
AUSTRALIA & NEW ZEALAND

LIVER TRANSPLANT REGISTRY



From the Combined Registries
of the Australian and New Zealand
Liver Transplant Centres

DATA TO 30-06-2003

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STATISTICAL METHODS

Kaplan-Meier survival curves have been produced using SPSS® for Windows™ Release 11.0.1 , SPSS Inc.

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Preface

We are pleased to present the 15th Report of the Australia and New Zealand Liver Transplant Registry (ANZLTR). This report contains data to 30th June 2003 and analyses cumulative data since the establishment of the first liver transplantation units in Australia or New Zealand in 1985.

The Registry is a collaborative effort of the liver transplant centres in Australia (Adelaide, Brisbane, Melbourne, Perth, Sydney) and New Zealand (Auckland). Prior to the establishment of the centre in Auckland in 1998, New Zealand patients were transplanted in Australia and their data is combined with data from later New Zealand recipients for analysis where appropriate. This was done to provide more accurate New Zealand demographic data and does not reflect the activity of the New Zealand unit.

Donor data have been supplied by the Australia and New Zealand Organ Donor Registry and we thank them for their collaboration.

The Editors would also like to thank all the Liver Transplant Units for the contribution of their data. A full list of the Units and their contact information can be found in the appendix. In particular we are grateful to the efforts of Jodie Fisher, Data Manager, and Pamela Dilworth, Program Manager, Royal Prince Alfred Hospital, Sydney for their continuing contribution to the maintenance of the data in the Cancer Registry and for preparation of the Cancer Report.

The registry now has some financial support and we are grateful to the Commonwealth Department of Health and Aging for their financial contribution.

The Registry is supervised by the Management Committee who are involved in the ongoing supervision of the development of the Registry. The members are listed on the inside cover together with contact information of the Coordinating Centre for comments or requests for further copies of this Report.

Stephen Lynch

Glenda Balderson

Summary

PAGE

5. Between January 1985 and 30th June 2003 , 2212 orthotopic liver transplants (OLTx) were performed in Australia and New Zealand on 2041 patients - 1639 adult patients (> 15 years) [80%] and 402 children [20%]. The median age of all recipients was 44.6 years. The ages ranged from 24 days to 70.9 years. There is a significant difference in gender distribution between children (M=45%) and adults (M=61%) ($\chi^2 = 31.99, p < 0.001$)
6. There was an increase in the total number of new patients in 2002 for both children and adults after a decrease in 2001.
- 7-8 Of 1567 Australian citizens, 1314 [84%] were adults, of 290 New Zealand citizens 229 [79%] were adults, and of 184 other citizens 96 [52%] were adults. This is reflected in the age grouping distributions and overall median ages.
9. There was an increase in the total number of liver transplants performed in 2002 compared with the number in 2001 to a record 191 transplants.
- 10-11. Increasing use of split grafts contributed to the increased number of transplants performed in 2002. In children, reduced size grafts have been used in 301 [64%] of 466 cases - 249 reduced grafts (including 8 living donor grafts) and 52 split liver grafts. Of adult patients, 24 received reduced size grafts (including 1 as auxiliary graft and 2 living donor grafts) and 65 [4%] split liver grafts (including 1 as auxiliary graft). The first domino transplant of a whole liver was also performed.
- 12-15 Overall chronic viral hepatitis (CVH) is the most common primary indication for liver transplantation. In children biliary atresia (BA) is the most common primary disease. In adults chronic viral hepatitis varied from 25% of Australian citizens, 28% on New Zealand citizens and 32% of other citizens. Full details of specific diagnoses categories by age group and citizenship are listed in the Appendices - Metabolic disorders (Appendix II), Other diseases (Appendix III), Fulminant Hepatic Failure (Appendix IV).
- 16-18. The predicted increase in the proportion of patients requiring transplantation for CVH is evident in recent data. By 2000-03, 33% of Australian adults, 43% of New Zealand adults and 46% of Other adult patients had a primary diagnosis of CVH. In Australian and other citizens hepatitis C predominates while hepatitis B predominates in New Zealand citizens. When patients with other primary diagnoses and a secondary diagnosis of Hepatitis B, C or both are included, the overall incidence of CVH in 2000-03 was 40% in Australian adults, 46% in New Zealand adult patients and 47% in Other adult citizens.
19. Current 1 year patient survival of all patients is 85%. Patient survival was 77% at 5 years and 69% at 10 years. There was no difference on survival between citizenship groups.
20. Australian adults had a significantly lower survival rate than children but this was not seen in other groups.
- 21-23. Older recipients (60-69 and 70+ years) had poorer outcomes than other adults while overall babies (< 1 year) also tended to have lower survival than other children.
- 24-25. Patient survival in 2000-03 cohort shows continued improvement for the first 3 years in patient outcome compared with earlier cohorts.

Summary

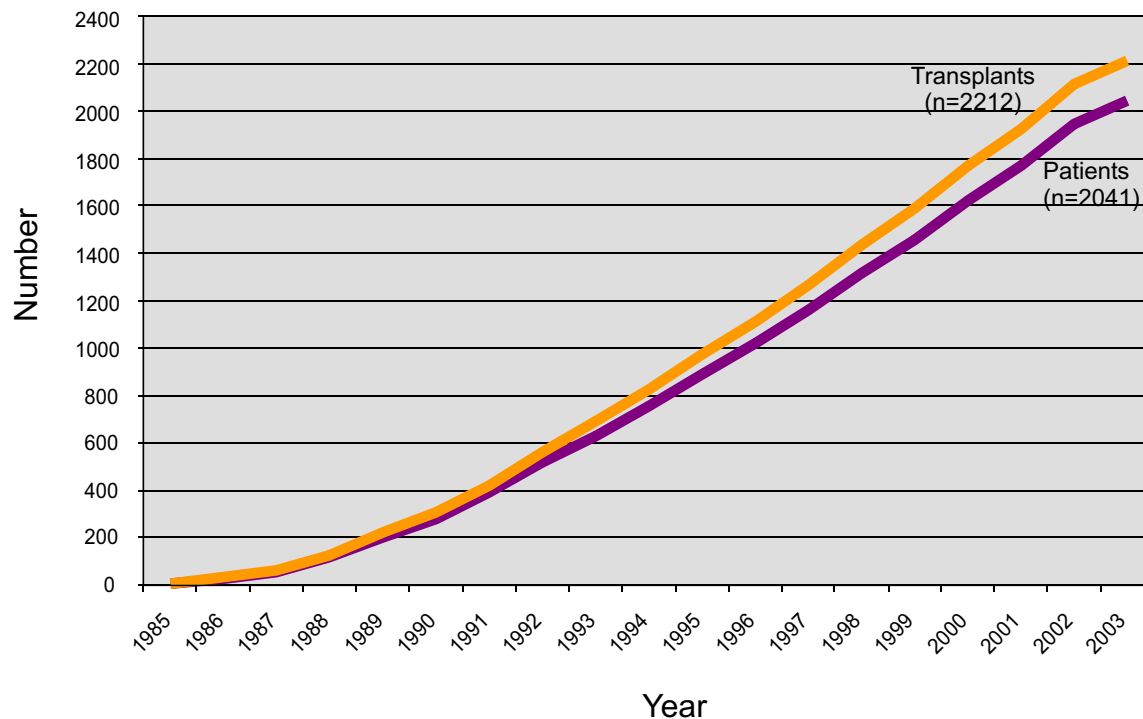
PAGE

26. Children weighing < 8 kg at the time of transplant had inferior survival compared to heavier patients.
27. The type of primary graft,(whole , reduced or split liver), had no effect on patient survival in either children or adults.
28. Adult patients transplanted for biliary atresia had the best long term survival while those whose primary disease was malignancy had a significantly lower survival rate.
29. In children, patient survival was similar for all disease groups. There were no differences in survival between adults and children transplanted for fulminant hepatic failure with 5 year survival about 70%.
30. Recent cohorts of adult patients with a primary diagnosis of hepatitis B show a significantly improved survival which is not seen in adult patients with hepatitis C as primary disease. Patients transplanted for malignancy continue to have a poor outcome.
31. Eleven patients have received a living related donor graft, 7 children and 3 adults as a primary graft and one child as a second graft.
32. Graft survival was significantly worse in second and third grafts.
- 32-33. Both split and other reduced grafts had lower graft survival in the early post-transplant years but an improving longer term outcome particularly for split grafts.
34. Vascular complications and rejection are the commonest indications for retransplantation
- 35-36. Over 50% of deaths have occurred within 6 months of transplant. Overall, sepsis and graft failure are the most frequent causes of death. Early graft failure is due to poor or no early graft function. After 1 year malignancy and graft failure from recurrent disease or chronic rejection cause most deaths. After 5 years cardiovascular disease and de novo malignancy are the most common.
37. Donor age has little effect on patient survival after transplantation. The fewer number of transplants in 2001 was a reflection of the decline in cadaveric donors in that year.

Section 1

Demographic Data

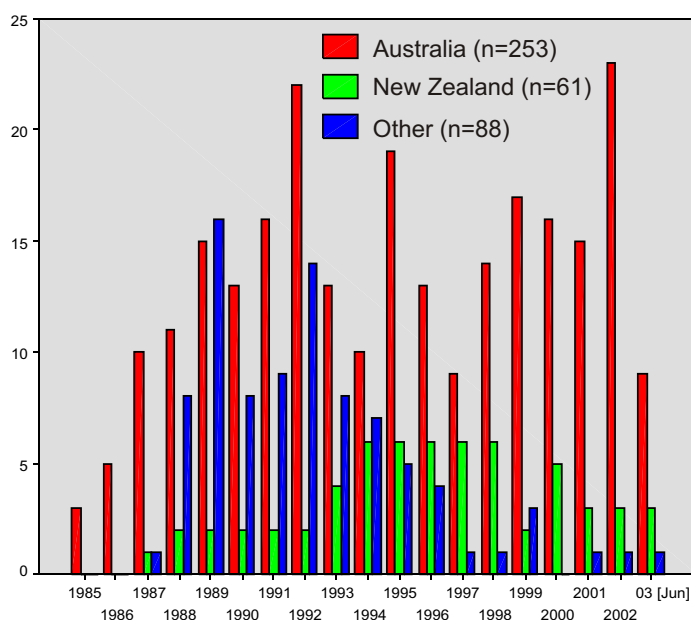
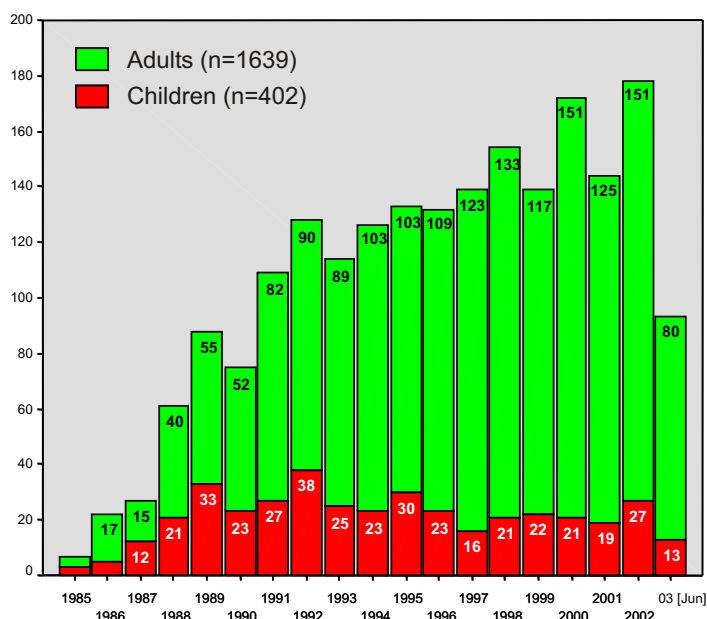




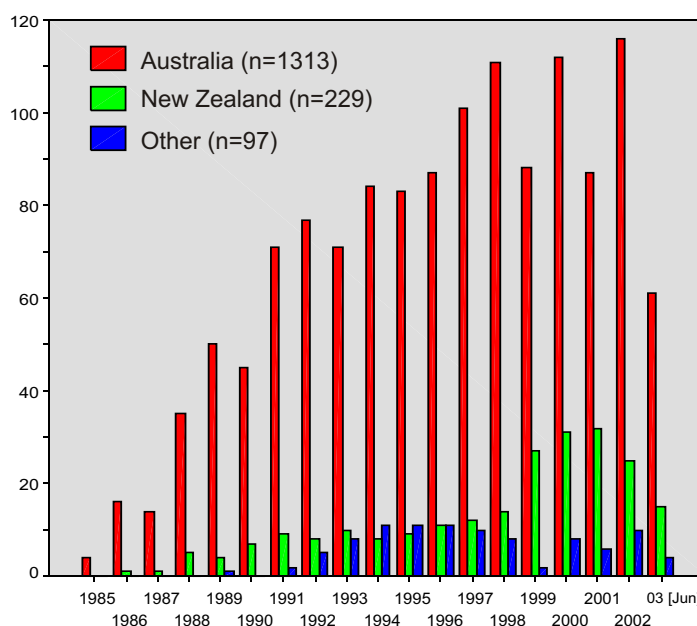
Summary Statistics - Age and Gender

ALL PATIENTS (AUSTRALIAN, NEW ZEALAND, OTHER)

	Children	Adults	Total
Patients 370	402	1639	2041
Age			
<i>Mean ± SD</i>	4.5 ± 4.2	46.2 ± 12	38 ± 19.9
<i>Median</i>	2.5y	48.1y	44.6y
<i>Range</i>	24d -14.9y	15.0 - 70.9y	24d - 70.9y
Gender			
<i>Female</i>	221 (55%)	646	1174 (58%)
<i>Male</i>	181	993 (61%)	867 (42%)
Surviving	314 (78%)	1229 (75%)	1543 (76%)

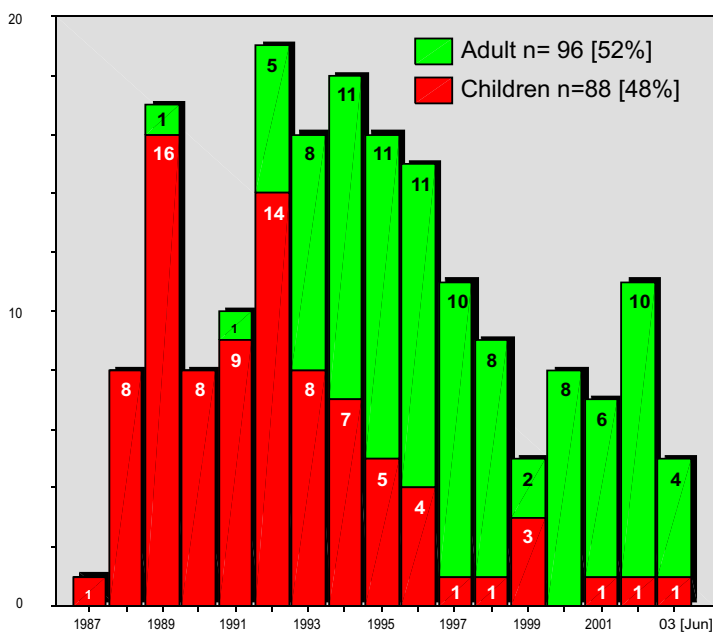
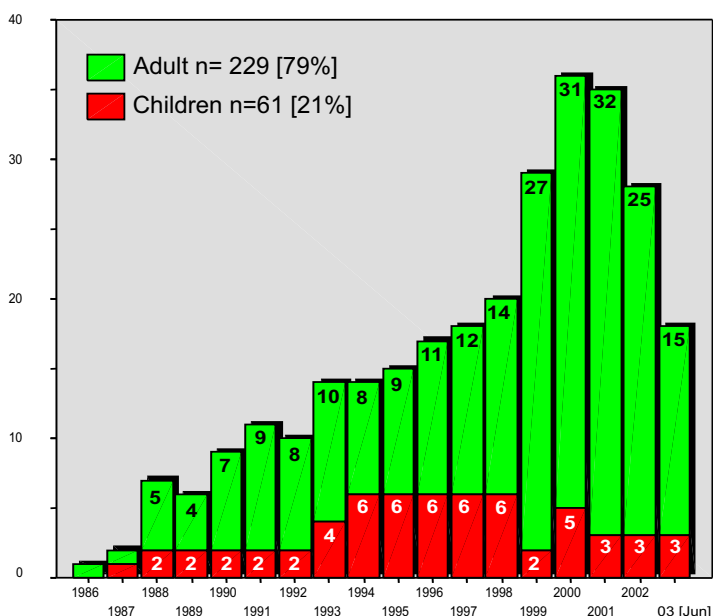
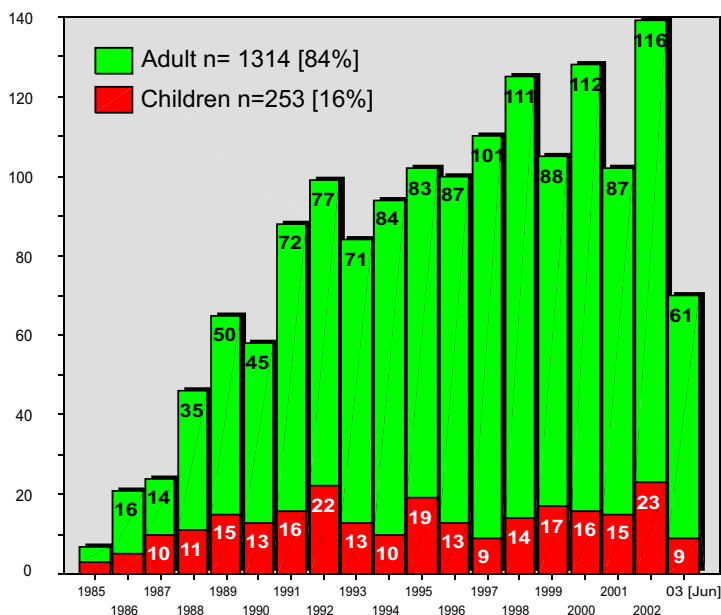


