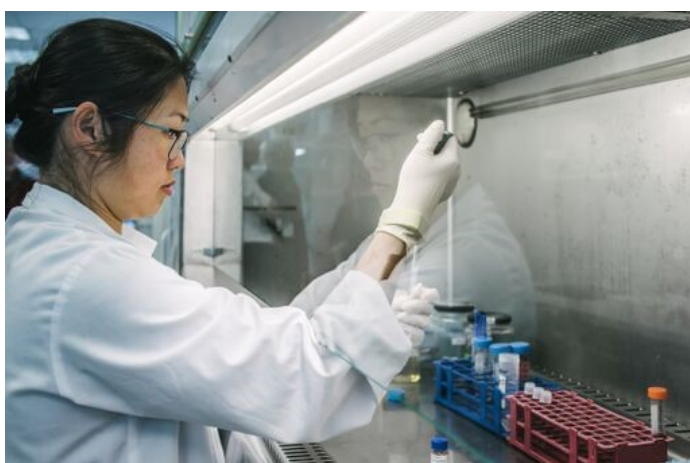


# New Zealand Nephrology

## 12th Annual Report

Reporting on treatment practices and patient outcomes of dialysis and kidney transplantation in Aotearoa New Zealand in 2017



# The Aotearoa NZ Nephrology Annual Report

Welcome to the New Zealand Nephrology Annual Report about treatment practices and care outcomes for adults and children who have severe kidney disease requiring treatment with dialysis or a kidney transplant.

This report is a way for health services, health funders, clinicians, and patients and whānau to examine the practice patterns and quality of dialysis and kidney transplant care across New Zealand.

The report is based on data that all New Zealand dialysis and transplant patients share with the Australia and New Zealand Dialysis and Transplant (ANZDATA) Registry, the New Zealand Peritoneal Dialysis Registry (NZPDR), National Health Index (NHI), Statistics New Zealand, and the New Zealand Blood Service. The databases are maintained through funding from government and through in-kind support by New Zealand renal clinicians.

The annual New Zealand Nephrology report has been written by dedicated nephrologists since 2005. The Standards and Audit Working Party was the original group to write the report. This Working Group formed by the National Renal Advisory Board in 2000 generated this report with the express purpose to provide a national annual audit of nephrology

practices, relevant to patient care. The audit is intended to inform planning and monitoring for adequate delivery of renal failure services according to mandatory specialist medical service [specifications](#).

The 2017 report is written by the Aotearoa New Zealand ANZDATA Working Group which is responsible for overseeing ANZDATA within New Zealand to enable data-driven monitoring and audit of care quality of treatment for end-stage kidney disease.

The findings of this report are reviewed by the National Renal Advisory Board.

For the first time, this report draft has been sent for consultation and feedback to the Consumer Council of Kidney Health New Zealand who recently expressed a clear wish to be informed about care practices and outcomes in New Zealand.

The report is also provided directly to the Ministry of Health.

The writing group members support the work of the NRAB, the National Renal Transplant Service, and the Dialysis Advisory Committee of the Australia and New Zealand Society of Nephrology to gener-

ate key quality indicators for dialysis and transplant care that can continually be incorporated into annual data reporting in New Zealand.

Finally, we wish again to acknowledge the sharing of data by New Zealand patients, the support of their whānau, the dedicated ANZDATA team based in Adelaide that helps with our requested analyses, the Ministry of Health data teams, the New Zealand Blood Service, and individual clinicians at each unit who report their dialysis vascular catheter infection data. We thank also of the clinicians in New Zealand who give their time to filling out the ANZDATA forms each year — without whom this report would not be possible. We also acknowledge the longstanding commitment to funding of ANZDATA provided by the New Zealand Ministry of Health.

Report Writing Group

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# About this report

## WHAT

12th annual report

## DATA

January 1 to December 31, 2017

## SOURCES

Australia and New Zealand Dialysis and Transplant Registry (ANZDATA)

New Zealand Peritoneal Dialysis Registry (NZPDR)

New Zealand Blood Service

Statistics New Zealand

Individual renal units

## COVERING

Care by District Health Boards which provide dialysis and kidney transplantation services for New Zealand. The 11 District Health Boards are

Northland (Northland DHB)

Waitemata (Waitemata DHB)

Auckland (Auckland DHB & Starship Hospital)

Counties Manukau (Counties Manukau DHB)

Waikato (Waikato, Bay of Plenty, Lakes, and Tairāwhiti DHBs)

Hawke's Bay (Hawke's Bay DHB)

MidCentral (Whanganui and MidCentral DHB)

Taranaki (Taranaki DHB)

Capital & Coast (Capital & Coast, Hutt, Wairarapa, and Nelson Marlborough DHBs)

Canterbury (Canterbury, West Coast and South Canterbury DHBs)

Southern (Southern DHB)



## POPULATION DATA

Ethnicity and District Health Board populations are based on Census populations for mid-2017 as the denominator, and adjusted for age, sex, and ethnicity where specified. In this report the data for European (NZ European and Other European, Māori, Pacific, and Asian ethnicities) are reported separately where possible.

## FUNDING

The writing of this report receives no funding. The ANZDATA Registry has received important financial contributions from the New Zealand Government through the Ministry of Health/Manatū Hauora. ANZDATA also receives funding from the Australian Commonwealth and Kidney Health Australia. The work of Stephen McDonald, Phil Clayton, Kylie Hurst, and Chris Davies at ANZDATA is acknowledged. The support of the NZ Peritoneal Dialysis Registry (NZPDR) Steering committee is also acknowledged.



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Peritoneal dialysis	36
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# Key statistics for 2017

**615**

Patients started treatment for end-stage kidney disease

**4658**

Patients being treated for kidney failure in New Zealand at end of 2017

**187**

Kidney transplants (40 per million)

**65-74**

Age group with the highest risk of starting treatment (and increasing)

**849**

The number of Pacific patients per million starting treatment (**12-fold higher than** European patients)

**14**

ABO incompatible transplants

**445**

Patients active on the kidney transplant waiting list

**2768**

Number of people living on dialysis

**436**

Patients doing home haemodialysis

**74%**

Diabetes as a cause of kidney failure for Pacific patients starting treatment

**11%**

Referred late to specialist services (40% among children and young adults)

**28%**

Percent of haemodialysis patients with temporary vascular access

# Key findings

- 1 The rate of patients starting treatment for end-stage kidney disease in New Zealand is stable and in line with population growth. The number of patients starting treatment has increased 9% over the last 5 years (population increase 7.3%).
- 2 Pacific patients experience a 12-fold higher rate of starting kidney replacement therapy. Māori patients experience a 6-fold higher rate of starting kidney replacement therapy.
- 3 The incidence of dialysis among patients 75 years or older is high and progressively increasing.
- 4 Diabetes causes kidney failure in 74% of Pacific patients starting dialysis and 68% of Māori patients. This compares with 24% of European patients in New Zealand.
- 5 New Zealand European patients are much more likely to receive a pre-emptive kidney transplant (4- to 8-fold).
- 6 Home haemodialysis rates are decreasing (after recent increases). It is possible this is related to increased transplantation rates.
- 7 Marked increases in deceased donor kidney transplantation since 2013 have resulted in the highest number of kidney transplants in a single year (187 transplants). The rate of kidney transplantation (40 per million) is now approaching that of Australia (45 per million).
- 8 Younger New Zealanders (25 years or younger) are particularly vulnerable to delayed referrals to specialist nephrology care. Nearly 40% starting dialysis are referred late.
- 9 There is limited growth in transplants from the Kidney Exchange program. ABO incompatible kidney transplantation numbers are increasing sharply.
- 10 Transplantation rates vary substantially by District Health Board. Waikato DHB has a low but slowly increasing kidney transplantation rate.
- 11 Permanent dialysis vascular access is present in >70% of New Zealand haemodialysis patients although low among patients treated at Taranaki DHB.
- 12 There is high use of tunneled dialysis vascular access catheters in patients starting haemodialysis in New Zealand. No DHB meets the current national standard for permanent access at start of dialysis.
- 13 All DHBs are providing at least 3 sessions of haemodialysis per week.
- 14 Delays in commencing peritoneal dialysis appear to be increasing at Hawke's Bay, Northland, and Taranaki District Health Boards.
- 15 Rates of peritoneal dialysis peritonitis do not meet international guideline recommendations and lead to hospitalisation in half of cases.
- 16 Forty percent of dialysis patients with a haemoglobin >130 g/l are prescribed erythropoietin therapy.
- 17 Mortality rates among dialysis patients are within the expected range across all District Health Boards.

# Summary

	2017	2013
People starting treatment for kidney failure, number [per million]	615 [128]	556 [125]
People treated for kidney failure, number [per million]	4658 [972]	4166 [937]
First kidney replacement therapy, number [per million]		
Transplant (pre-emptive)	26 [5]	19 [4]
Deceased donor	7	4
Live donor	19	15
Peritoneal dialysis	220 [46]	180 [41]
Haemodialysis	369 [77]	357 [80]
Age category of starting treatment, number [per million]		
0-24 years	24 [15]	14 [9]
25-44 years	84 [66]	92 [81]
45-64 years	273 [227]	278 [244]
65-74 years	181 [437]	126 [350]
75+ years	53 [240]	46 [244]
Ethnicity of starting treatment, number of people [per age-standardized million]*		
Māori	186 [432]	190 [513]
Pacific	146 [849]	118 [738]
Asian	62 [154]	43 [162]
New Zealand or Other European	218 [71]	204 [69]
Kidney transplant, number [per million]	187 [40]	116 [26]
Live donor	69 [14]	59 [13]
Deceased donor	118 [25]	57 [13]
DBD	98	54
DCD	20	3
ABO blood group incompatible transplant, number [per million]	14 [3]	0 [0]
Kidney transplants via Kidney Exchange, number [per million]	4 [0.8]	1 [0.2]
Non-directed donor transplants, number [per million]	8 [1.7]	8 [1.8]
Multiorgan transplants including kidney	5 [1.0]	1 [0.2]
People active on waiting list for kidney transplant, number [per million]	445 [93]	464 [105]
Total people on waiting list for kidney [including those suspended]	658 [137]	- -
Number of patients who received kidney transplant for every 100 active on transplant waiting list	42	25



	2017	2013
Dialysis prevalence (people living on dialysis), number [per million]	2768 [577]	2600 [586]
Facility haemodialysis	1477 [308]	1284 [289]
Home haemodialysis	436 [91]	479 [108]
Automated peritoneal dialysis	448 [93]	393 [89]
Continuous ambulatory peritoneal dialysis	407 [85]	444 [100]
Home based dialysis overall, number [per million]	1291 [270]	1316 [296]
People living with transplant (prevalence), number [per million]	1890 [394]	1571 [355]
Primary PD peritonitis rate, episodes per patient-year	0.53	0.48
Exit site infection rate, episodes per patient-year	0.26	—
PD peritonitis outcome		
Hospitalisation	53.2%	
Catheter removal	16.4%	
Death	3.5%	
Cause of kidney disease for patients starting treatment, number [%]		
Diabetes	318 [52%]	293 [53%]
Glomerulonephritis	129 [21%]	95 [17%]
Hypertension	51 [8%]	51 [9%]
Adult polycystic kidney disease	29 [5%]	20 [4%]
Reflux nephropathy	6 [1%]	19 [3%]
Diabetes as cause of kidney disease		
Māori	126 [68%]	
Pacific	108 [74%]	
Asian	24 [39%]	
New Zealand or Other European	54 [26%]	
Late referral to specialist services, number [% starting treatment]	68 [11%]	79 [14%]
Starting haemodialysis with temporary vascular access, number [% starting treatment]*	305 [56%]	288 [60%]
Prevalent haemodialysis patients with temporary vascular access, number [% of all receiving treatment]	537 [28%]	404 [23%]

\*Excluding those who were referred late to specialist nephrology services

# Incidence and prevalence by District Health Board

DISTRICT HEALTH BOARD	POPULATION	STARTING TREATMENT		PREVALENT DIALYSIS		PREVALENT TRANSPLANT	
		Number	Per million	Number	Per million	Number	Per million
		(2013 data shown in brackets)					
<b>NORTHLAND</b>	175,430	32 (24)	182 (158)	157	895	94	536
<b>WAITEMATA</b>	605,960	73 (74)	120 (141)	288	475	201	332
<b>AUCKLAND</b>	523,530	76 (63)	145 (144)	355	678	271	518
<b>COUNTIES MANUKAU</b>	546,610	121 (116)	221 (247)	616	1127	210	384
<b>WAIKATO</b>	797,765	129 (84)	162 (119)	541	678	213	267
<b>HAWKE'S BAY</b>	163,930	21 (25)	128 (165)	117	714	92	561
<b>MIDCENTRAL</b>	240,565	19 (20)	79 (90)	126	524	82	341
<b>TARANAKI</b>	118,090	13 (8)	110 (73)	59	500	47	398
<b>CAPITAL &amp; COAST</b>	653,675	67 (72)	102 (120)	260	398	296	453
<b>CANTERBURY</b>	643,310	47 (42)	73 (74)	158	246	270	420
<b>SOUTHERN</b>	324,290	17 (13)	52 (44)	91	281	114	352
<b>TOTAL</b>	<b>4,793,155</b>	<b>615 (541)</b>	<b>128 (128)</b>	<b>2768</b>	<b>577</b>	<b>1890</b>	<b>394</b>

In 2017, 606 adults and 9 children started treatment with dialysis or a kidney transplant in New Zealand. There were 582 adults and 7 children who started dialysis, and 24 adults and 2 children who receive a preemptive transplant (transplant as first treatment).

In 2017 there were 187 kidney transplants in New Zealand. There were 182 adults and 5 children who received a kidney transplant. The

transplants were received from 118 deceased donors and 69 live donors.

The incidence and prevalence of treatment varies between District Health Boards. The rate of people starting treatment (incidence) varied between 52 per million of the local DHB population at the Southern DHB to 221 per million at Counties Manukau DHB.

Different rates of starting therapy are likely due

to different DHBs (including the rate of diabetes). Respective rates vary by local practice. Absolute numbers are increasing as the population increases.

# Health Board

## PREVALENT

### ALL PATIENTS

Number Per million  
(2013 data shown in brackets)

251 (236)	1431 (1556)
489 (435)	807 (828)
626 (503)	1196 (1153)
826 (715)	1511 (1524)
754 (653)	945 (923)
209 (175)	1275 (1154)
208 (203)	865 (912)
106 (90)	898 (820)
556 (513)	851 (855)
428 (389)	665 (683)
205 (200)	632 (672)
<b>4658 (4112)</b>	<b>972 (970)</b>

HB population characteristics

specific burden of diseases such as  
residual variation may be explained  
differences and other unmeasured factors.

Numbers of people starting treatment  
although appear to be caused by  
increases.



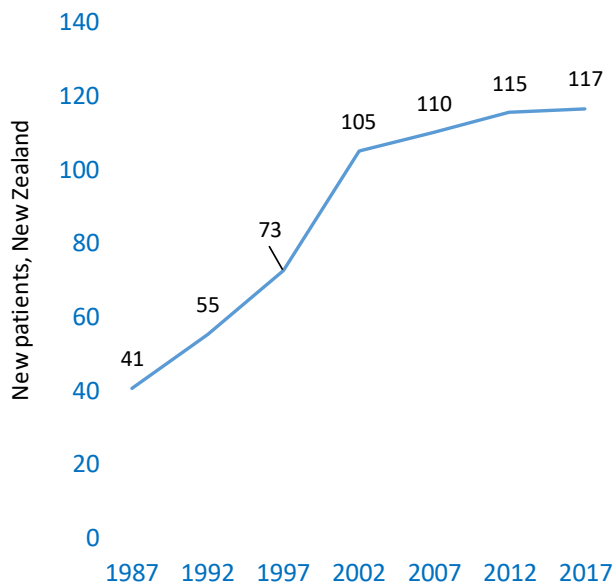
Number starting treatment at each DHB in  
2017, per million of local population

## DISTRICT HEALTH BOARD

<b>NORTHLAND</b>	182
<b>WAITEMATA</b>	120
<b>AUCKLAND</b>	145
<b>COUNTIES MANUKAU</b>	221
<b>WAIKATO</b>	129
<b>HAWKE'S BAY</b>	165
<b>MIDCENTRAL</b>	79
<b>TARANAKI</b>	110
<b>CAPITAL &amp; COAST</b>	67
<b>CANTERBURY</b>	73
<b>SOUTHERN</b>	52

# Starting treatment

Number of people starting people starting treatment shown per million of NZ's population



In 2017, 615 people started treatment for end-stage kidney disease with dialysis or a transplant. This was 117 people for every one million New Zealanders on average over the last 5 years. The number of people starting treatment is quite variable from year to year, but over the last 15 years has been similar to population growth. Even though the rate

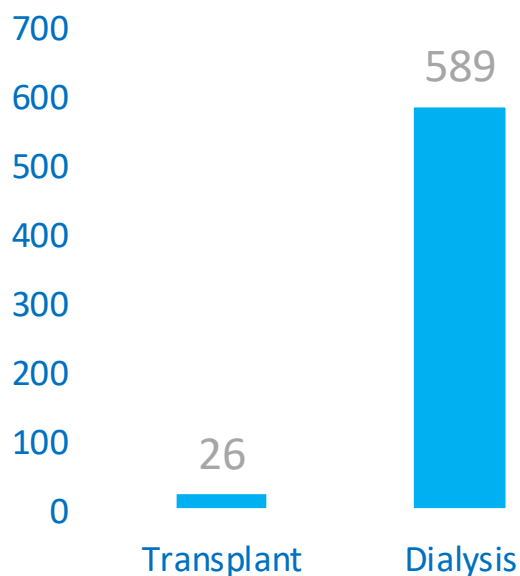
of starting treatment has been reasonably stable over this time, this still translates into large increase in numbers of people, as the New Zealand population has grown 23% since 2001.

