rate, expressed as episodes per patient-year in the table and on the left y axis of the figures and patient-months per episode on the right y axis of the figures, according to different categories. The overall peritonitis rate in Australia has dropped considerably over the last few years (figure 5.23). However, there remains significant variation between states (figures 5.24 and 5.25) and individual treating hospitals (figures 5.26 and 5.27).

Table 5.21 PD Peritonitis Episodes Per Year By State, Australia 2013-2017

State	2013	2014	2015	2016	2017	2013-2017
QLD	0.52	0.44	0.48	0.39	0.42	**0.45**
NSW	0.34	0.34	0.31	0.31	0.31	**0.32**
ACT	0.36	0.41	0.58	0.42	0.39	**0.43**
VIC	0.34	0.24	0.30	0.31	0.24	**0.28**
TAS	0.38	0.29	0.33	0.29	0.12	**0.28**
SA	0.38	0.37	0.31	0.27	0.28	**0.32**
NT	0.61	0.79	0.71	0.58	0.60	**0.66**
WA	0.43	0.49	0.48	0.38	0.32	**0.42**
Australia	**0.39**	**0.36**	**0.37**	**0.33**	**0.31**	**0.35**

Figure 5.23 - PD Peritonitis Rate - Australia 2004-2017

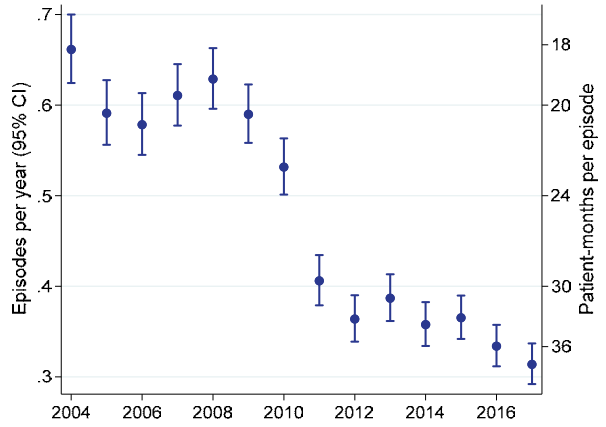


Figure 5.24 - PD Peritonitis Rate - By State, Australia 2013-2017

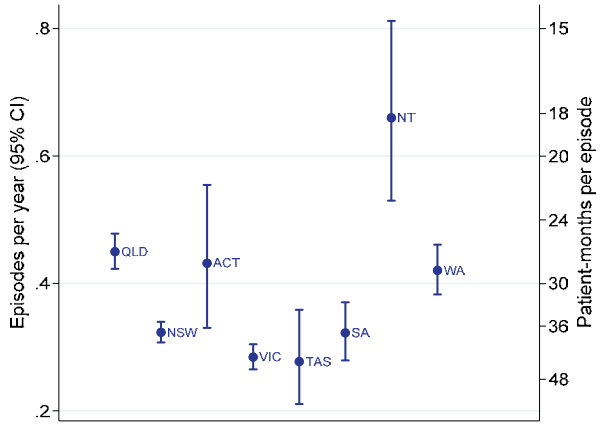


Figure 5.25 - PD Peritonitis Rate - By State, Australia 2008-2017

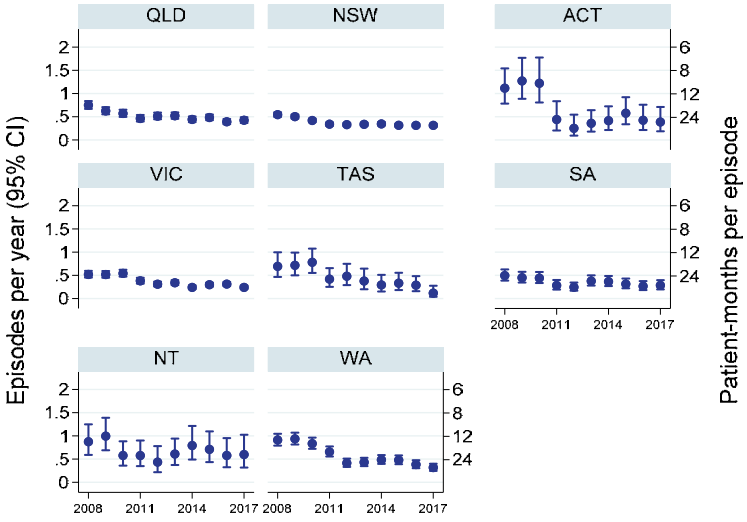


Figure 5.26 - PD Peritonitis Rate - By Treating Unit, Australia 2008-2017

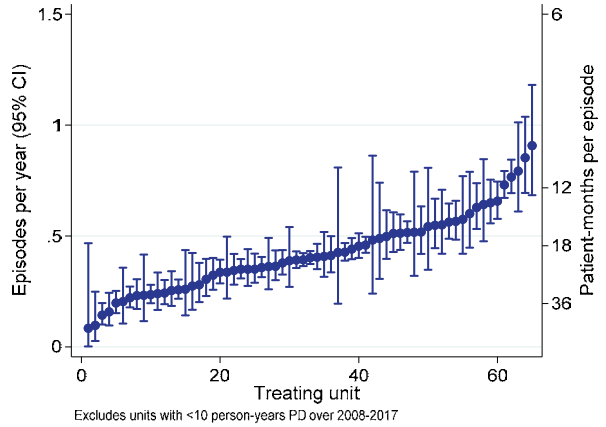
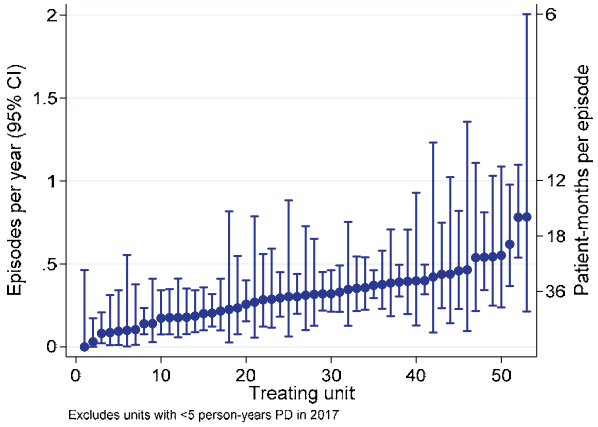


Figure 5.27 - PD Peritonitis Rate - By Treating Unit, Australia 2017



The organisms causing peritonitis are presented in figure 5.28. The distribution of organisms is quite stable, although there has been a gradual increase the proportion of culture negative infections. Figure 5.29 shows these data for 2017 stratified by state.

Figure 5.28 - Distribution of Organisms Causing Peritonitis - Australia 2008-2017

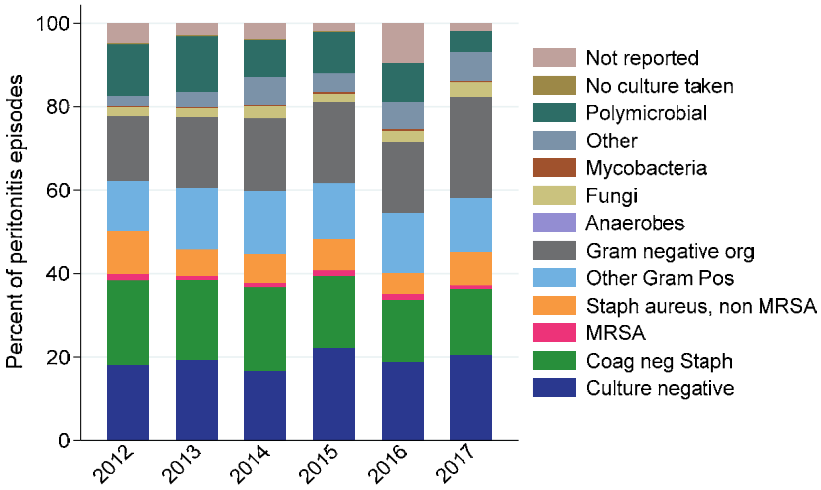
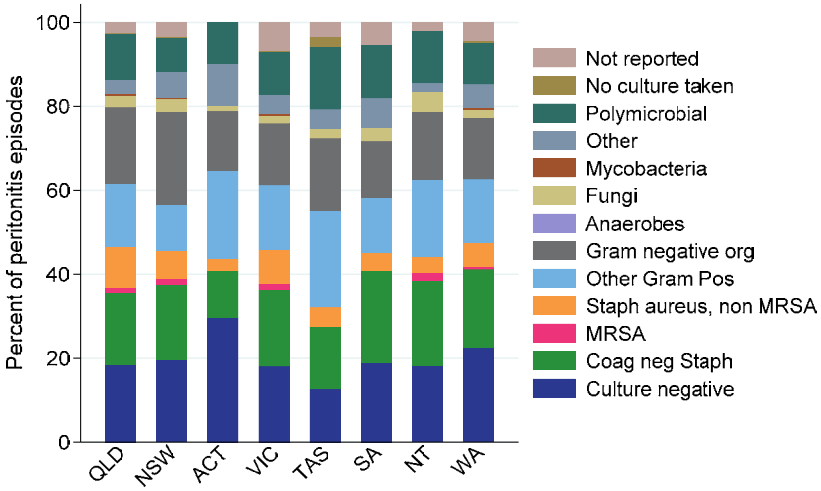