Children
n = 402

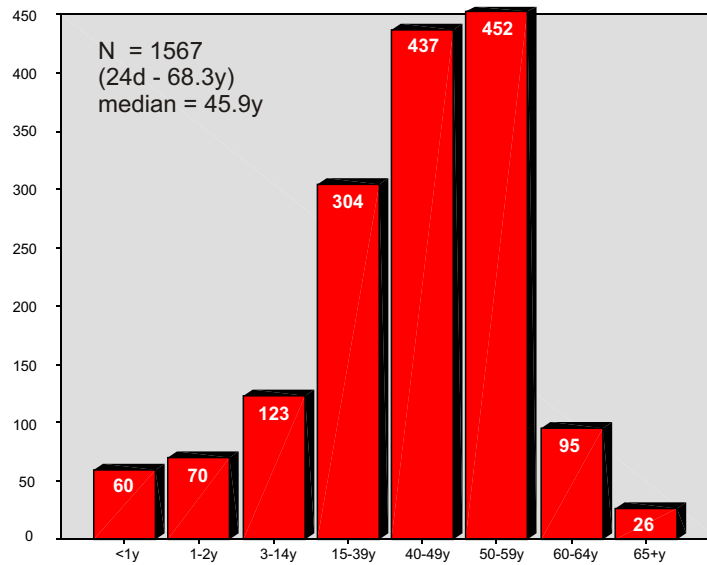


Adults
n = 1639

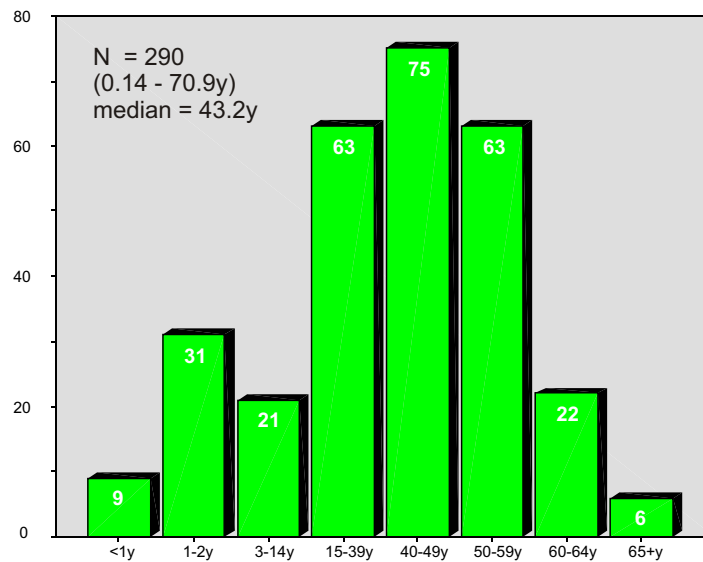
Year of Transplant



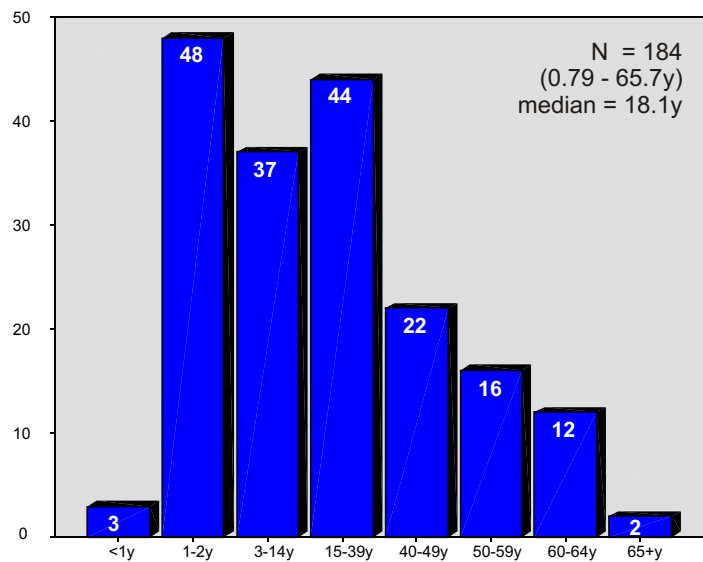
Australian Citizens



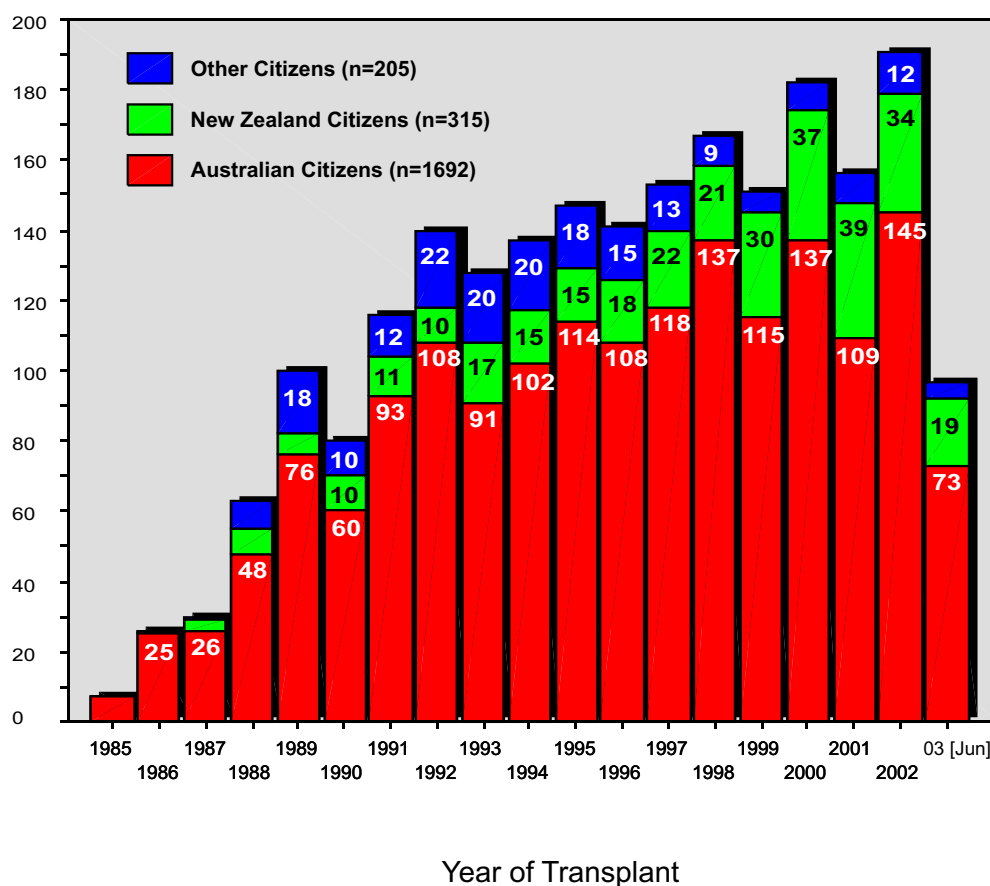
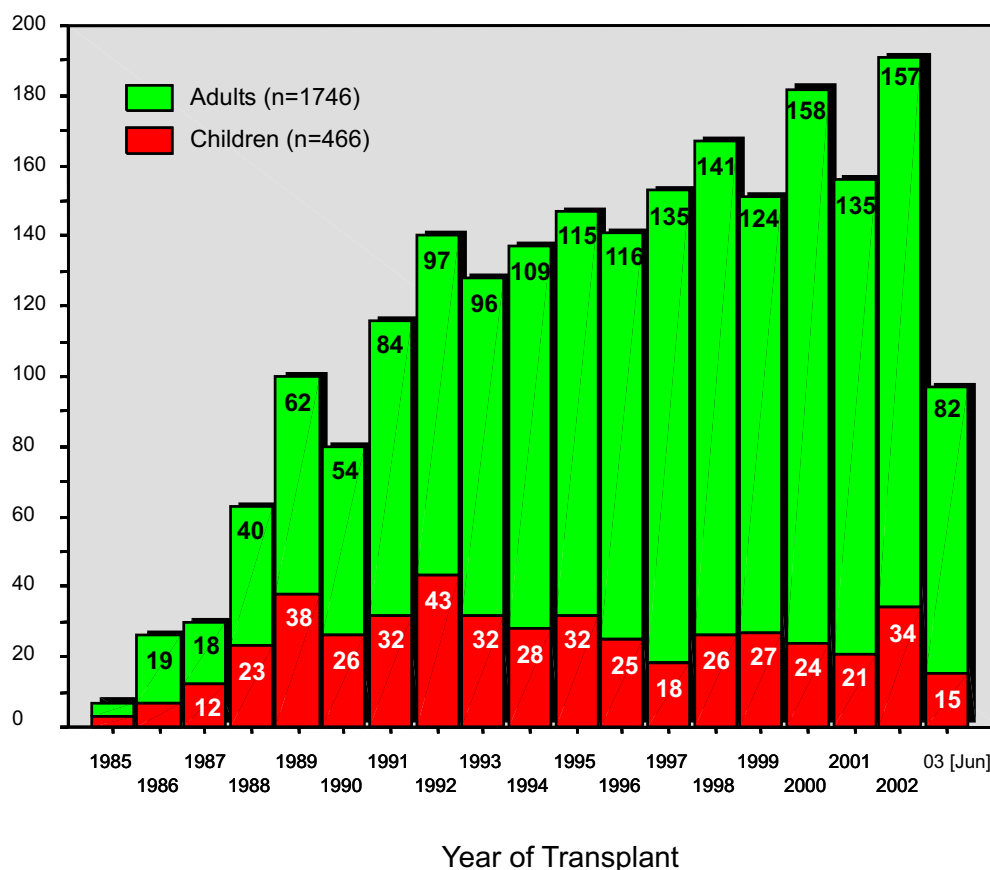
New Zealand Citizens



Other Citizens

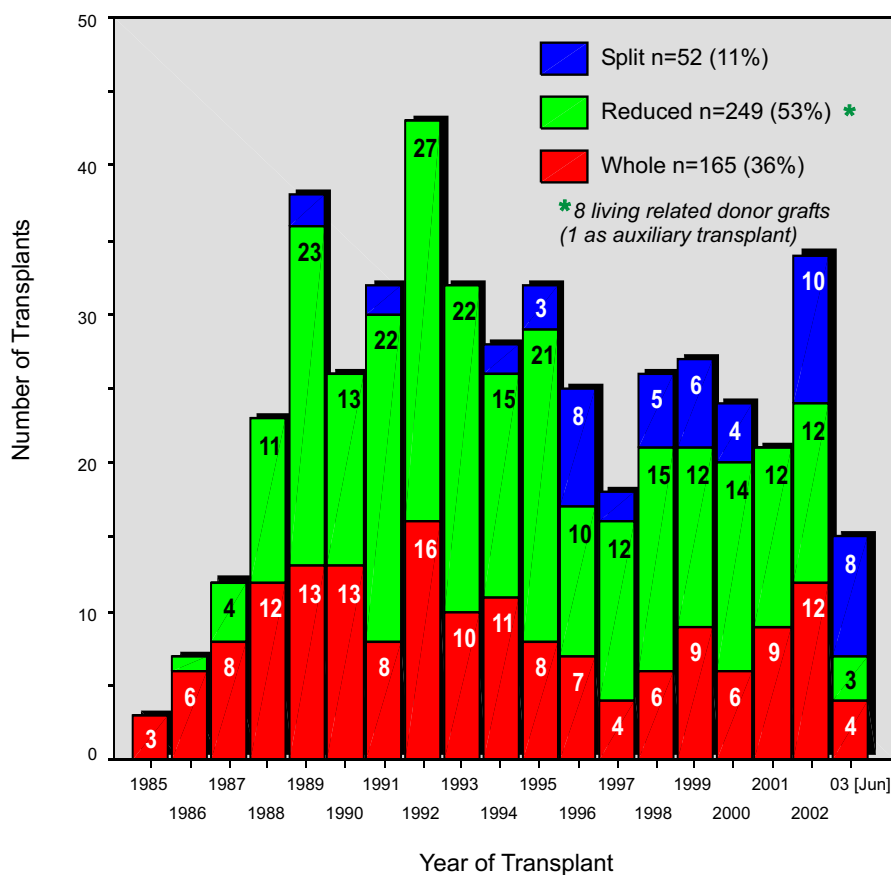


Age (Years)

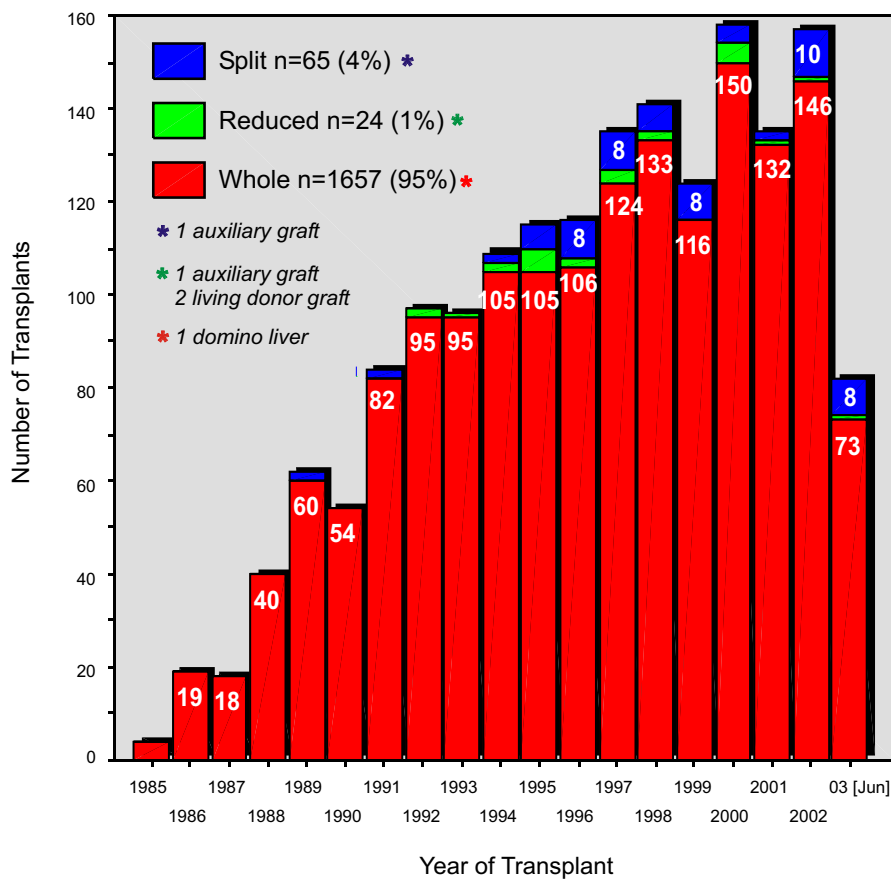


Type of Graft by Year Split vs Reduced vs Whole

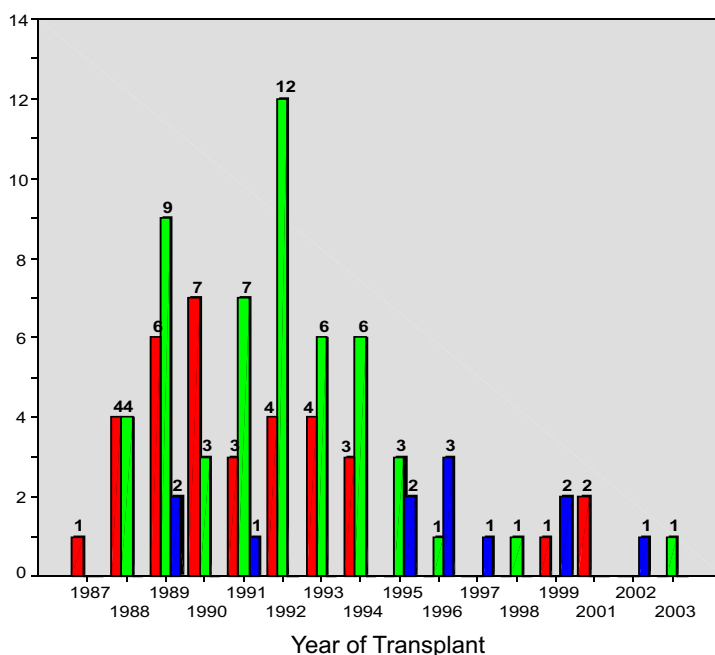
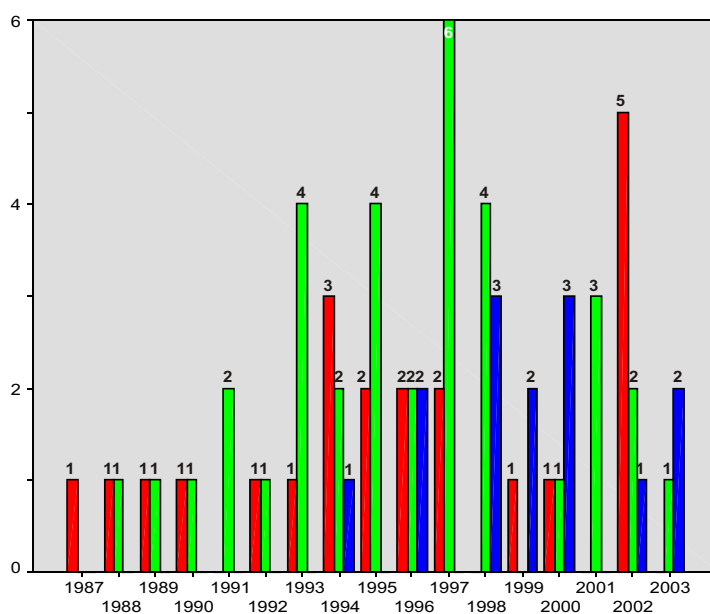
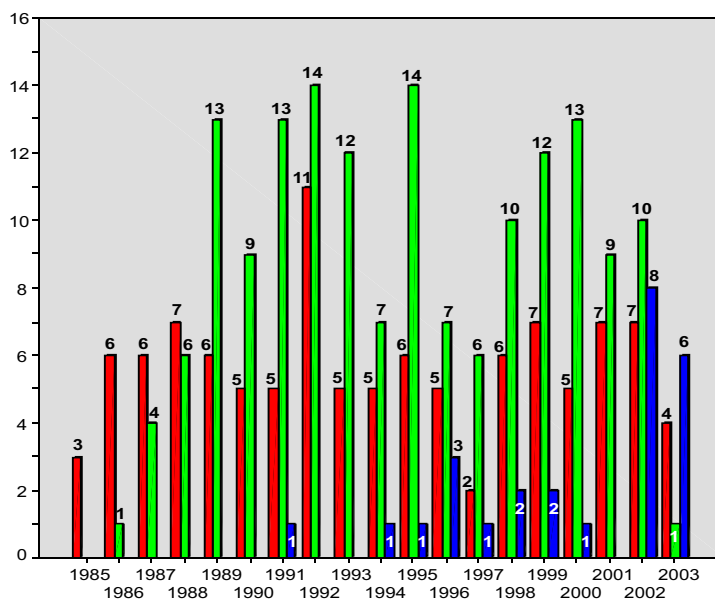
Children (n = 466)



Adults (n = 1746)



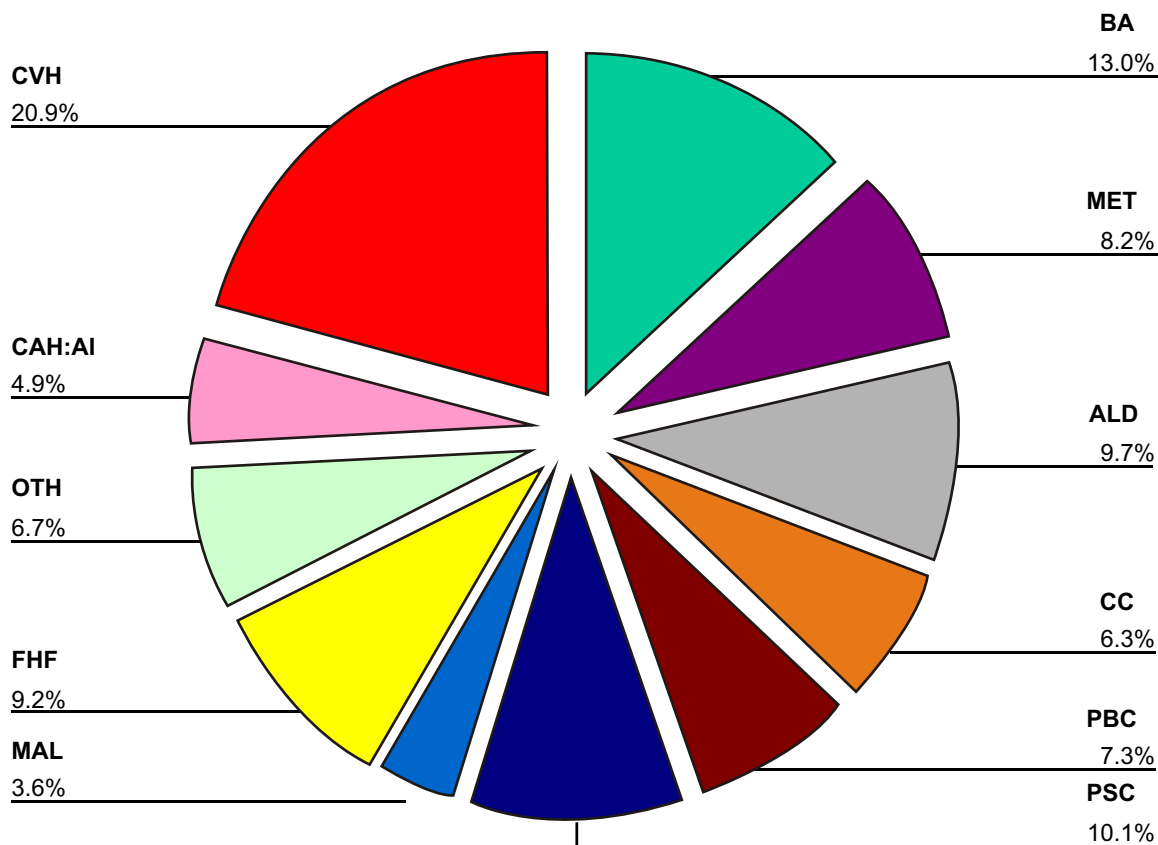
Type of Graft by Year Children - Reduced vs Whole