615 people started treatment in 2017 compared to 466 people in 2001.

Number of people starting people starting treatment with dialysis or transplant

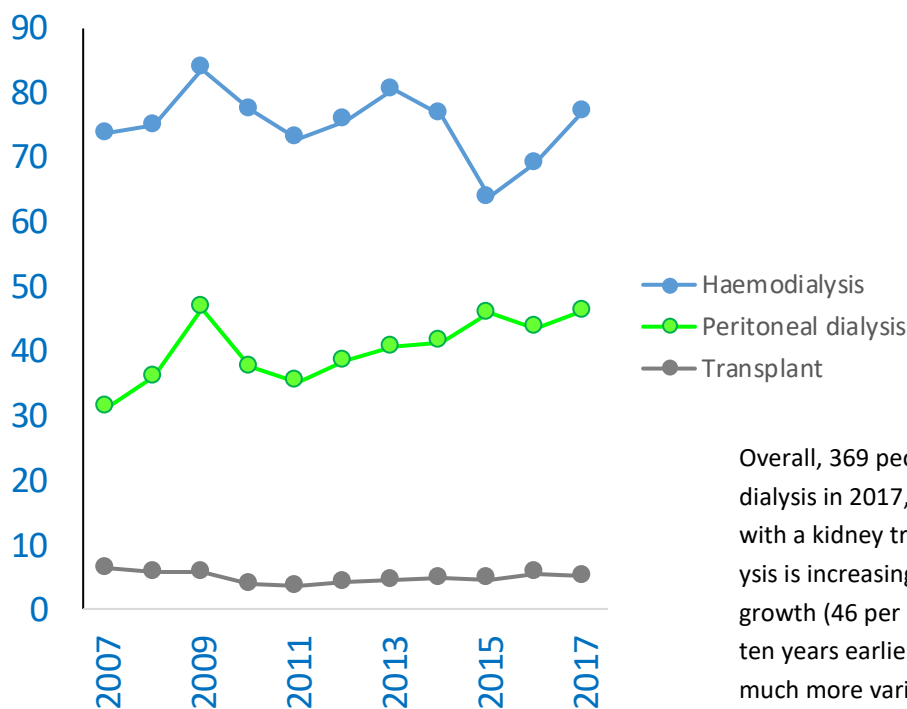
Nearly all patients (589 people) started treatment with dialysis (rather than receiving a kidney transplant as their first treatment). Twenty-six patients started treatment by receiving a kidney transplant. Research has shown that socio-economic deprivation, late referral to specialist services, ethnicity, and comorbidity

(diabetes and cardiovascular disease) are linked to lower rates of pre-emptive transplantation in New Zealand.



# Starting treatment

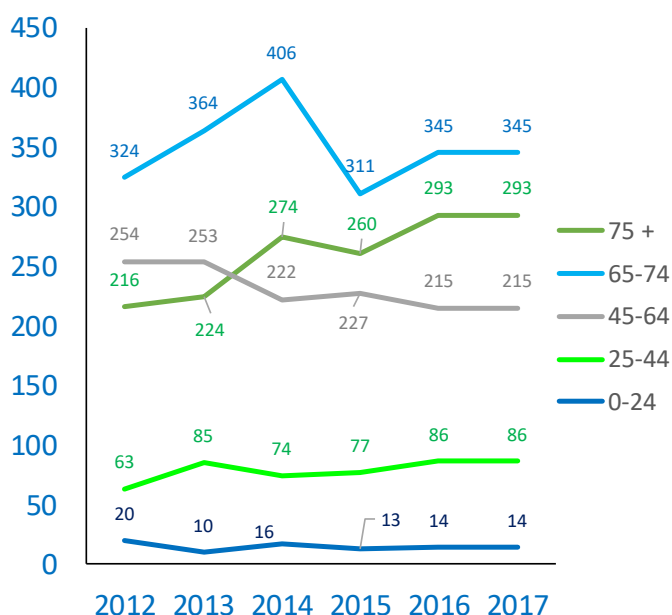
Number of people starting people starting each treatment type shown per million of NZ's population

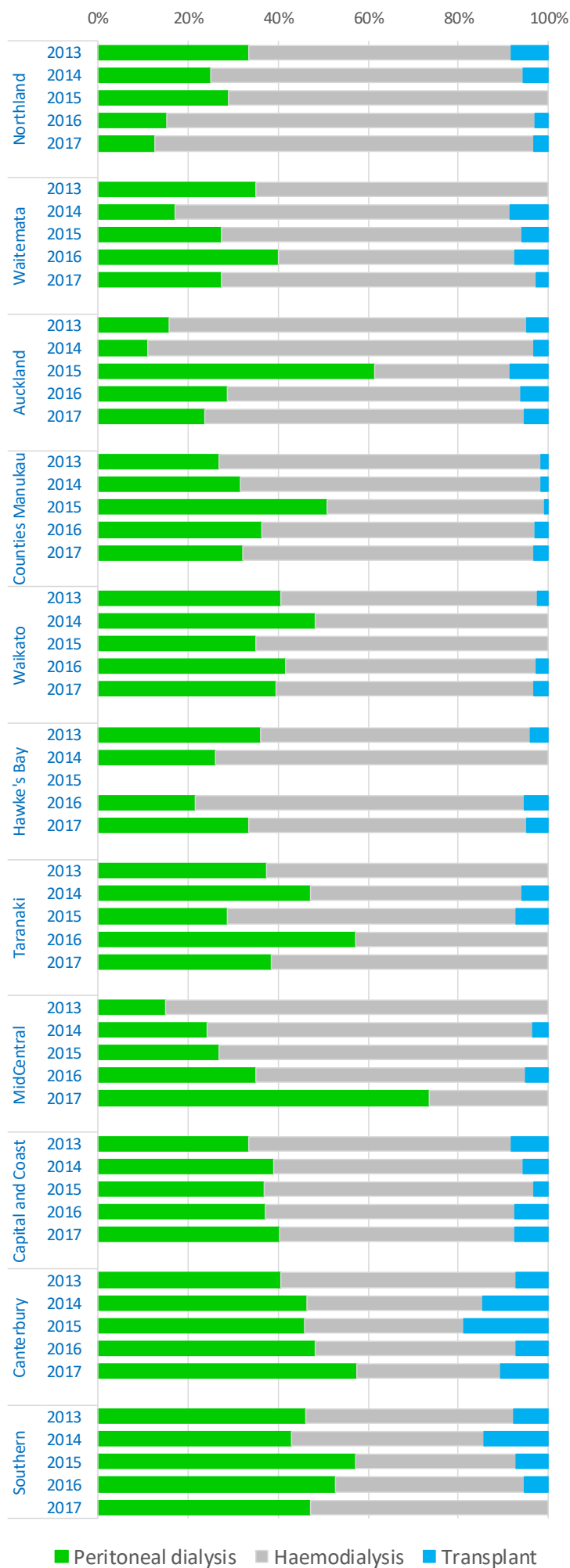


Overall, 369 people started treatment with haemodialysis in 2017, 220 with peritoneal dialysis, and 26 with a kidney transplant. The rate of peritoneal dialysis is increasing year on year ahead of population growth (46 per million compared to 36 per million ten years earlier). The incidence of haemodialysis is much more variable from year to year, with an incidence very similar to a decade previously. Pre-emptive transplantation is static at 4-6 per million of population.

Age of starting treatment, shown per million of population for each age group

Adults aged 65 to 74 years remain the age group with the highest incidence of starting treatment with a 2.7-fold higher rate than the overall average in NZ. Notably, incidence in the age group of 75 years + has continued to have year on year increases and is the age group with the second highest incidence. Incidences in the younger age groups have remained steady, largely reflecting stability in causes of kidney disease in these age groups as predominantly kidney-specific such as glomerulonephritis, or genetic/developmental. Increases in older age groups are likely to reflect ageing population, increasing acceptance and expectations of dialysis among older patients and increased prevalence of diabetes, hypertension, and cardiovascular disease.





### Number of people starting each treatment type according to their District Health Board

This figure shows the per cent of patients who start treatment with each of the available treatment types. These are haemodialysis (grey), peritoneal dialysis (green), and kidney transplant (blue), over each of the last 5 years.

It is noticeable and expected that there is variability within each DHB from year to year and between each DHB.

In Northland DHB, the per cent of patients starting treatment with haemodialysis is increasing at the expense of peritoneal dialysis. In Auckland DHB, a high percentage of peritoneal dialysis occurred in 2015, but is now returning more toward the unit average. A similar observation is seen at Counties Manukau DHB.

MidCentral DHB is showing a rapid and marked year on year increase in peritoneal dialysis use.

Pre-emptive transplantation is rare at the Waikato DHB compared to its size, while peritoneal dialysis is somewhat higher than other DHBs in the northern North Island. Capital & Coast Health and Canterbury DHBs appear to show incremental increases in peritoneal dialysis. The two Southernmost DHBs appear to have somewhat higher incidence of pre-emptive transplantation, although none were received by Southern DHB patients in 2017.

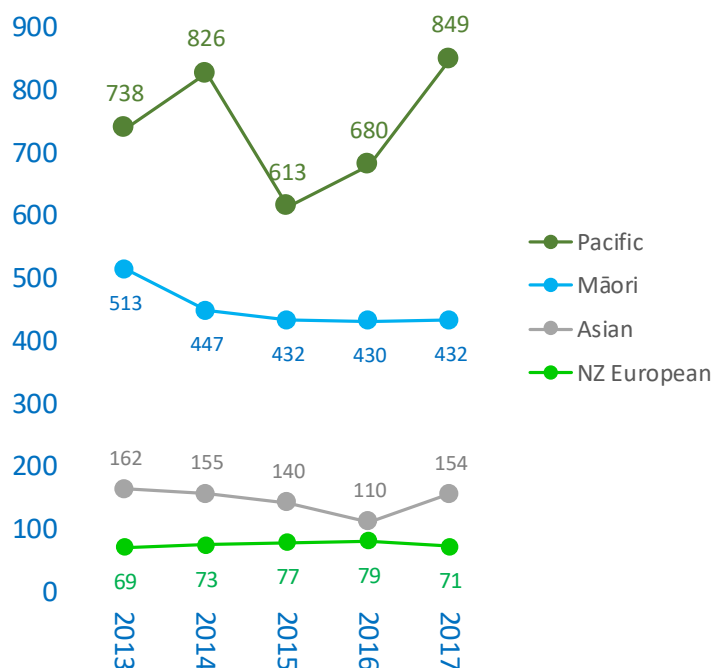
The reasons for differences between units and treatment trends cannot be determined by these analyses. Standardization by age, sex, ethnicity, and comorbidity may assist, but is unlikely to fully account for differences, which may also be influenced by local practice patterns, expertise, and preferences.

■ Peritoneal dialysis ■ Haemodialysis ■ Transplant

# Starting treatment

## Ethnicity

Number of people starting treatment according to their ethnicity, expressed per million of population \*standardized by age



The number of people starting treatment is markedly different for each ethnicity grouping. In this figure, the populations have been standardized by age to account for the fact that Pacific and Māori populations tend to be younger.

Notably, the rate of starting dialysis care is 12-fold higher for Pacific patients than among New Zealand European or European patients. The rate of starting dialysis for Māori is 6-fold higher than New Zealand European and European patients.

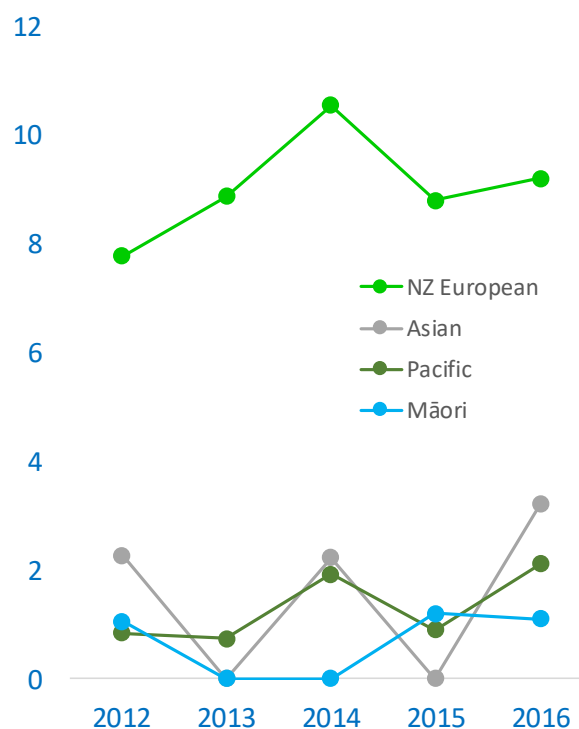
The differences based on ethnicity appear to be sustained and not closing.

It is likely that markedly different rates of diabetes based on ethnicity is one contributing factor to the difference incidences of treatment.

\*Notably, ethnicity is not self-identified in ANZDATA and patients are assigned only to a single ethnicity group.

Number of people receiving a pre-emptive transplant according to their ethnicity, expressed per every 100 ethnicity-specific patients starting treatment

The number of people who receive a transplant as their first treatment (*called a pre-emptive transplant*) is relatively low overall (26 in total in 2017). Even with small numbers, there is a difference noted between ethnicity groups, which hasn't changed over the last 5 years. New Zealand European and European patients consistently experience higher pre-emptive transplantation rates. Our recent research using ANZDATA has shown European patients are substantially more likely to receive a pre-emptive transplant even after adjustment for age, socioeconomic deprivation, smoking, comorbidity and body mass index.



# Starting treatment

## Ethnicity and age

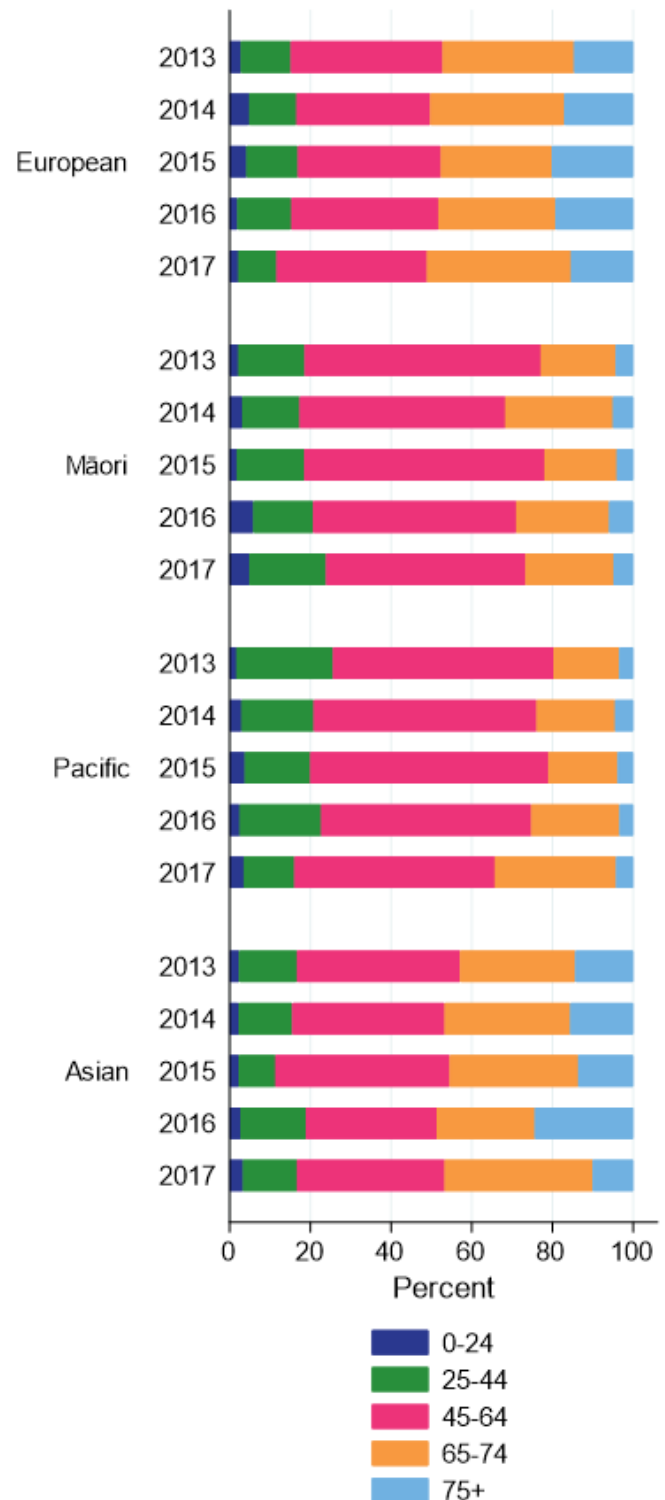
### Starting renal replacement therapy according to age and ethnicity

The largest proportion of Māori and Pacific patients start treatment in the 45 to 64 year old age group while among European and Asian patients, there are similar proportions of patients who start treatment when they are in the 65 to 74 year old age group. Very small proportions of Māori and Pacific patients commence dialysis in the 75+ year age group, consistent with shorter life expectancy, and a predominance of diabetes as a cause of renal failure.