Figure 5.29 - Distribution of Organisms Causing Peritonitis - Australia 2017



Around 40% of episodes are initially treated with vancomycin, and the majority receive an aminoglycoside (figure 5.30). The use of these drugs in the final regimen are shown in figure 5.31.

Figure 5.30 - Initial Antibiotic Regimen - Australia 2008-2017

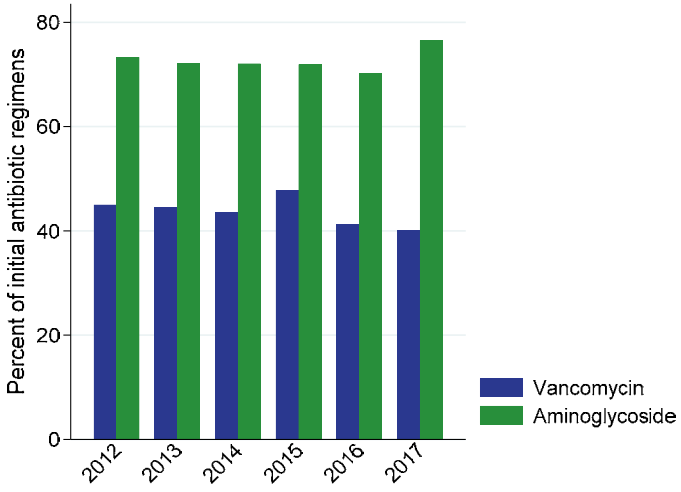
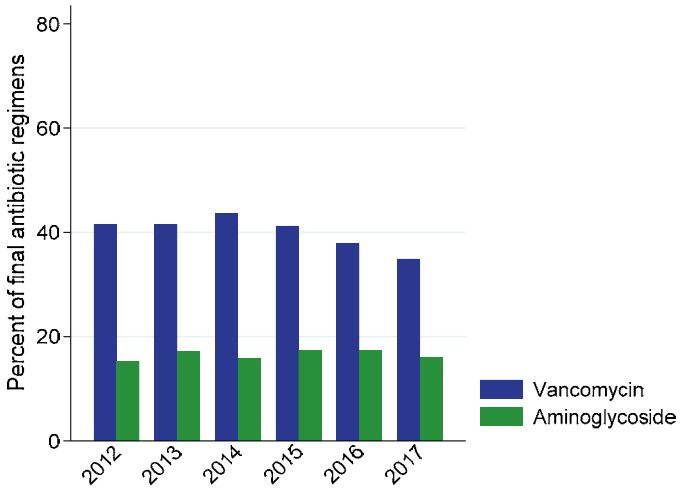
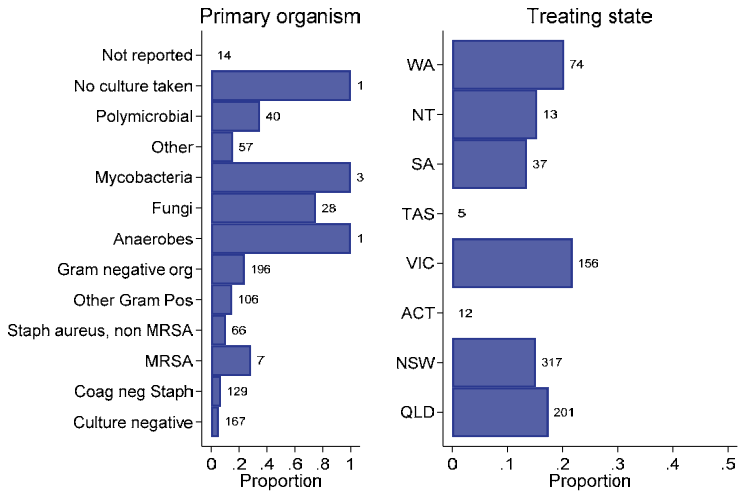


Figure 5.31 - Final Antibiotic Regimen - Australia 2011-2017



The proportion of peritonitis episodes resulting in a permanent transfer to haemodialysis varies by organism and, to a lesser extent, state (figure 5.32).