Section 2

Primary Diagnosis

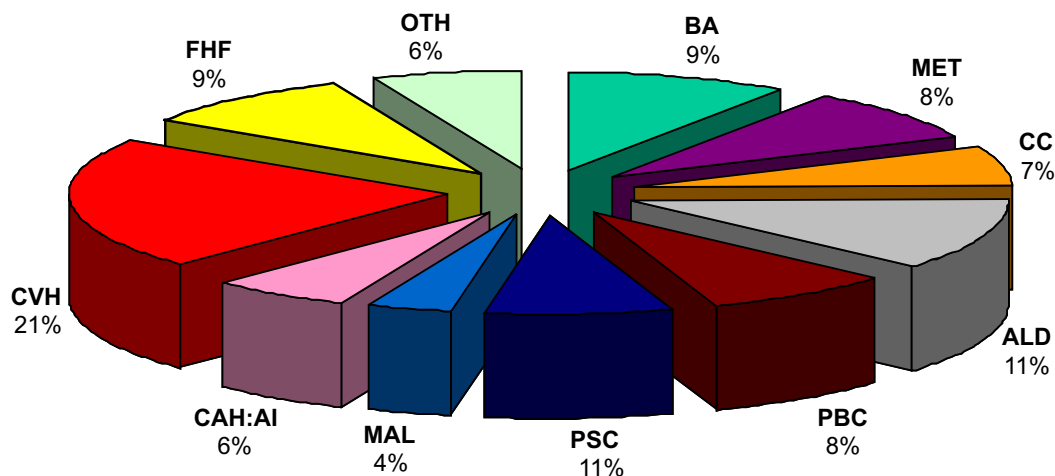




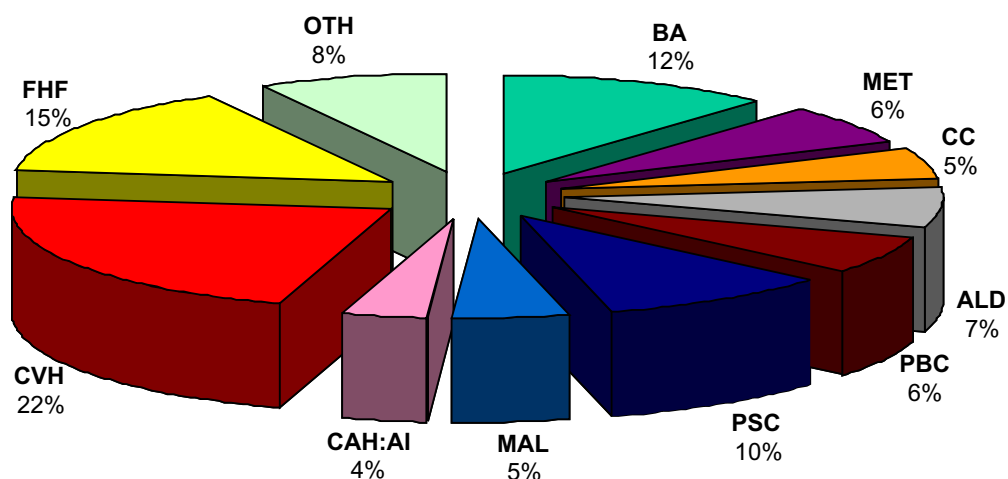
Disease Abbreviations

BA	-	Biliary atresia
MET	-	Metabolic diseases
ALD	-	Alcoholic cirrhosis
CC	-	Cryptogenic cirrhosis
PBC	-	Primary biliary cirrhosis
PSC	-	Primary sclerosing cholangitis
MAL	-	Malignancy
FHF	-	Fulminant hepatic failure
OTH	-	Other diseases
CAH : AI	-	Chronic active hepatitis [autoimmune]
CVH	-	Chronic viral hepatitis

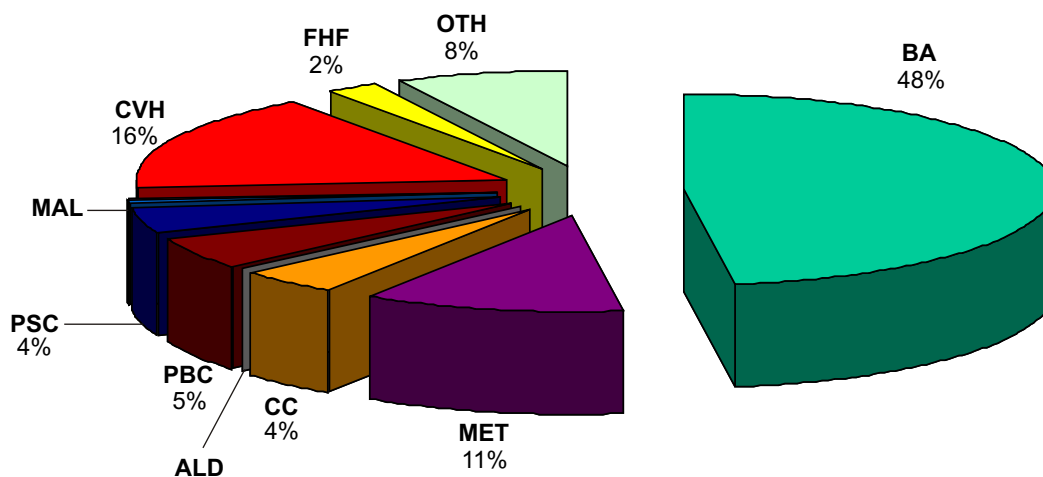
Australian Citizens n=1567



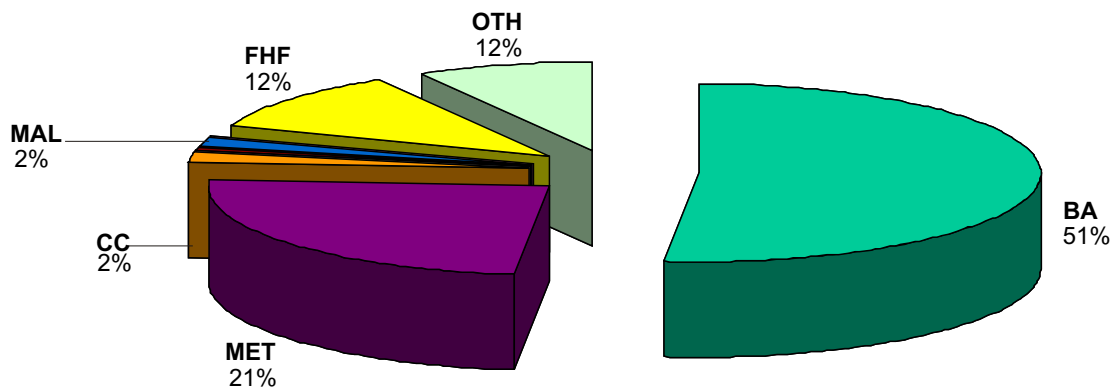
New Zealand Citizens n= 290



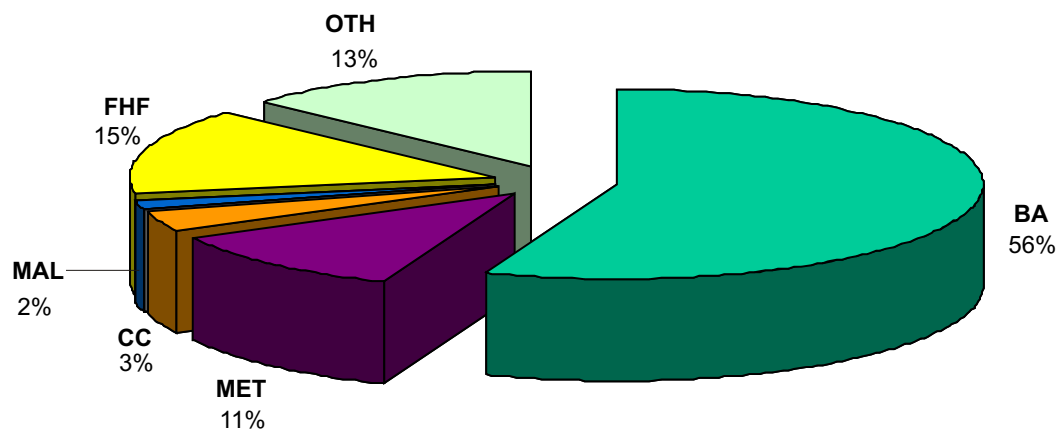
Other Citizens n= 184



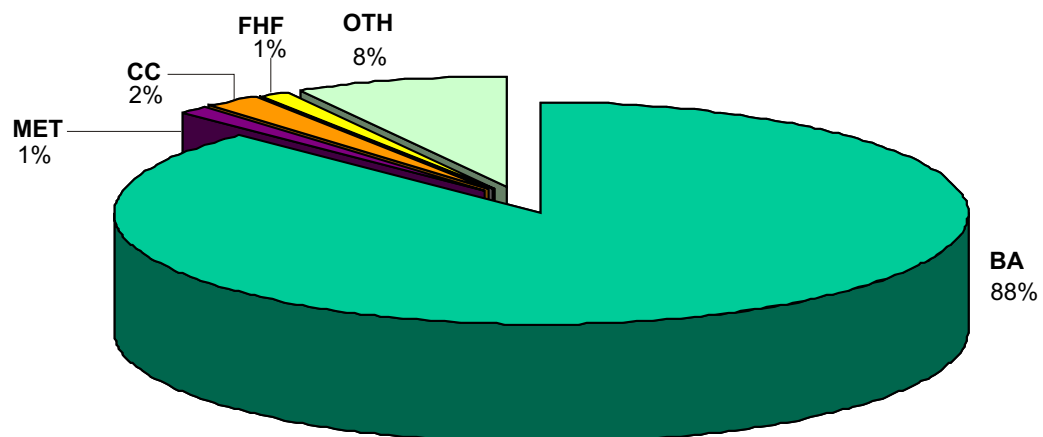
Australian Citizens



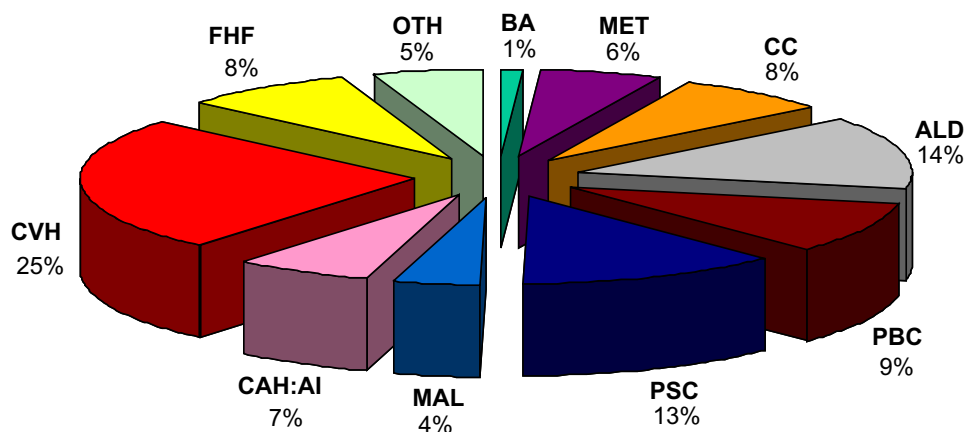
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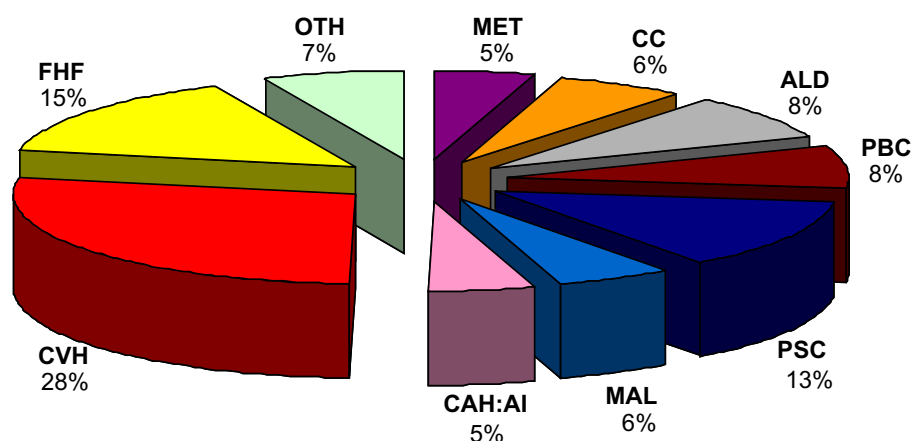
Other Citizens



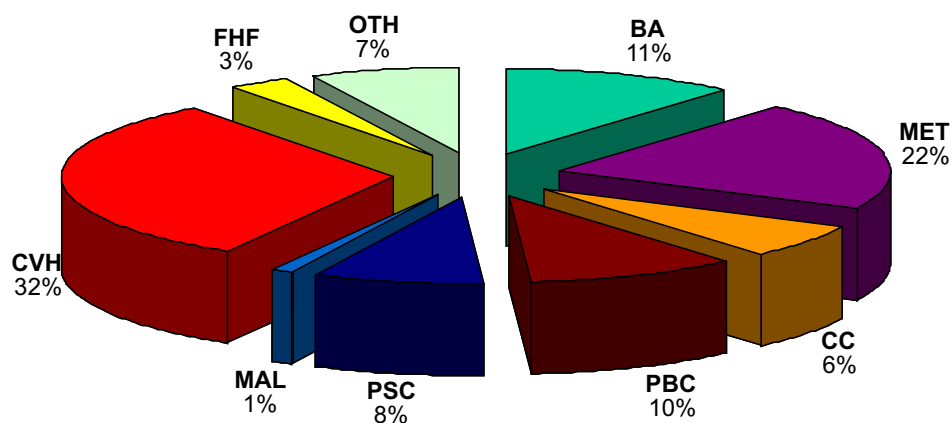
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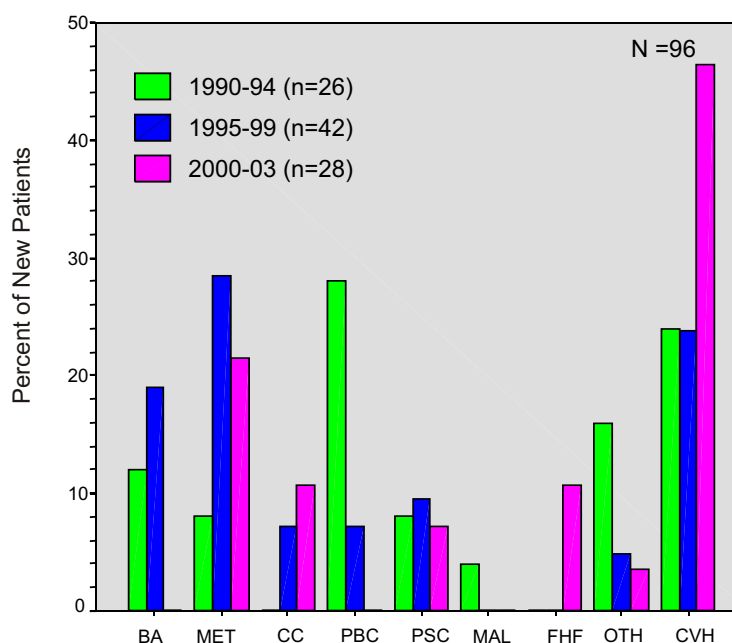
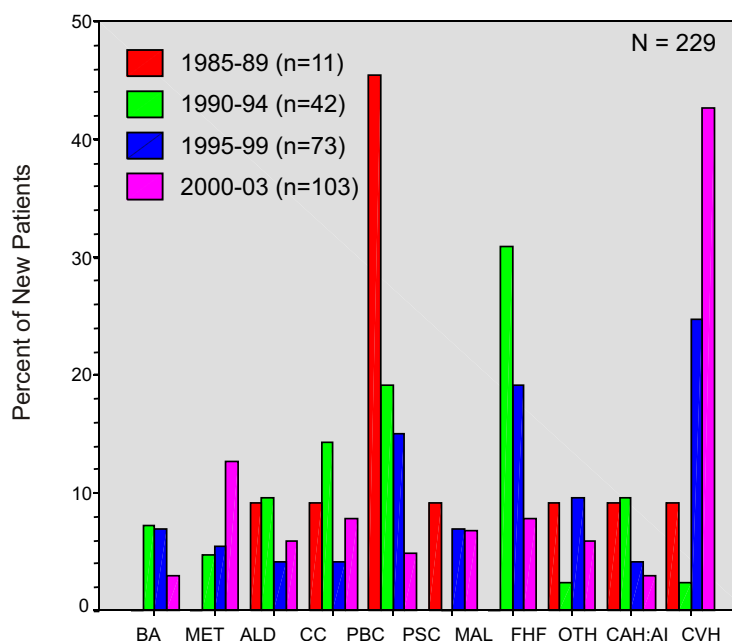
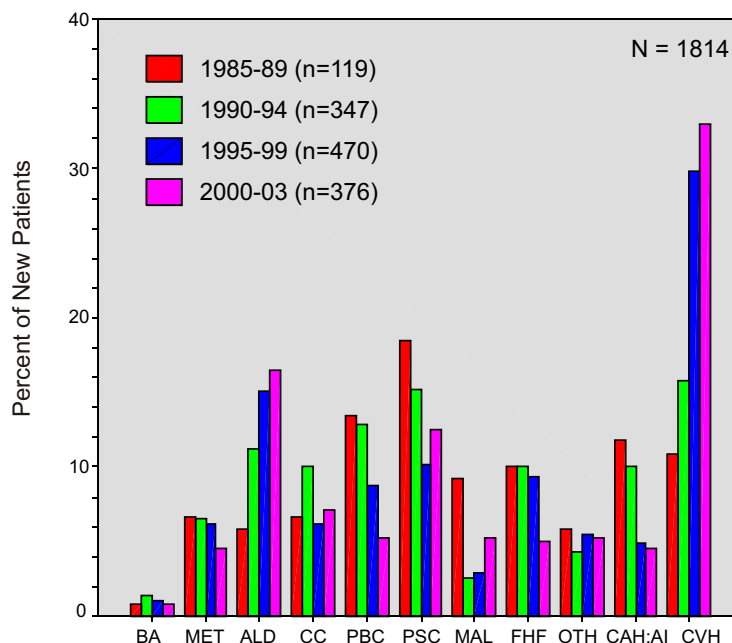


New Zealand Citizens



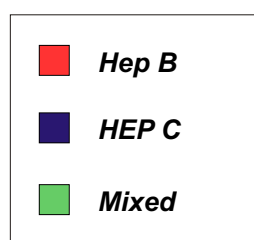
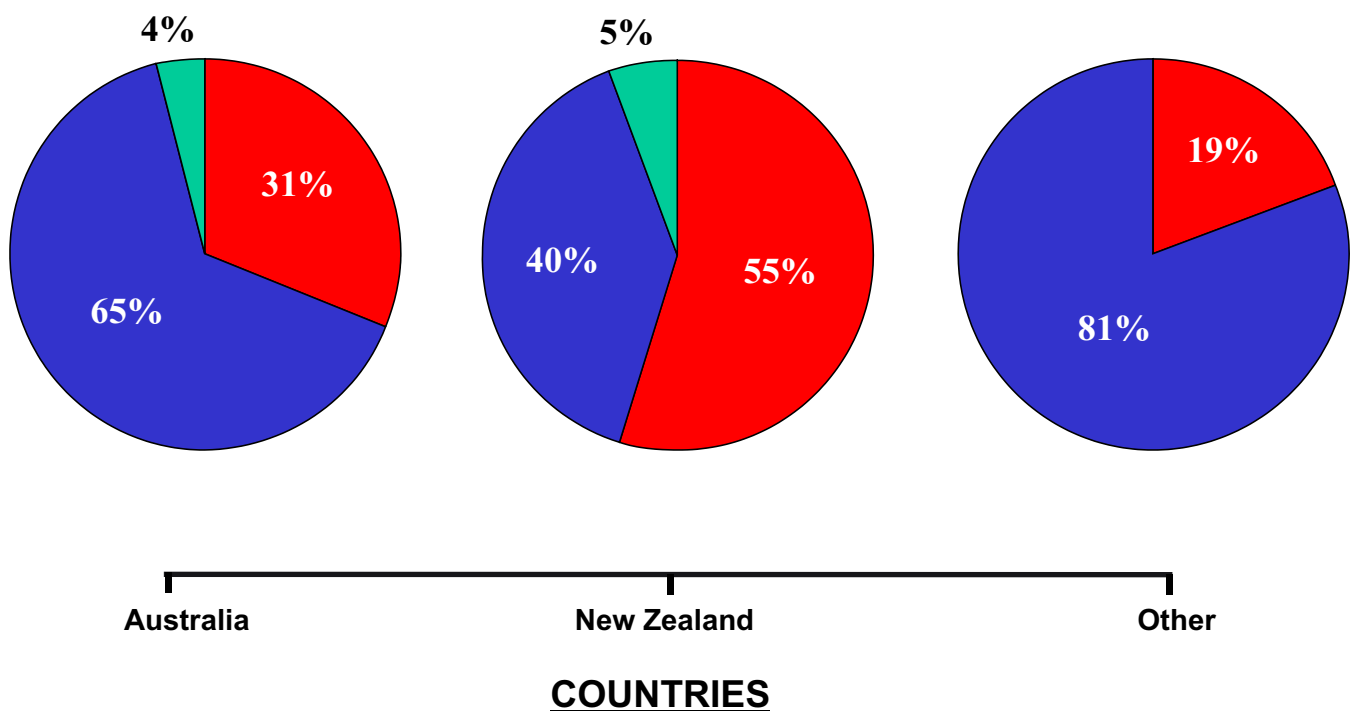
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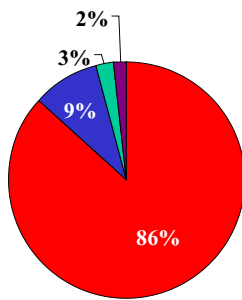


			<i>Secondary Diagnosis</i>			
<i>Primary Diagnosis</i>		n =	Hepatitis C	Hepatitis B	Hepatitis B,C	HCC
	Hepatitis C	264				48
	Hepatitis B	145				39
	Hepatitis BD/BC/BCD	17				2
	HCC + cirrhosis	56	24	20	2	
	ALD	198	7			17
	Other	959	10	1		20
	TOTAL	1639				

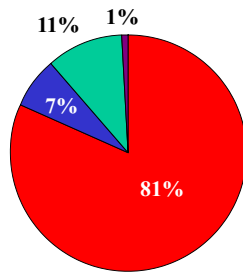
Type of Chronic Viral Hepatitis in Adult Patients