The proportion of patients starting dialysis in the 65 to 74 year old age group is increasing in European, Pacific, and Asian patients.

Notably, the proportion of Māori patients who start dialysis younger than 44 years of age is slowly increasing.

As seen in the table below, Māori commence dialysis 7 years younger than European patients and Pacific patients 5 years younger.



### Age at dialysis start by ethnicity, years

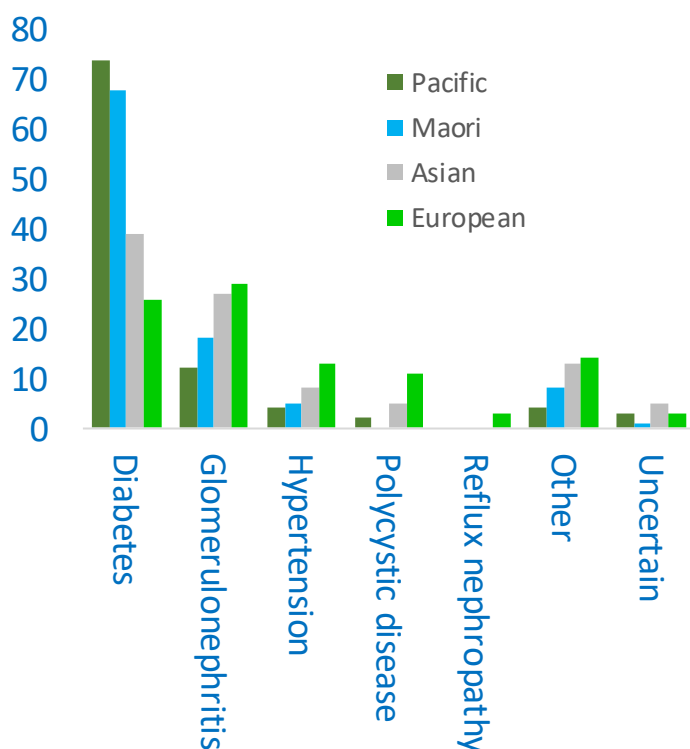
Ethnicity	2013	2014	2015	2016	2017
<b>European</b>	60.2 (14.8)	60.3 (16.5)	60.3 (16.1)	60.7 (16.0)	60.8 (14.9)
<b>Māori</b>	55.1 (12.6)	56.2 (14.7)	55.4 (13.0)	55.3 (15.2)	53.7 (14.9)
<b>Pacific</b>	53.1 (14.0)	54.3 (14.0)	53.5 (13.6)	53.9 (13.5)	55.8 (13.9)
<b>Asian</b>	59.6 (14.7)	59.5 (15.7)	60.9 (13.2)	60.4 (16.8)	58.6 (15.8)



# Starting treatment

## Primary renal disease

Cause of kidney disease, according to ethnicity and expressed as a percentage of patients



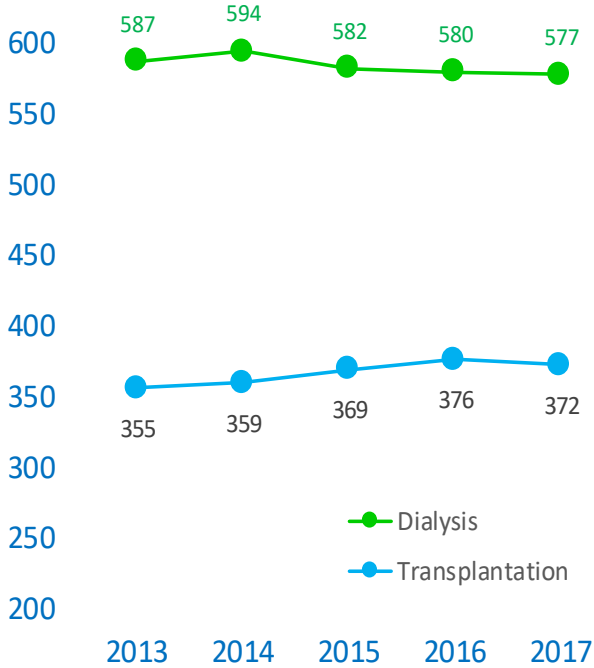
In previous years, we have reported the overall percentage of patients who start treatment due to each disease type. This obscured the substantial differences in disease risks for each ethnicity, and renders a summary estimate for all New Zealanders meaningless. Therefore, this year we report the cause of kidney failure for each ethnicity separately.

Diabetes is the cause of kidney failure among three-quarters (74%) of Pacific patients who start treatment, 68% of Māori patients and 39% of Asian patients. Glomerulonephritis also shows differences in the contribution to kidney failure by ethnicity, with the lowest among Pacific and Maori patients, although this is likely not necessarily due to differences in underlying rates of disease, but the competing impact of diabetes. Similar trends are noted for all other disease categories.

This finding suggests that population health measures to prevent, manage, and treat diabetes is likely to be necessary to address inequitable rates of kidney failure by ethnicity in New Zealand. These statistics are also likely to account for differences in access to live donor and pre-emptive kidney transplantation due to comorbidity for both transplant recipient and potential live kidney donors.

# Prevalence

People living on dialysis or with transplant in New Zealand, shown per million population



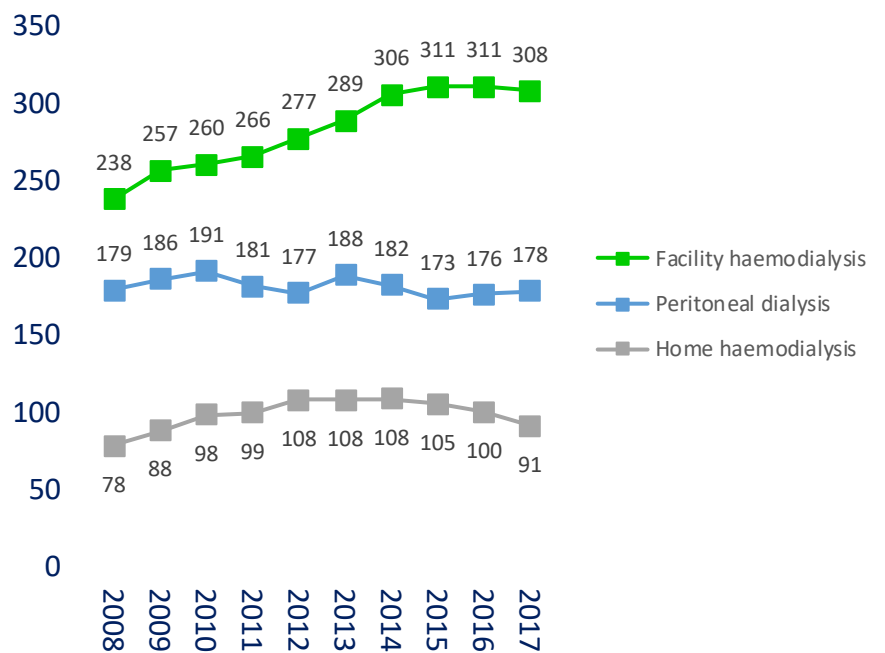
At the end of 2017, 4658 people were receiving treatment with dialysis or a kidney transplant. This is 949 people for every million living in New Zealand.

Most people receiving kidney replacement therapy are treated with dialysis. In 2016, there were 2768 patients treated with dialysis on the census date of 31 December 2017. Overall, 1890 people were living with a kidney transplant (372 per million).

The number of people living on dialysis is slowly decreasing relative to population growth, and the number of people living with a kidney transplant is gradually increasing. It may be that these two observations are directly related.

People living on facility or home haemodialysis or peritoneal dialysis in New Zealand, shown per million population

The use of facility based haemodialysis is continuing to increase faster than population growth. Peritoneal dialysis use is somewhat more variable, although appears to similar to rates of 10 years ago. Home hemodialysis increased toward 2013-2014 and has since had a marked decrease in each of the last 3 years. It is possible this is directly related to increased deceased donor kidney transplantation rates during this time period, although this is speculative. Ninety-six patients ceased haemodialysis to receive a kidney transplant in 2017, and 66 patients ceased peritoneal dialysis to receive a kidney transplant. In future reports, we will aim to evaluate the number of patients who stop home haemodialysis for kidney transplantation.



# Prevalence

## By District Health Board

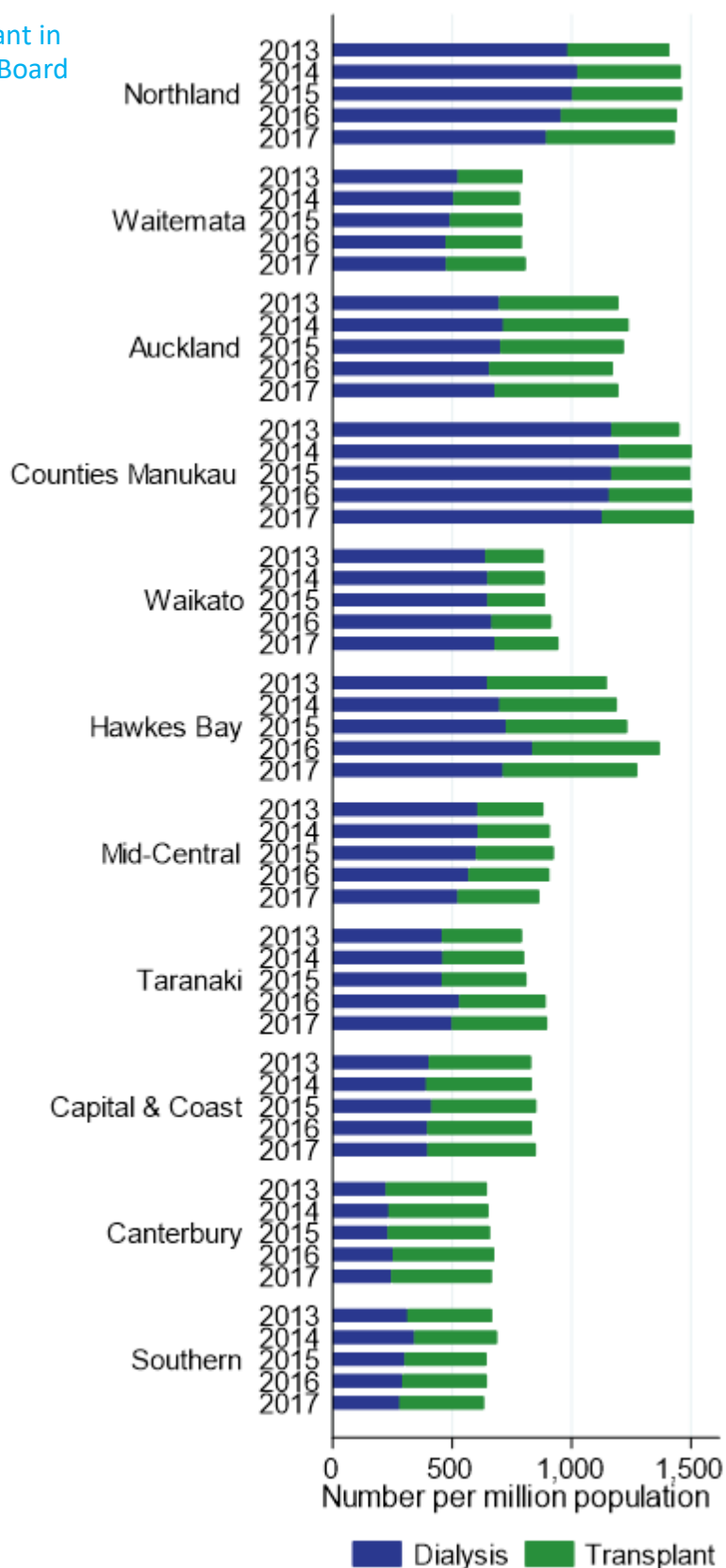
People living on dialysis or with transplant in New Zealand, shown by District Health Board and per million population

The prevalence of treated end-stage kidney disease varies markedly by District Health Board, likely to reflect the burden of long term conditions (especially diabetes) in each region.

Most patients with end-stage kidney disease treated by Capital and Coast, Canterbury, and Southern DHBs are treated with a kidney transplant. A substantial majority of patients at the two DHBs with the highest prevalence of kidney failure (Northland and Counties Manukau) are treated with dialysis. Hawke's Bay, Taranaki, and Waikato DHBs are showing steady increases compared to population growth.

Dialysis prevalence appears to be falling while transplantation prevalence is increasing at Counties Manukau, Northland, Waitemata, and MidCentral DHBs.

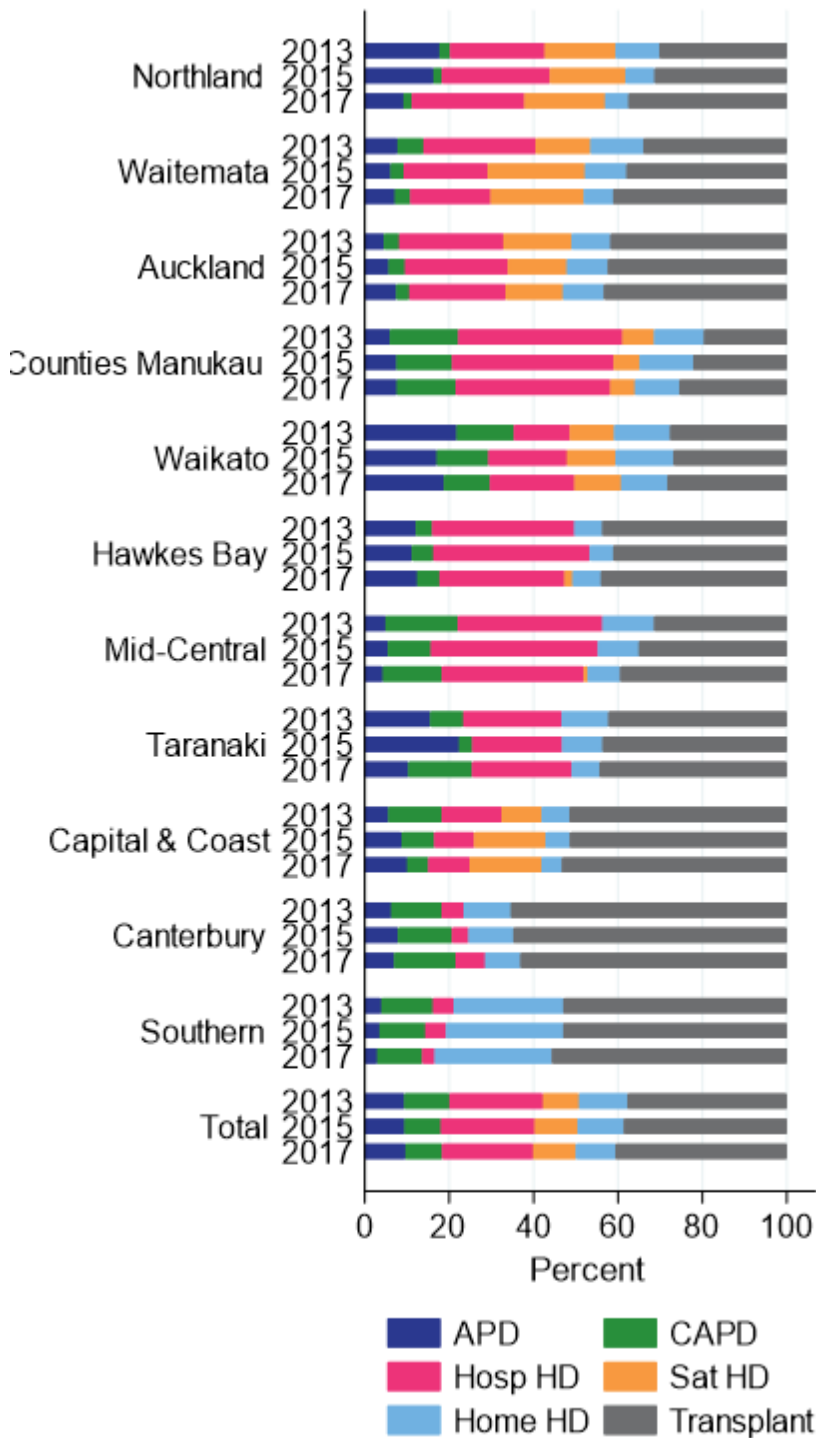
These estimates have not been adjusted for local rates of diabetes, or for age, sex, or ethnicity.



# Prevalence

## Modality by District Health Board

Trends in people living on dialysis or with transplant by District Health Board



The figure shows the percentage of patients who are treated with each form of dialysis or a kidney transplant. Each year at each District Health Board

It is notable that many District Health Boards do not provide satellite haemodialysis (supervised haemodialysis at a satellite rather than hospital facility).

In Northland DHB, increasing transplantation proportions appear to be directly decreasing home dialysis rates (PD and haemodialysis). Similarly at Waitemata, Counties Manukau, MidCentral, and Taranaki DHBs, the increasing proportion of transplant patients is linked to a decreasing proportion of home haemodialysis. The high rate of APD at Taranaki in 2015 appears to be reversed to greater use of CAPD in 2017.

Capital and Coast DHB have maintained an increased satellite haemodialysis population and has a growing proportion of peritoneal dialysis use.