Figure 5.32 - Proportion of Episodes Resulting in Permanent HD Transfer - Australia 2017



Values are total number of peritonitis episodes reported in 2017

Laboratory Values

Anaemia

Figure 5.33 shows the distribution of Hb in PD patients over the last 3 years, and figure 5.34 presents the same data stratified by the presence or absence of coronary artery disease.

Figure 5.33 - Haemoglobin - Peritoneal Dialysis - December 2015-2017

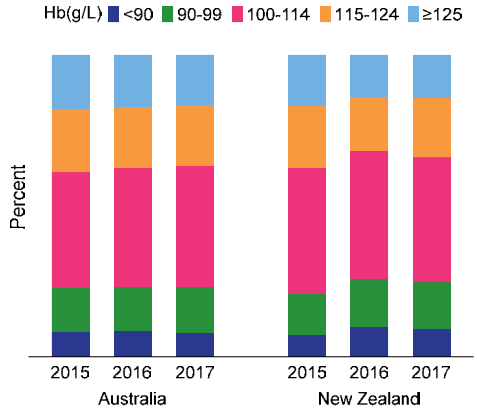


Figure 5.34.1 - Haemoglobin - Peritoneal Dialysis - By Coronary Artery Disease Status Australia, December 2015-2017

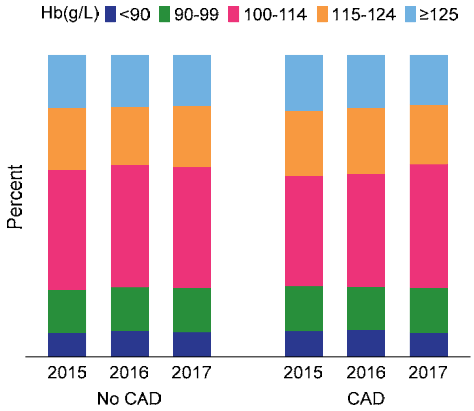


Figure 5.34.2 - Haemoglobin - Peritoneal Dialysis - By Coronary Artery Disease Status New Zealand, December 2015-2017

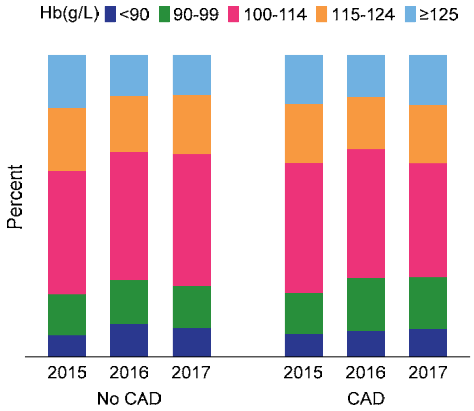


Figure 5.35 shows the variation in Hb between treating hospitals; median Hb ranged from 100 to 123g/L in Australia and 106-115g/L in New Zealand.

Figure 5.35.1 - Haemoglobin in Peritoneal Dialysis Patients - Australia 31 December 2017

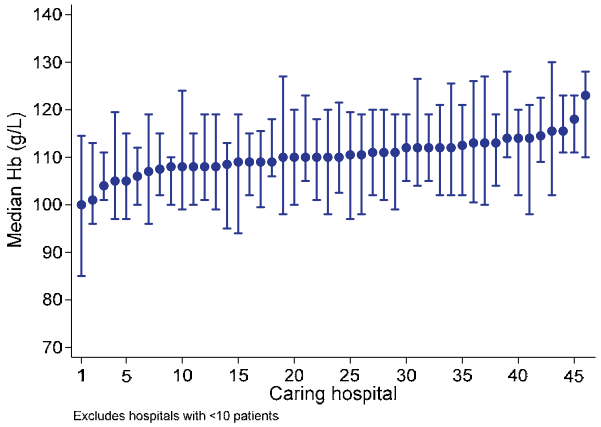


Figure 5.35.2 - Haemoglobin in Peritoneal Dialysis Patients - New Zealand 31 December 2017