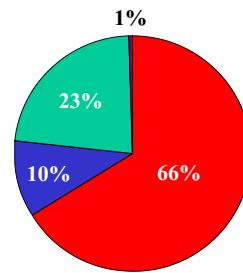
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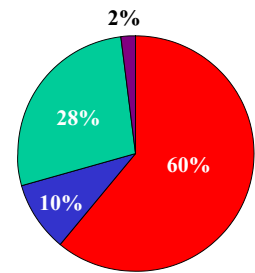
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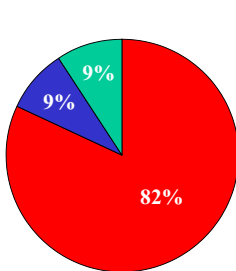


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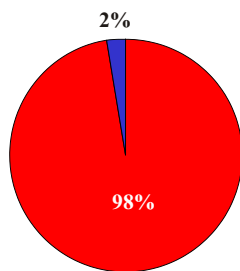


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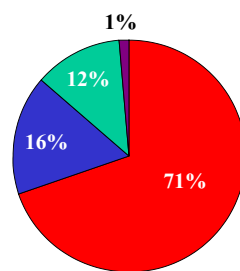
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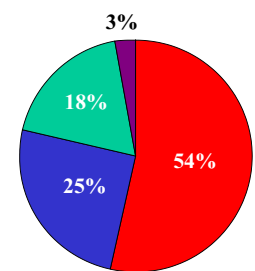
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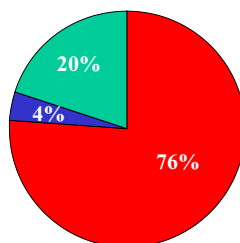
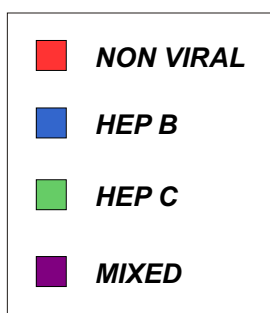


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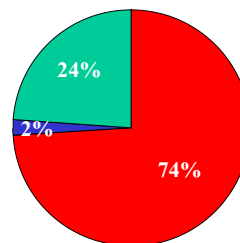


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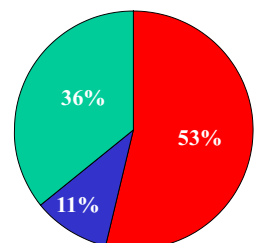
Other Citizens



N= 25



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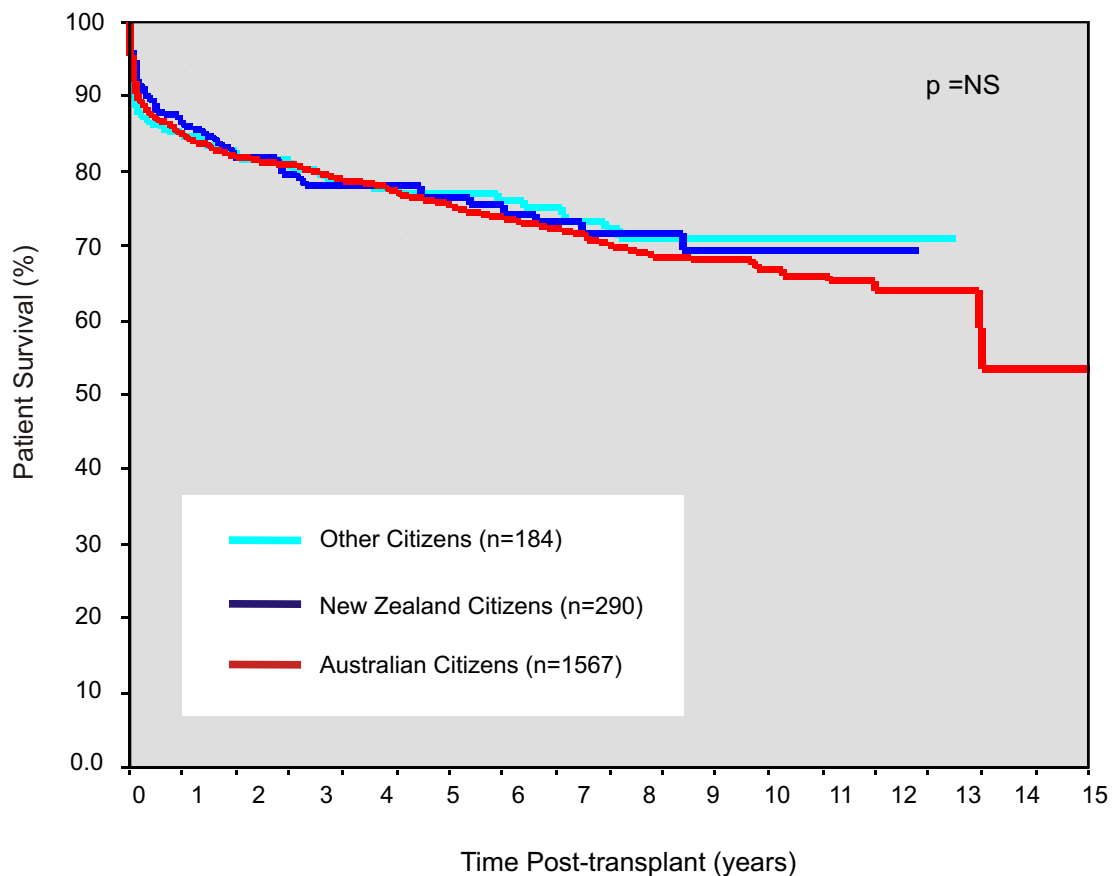
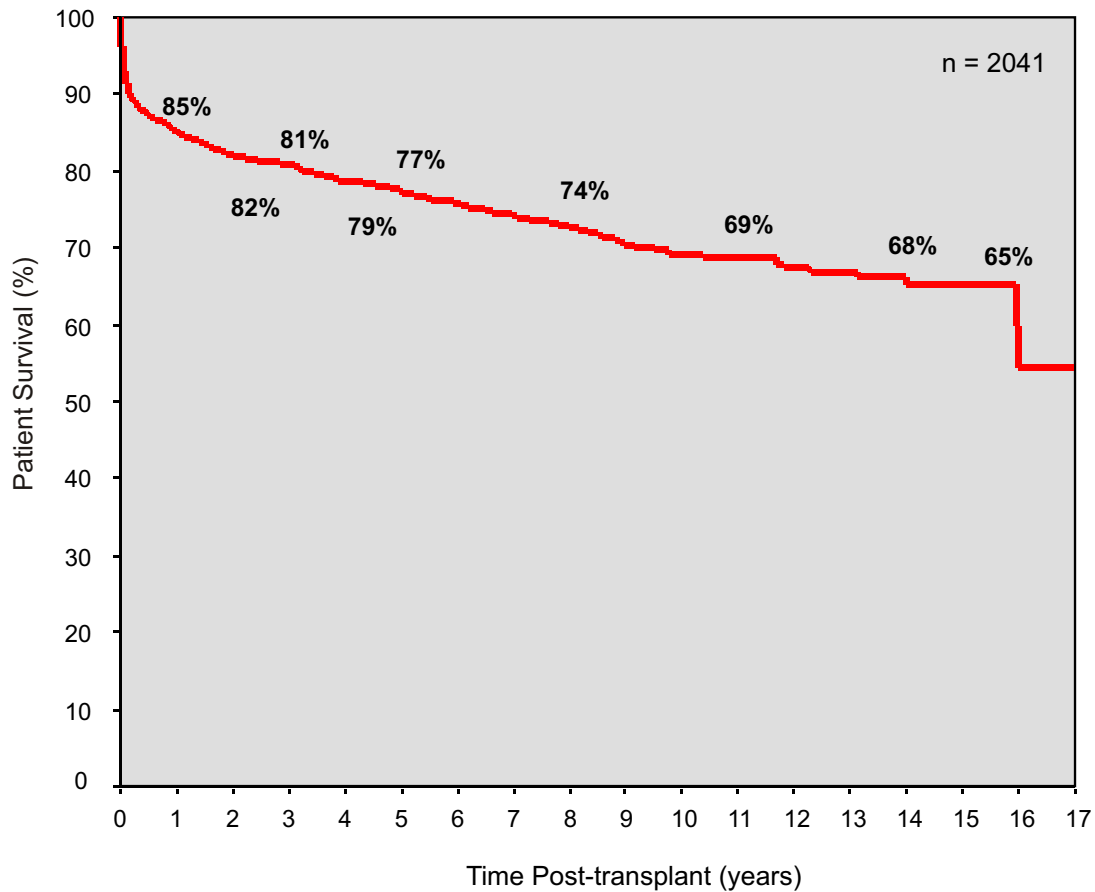
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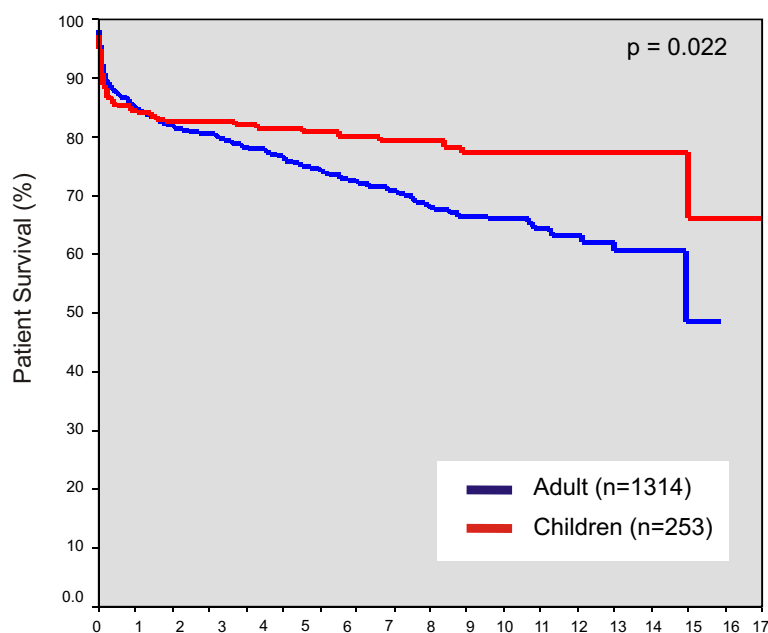
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Section 3

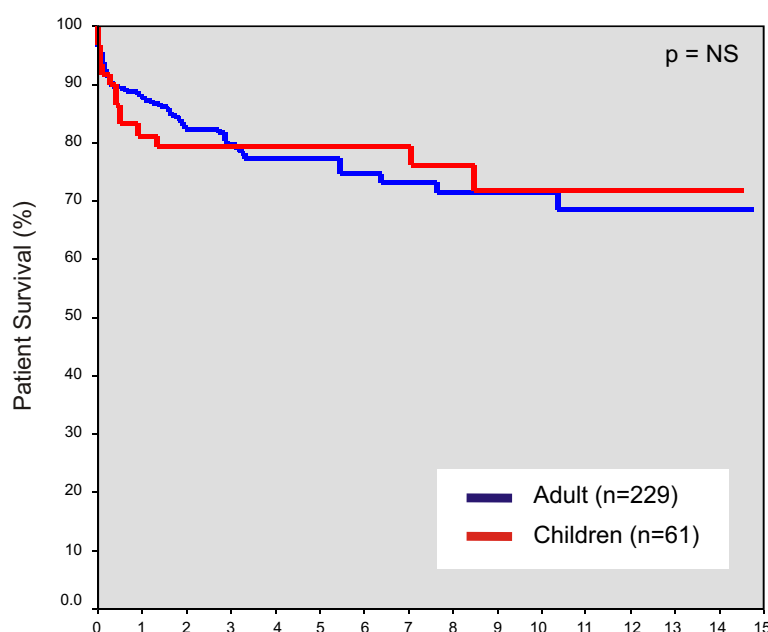
Patient Survival



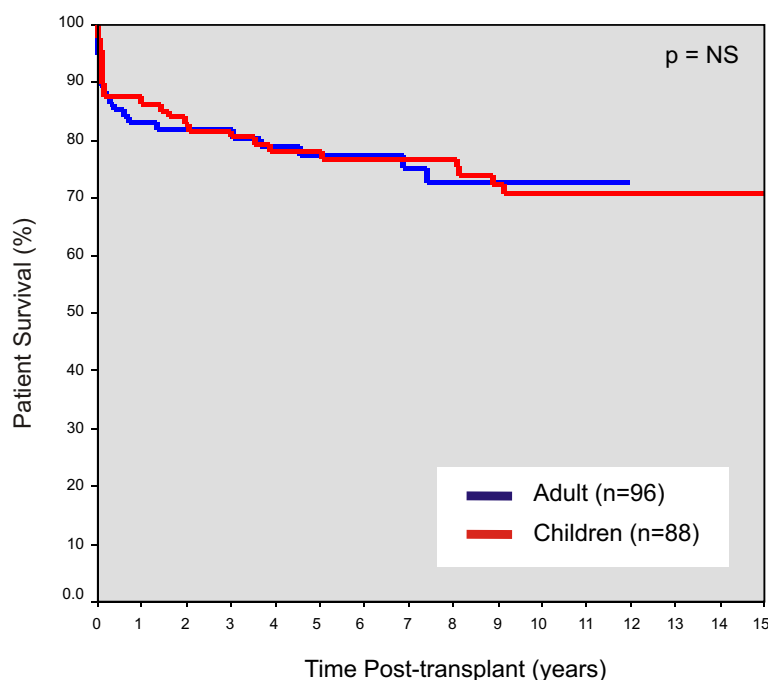




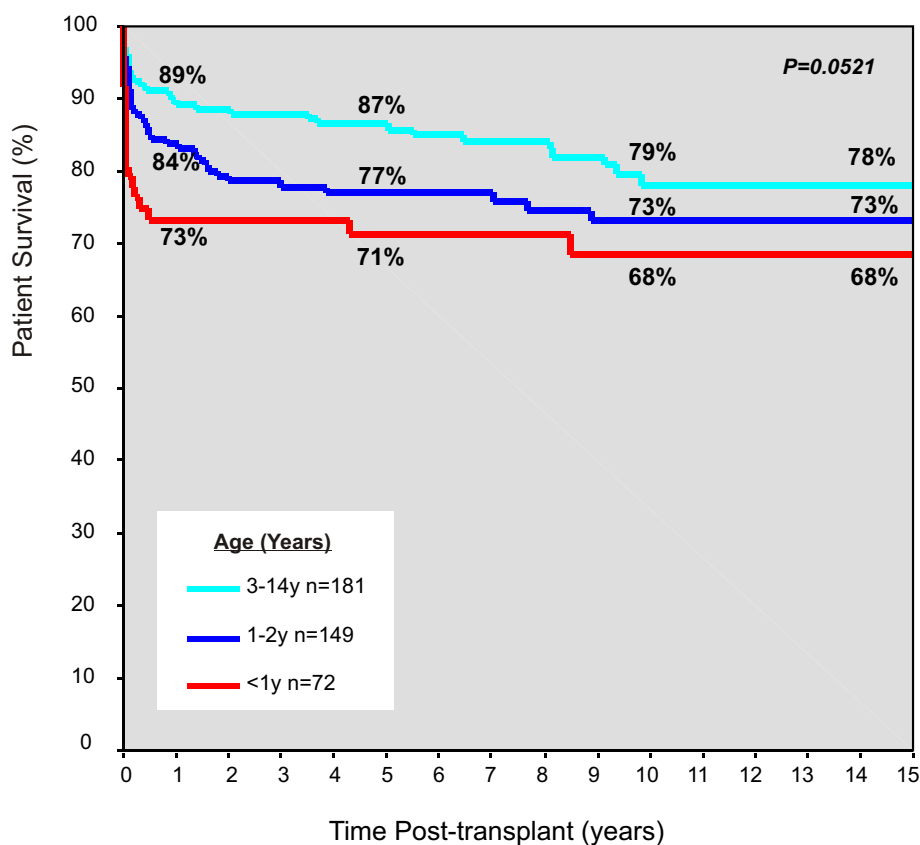
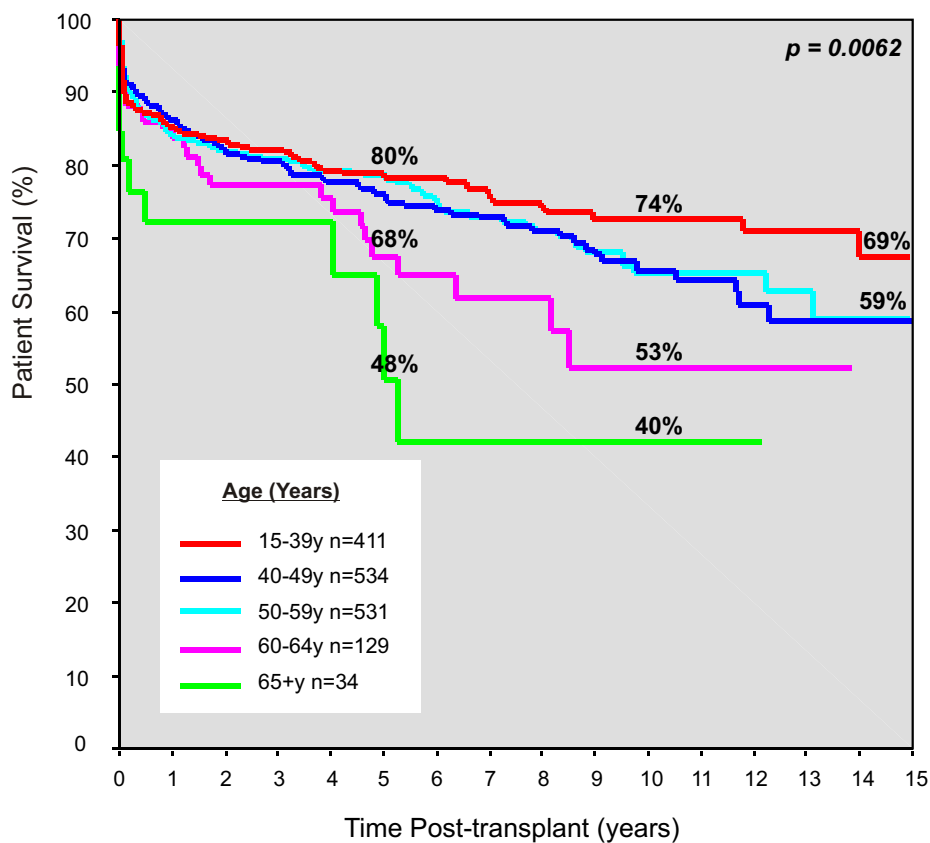
Australian Citizens
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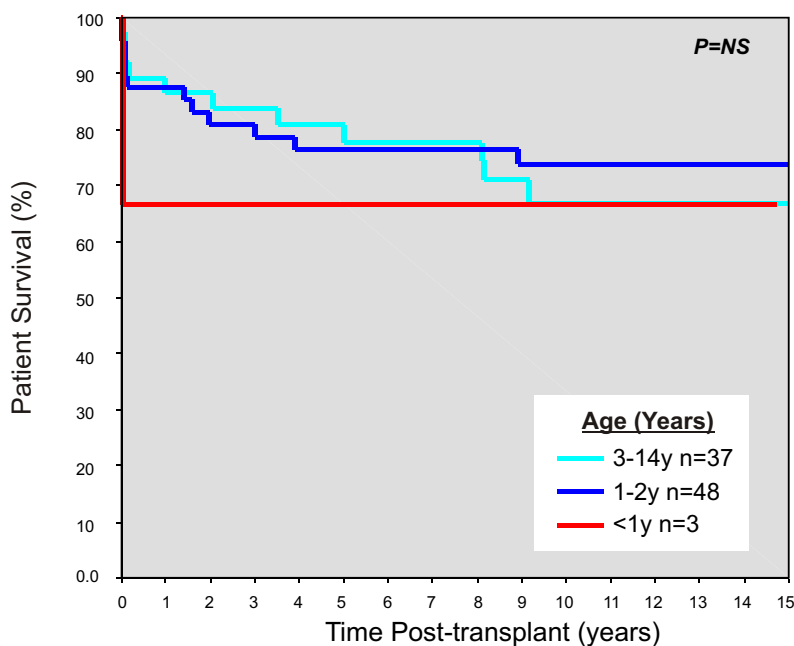
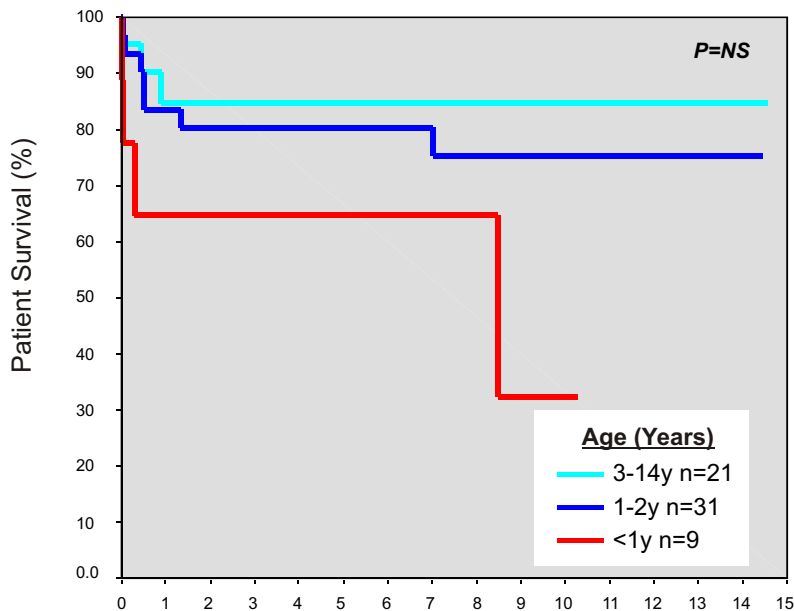
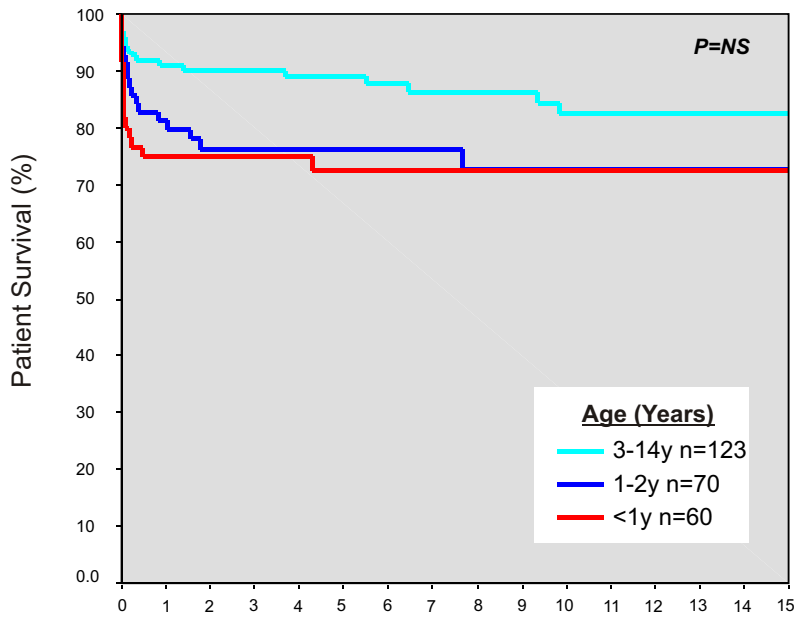


