

## **CHAPTER 1**

### **BLOOD AND MARROW TRANSPLANTATION**

#### *Editors:*

Dr Alan Teh Kee Hean

Prof Dr Chan Lee Lee

#### *Expert Panel*

Dr Alan Teh Kee Hean (co-chairperson)

Prof Dr Chan Lee Lee (co-chairperson)

Dr Gan Gin Gin

Dr Hishamshah Mohd Ibrahim

Prof Dr S. Fadilah Abdul Wahid

Dr Ong Tee Chuan

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**1.0 INTRODUCTION**

Haematopoietic Stem Cell Transplantation (HSCT) activity in Malaysia continued to increase at a steady pace and for the first time exceeded 200 new transplants per year in 2009. Overall access to HSCT in the general population still remains low but has increased slightly to 8 per million population. This 6<sup>th</sup> annual report attempts to provide an accurate record of HSCT activity in 2009.

**1.1 STOCK AND FLOW**

In 2009 a total of 213 HSCTs were performed. The vast majority (87.7%) were performed in public/university hospitals, the single largest centre being Hospital Ampang which contributed to about 40% of transplants in 2009.

Table 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2009

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New transplant patients	8	6	22	5	12	21	19	25	30	28	33
Deaths	1	1	6	6	1	2	9	5	17	11	15
Lost to follow- up	0	0	0	0	0	0	0	0	0	0	0
Alive at 31 <sup>st</sup> December	7	12	28	27	38	57	67	87	100	117	135

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
New transplant patients	49	62	94	108	114	128	140	148	136	149	181	213
Deaths	17	16	31	47	34	56	52	63	42	50	70	43
Lost to follow- up	0	0	0	0	0	0	0	0	0	0	0	0
Alive at 31 <sup>st</sup> December	167	213	276	337	417	489	577	662	756	855	966	1136

Figure 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2009

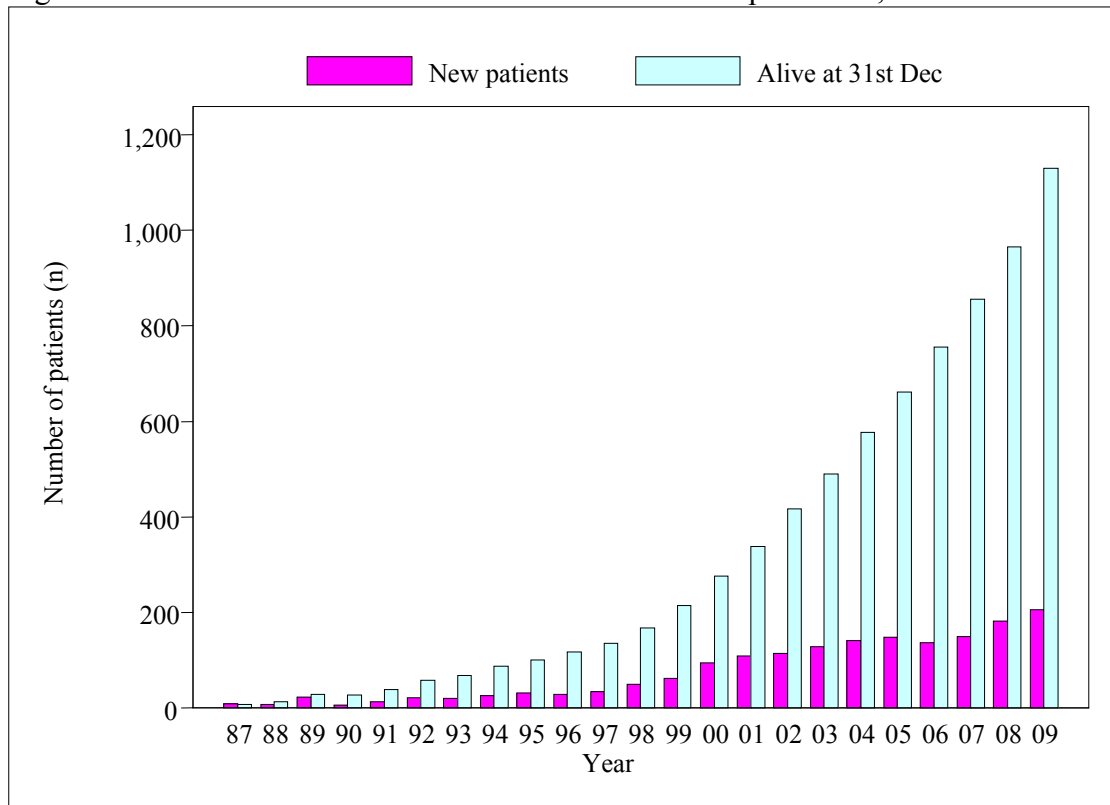


Table 1.1.2: New Transplant Rate per million population (pmp), 1987-2009

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New transplant patients	8	6	22	5	12	21	19	25	30	28	33
New transplant rate pmp	1	0	1	0	1	1	1	1	1	1	2