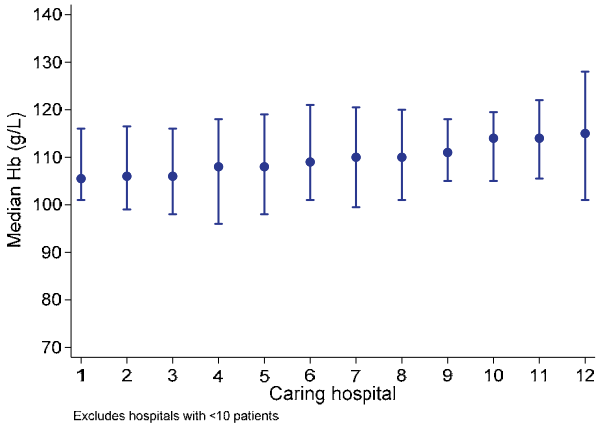


Figure 5.36 shows the proportion of patients with Hb between 110-129g/L; the proportion ranged from 20-65% in Australia and 30-64% in New Zealand.

Figure 5.36.1 - % Peritoneal Dialysis Patients with Hb 110-129 g/L - Australia 31 December 2017

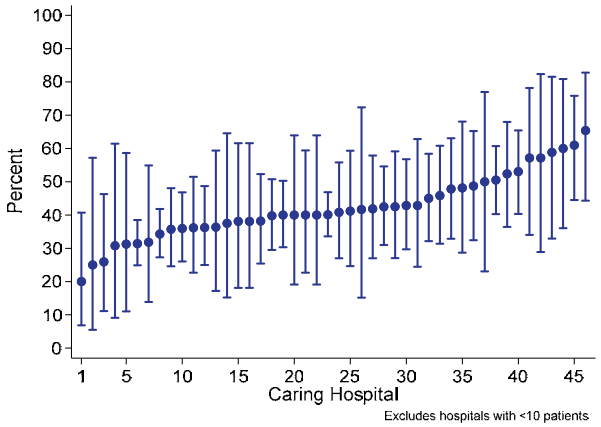
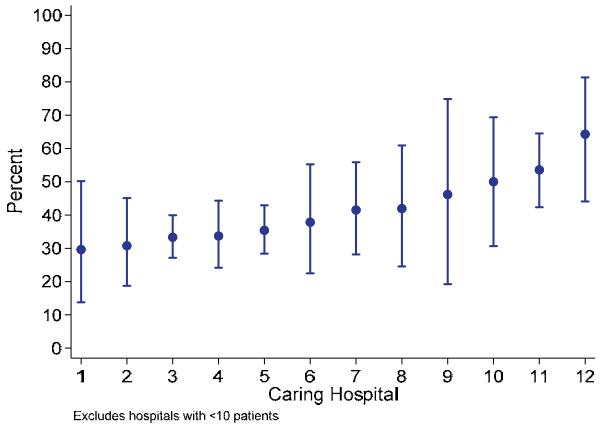


Figure 5.36.2 - % Peritoneal Dialysis Patients with Hb 110-129 g/L - New Zealand 31 December 2017



Biochemistry

Figures 5.37-5.40 present the distributions of calcium and phosphate. These numbers remain stable compared with previous years.

Figure 5.37 - Serum Calcium - Peritoneal Dialysis - December 2015-2017

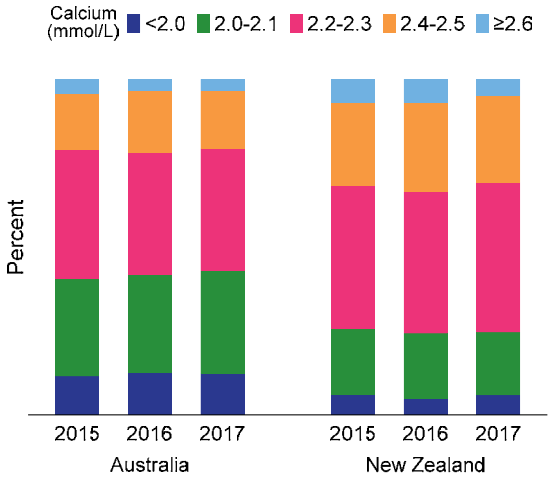


Figure 5.38.1 - % PD Patients with Calcium 2.1-2.4 mmol/L - Australia 31 December 2017