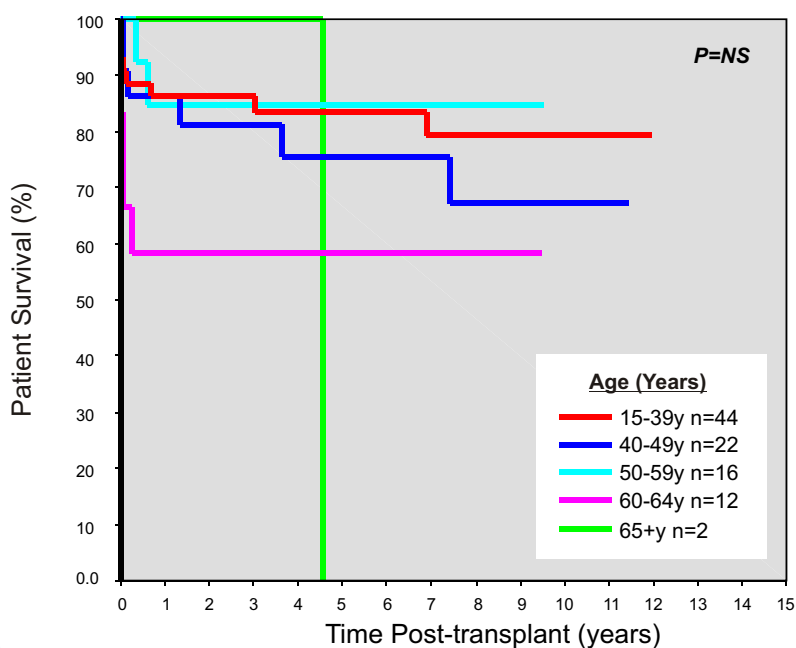
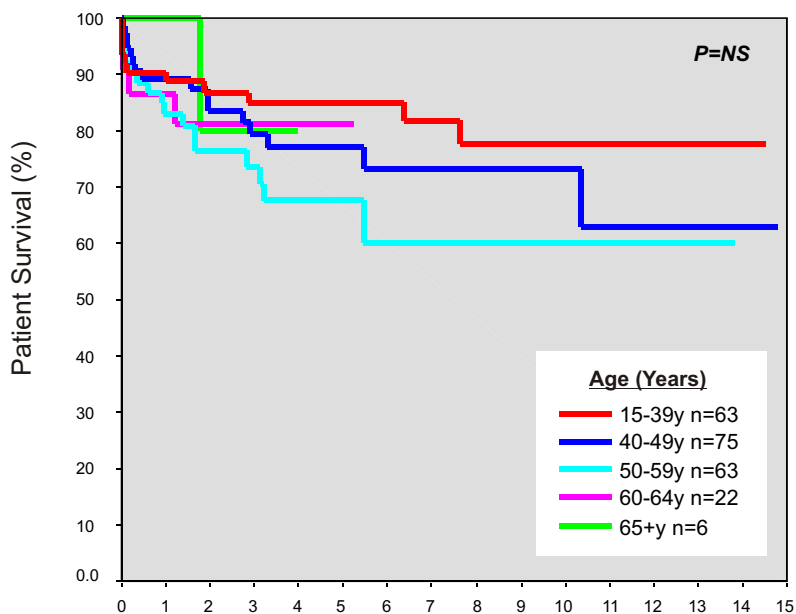
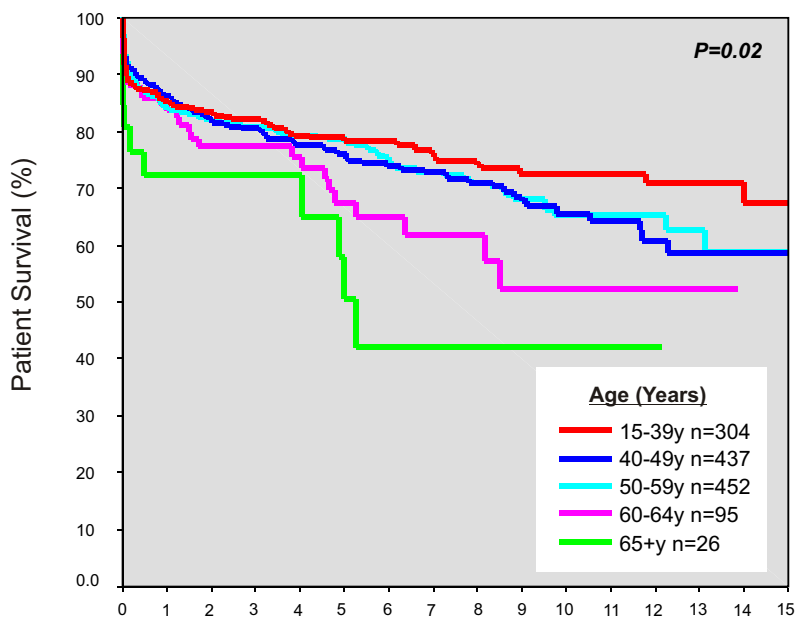
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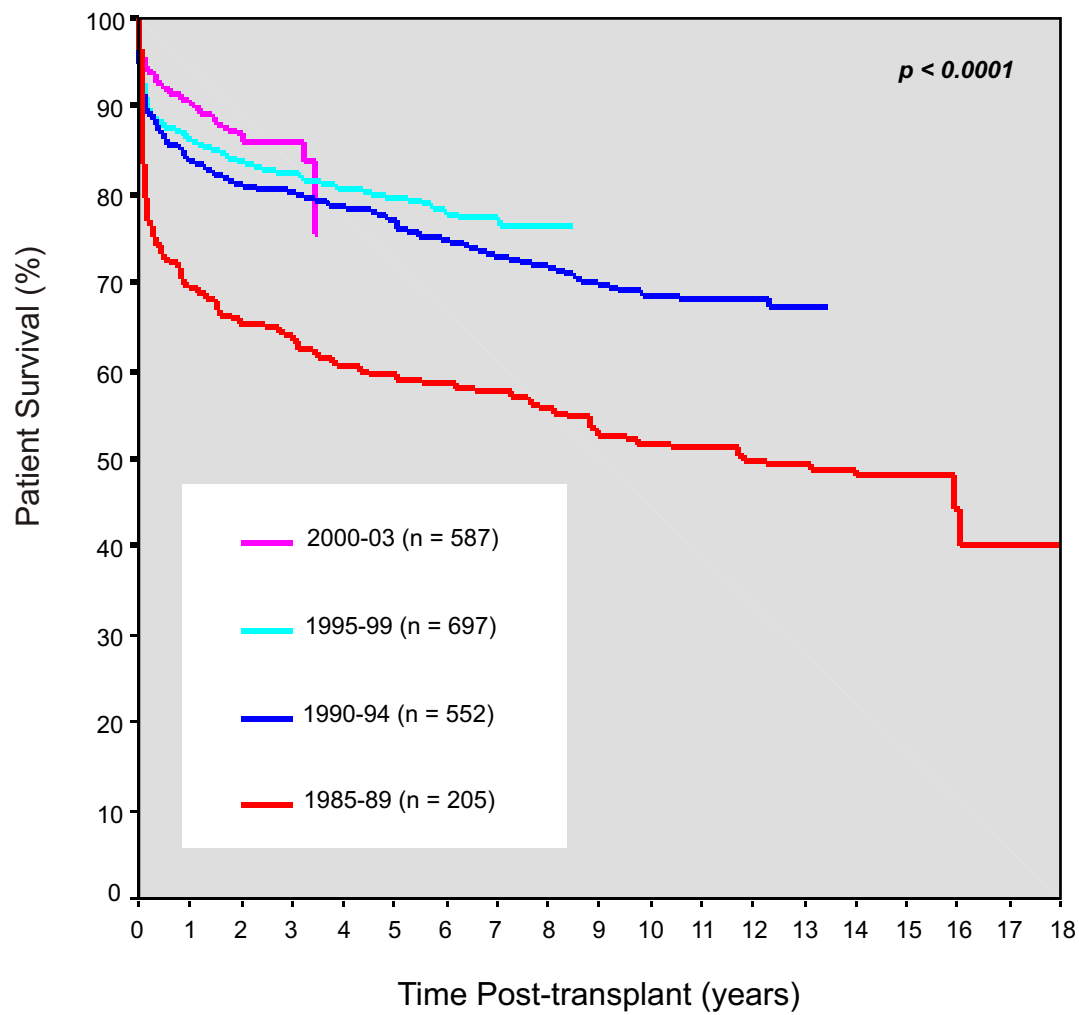


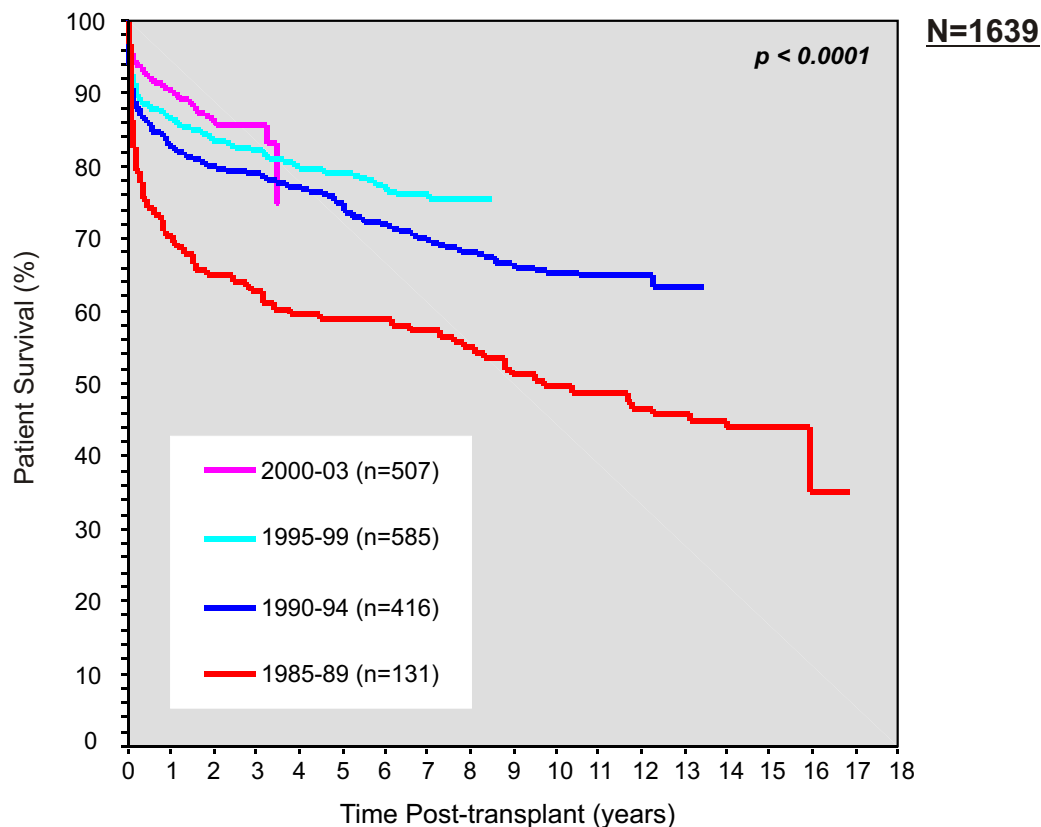
Other Citizens
n = 184



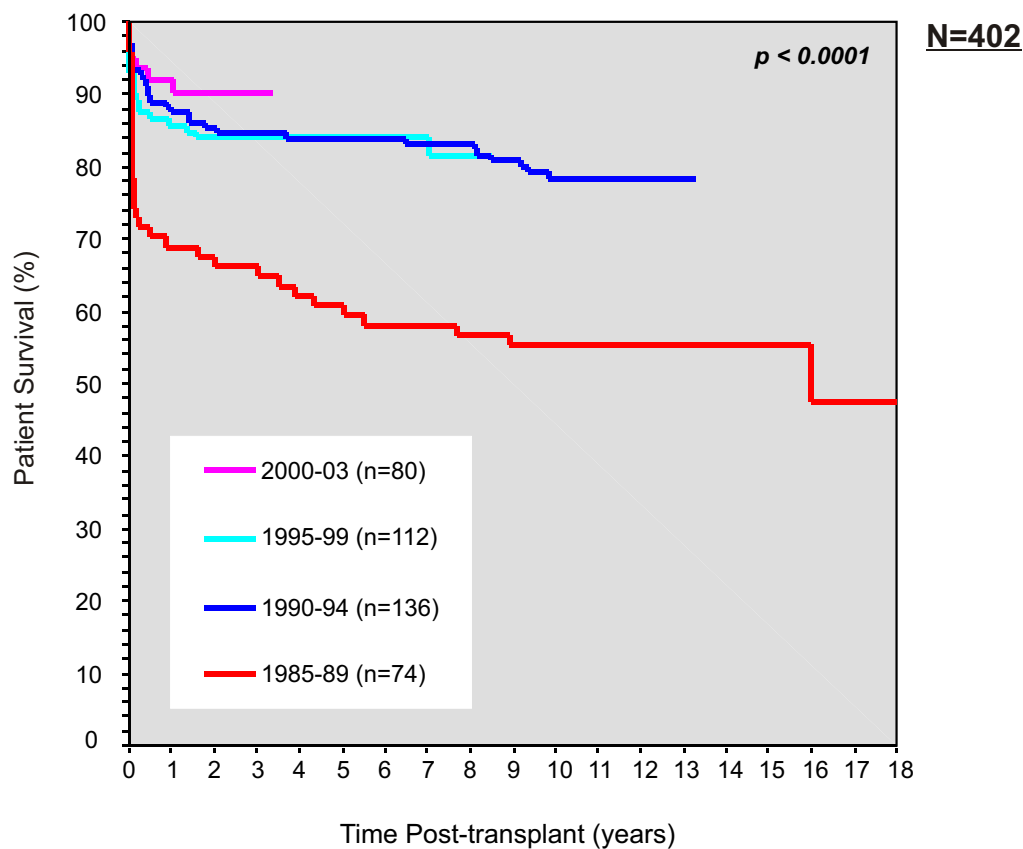


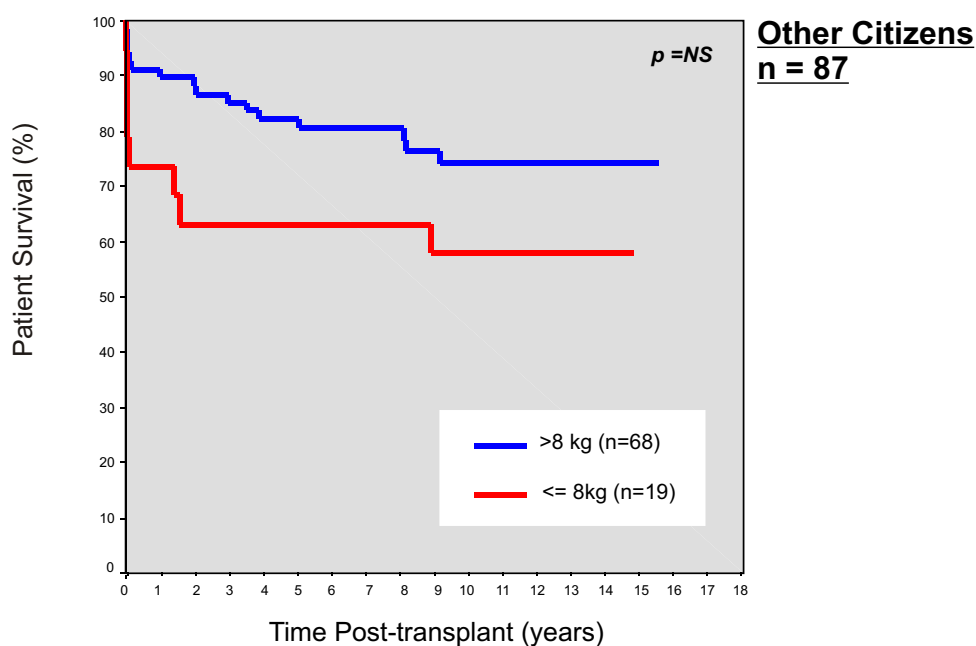
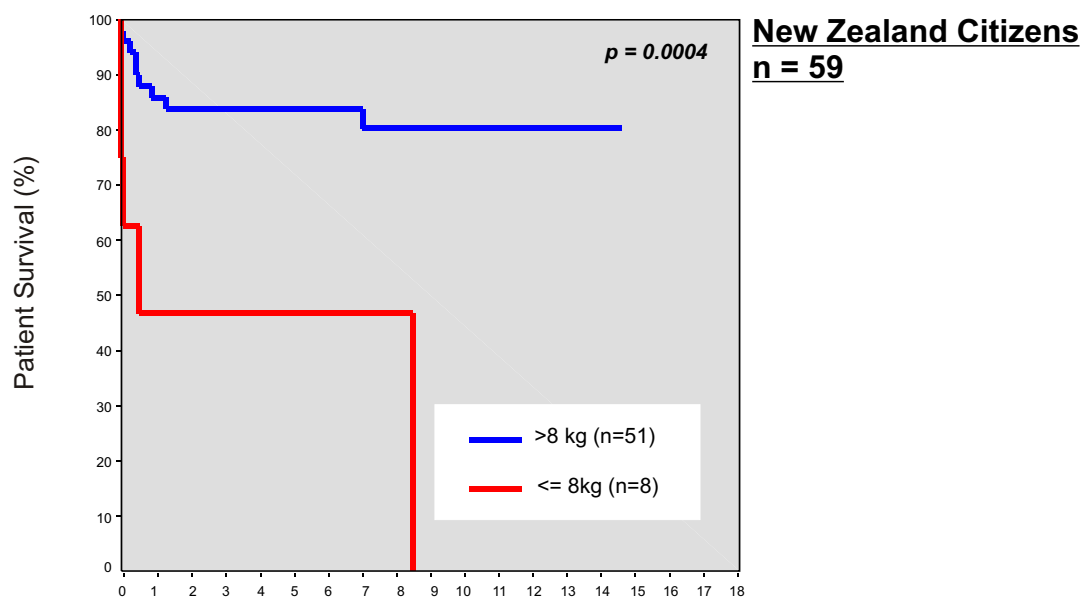
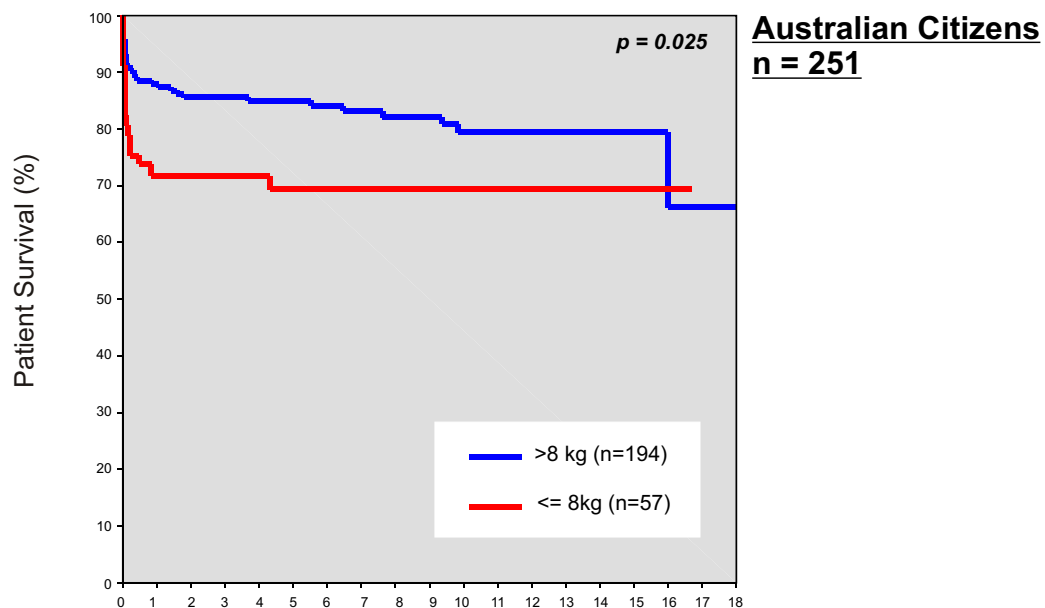