Canterbury DHB has a decreasing percentage of patients on home haemodialysis with increases in hospital haemodialysis, and peritoneal dialysis. Southern DHB appears to have a sustained percentage of patients on home haemodialysis with an increasing transplant population.

Overall, increasing transplantation percentages appear to be decreasing home dialysis rates (as would be expected) without impacting on hospital or satellite haemodialysis.

# Late specialist assessment

*“First specialist nephrologist assessment occurring within 90 days of starting renal replacement therapy”.*

*Late assessment prevents timely preparation for renal replacement therapy including placement of dialysis vascular access or peritoneal dialysis catheter and adequate time to prepare for kidney transplantation*

Year	Age at RRT start	% referred late
2013	0-24	29
	25-44	26
	45-64	13
	65-84	10
	85+	25
2014	0-24	38
	25-44	16
	45-64	11
	65-84	14
	85+	0
2015	0-24	29
	25-44	12
	45-64	13
	65-84	13
	85+	.
2016	0-24	25
	25-44	24
	45-64	13
	65-84	10
	85+	20
2017	0-24	39
	25-44	16
	45-64	11
	65-84	7
	85+	100

Late referral to specialist services varies according to age. Younger people (25 years or younger) are particularly affected. Approximately 40% of young people who commenced dialysis in 2017 were referral to specialist nephrology services within 90 days of commencing dialysis. The rate of late referral among people is not decreasing.

Higher rates of late referral among Pacific patients appear to be decreasing, although variation from year to year prevents a confident interpretation of available information.

Year	European	Māori	Pacific	Asian
2013	13	15	22	5
2014	13	8	20	18
2015	15	16	11	2
2016	14	13	18	11
2017	12	14	9	8

# Transplantation

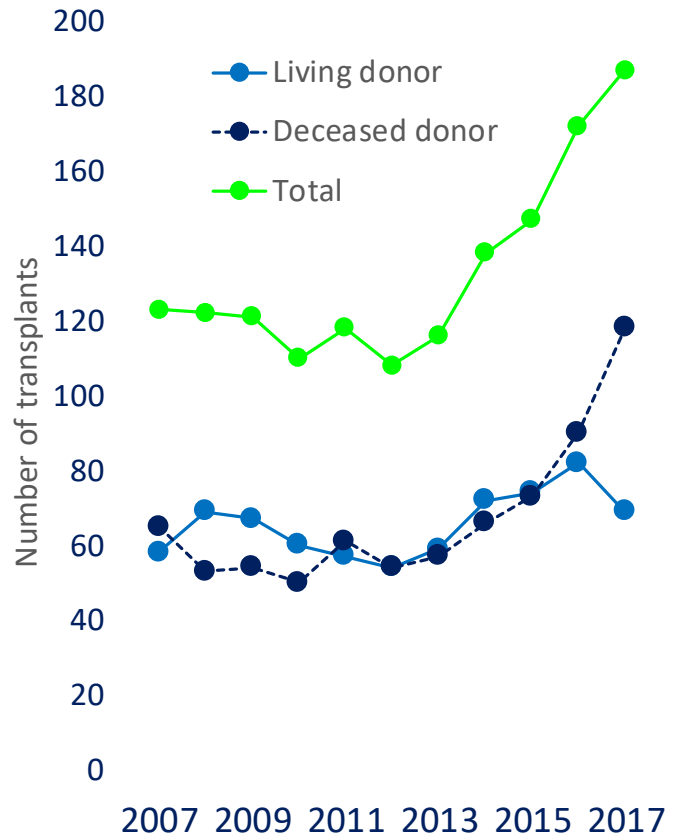
Overall, 187 patients received a kidney transplant in New Zealand in 2017. This is the highest ever number of kidney transplants done in a single year in New Zealand. This represents a year on year increase that commenced about 6-7 years ago. Overall, in 2017, there were 118 transplants from a deceased donor and 69 transplants from a live donor.

An exponential increase has been observed in the number of deceased donor kidney transplants since 2013-2014. This is likely to relate to quality improvements in processes in critical care settings throughout New Zealand.

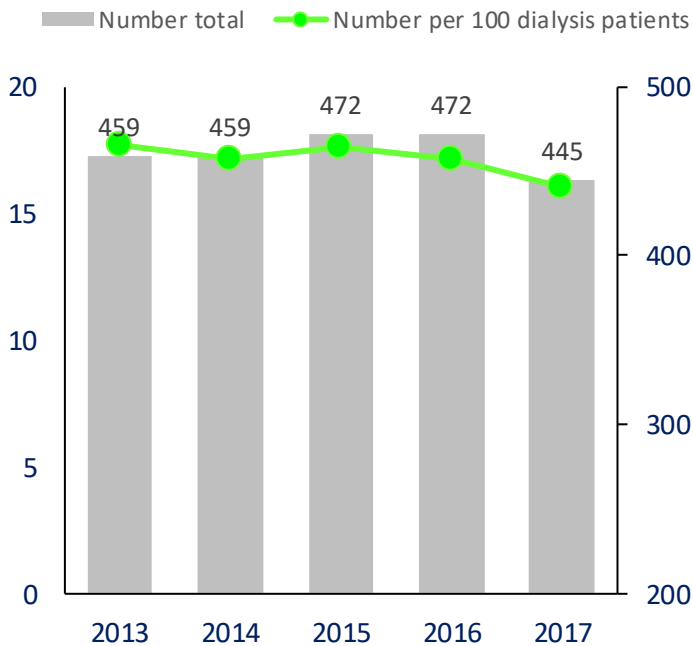
The transplantation rate in New Zealand was 40 per million of population. This compares with 45 per million of population in Australia.

The transplantation rate is growing at substantially faster rate than population growth, and compares with only 26 kidney transplants per million in 2013.

Number of kidney transplants by donor source in New Zealand



Number of patients active on kidney transplant waiting list

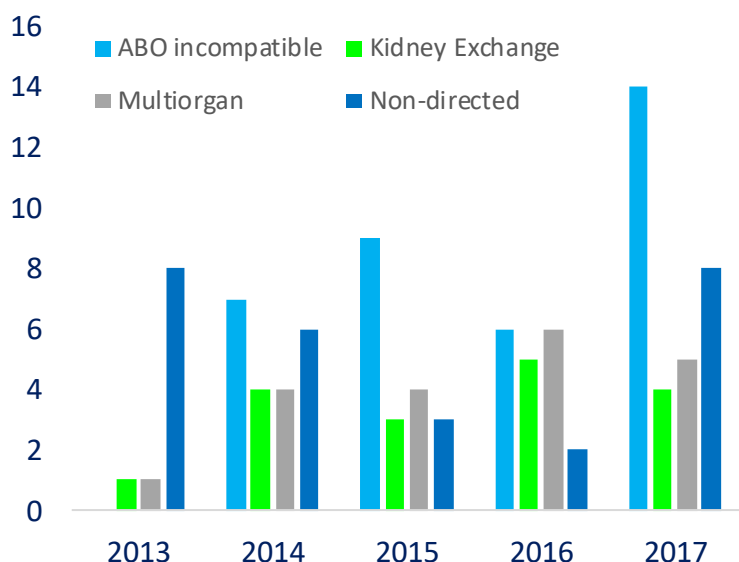


The number of patients who were active on the kidney transplant waiting list at the end of 2017 was 445. This is slightly lower than has been in previous years and may reflect increased transplantation activity.

The number of people overall on the waiting list was 658, including 213 patients who had previously been activated on the waiting list but who had since been suspended temporarily.

# Transplantation

## ABO incompatible, Kidney Exchange, Multiorgan, and non-directed donor transplantation



In 2017, there were 14 ABO incompatible kidney transplants, which now represents 1 in every 5 live donor kidney transplant procedures. There were 4 kidney transplants arising from the Kidney Exchange program.

Five kidney transplants occurred as part of a multiorgan transplant at Auckland DHB.

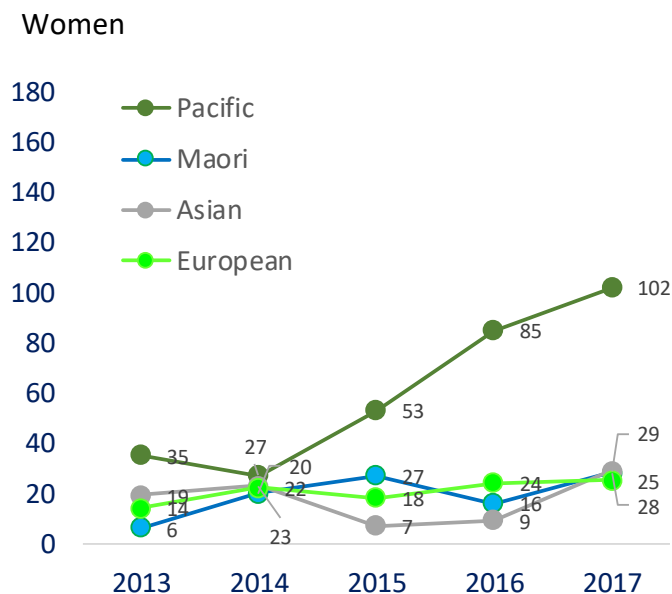
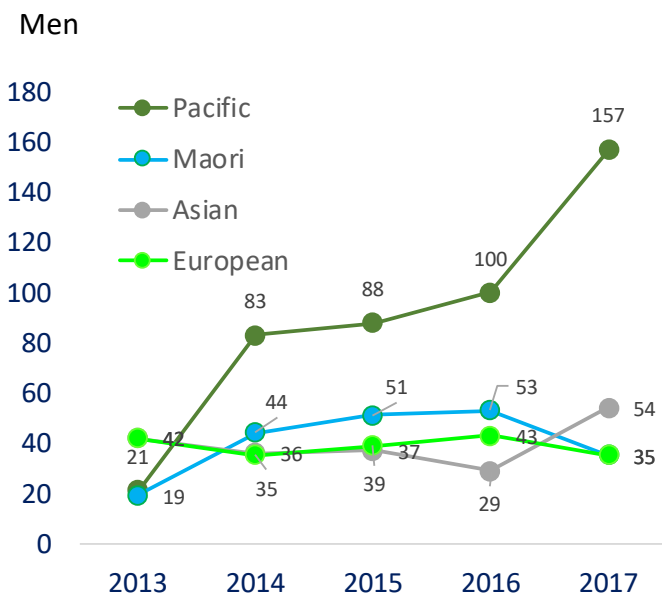
There were 8 non-directed donor kidney transplants in 2017.

ABO incompatible and Kidney Exchange programs represent an expanded opportunity for transplantation across blood group and immunological barriers.

Notably in the last 5 years there has been an increase in the number of kidney transplants among Pacific men and women, although this rate does not yet match the rate of kidney failure occurring for Pacific patients. The rate of kidney transplantation for Māori men has somewhat increased similar to the rate of increase generally, while the rate for Māori women has increased from the initial very low rate in 2013. These increases

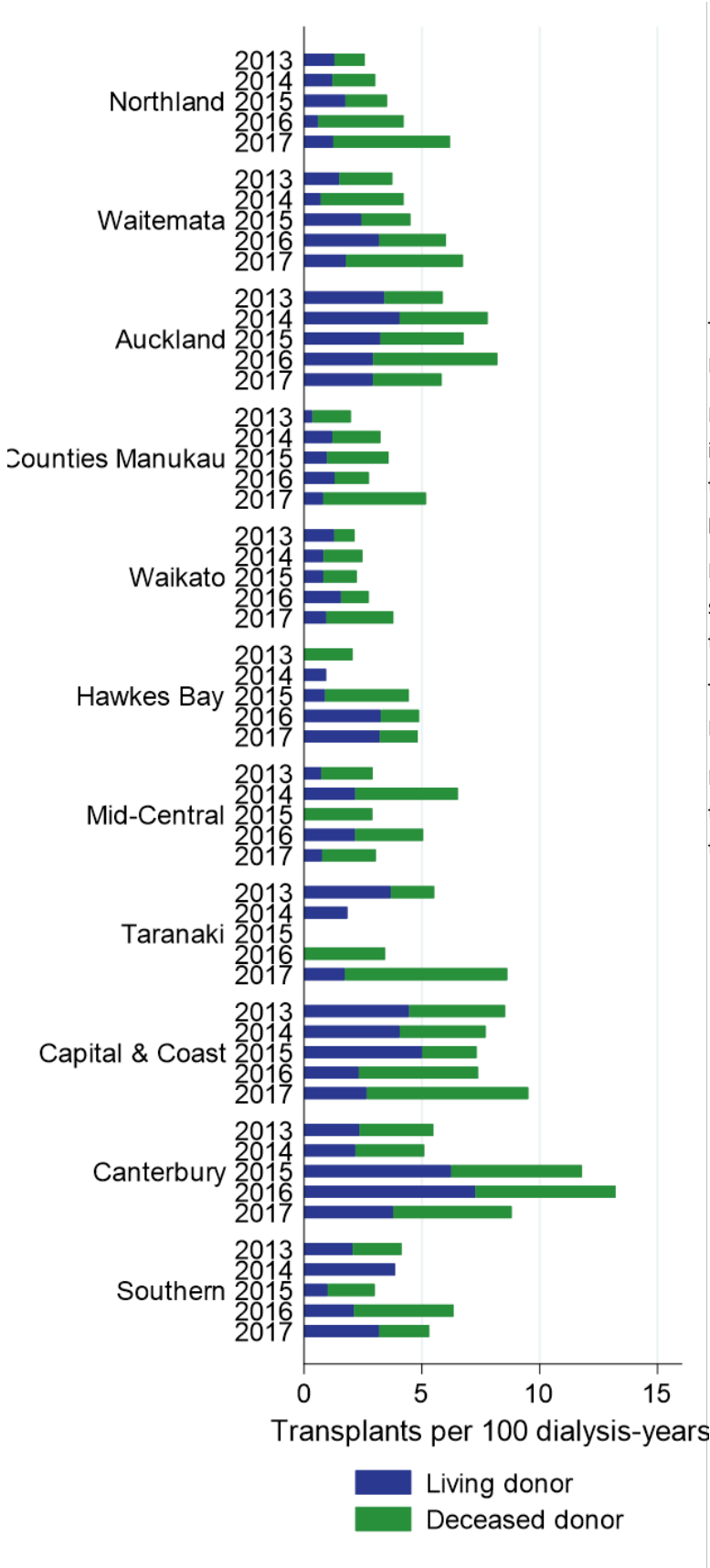
are still not sufficient to match the 6-fold higher rate of end-stage kidney disease among Māori patients. Our research shows there are smaller differences between ethnicity groups for deceased donor kidney transplantation, and increases among Pacific men and women are likely to reflect in part the increased availability of deceased donor kidney transplantation over the last 5 years.

## Transplants by sex and ethnicity, shown as number per million of population



# Transplantation

Rate of kidney transplantation by District Health Board in New Zealand, expressed per 100 dialysis years



There is evidence of transplantation growth at many District Health Boards.

Notably, deceased donor kidney transplantation has increased transplantation rates at Northland, Counties Manukau, Waitemata, Capital and Coast, and particularly Taranaki DHBs.

Live donor kidney transplantation has decreased somewhat at Auckland, Capital and Coast, and Canterbury District Health Boards.

Transplantation rates are low at Waikato District Health Board, although appear to be increasing.

Hawke's Bay has an increasing live donor kidney transplantation rate, which is currently higher than the deceased donor transplant rate.



# Transplantation

## Immunosuppression

### Antibody use for induction immunosuppression

Type of agent	2013	2014	2015	2016	2017
Intravenous immunoglobulin	-	-	1 (0.7%)	-	-
Anti-CD25	115 (99.1%)	133 (96.4%)	142 (96.6%)	167 (97.1%)	185 (98.9%)
Rituximab	6 (5.2%)	9 (6.5%)	9 (6.1%)	5 (2.9%)	11 (5.9%)
T cell depleting polyclonal Ab	2 (1.7%)	2 (1.4%)	1 (0.7%)	6 (3.5%)	7 (3.7%)
Other	-	-	1 (0.7%)	-	-
Not reported	-	-	-	1 (0.6%)	-
<b>Total new transplants</b>	<b>116</b>	<b>138</b>	<b>147</b>	<b>172</b>	<b>187</b>

### Rejection rates at six months after transplantation

Donor Type	Graft Number	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Living donor	First	27.8%	16.7%	15.3%	20.3%	11.5%	16.3%	10.5%	26.9%	23.5%	16.0%
	Second and subsequent	0.0%	33.3%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	16.7%	14.3%
Deceased donor	First	13.8%	22.2%	32.0%	33.3%	13.8%	10.0%	5.6%	18.6%	10.8%	7.5%
	Second and subsequent	14.3%	0.0%	0.0%	0.0%	33.3%	25.0%	0.0%	57.1%	12.5%	10.0%

### Antibody mediated rejection rates at six months after transplantation

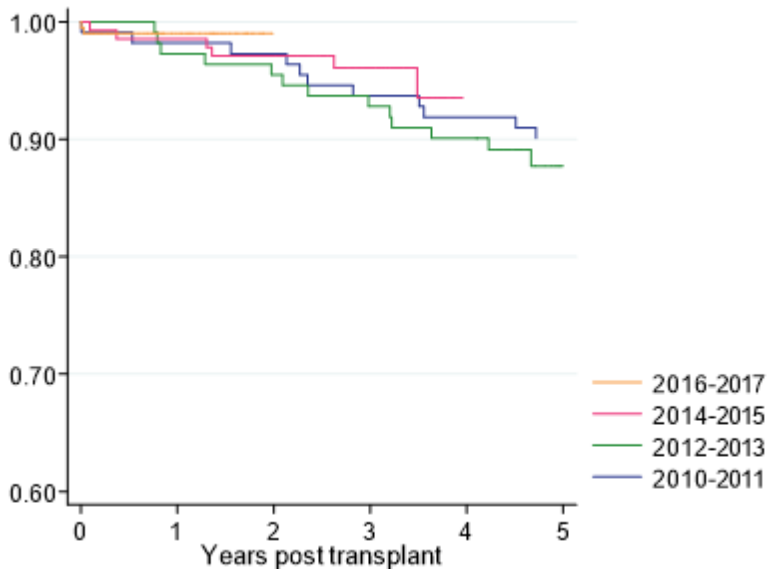
Donor Type	Graft Number	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Living donor	First	0.0%	1.5%	0.0%	0.0%	0.0%	2.0%	0.0%	1.5%	0.0%	0.0%
	Second and subsequent	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Deceased donor	First	3.4%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	1.7%	1.5%	0.0%
	Second and subsequent	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%

Nearly all kidney transplants in New Zealand have an anti-CD25 agent for induction of immunosuppression. Rejection rates at 6 months after transplantation are variable, but are approximately 10-15% in 2016. Antibody-mediated rejection occurs in fewer than 2% of transplants by 6 months after transplantation.