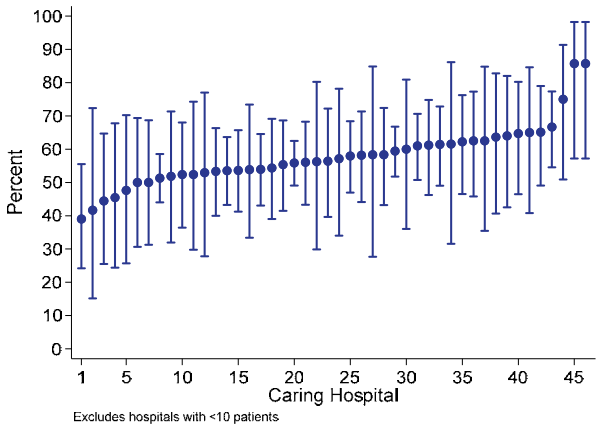


Figure 5.38.2 - % PD Patients with Calcium 2.1-2.4 mmol/L - New Zealand 31 December 2017

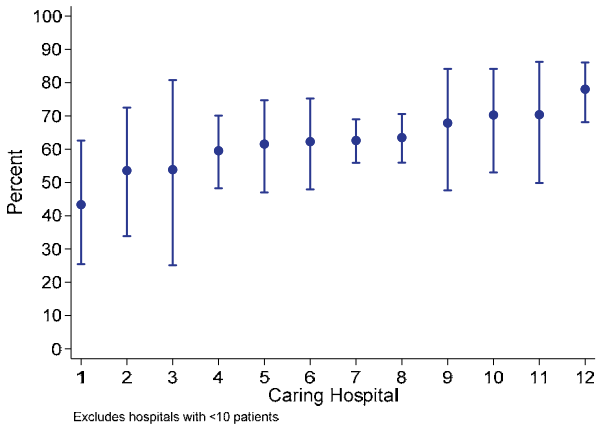


Figure 5.39 - Serum Phosphate - Peritoneal Dialysis - December 2015-2017

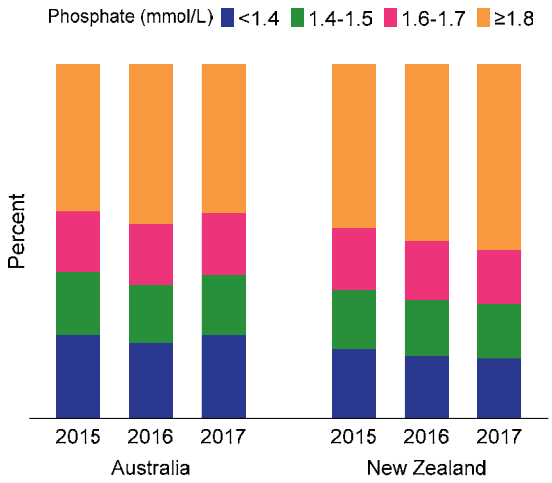


Figure 5.40.1 - % PD Patients with Phosphate 0.8-1.6 mmol/L - Australia 31 December 2017

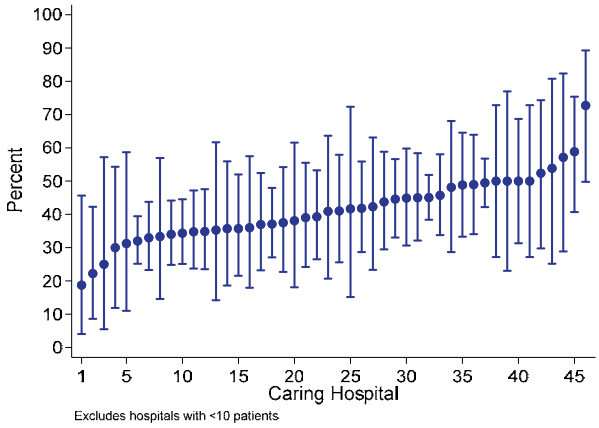
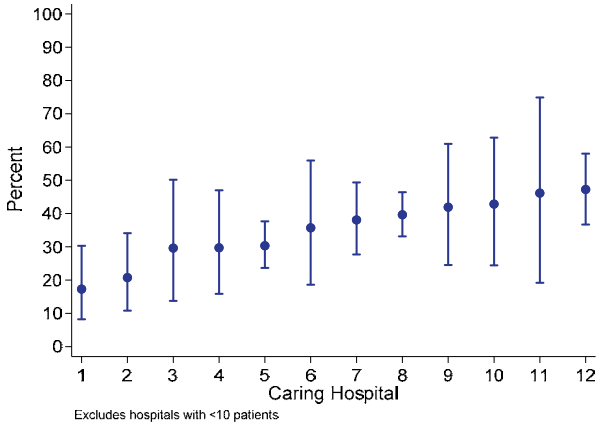


Figure 5.40.2 - % PD Patients with Phosphate 0.8-1.6 mmol/L - New Zealand 31 December 2017



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[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/