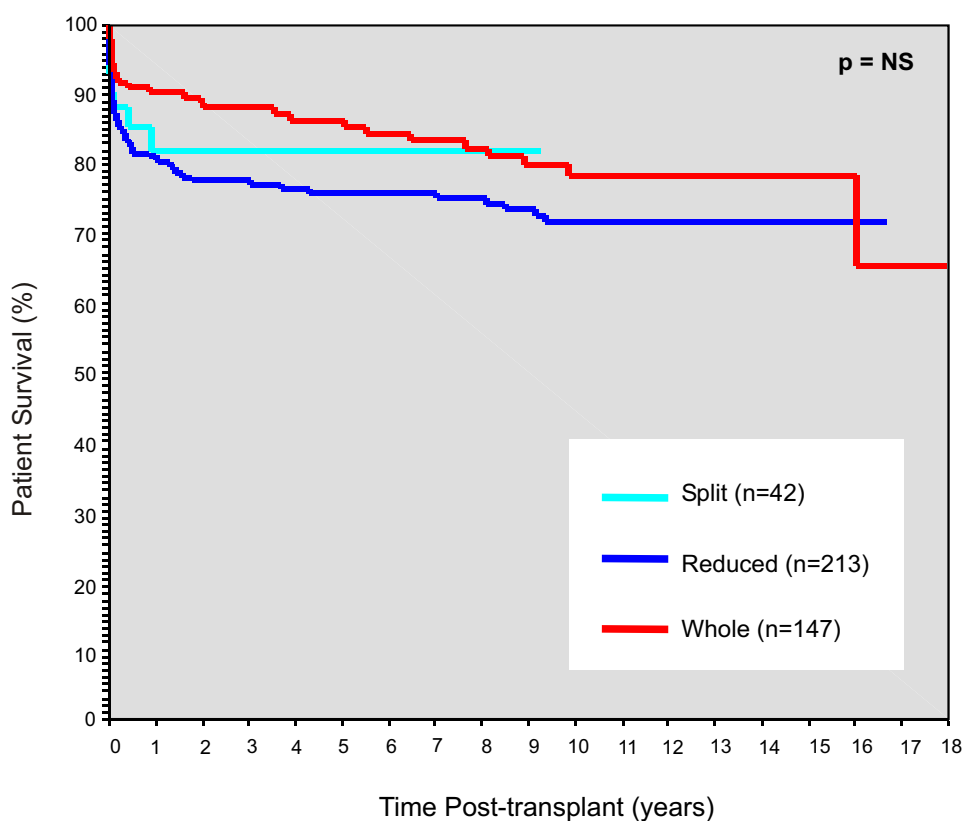


Patient Survival - Children

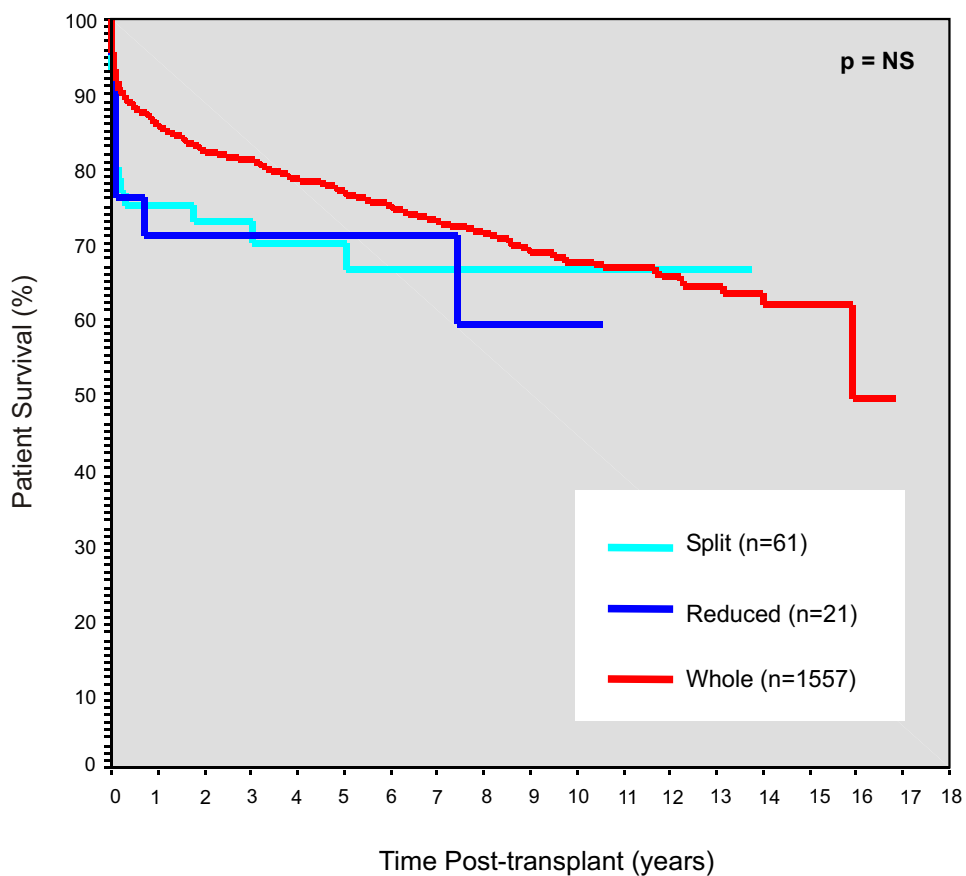




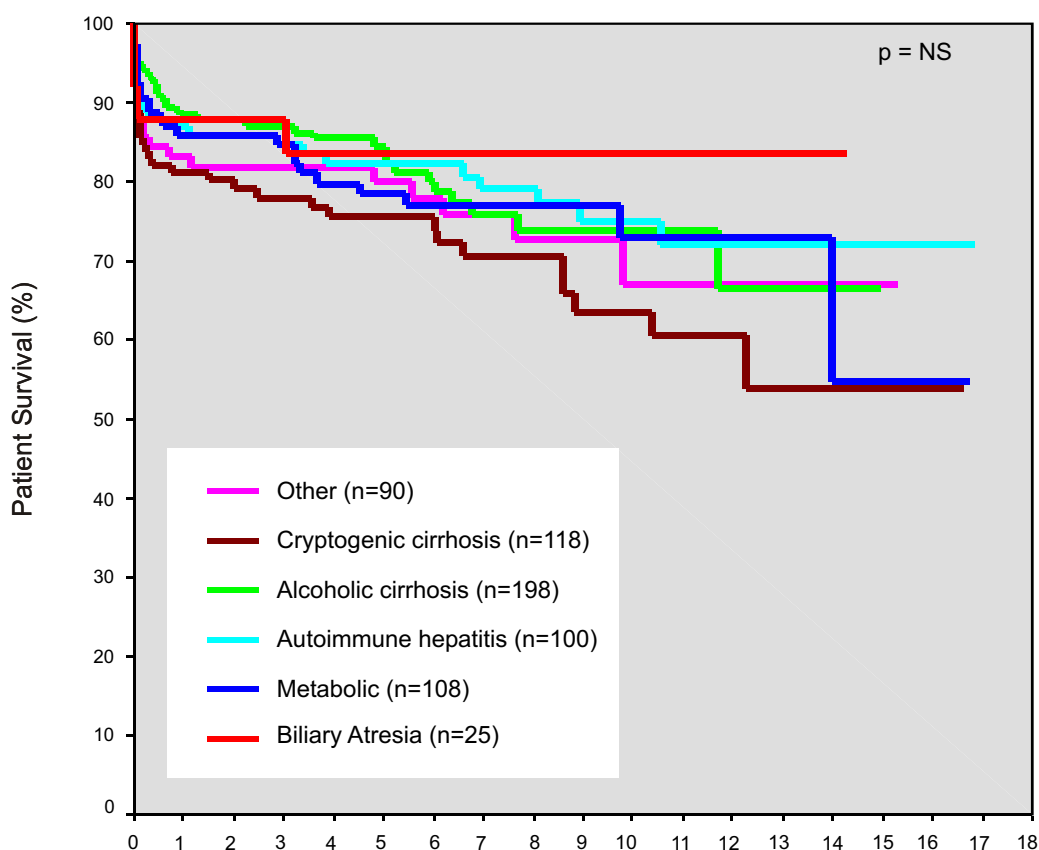
Children - n = 402



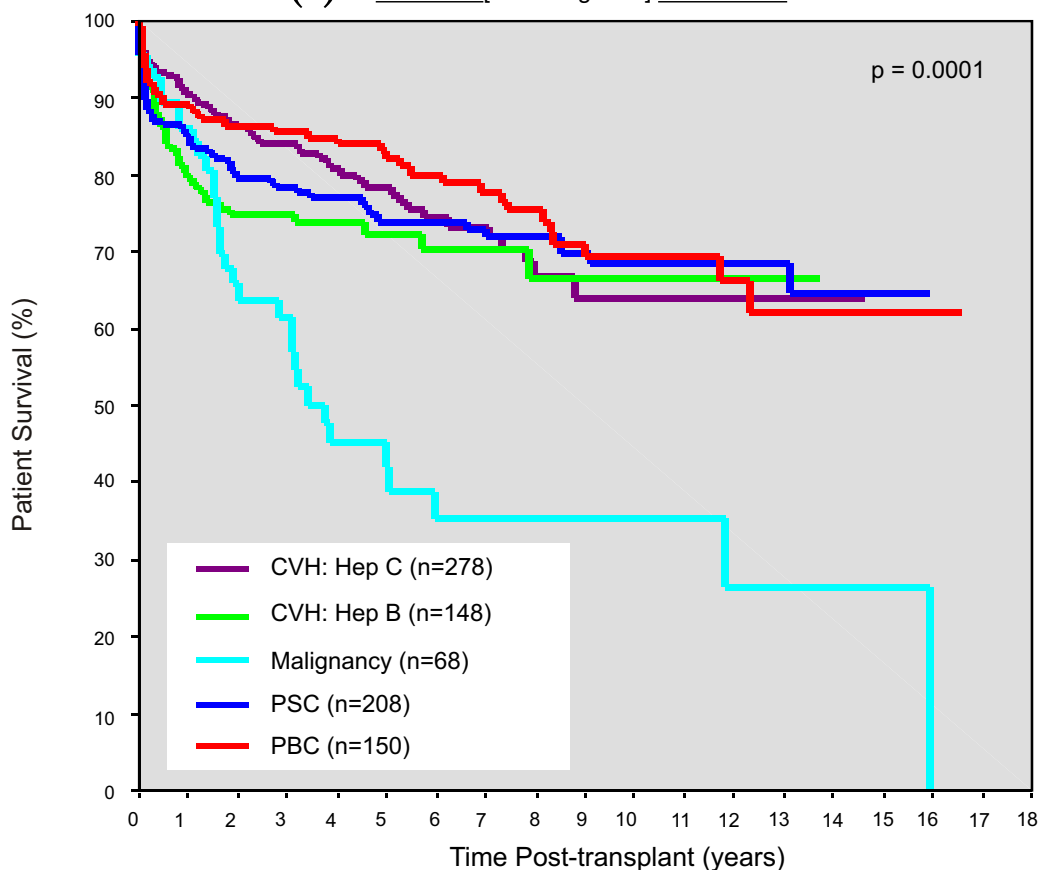
Adults - n = 1639



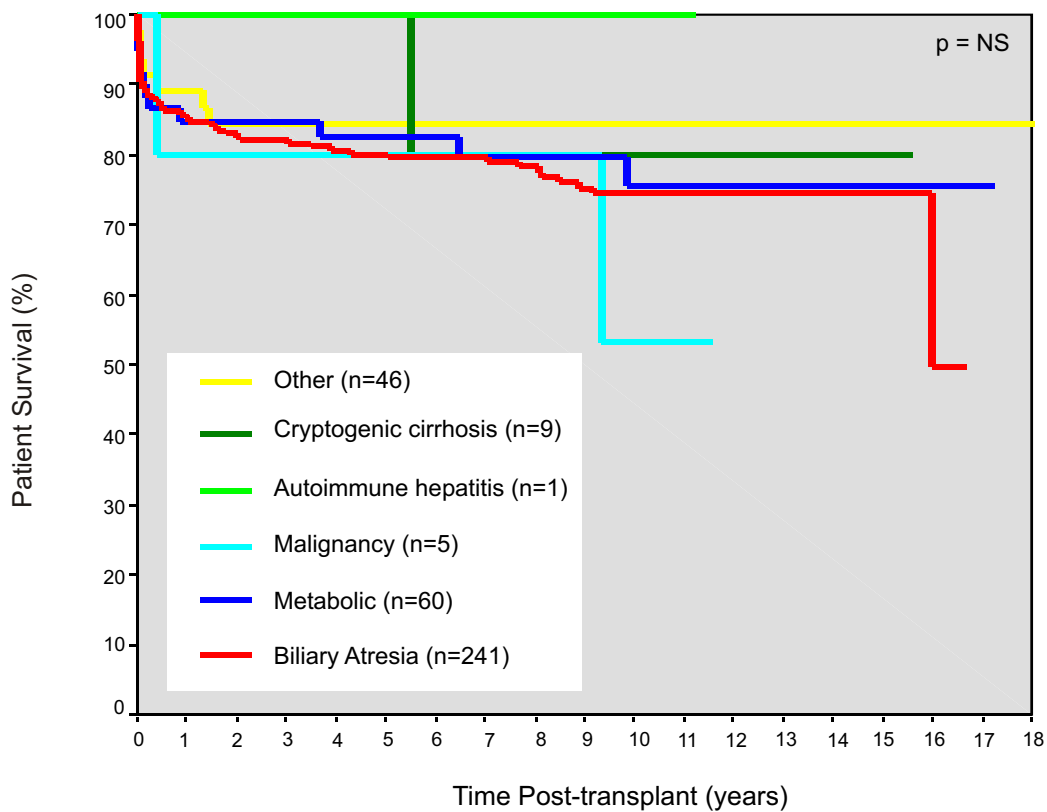
(1) Adults [excluding FHF] - n = 639



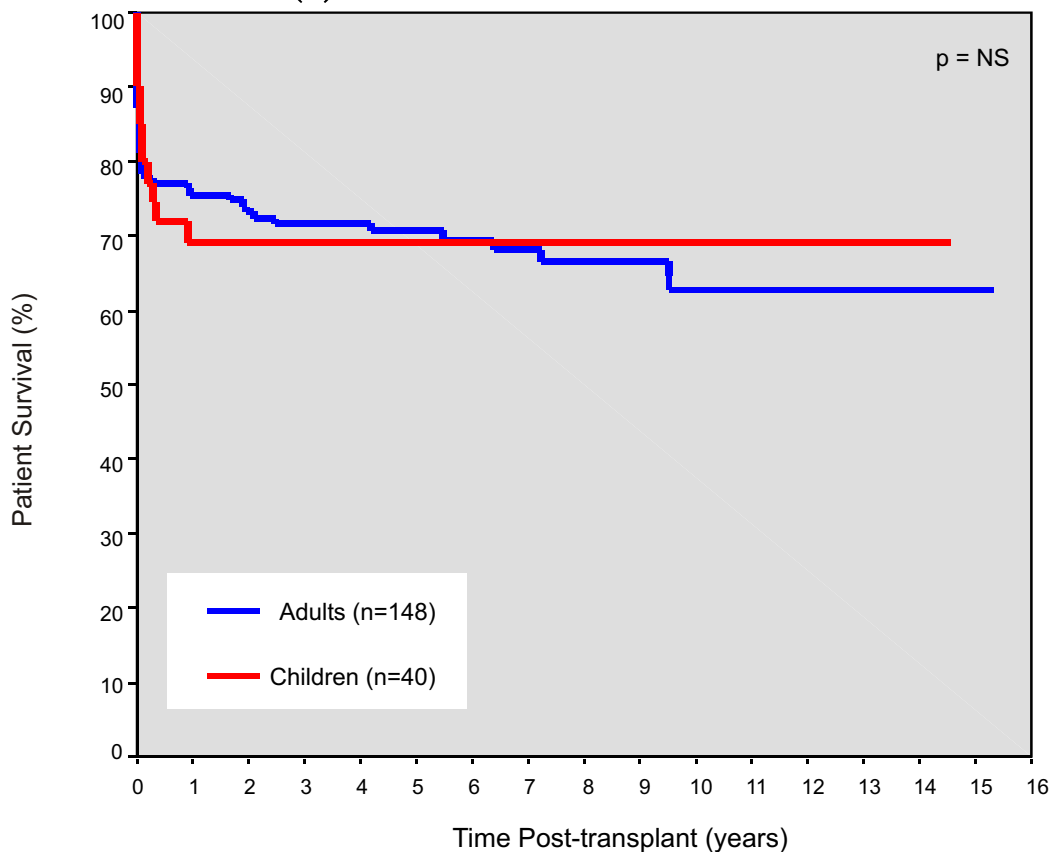
(2) Adults [excluding FHF] - n = 852

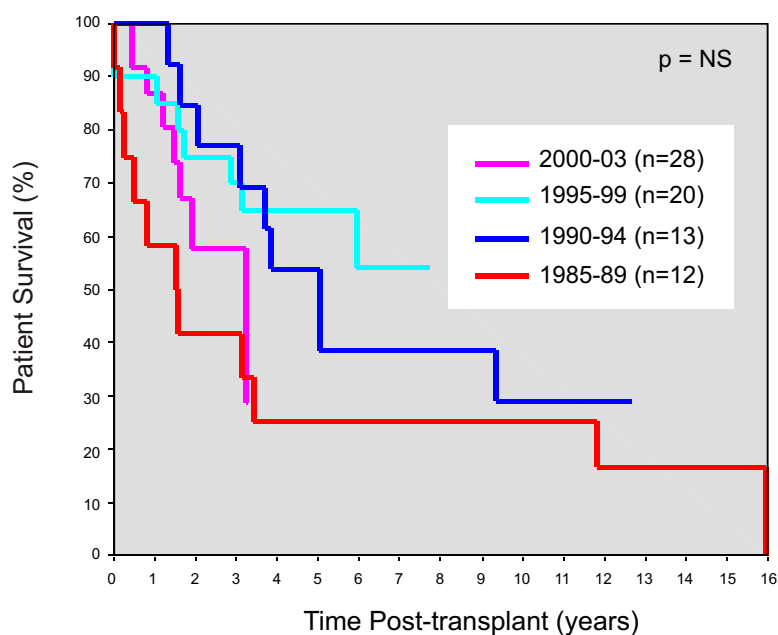
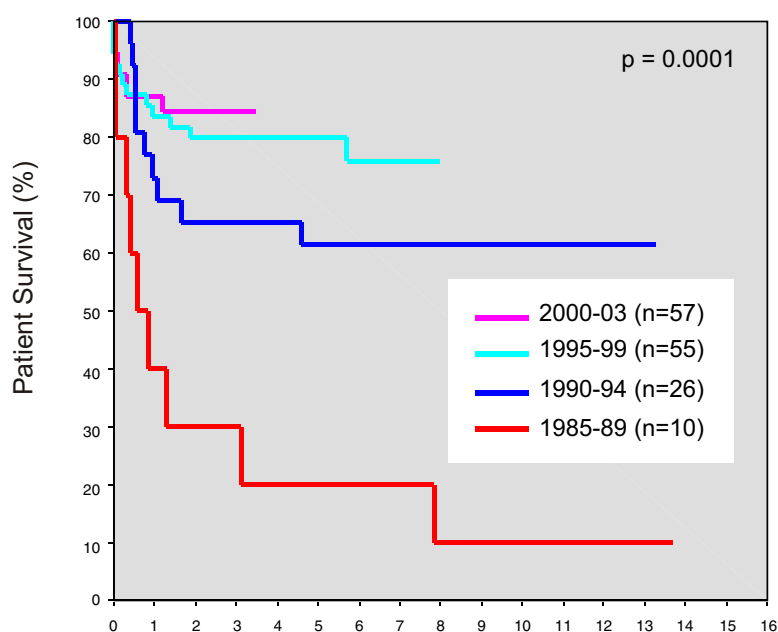
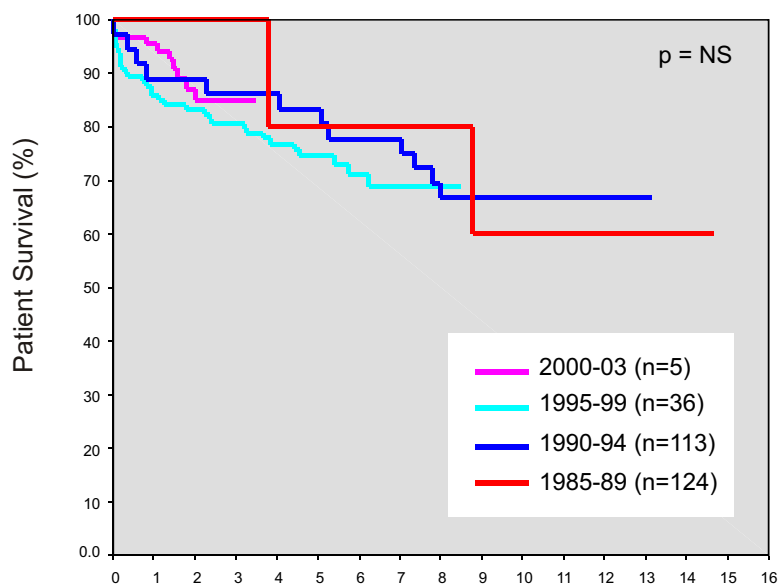