# Transplantation

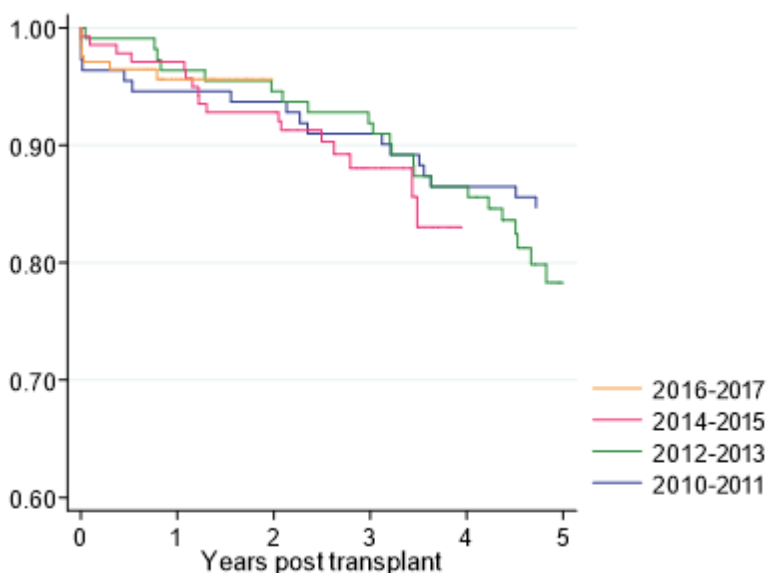
## Survival—deceased donor

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2010-2011 (n=103)	99 (93, 100)	99 (93, 100)	98 (92, 100)	89 (82, 94)
	2012-2013 (n=104)	100	100	97 (91, 99)	88 (79, 93)
	2014-2015 (n=124)	100	99 (94, 100)	99 (94, 100)	-
	2016-2017 (n=192)	99 (96, 100)	99 (96, 100)	99 (96, 100)	-
Graft survival	2010-2011 (n=103)	96 (90, 99)	95 (89, 98)	94 (87, 97)	83 (75, 89)
	2012-2013 (n=104)	99 (93, 100)	99 (93, 100)	96 (90, 99)	78 (68, 85)
	2014-2015 (n=124)	99 (94, 100)	98 (94, 100)	98 (93, 99)	-
	Graft survival 2016-2017 (n=192)	97 (94, 99)	97 (93, 99)	96 (91, 98)	-



### Patient survival

The graphic shows the patient survival after a deceased donor kidney transplant in New Zealand. Approximately 88% of patients receiving a deceased donor kidney transplant in 2012-2013 survived for at least 5 years. We are 95% confident that survival is between 79 and 93% after 5 years.



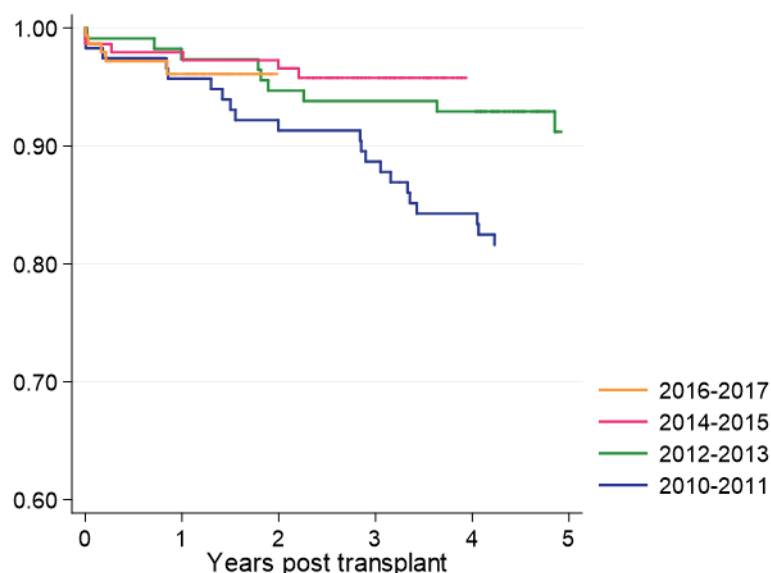
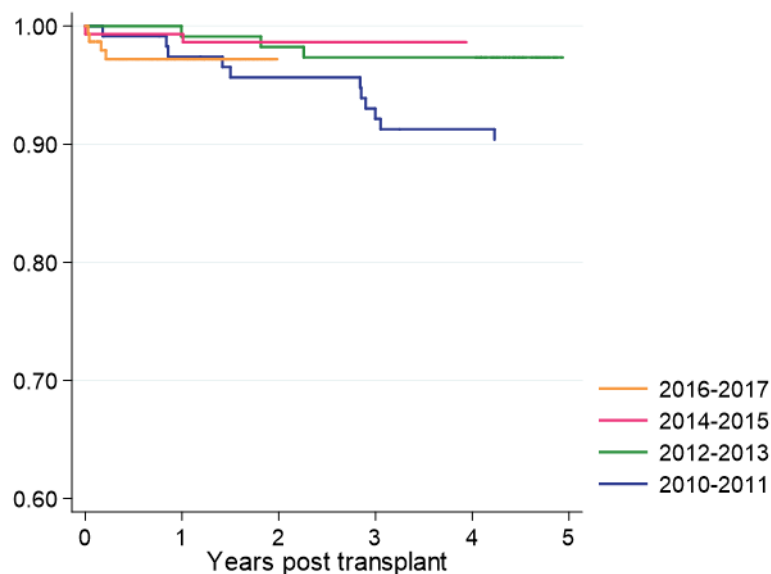
### Graft survival

The graphic shows the graft survival after a deceased donor kidney transplant in New Zealand. This is the number of patients who have a functioning transplant. At 5 years after a deceased donor kidney transplant in 2012-2013 in New Zealand, 78% of patients have a functioning transplant. We are 95% confident that transplant function survival is between 68 and 85% after 5 years.

# Transplantation

## Survival—live donor

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2010-2011 (n=117)	100	99 (94, 100)	97 (92, 99)	90 (83, 95)
	2012-2013 (n=113)	100	100	99 (94, 100)	97 (92, 99)
	2014-2015 (n=146)	99 (95, 100)	99 (95, 100)	99 (95, 100)	-
	2016-2017 (n=151)	99 (95, 100)	97 (93, 99)	97 (93, 99)	-
Graft survival	2010-2011 (n=117)	98 (93, 100)	97 (92, 99)	96 (90, 98)	82 (73, 88)
	2012-2013 (n=113)	99 (94, 100)	99 (94, 100)	97 (92, 99)	91 (83, 95)
	2014-2015 (n=146)	99 (95, 100)	98 (94, 99)	98 (94, 99)	-
	2016-2017 (n=151)	99 (95, 100)	97 (93, 99)	96 (91, 98)	-



### Patient survival

The graphic shows the patient survival after a live donor kidney transplant in New Zealand. Approximately 97% of patients receiving a live donor kidney transplant in 2012-2013 survived for at least 5 years. We are 95% confident that survival is between 92 and 99% after 5 years.

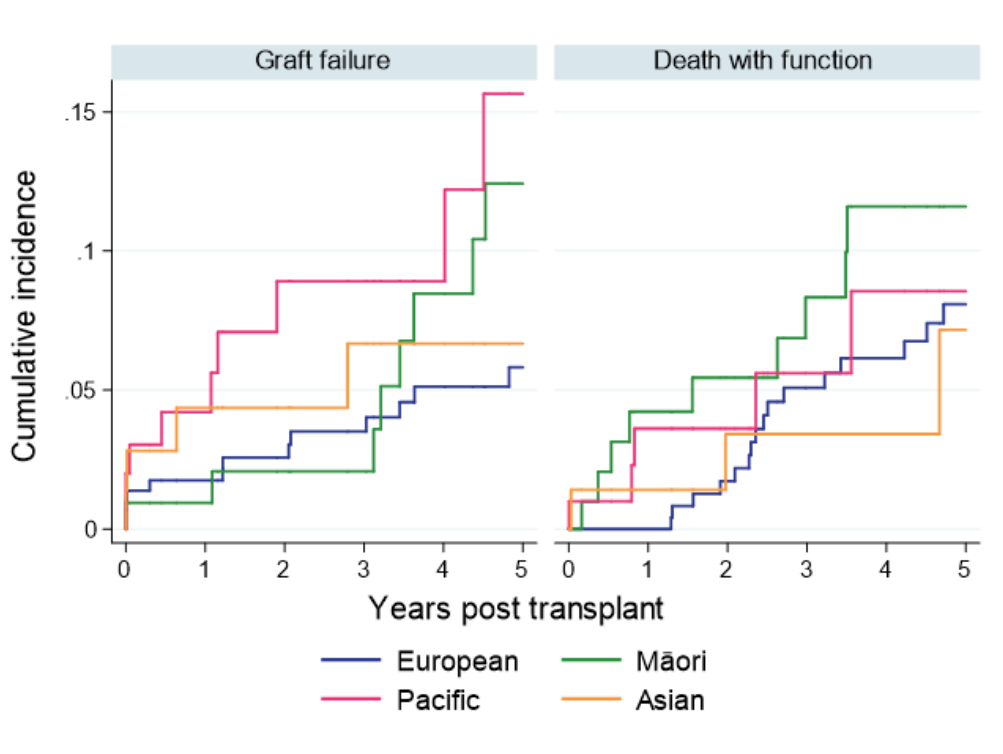
### Graft survival

The graphic shows the graft survival after a live donor kidney transplant in New Zealand. This is the number of patients who have a functioning transplant. At 5 years after a live donor kidney transplant in 2012-2013 in New Zealand, 91% of patients have a functioning transplant. We are 95% confident that transplant function survival is between 83 and 95% after 5 years.

# Transplantation

## Survival—by ethnicity

Transplant outcomes of primary deceased donor kidney transplants 2008-2017



The graphic shows the incidence of transplant failure and patient death (with a functioning kidney transplant) for kidney transplants in New Zealand between 2008 and 2017. Notably, transplant failure occurs for 12-15% of Māori and Pacific patients by 5 years and 5-8% of European and Asian patients. It is likely that differences may relate to the differential

burden of diabetes and vascular diseases, although this has not been evaluated. Māori patients experience a higher 5-year mortality after first deceased donor kidney transplant, although smaller numbers of patients in each group lead to somewhat lower confidence in these findings.

# Haemodialysis

## TRENDS IN HAEMODIALYSIS USE

The number of patients treated with haemodialysis has remained stable over the last 5 years at 400 per million of New Zealand's population.

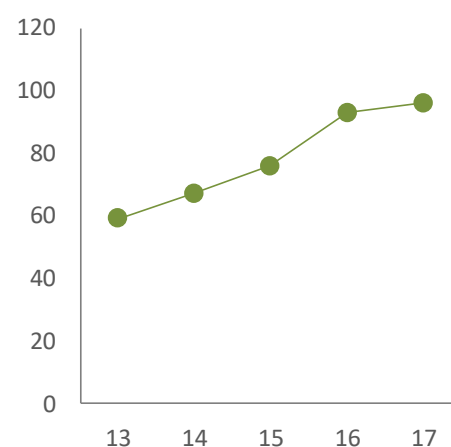
The key trends in the last 5 years for haemodialysis use are:

- There is an increasing number of patients who stop dialysis to receive a kidney transplant.
- There is an increasing number of patients who die while on haemodialysis.

- There is a decreasing proportion of patients who do home haemodialysis (fallen by 5% in absolute terms from 27% to 23% between 2013 and 2017).

It is possible that the falling home haemodialysis rate may be associated with increasing rates of kidney transplantation, although this is not confirmed.

## STOPPED HAEMODIALYSIS DUE TO TRANSPLANT



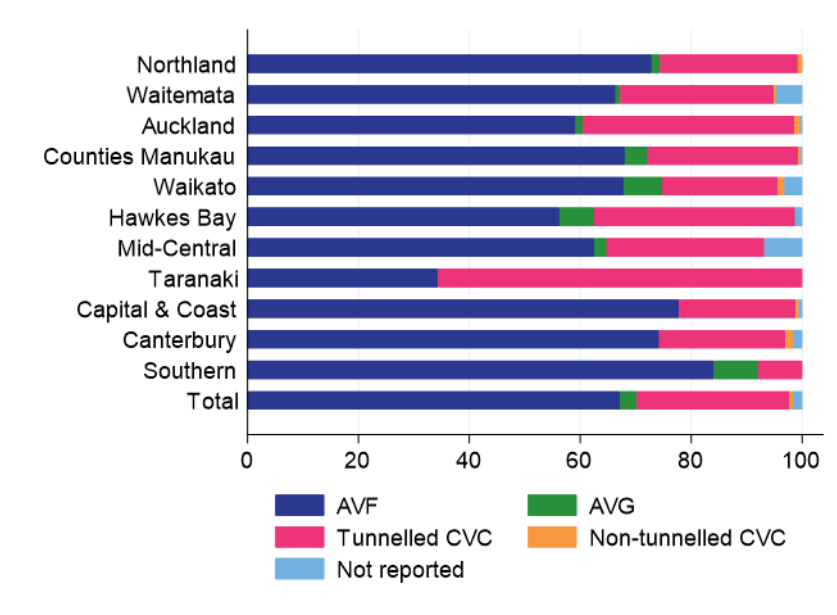
## PATTERNS OF HAEMODIALYSIS USE New Zealand 2013-2017

	2013	2014	2015	2016	2017
<b>Patients who commenced haemodialysis</b>					
First ever dialysis treatment	362	353	319	341	374
Transfer from peritoneal dialysis	115	146	177	165	117
Failed kidney transplant	23	30	22	25	27
<b>Total</b>	<b>500</b>	<b>529</b>	<b>518</b>	<b>531</b>	<b>518</b>
<b>Patients who stopped hemodialysis</b>					
Received kidney transplant	59	67	76	93	96
Transferred to peritoneal dialysis	141	124	111	130	119
Recovered kidney function	6	10	9	8	17
Death	227	225	278	285	294
<b>Total</b>	<b>433</b>	<b>426</b>	<b>474</b>	<b>516</b>	<b>526</b>
<b>Total treated with haemodialysis at 31 December</b>					
(Per million of population)	1763 (397)	1867 (414)	1913 (416)	1926 (406)	1913 (399)
<b>Total treated with home hemodialysis at 31 December (%)</b>					
	479 (27.2)	489 (26.2)	483 (25.2)	468 (24.3)	436 (22.8)

# Haemodialysis

## Vascular access

### Prevalent haemodialysis vascular access in 2017



The current Tier 2 specification for haemodialysis vascular access is that at least 70% of prevalent patients treated with haemodialysis have permanent vascular access (either an arteriovenous fistula or a graft).

In 2017, 70% of patients in New Zealand had haemodialy-

sis via a fistula or graft, meeting the national standard.

Notably, Taranaki District Health Board has a permanent access prevalence of <40%, which has been noted in previous years, and warrants examination of local vascular access processes and services.

# Haemodialysis

## Vascular access

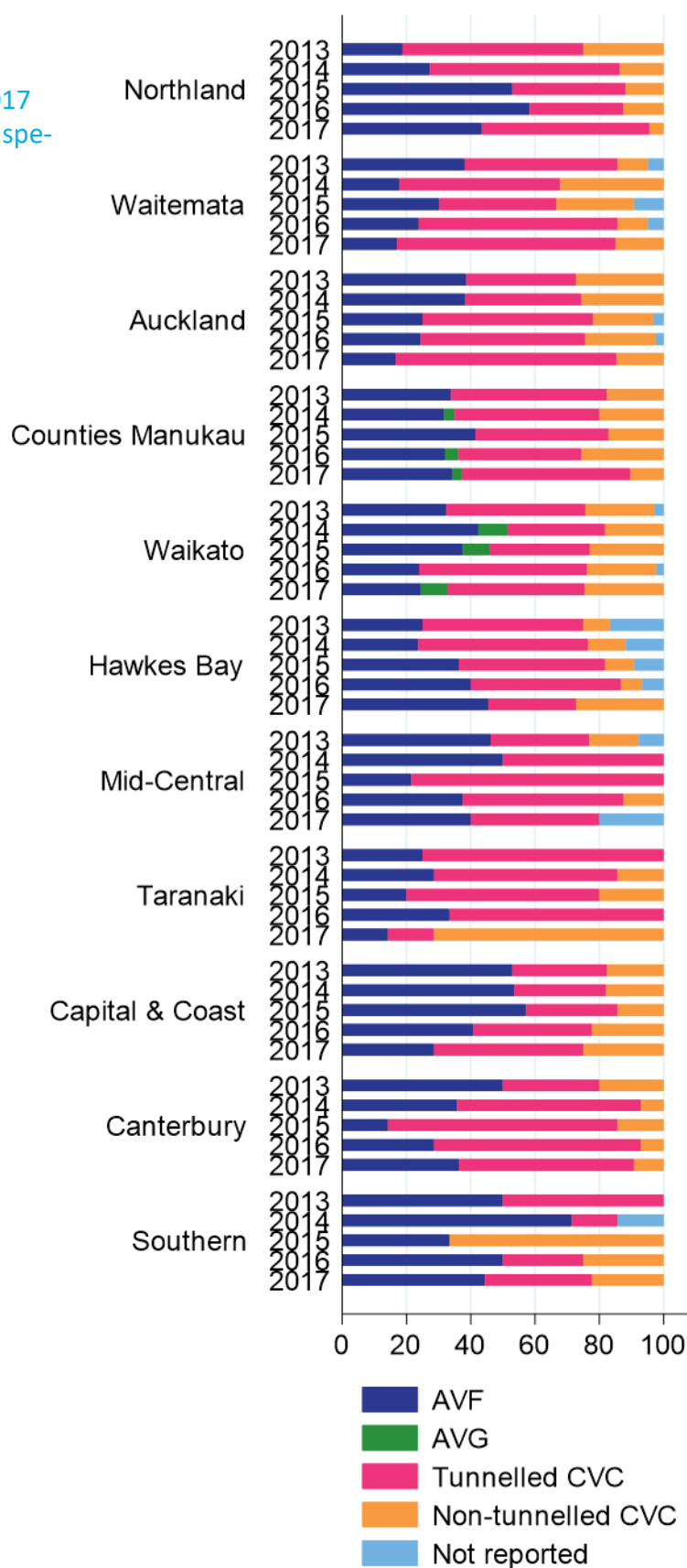
### Incident haemodialysis vascular access in 2017 (excluding patients who are referred late to specialist services)

The national standard for dialysis vascular access at the time a patient permanently started haemodialysis is 80% of all patients with an arterio-venous fistula or graft, excluding those patients who were referred to specialist services within the previous 90 days.

This standard has not been met by all District Health Boards repeatedly.

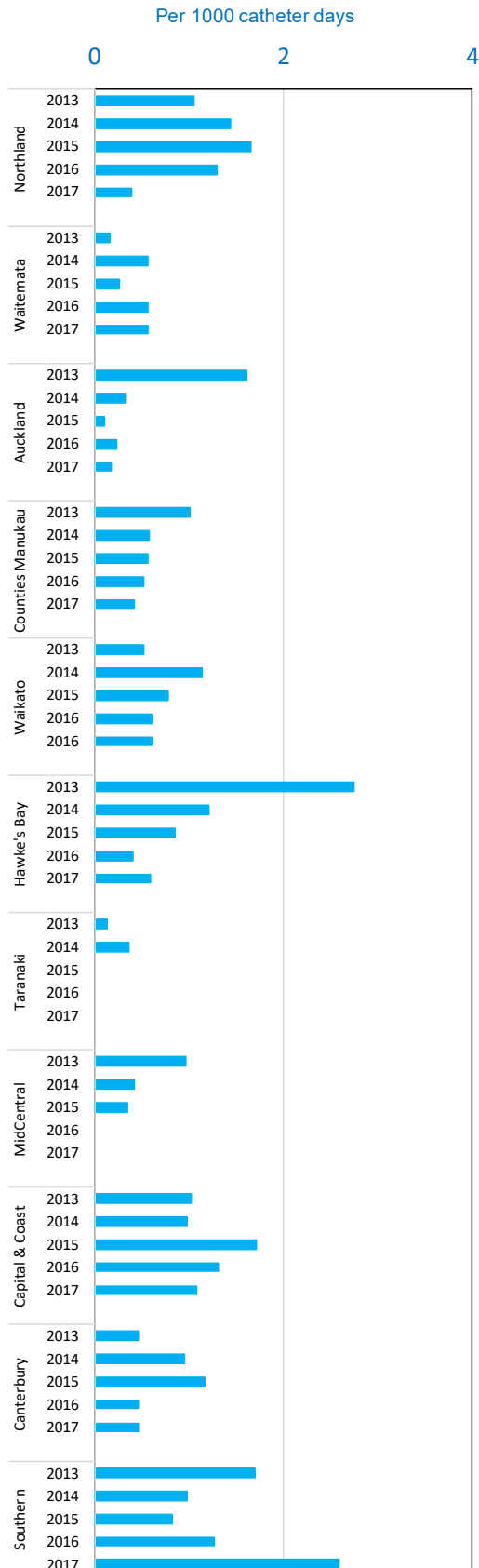
Currently, dialysis vascular access at first treatment is predominantly a tunneled dialysis central venous catheter.

Notably, reporting is generally complete and has improved at the Hawke's Bay District Health Board.



# Haemodialysis

## Catheter-associated blood stream infections



The rate of central-line associated blood stream infections (CLABSI) for each District Health Board is shown. This is an important quality measure as it reflects several intersecting dialysis unit practices including handwashing, dressing policies and procedures, adherence to protocols, patient education, and wider dialysis unit quality and safety practices.

The CLABSI rate is provided by each District Health Board unit on request each year. Two units did not supply data for 2017.

Northland DHB has shown marked lowering of the rate in 2016 and 2017. Auckland DHB has a sustained low rate.

Hawke's Bay DHB has sustained their recent improvements. Counties Manukau has shown progressive year or year decreases.

Capital and Coast DHB has a somewhat higher rate than other units, although this appears to be improving.

Southern DHB has a high and increasing rate of CLABSI.



# Haemodialysis

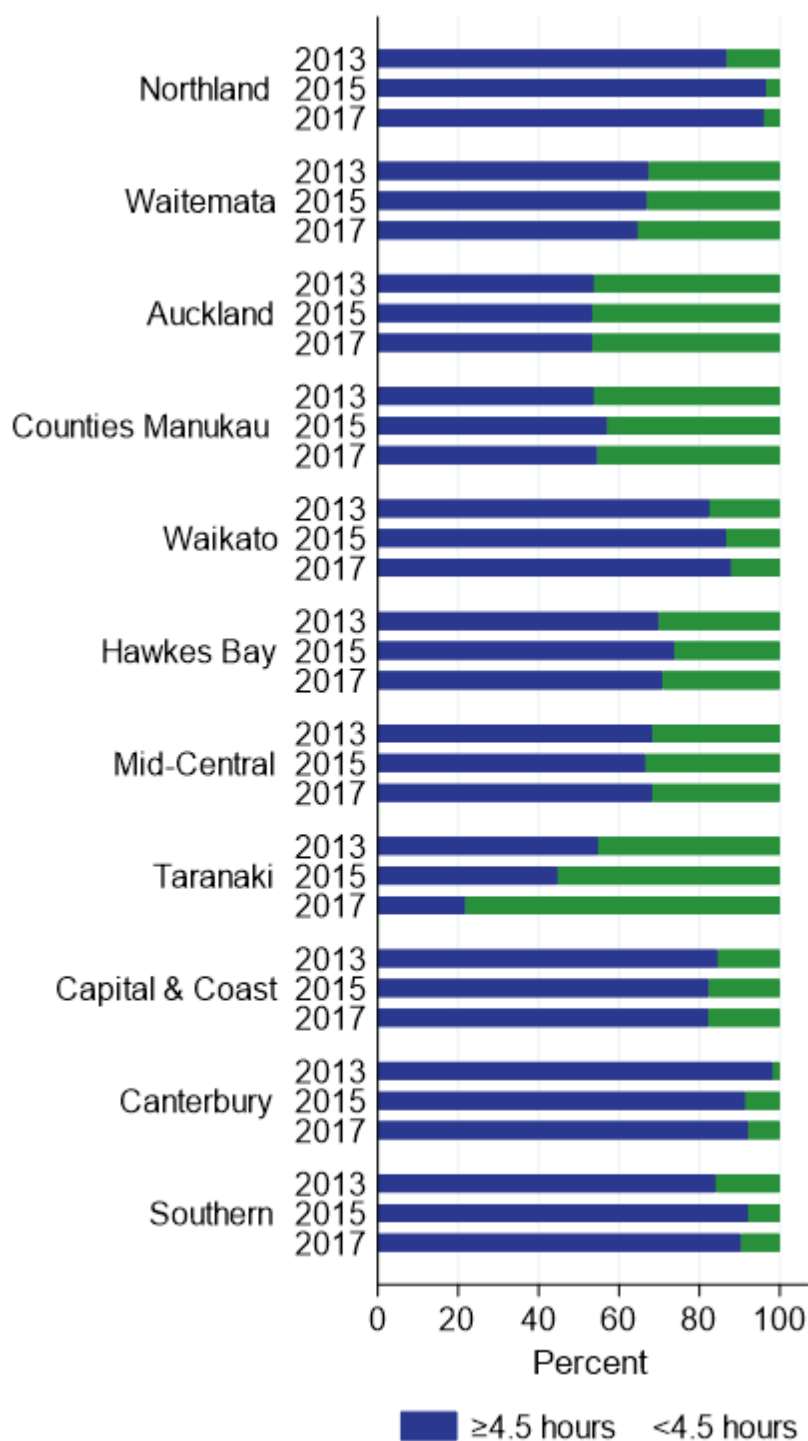
## Duration

### Duration of haemodialysis sessions by District Health Board

The proportion of haemodialysis patients who receive at least 4.5 hours per dialysis session at each District Health Board is shown.

Northland, Waikato, Capital and Coast, Canterbury, and Southern District Health Boards provide at least 4.5 hours of haemodialysis for over 80% of their patients.

The proportion of adequate hours dialysis has fallen markedly at Taranaki District Health Board and is now provided to <25% of patients. Auckland and Counties Manukau District Health Boards provide at least 4.5 hours per dialysis session in <60% of patients.



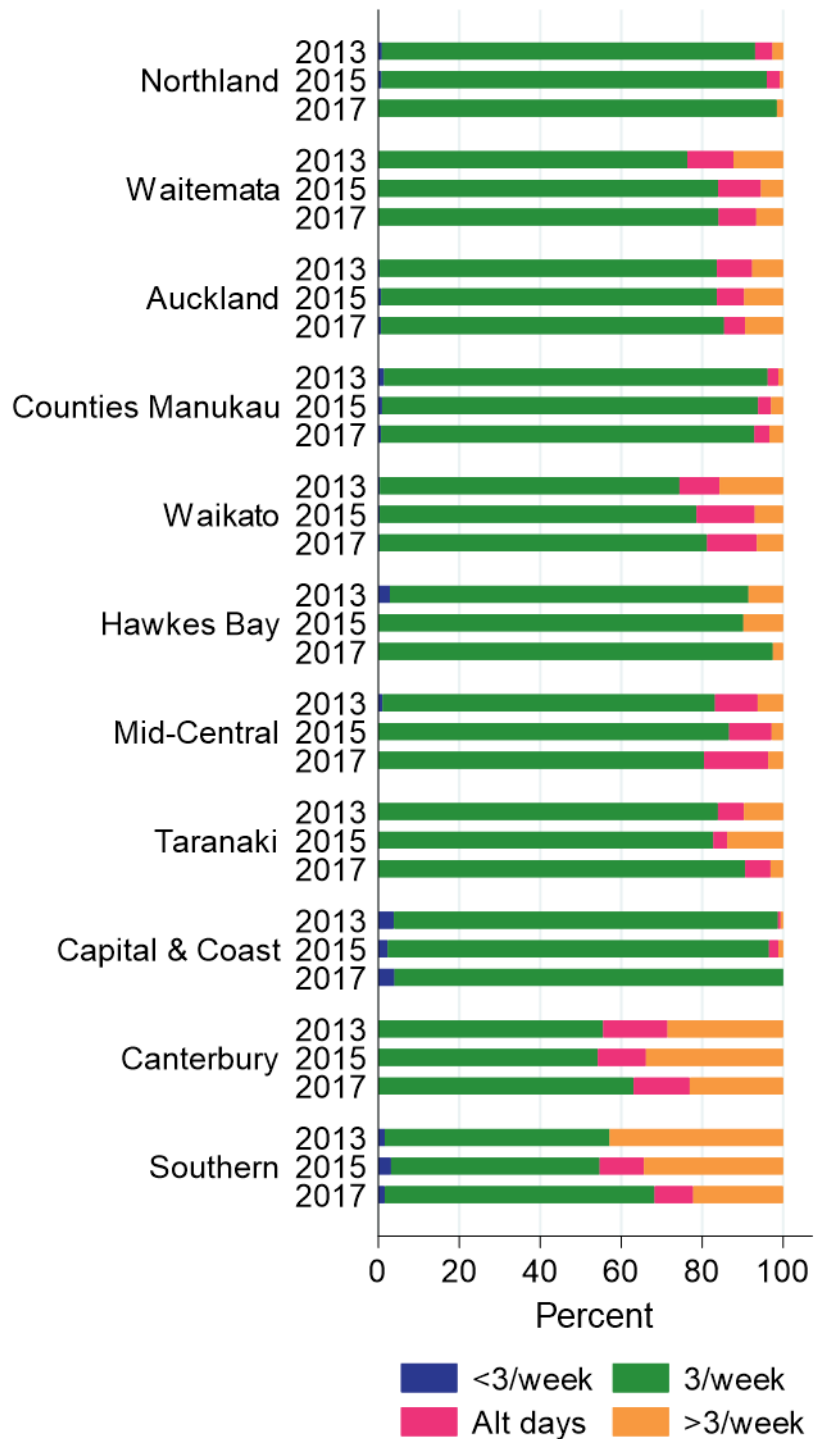
# Haemodialysis

## Frequency

Haemodialysis frequency by District Health Board

As in previous years, few patients receive haemodialysis fewer than 3 sessions per week.

Notably, alternate day haemodialysis is infrequent. Haemodialysis performed on >3 sessions per week appears to be highest in the southernmost District Health Boards which have a higher prevalence of home based dialysis.



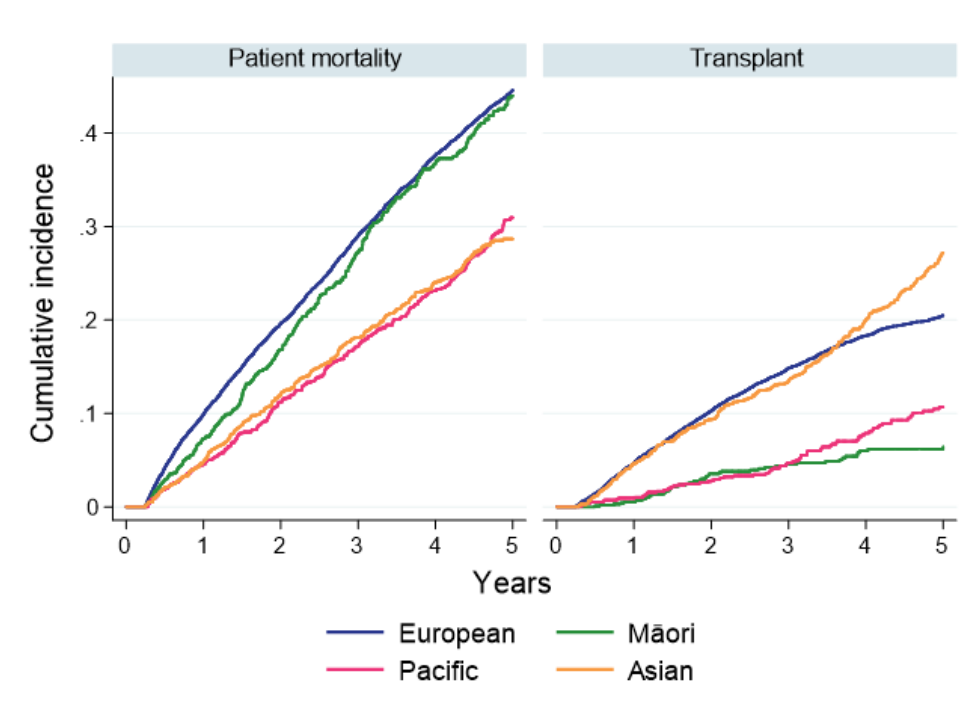
# Haemodialysis

## Survival

Patient survival on haemodialysis by age group (censored for transplant)

Age Group	Number of Patients	Survival			
		6 months	1 year	3 years	5 years
<40 years	395	99 [98, 100]	97 [94, 98]	87 [82, 90]	77 [70, 83]
40-59 years	1364	98 [97, 98]	95 [93, 96]	81 [78, 83]	64 [61, 68]
60-74 years	1202	96 [94, 97]	90 [88, 92]	65 [62, 69]	46 [42, 49]
≥75 years	299	93 [89, 95]	81 [76, 86]	46 [39, 52]	20 [14, 26]

Patient survival on haemodialysis by ethnicity (censored for transplant) and transplantation

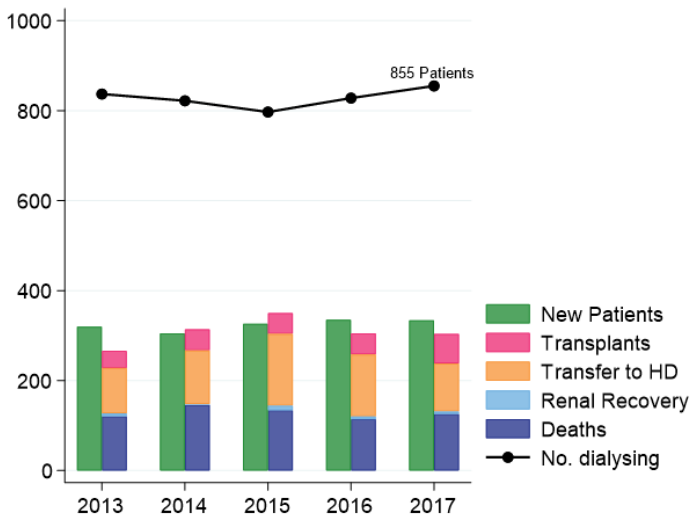


There are different rates of survival on haemodialysis based on ethnicity. These are likely in part to relate to patient characteristics such as age (European patients on dialysis tend to be older), and burden of disease including diabetes and vascular disease (higher for Māori and Pacific patients). European and Asian patients are markedly more likely to transition to transplantation during haemodialysis care.