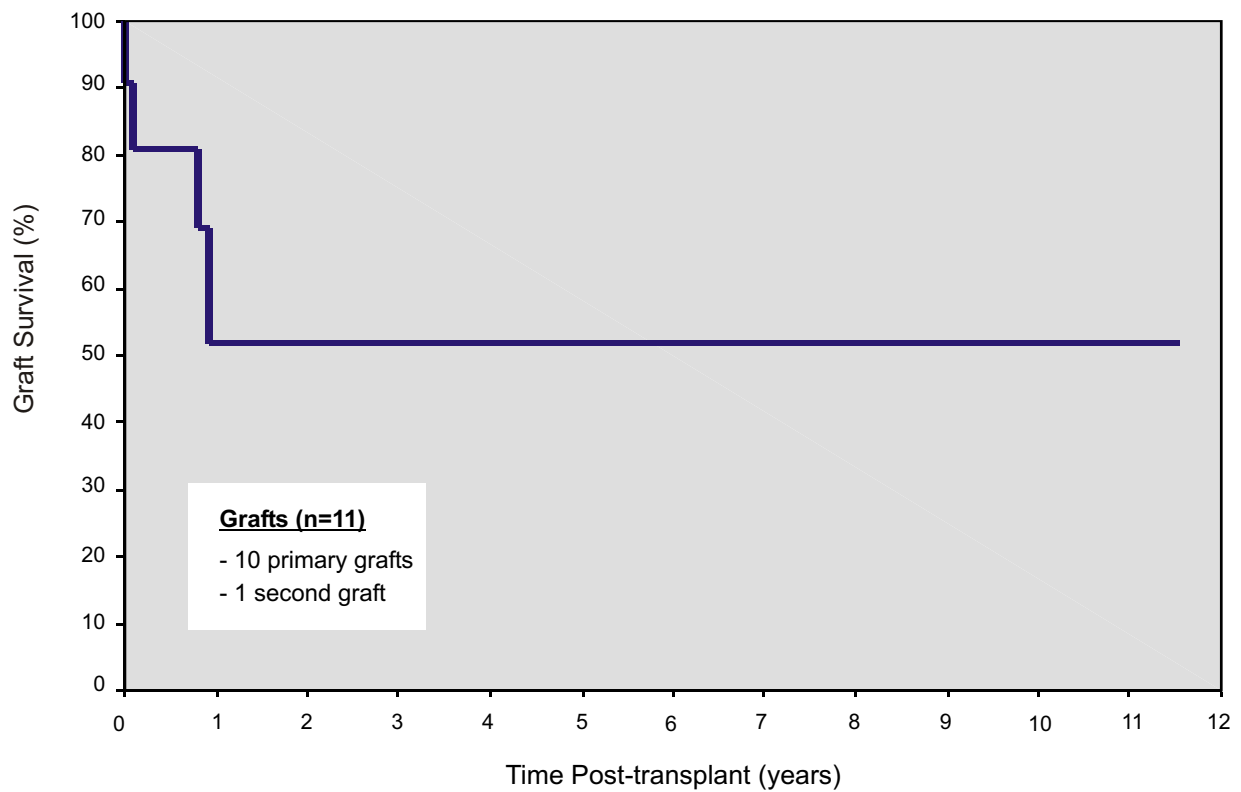
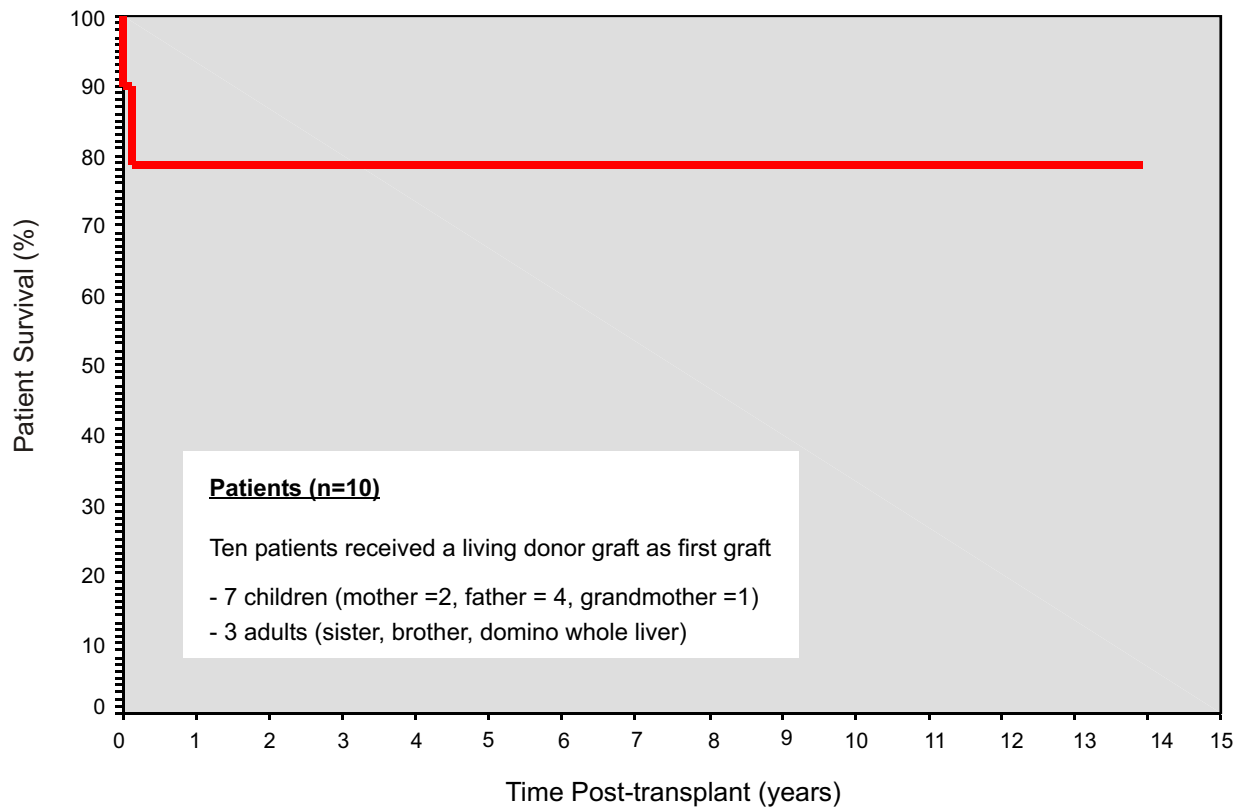
(3) Paediatric recipients [excluding FHF] - n = 362



(4) Acute fulminant failure (n = 188)