# Peritoneal dialysis

## Patterns of peritoneal dialysis use in New Zealand, 2013-2017

	2013	2014	2015	2016	2017
<b>All patients who commenced PD</b>					
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
<b>Total</b>	<b>320</b>	<b>305</b>	<b>326</b>	<b>335</b>	<b>334</b>
<b>All patients who ceased PD</b>					
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
<b>Total</b>	<b>266</b>	<b>314</b>	<b>350</b>	<b>305</b>	<b>304</b>
<b>Total patients on PD at 31 December</b>	<b>837</b>	<b>822</b>	<b>797</b>	<b>828</b>	<b>855</b>



There were 334 patients who started peritoneal dialysis for at least 30 days in 2017. In total 855 patients were treated with peritoneal dialysis at 31 December 2019.

# Peritoneal dialysis

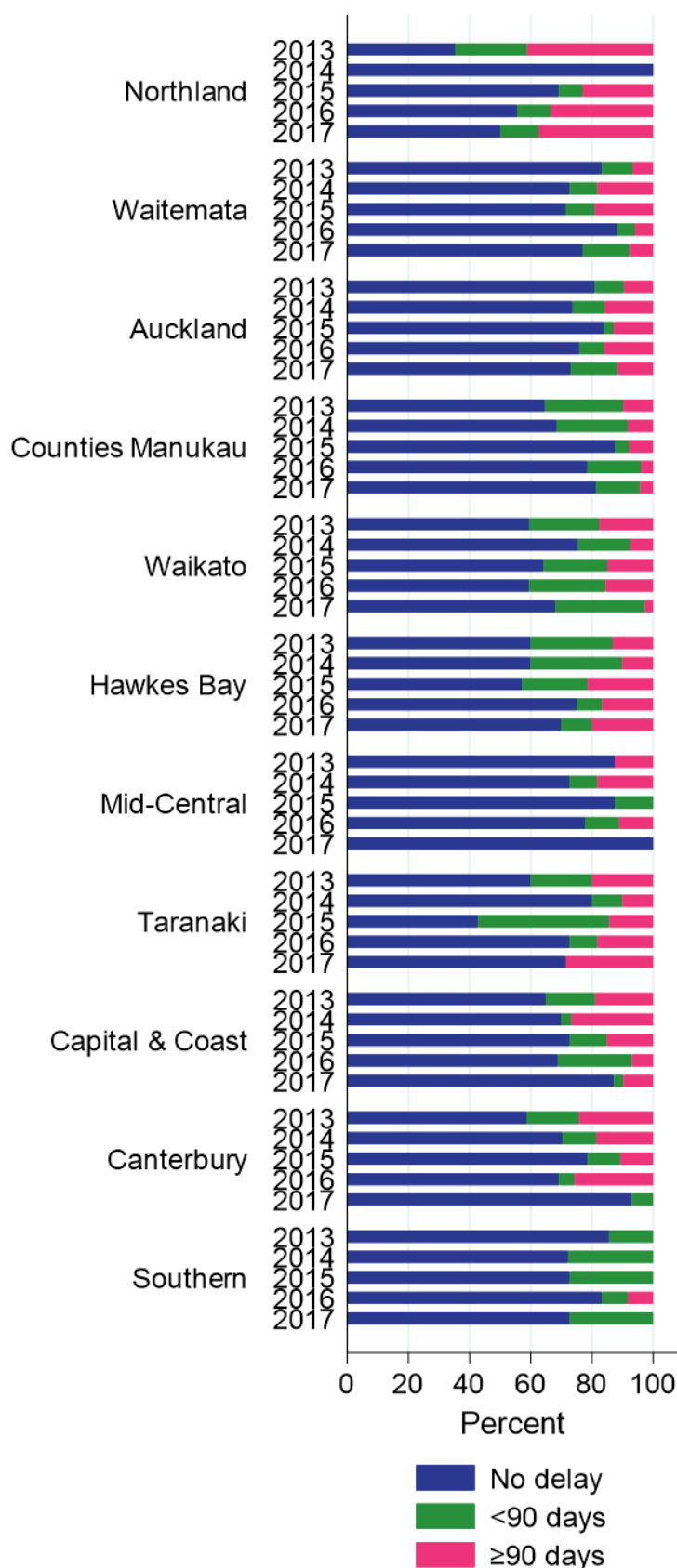
## Delay in starting peritoneal dialysis

Delay in starting peritoneal dialysis is when patients whose preferred treatment modality is peritoneal dialysis start treatment with haemodialysis first. Delay is measured as up to 90 days after starting dialysis and beyond 90 days.

In general, the percentage of patients who experience delay in starting peritoneal dialysis is highest at Taranaki and Northland District Health Boards.

Delays appear to be decreasing progressively at Counties Manukau and are now at low levels.

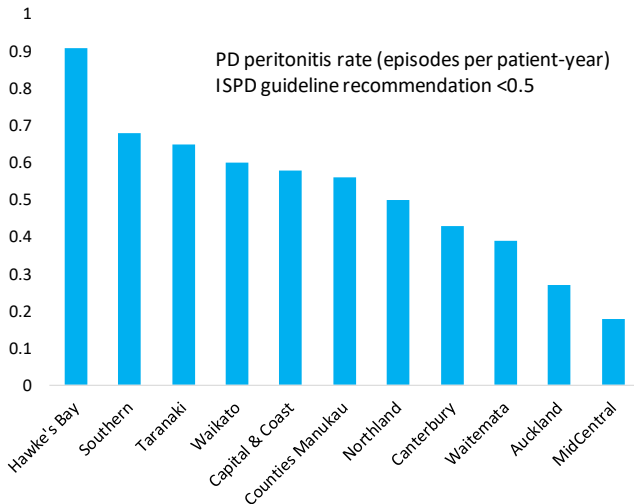
Delays appear to be increasing at Hawke's Bay, Northland, and Taranaki District Health Boards.



# Peritoneal dialysis

## Peritoneal dialysis infection rates

### Primary PD peritonitis rate by District Health Board



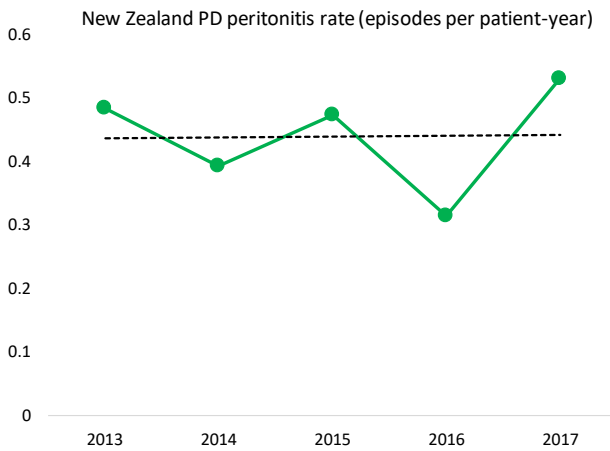
There were 412 episodes of primary PD peritonitis in 2017 in NZ. There were 43 episodes of PD peritonitis that were a relapse or a recurrence of a previous infection.

The PD peritonitis rate varies by District Health Board from 0.91 per patient-year on dialysis at Hawke's Bay to 0.18 per patient-year at MidCentral.

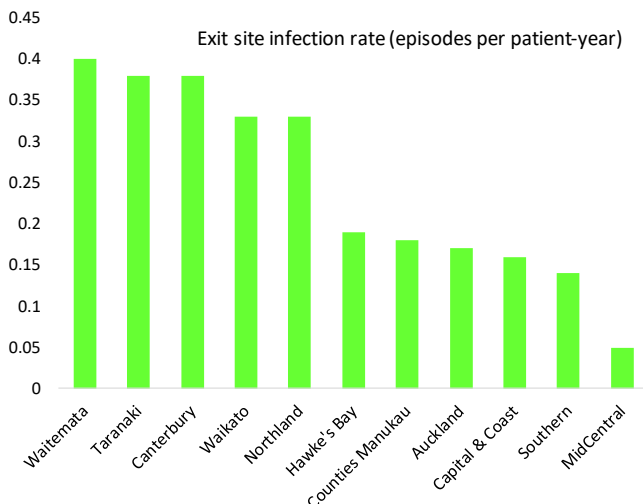
The national NZ peritonitis rate in 2017 was **0.53**. This is **higher than the** International Society for Peritoneal Dialysis (ISPD) recommendation that the overall peritonitis rate should be no more than 0.5 episodes per year.

Four DHBs (Waitemata, Auckland, Canterbury, and MidCentral) had peritonitis rates lower than ISPD guideline recommendations.

The ISPD guidelines recommend each PD centre have a continuous quality improvement (CQI) program in place to reduce peritonitis rates.



### Exit-site infection rate by District Health Board, 2017



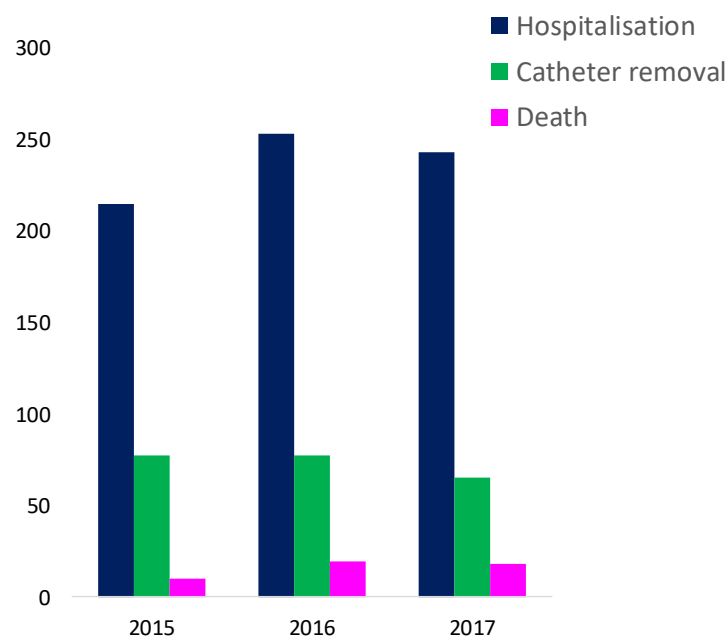
There were 216 reported episodes of exit-site infection in 2017 in NZ.

Exit-site infections are major predisposing factors to PD-related peritonitis.

The rate of exit-site infection was highest at Waitemata, Taranaki, and Canterbury DHBs and lowest at Southern and MidCentral.

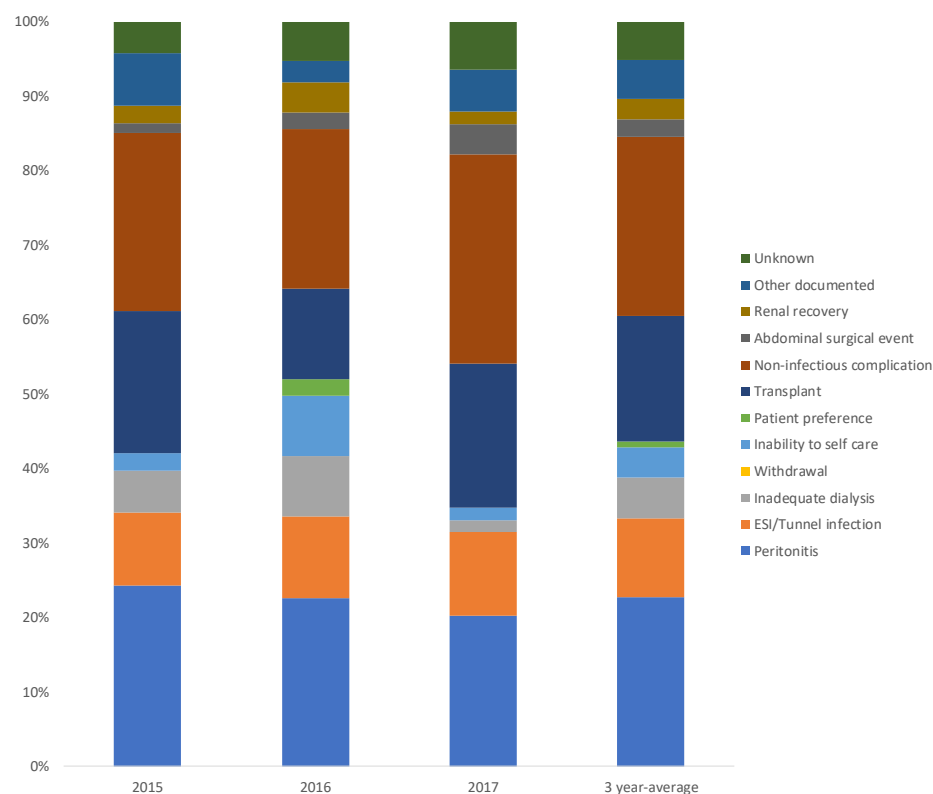
# Peritoneal dialysis

## Outcomes of PD peritonitis



Of the 455 episodes of PD peritonitis that occurred in 2017, 243 resulted in hospitalization (53%) and 65 resulted in removal of the PD catheter (14%). Four percent were fatal which is consistent with the international experience.

## Reasons for removal of PD catheter



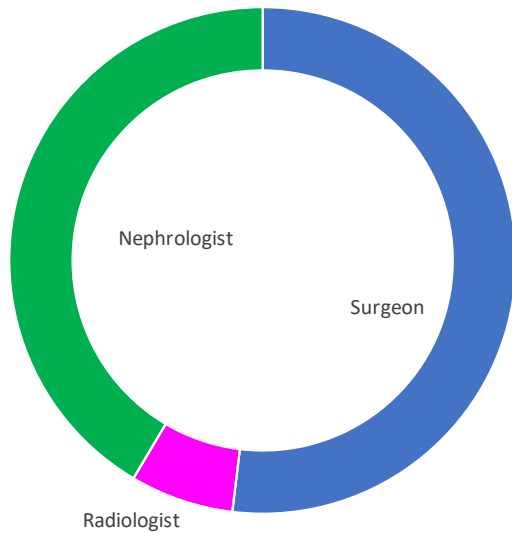
Overall, 124 PD dialysis catheters were removed in 2017. The most common reason for PD catheter removal in 2017 was a non-infectious technical complication. Peritonitis was the second most common rea-

son for removal, while exit site infection and tunnel infection led to >10% of removals. Transplantation is the fourth most frequent reason for catheter removal.

# Peritoneal dialysis

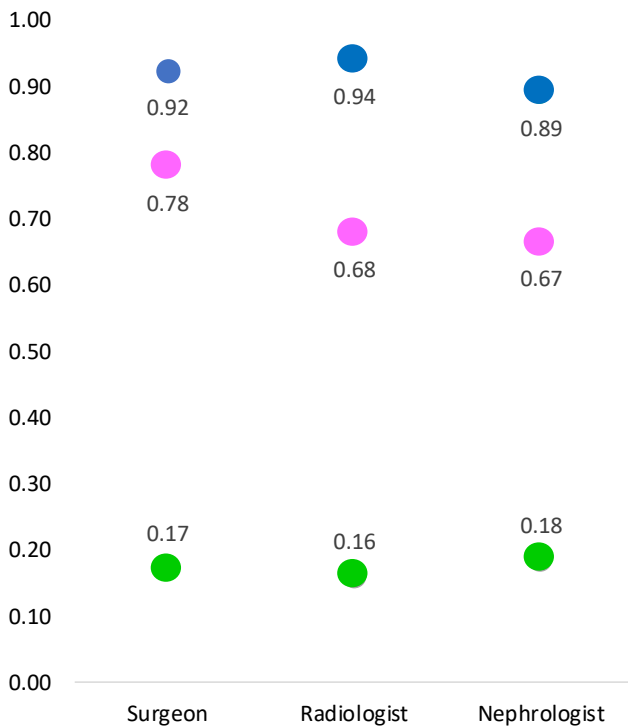
## PD catheter outcomes

### PD catheter insertion by clinician



PD catheters are inserted by surgeons, radiologists, and nephrologist in NZ. A total of 757 PD catheters were inserted in 2017, with most (52%) inserted by a surgeon. Radiologists inserted a small percentage (6.6%).

### PD catheter survival by inserting clinician



Outcomes for PD catheters appeared to be somewhat better when inserted by a surgeon.

The primary patency for a PD catheter (patient able to commence PD within 90 days) was 92% for catheters inserted by a surgeon, 94% by a radiologist, and 89% by a nephrologist.

The catheter survival at 1 year was 78% among those inserted by a surgeon, 68% by a radiologist, and 67% by a nephrologist.

The catheter complication rate measured at 30 days appeared to be similar and approximately 16-18%.

- Primary Patency (commenced PD within 90 days)
- Catheter survival at 1 year
- Catheter complication rate (within 30 days)

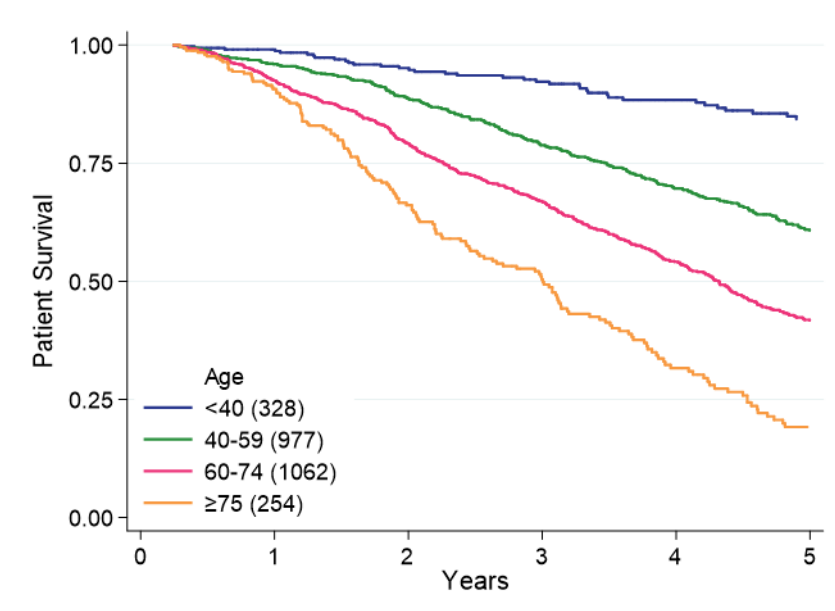


# Peritoneal dialysis

## Survival

Patient survival on peritoneal dialysis censored for transplant

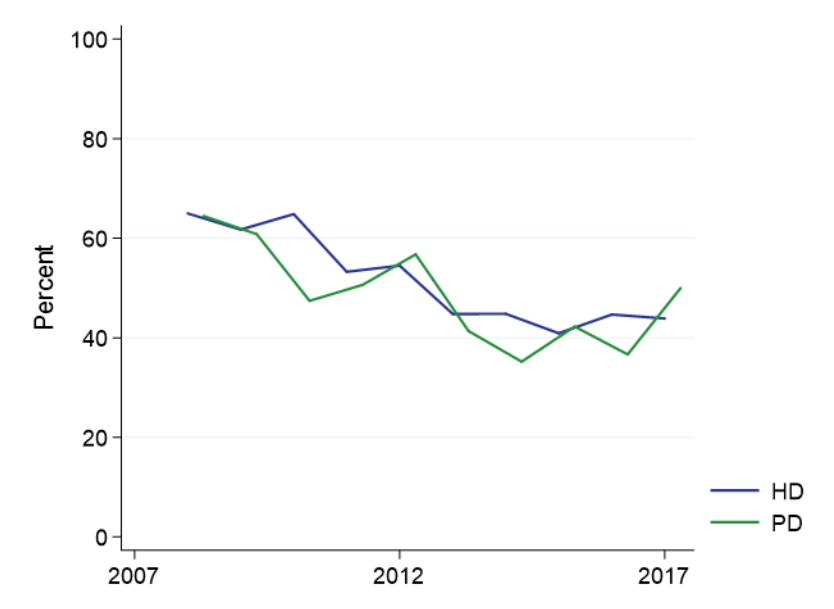
Age Group	Number of Patients	Survival			
		6 months	1 year	3 year	5 year
<40	328	99[98,100]	99[97,100]	92[88,95]	84[79,89]
40-59	977	99[98,99]	96[94,97]	79[76,81]	61[57,64]
60-74	1062	98[98,99]	92[91,94]	67[64,70]	42[38,45]
≥75	254	98[95,99]	91[86,94]	50[43,57]	19[13,26]



Survival on peritoneal dialysis is not unexpectedly related to age. People starting peritoneal dialysis at younger than 40 years of age have a 5 year survival of 84% while those over 75 years of age have a 5 year survival of 19%. This information might reasonably be used when guiding decision-making in the pre-dialysis process.

# Anaemia treatment

Erythropoiesis-stimulating agent (ESA) use among patients with a haemoglobin above 130 g/l



Erythropoiesis-stimulating agent use to achieve a higher haemoglobin target (above 120-130 g/l) increases risk of death and cardiovascular events without increasing quality of life.

While the use of ESA treatment in patients with a haemoglobin level >130 g/l has decreased over the last decade from over 60% of all patients, the prevalence of drug use in pa-

tients with over-corrected anaemia is still high, and approaching half of all patients.

District Health Boards should review treatment processes to ensure patients are not prescribed ESAs when the haemoglobin >120 g/l.

# Overall survival

Category	Level	Dialysis			Transplant		
		Rate	Lower CI	Upper CI	Rate	Lower CI	Upper CI
<b>Overall</b>		15.5	14.0	17.0	2.7	2.0	3.6
<b>Age</b>	<b>&lt;25</b>	3.0	0.4	10.7	1.2	0.0	6.8
	<b>25-44</b>	5.0	3.1	7.5	0.3	0.0	1.6
	<b>45-64</b>	11.7	9.8	13.7	2.2	1.4	3.4
	<b>65-74</b>	23.0	19.6	26.9	5.5	3.3	8.6
	<b>75+</b>	33.8	27.2	41.5	10.4	4.2	21.5
<b>Gender</b>	<b>Male</b>	16.6	14.6	18.7	3.2	2.2	4.5
	<b>Female</b>	14.0	11.9	16.3	2.0	1.1	3.3
<b>Diabetes status</b>	<b>Non-diabetic</b>	12.6	10.7	14.7	2.5	1.8	3.5
	<b>Type 1 diabetes</b>	15.9	8.7	26.6	4.4	0.9	12.7
	<b>Type 2 diabetes</b>	18.1	15.9	20.5	3.9	1.4	8.6
<b>Coronary disease</b>	<b>No</b>	12.5	11.0	14.1	2.8	2.0	3.7
	<b>Yes</b>	24.2	20.7	28.1	1.9	0.2	6.9
<b>Ethnicity</b>	<b>European</b>	19.8	16.9	23.1	3.1	2.2	4.2
	<b>Māori</b>	16.2	13.7	19.1	3.1	1.1	6.7
	<b>Pacific</b>	10.1	7.9	12.7	0.7	0.0	3.8
	<b>Asian</b>	14.1	9.8	19.6	1.2	0.1	4.4

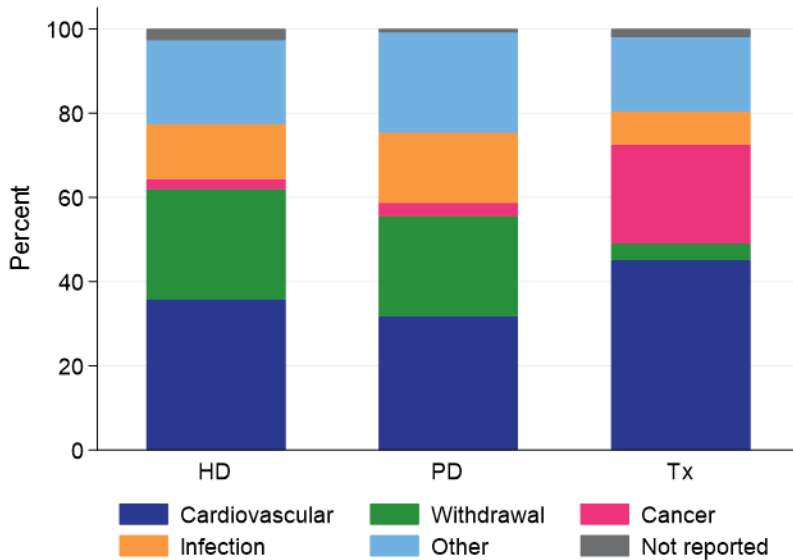
Overall survival for New Zealand patients who started renal replacement therapy in the period 2008 to 2017 is shown. This table includes all episodes of dialysis and transplantation and deaths are attributed to the modality being used at the time of death. For this table, episodes of treatment include all people treated in 2017 regardless of when they started treatment. Mortality rates are 15.5 deaths for every 100 patient years if the patient is on dialysis at time of death and 2.7 for every 100 patient years of treatment if the patient is transplanted at time of death.

Mortality rates are higher with older age, diabetes and coronary artery disease.

Death according to ethnicity are likely to be confounded. European patients who are on dialysis at time of death are likely to be older and have higher comorbidity (and therefore not transplanted), while Pacific and Māori patients on dialysis at time of death are likely to be younger and have less comorbidity due to lower incidence of transplantation.

# Causes of death

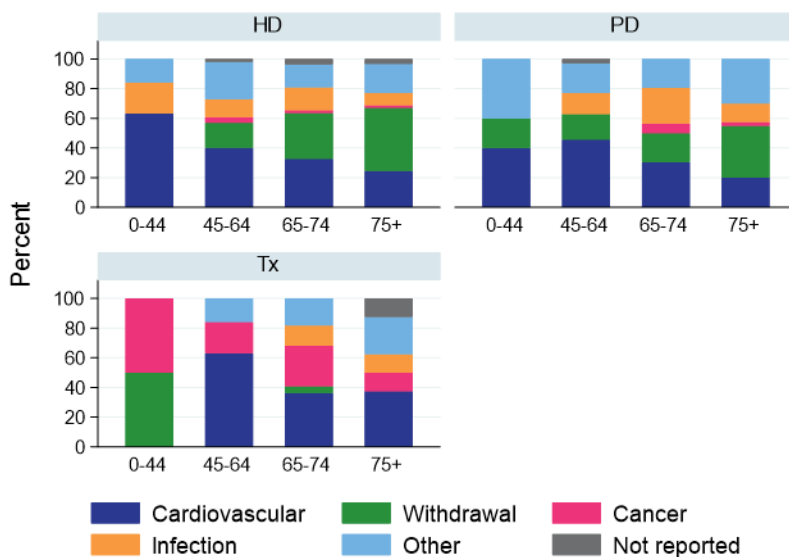
Cause of death—deaths occurring in 2017



The causes of death with each treatment modality are shown. A greater proportion of deaths among patients with kidney transplants are due to cancer, although the most common cause is cardiovascular disease in nearly half of patients.

In dialysis patients, cardiovascular death and withdrawal from therapy are the most common causes of death. Death from infection are higher for dialysis patients than transplant patients.

Cause of death by treatment modality and age at death

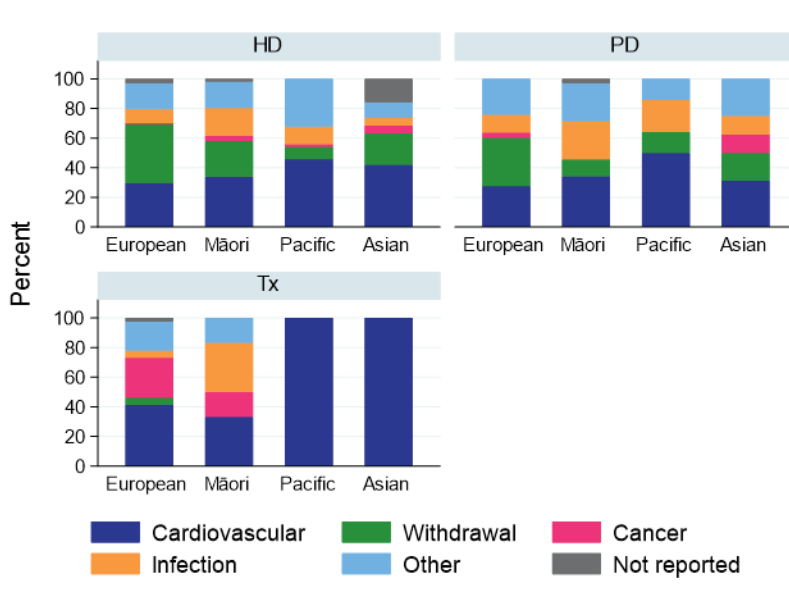


Among young transplant patients, the highest causes of death are cancer and withdrawal from treatment. Cardiovascular disease is the dominant cause of death for transplant patients who die between 45 and 64 years of age.

In older dialysis patients, withdrawal from treatment is a frequent occurrence particularly among patients older than 75 years of age.

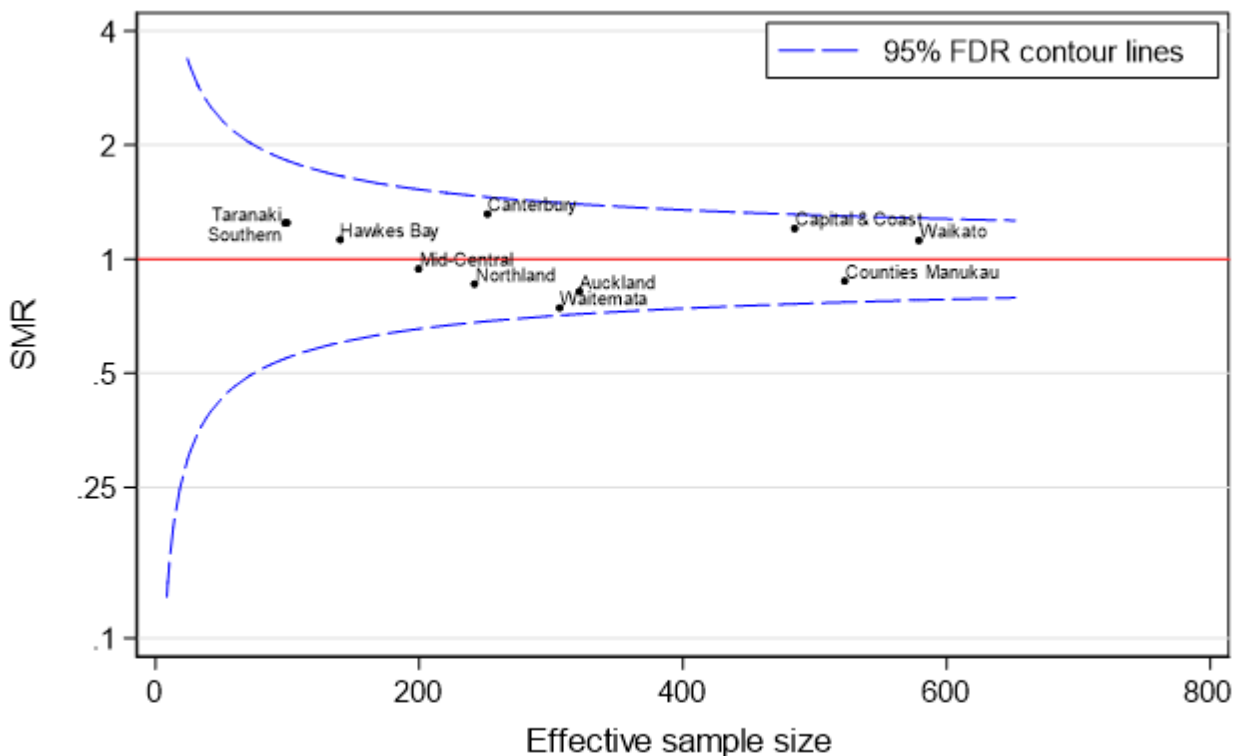
# Overall survival

## Cause of death by treatment modality and ethnicity



Withdrawal from dialysis appears to occur less frequently among Pacific patients, who experience a higher rate of death from cardiovascular causes. Infection-related mortality is higher for Māori patients who have a kidney transplant.

The standardized mortality ratio (SMR) below is the ratio of actual deaths to expected deaths within each District Health Board among patients on dialysis for at least 90 days during 2012-2017 and older than 18 years. The chance of a DHB having a mortality outside the dotted blue lines (either a high or low rate) is 5%. Note that all District Health Boards have an standardized mortality ratio within this limit. Therefore, there are no District Health Boards in NZ that have a mortality rate among dialysis patients that is higher or lower than expected.



Observations with missing values are dropped from the model



## National Renal Advisory Board

Aotearoa New Zealand ANZDATA 12th Annual Report

Written by Suetonia Palmer

On behalf of the Aotearoa New Zealand ANZDATA Working Group  
reporting data collected January to December 2017

Data collected by the Australia and New Zealand Dialysis and Transplant Registry  
(ANZDATA)

Written on behalf of the National Renal Advisory Board (NRAB)

Funded by the Ministry of Health

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**How to cite:** The Aotearoa New Zealand Working Group on behalf of the National Renal Advisory Board. New Zealand Nephrology 12th Annual Report for 2017. Available at <https://www.health.govt.nz/about-ministry/leadership-ministry/expert-groups/national-renal-advisory-board/papers-and-reports>.