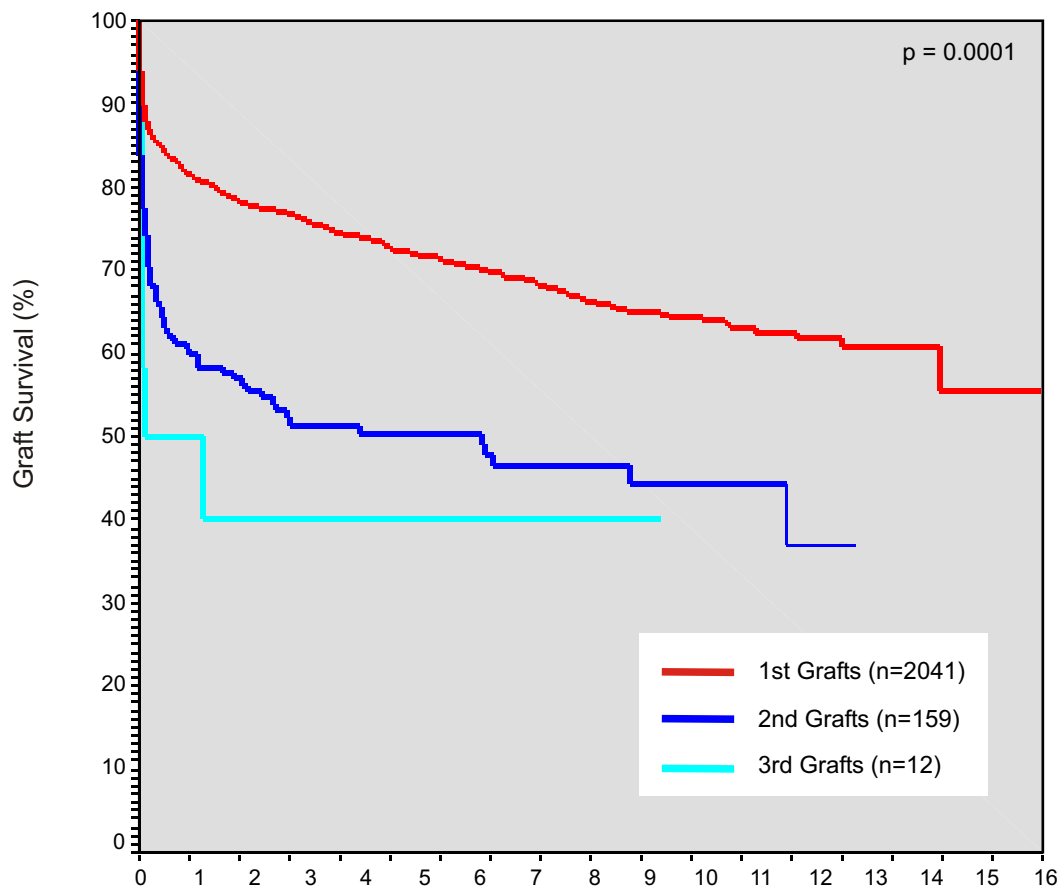


Section 4

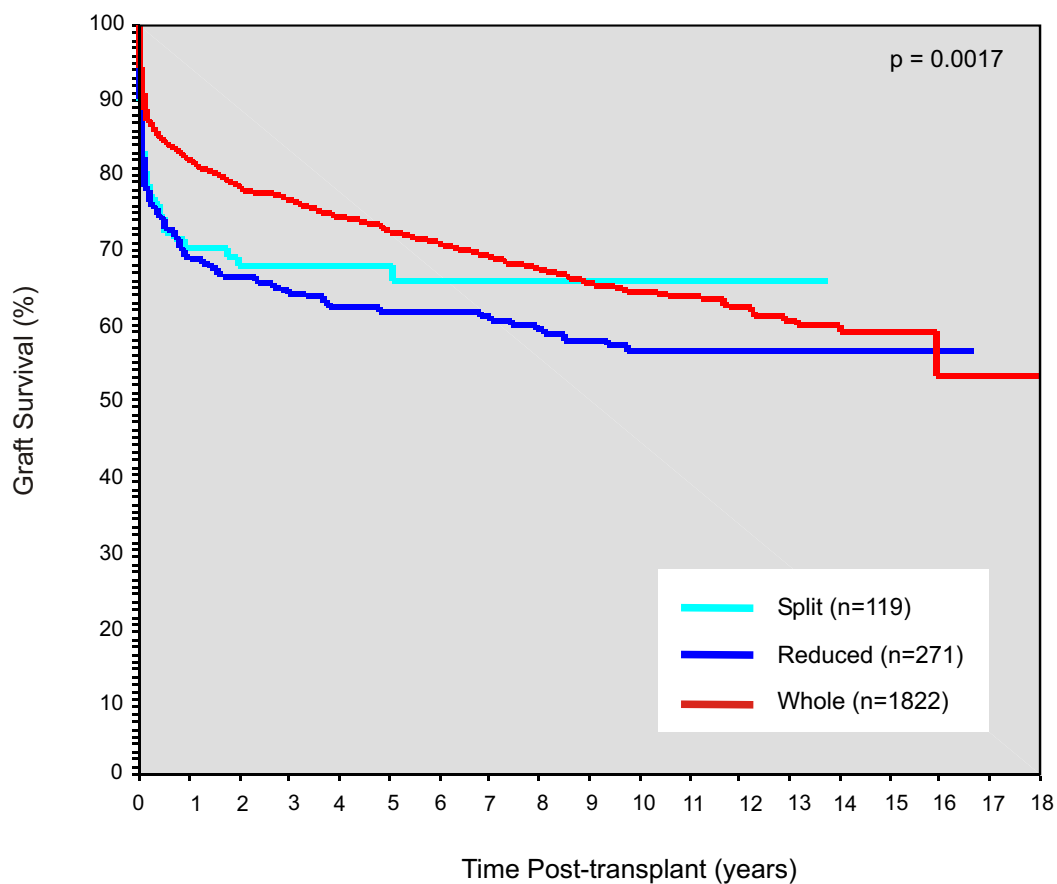
Graft Outcome



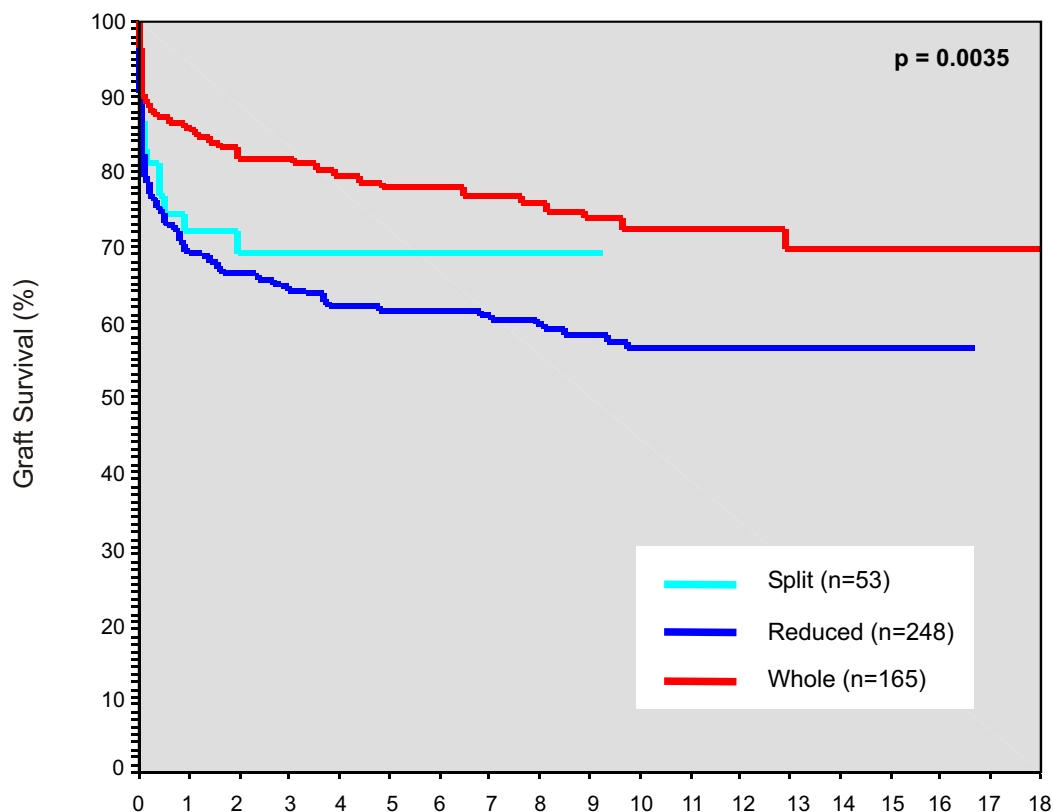
All Grafts - n=2212



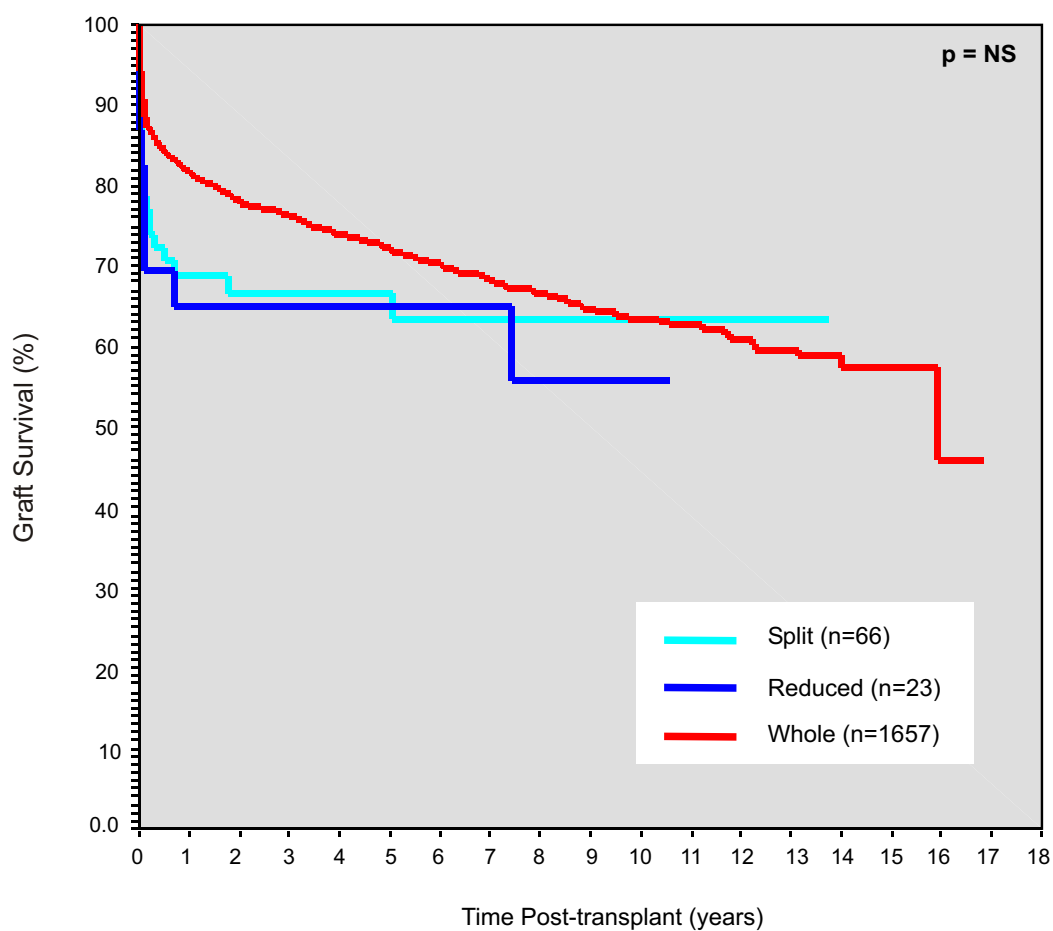
All Grafts - n = 2212



Children - n = 466

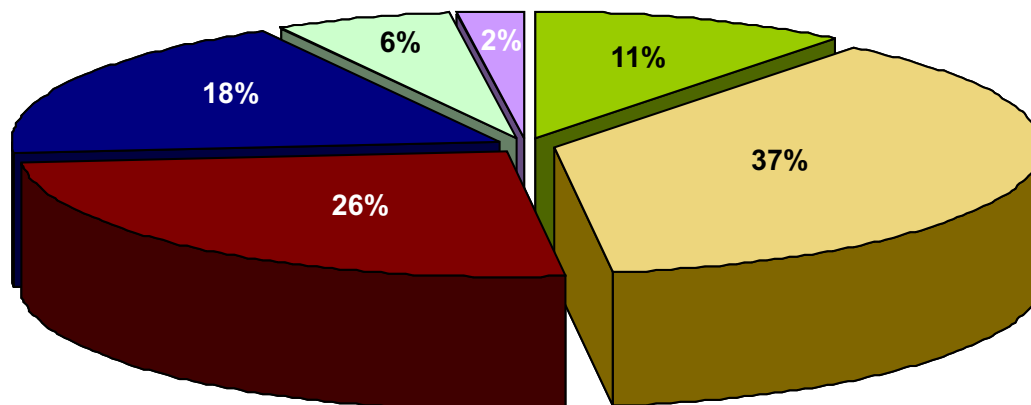


Adults - n = 1746

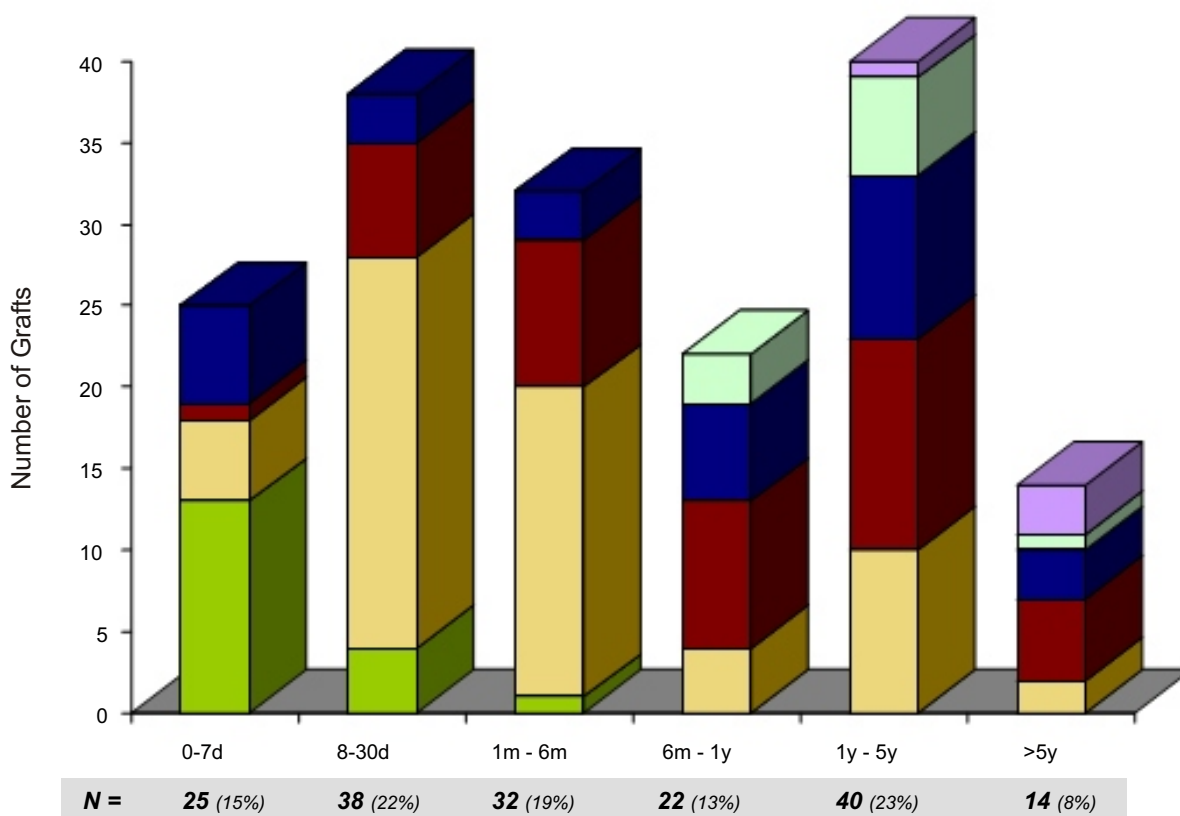


Indication for Retransplantation

n = 159



- Recurrent PBC / PSC / CAH:AI
- Recurrent HBV / HCV
- Other
- Rejection
- Vascular
- PNF / poor graft function

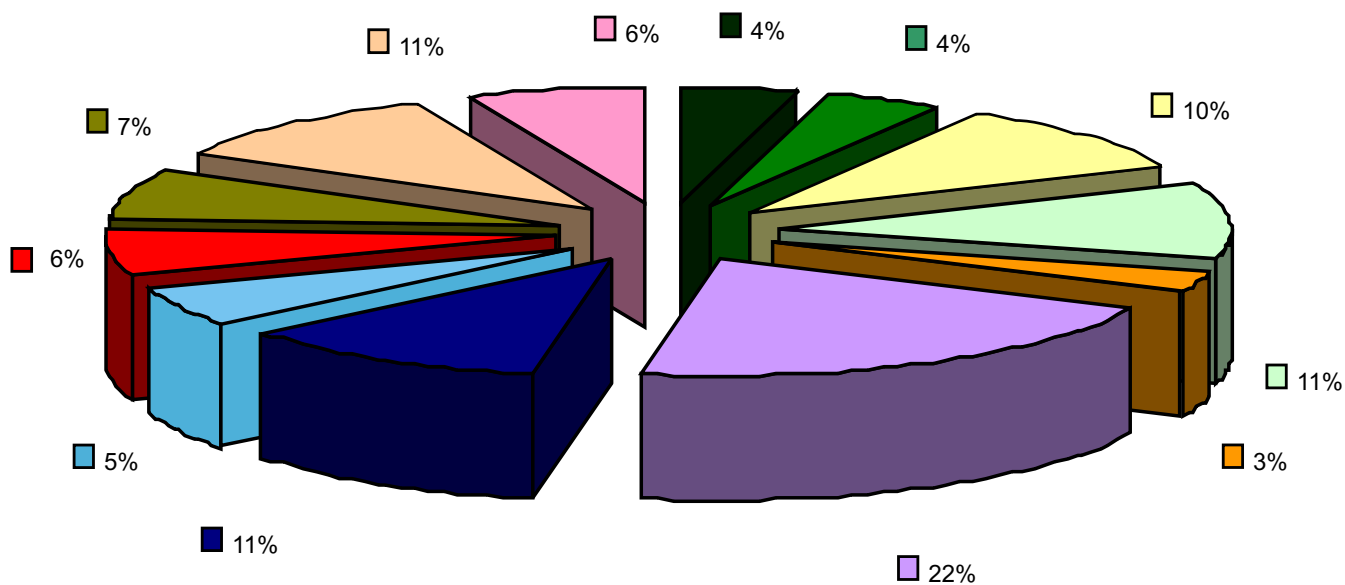


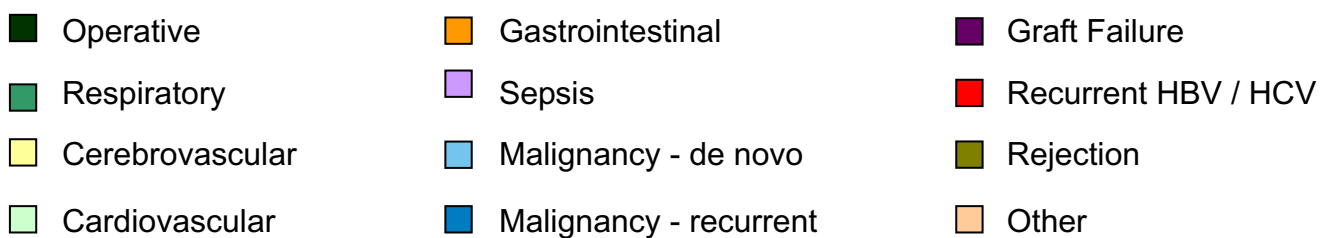
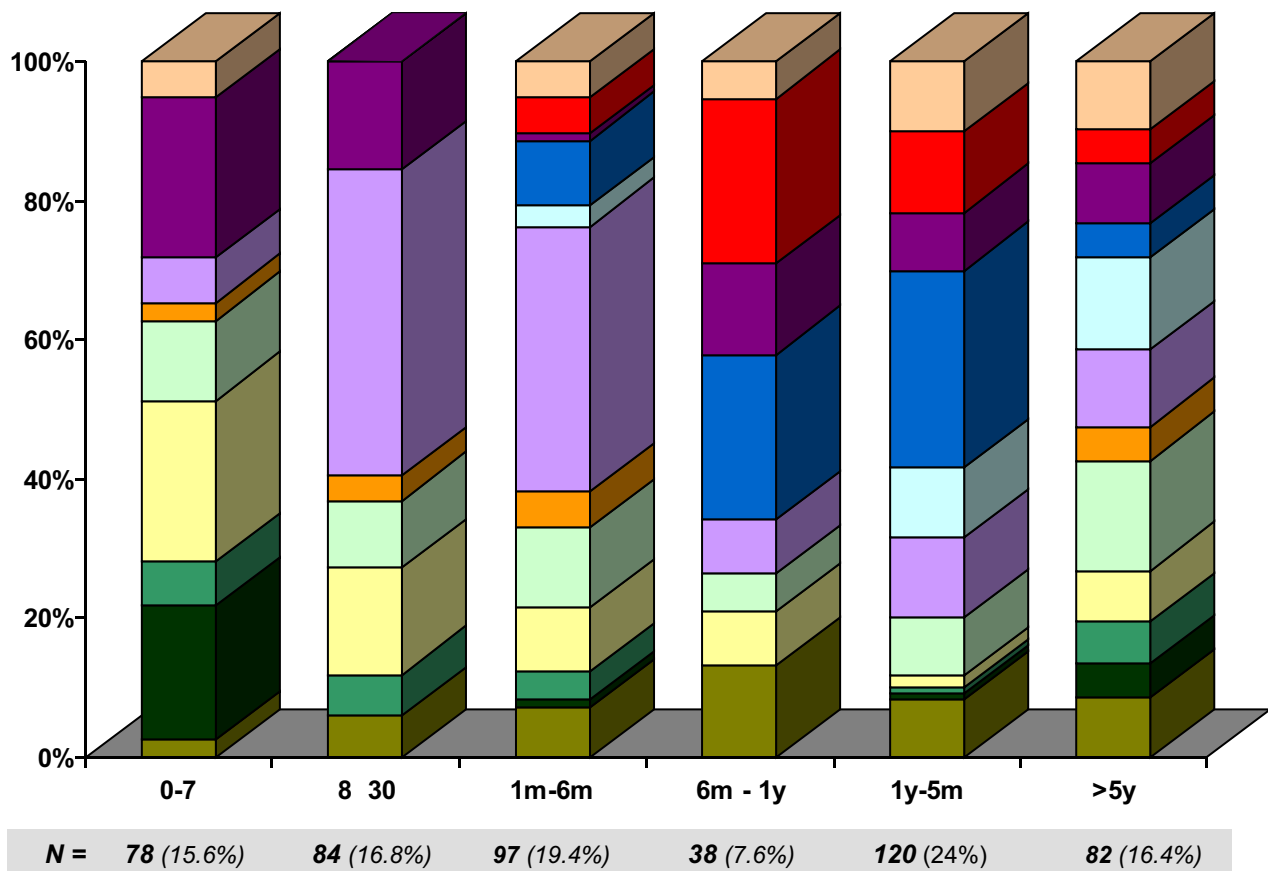
Section 5

Cause of Patient Death



All Patients n = 499 (? %)



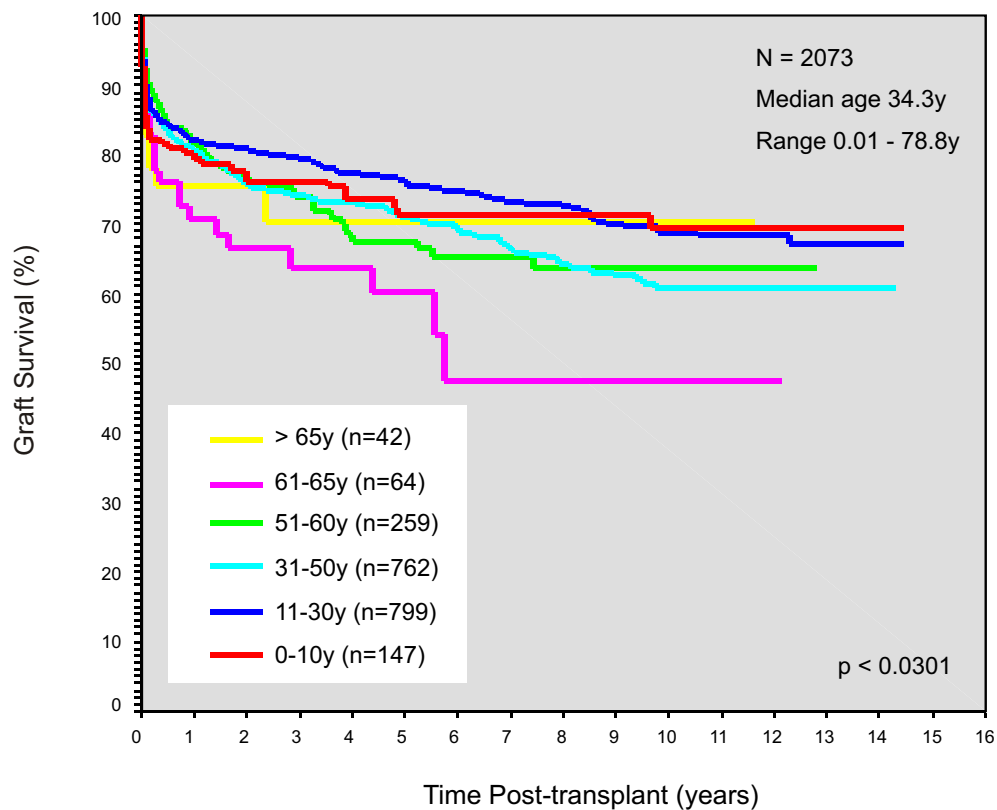


Section 6

Donor Information



Donor Age vs Survival



Donation by Year

	QLD	NSW	VIC/TAS	SA/NT	WA	NZ	TOTAL
1990	22	27	16	5		7	77
1991	29	35	20	6	8	11	109
1992	43	32	18	9	8	24	134
1993	28	40	25	12	6	16	127
1994	29	39	23	12	10	21	134
1995	29	44	24	17	8	21	143
1996	26	37	19	17	10	24	133
1997	31	49	19	19	8	22	148
1998	29	44	27	22	13	27	162
1999	15	31	31	29	11	27	144
2000	26	51	26	24	12	34	173
2001	37	40	26	14	9	29	155
2002	34	42	38	24	11	30	179
2003 (June)	18	19	20	5	10	15	87

Appendix I

Liver Transplant Units of Australia and New Zealand

<p>Australian National Liver Transplant Unit Royal Prince Alfred Hospital Missenden Road CAMPERDOWN NSW 2050 Email: anltu@cs.nsw.gov.au http://www.cs.nsw.gov.au/Gastro/LiverTransplant/default.htm</p>	<i>and</i>	<p>The New Children's Hospital Hawkesbury Road WESTMEAD NSW 2145</p>
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<p>Liver Transplant Unit The Austin Studley Road HEIDELBERG VIC 3084</p>	<i>and</i>	<p>Royal Children's Hospital Flemington Road PARKVILLE VIC 3052</p>
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<p>Queensland Liver Transplant Service Princess Alexandra Hospital Ipswich Road WOOLLOONGABBA QLD 4102</p>	<i>and</i>	<p>Royal Children's Hospital Bowen Bridge Road HERSTON QLD 4029</p>
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<p>South Australian Liver Transplant Unit Flinders Medical Centre Flinders Drive BEDFORD PARK SA 5042 http://www.flinders.sa.gov.au/flinders_centre_for_digestive_health/default.asp?NAVGRP=2135</p>	<i>and</i>	<p>Royal Children's Hospital Bowen Bridge Road HERSTON QLD 4029</p>
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WA Liver Transplantation Service
Sir Charles Gardiner Hospital
Verdun Street
NEDLANDS WA 6009

New Zealand Liver Transplant Unit
Auckland Public Hospital
Park Road
Auckland
New Zealand
[Http://www.nzliver.org](http://www.nzliver.org)

Appendix II

ANZLTR PRIMARY Diagnosis Metabolic disorders by Age Group and Country

Age group	Country			Total
	AUSTRALIA	NEW ZEALAND	OTHER	
Children				
Wilson's disease	5	1	0	6
Haemochromatosis	0	1	0	1
1 Antitrypsin deficiency	23	4	0	27
Hypercholesterolemia	2	0	0	2
Tyrosinemia	4	0	0	4
Hyperoxaluria	4	0	1	5
Crigler-Najjer	3	0	0	3
Citrullinemia	1	0	0	1
Indian childhood cirrhosis	1	0	0	1
Urea cycle disorder	5	0	0	5
Other (mitochondrial disease,bile acid synthesis disorder, Protein C deficiency, familial immunodeficiency)	4	1	0	5
Total	52	7	1	60
Adult				
Wilson's disease	17	4	2	23
Haemochromatosis	19	2	0	21
1 Antitrypsin deficiency	29	1	0	30
Glycogen storage disease	1	0	0	1
Hypercholesterolemia	1	0	0	1
Familial / Amyloid Polyneuropathy	5	3	16	24
Hyperoxaluria	5	1	0	6
Crigler-Najjer	0	0	1	1
Citrullinemia	0	0	1	1
Total	77	11	20	108

Appendix III

ANZLTR PRIMARY Diagnosis - Other by Age Group by Country

Age group	Country			Total
	AUSTRALIA	NEW ZEALAND	OTHER	
Children				
PFIC	7	1	1	9
Secondary cirrhosis not specified	1	0	0	1
Secondary cirrhosis - cystic fibrosis	4	0	0	4
Caroli's	1	0	0	1
Choledochal cyst	0	0	1	1
Alagilles syndromic	13	5	3	21
Alagilles non-syndromic	1	1	0	2
Chronic Budd Chiari	1	0	0	1
Histiocytosis X	2	0	1	3
Neonatal hepatitis	1	1	1	3
Total	31	8	7	46
Adult				
PFIC	2	0	2	4
Secondary cirrhosis not specified	8	1	0	9
Secondary cirrhosis - cystic fibrosis	4	1	0	5
Secondary cirrhosis - hepatolithiasis	3	0	1	4
Caroli's	8	0	2	10
Alagilles	1	0	0	1
Cirrhosis specify	1	0	0	1
Cirrhosis - NAFLD or NASH	3	3	0	6
Cirrhosis - granulomatous hepatitis	1	1	0	2
Benign - adenomatosis	1	0	0	1
Benign-haemangioma	1	1	0	2
Other-specify #	5	2	1	8
Chronic Budd Chiari	15	6	1	22
Ductopenia	2	0	0	2
Nodular regenerative hyperplasia	3	0	0	3
Liver trauma	1	0	0	1
Polycystic liver disease	5	0	0	5
Polycystic liver & kidney disease	4	0	0	4
Total	68	15	7	90

Vanishing bile duct syndrome
Haemangiotelangiectasia
Veno-occlusive disease
Chronic Active Hepatitis A
Non-cirrhotic portal hypertension
Kassabach-Merritt syndrome
Arterial-venous malformation
Hereditary haemorrhagic telangiectasia

Appendix IV

ANZLTR PRIMARY Diagnosis Fulminant Hepatic Failure by Age Group by Country

Age group	Country			Total
	AUSTRALIA	NEW ZEALAND	OTHER	
Children				
Acute - Wilson's	3	0	1	4
Acute - Drug	2	0	0	2
Acute Unknown/unspecified	21	7	0	28
Acute Post liver resection	0	1	0	1
Acute NonA-NonB	1	0	0	1
Acute - 1 Antitrypsin deficiency	2	0	0	2
Subacute Unknown/unspecified	1	1	0	2
Total	30	9	1	40
Adult				
Acute Hepatitis A	1	0	0	1
Acute Hepatitis B	11	6	1	18
Acute Autoimmune Hepatitis	1	2	0	3
Acute - BUDD CHIARI	1	1	0	2
Acute Wilson's	8	1	0	9
Acute - Paracetamol	5	1	0	6
Acute Other drugs	9	1	0	10
Acute - Herbs	2	0	0	2
Acute Unknown/unspecified	41	10	1	52
Acute Hepatitis E	1	0	0	1
Acute - NANB	6	3	0	9
Subacute Autoimmune hepatitis	3	1	0	4
Subacute - Hepatitis - A	0	0	1	1
Subacute Hepatitis B	5	1	0	6
Subacute Unknown/unspecified	12	8	0	20
Subacute - Drug	2	0	0	2
Subacute - Wilson's	2	0	0	2
Total	110	35	3	148