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
New transplant patients	49	62	94	108	114	128	140	148	136	149	181	213
New transplant rate pmp	2	3	4	5	5	5	5	6	5	5	7	8

Figure 1.1.2: New Transplant Rate per million population (pmp), 1987-2009

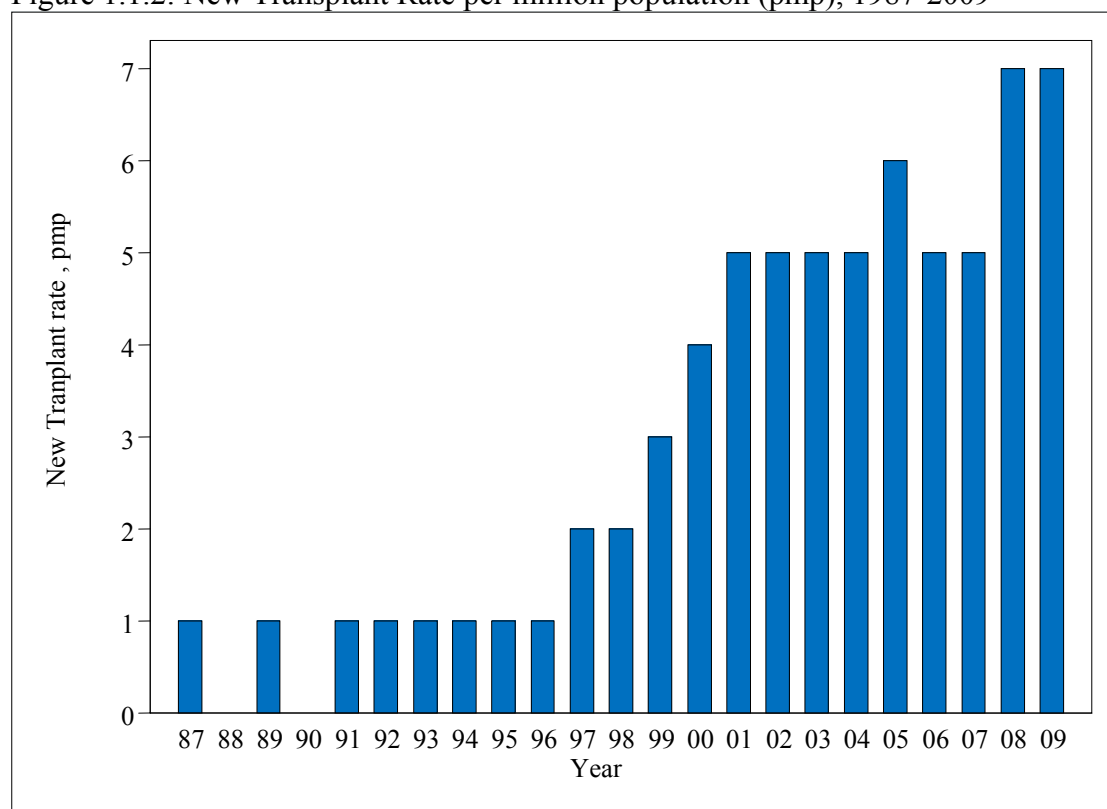


Table 1.1.3: Distribution of Patients by Transplant Centre, 1987-2009

Year	1987		1988		1989		1990		1991		1992		1993	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KLP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UKM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SJMCA	0	0	0	0	1	5	0	0	0	0	0	0	0	0
UMA	0	0	0	0	0	0	0	0	0	0	0	0	1	5
UMP	8	100	6	100	21	95	5	100	12	100	21	100	18	95
GMC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LWE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SJMCP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HUSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APSH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>22</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>19</b>	<b>100</b>

Year	1994		1995		1996		1997		1998		1999		2000	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	0	0	0	0	0	0	0	0	0	0	6	10	15	16
KLP	4	16	10	33	10	36	9	27	16	33	19	31	16	17
UKM	0	0	0	0	0	0	0	0	0	0	2	3	9	10
SJA	0	0	0	0	0	0	0	0	0	0	5	8	19	20
UMA	4	16	7	23	6	21	9	27	15	30	11	18	13	14
UMP	17	68	13	43	11	39	15	46	18	37	19	31	22	23
GMC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LWE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SJP	0	0	0	0	1	4	0	0	0	0	0	0	0	0
HUSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APSH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>25</b>	<b>100</b>	<b>30</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>62</b>	<b>100</b>	<b>94</b>	<b>100</b>

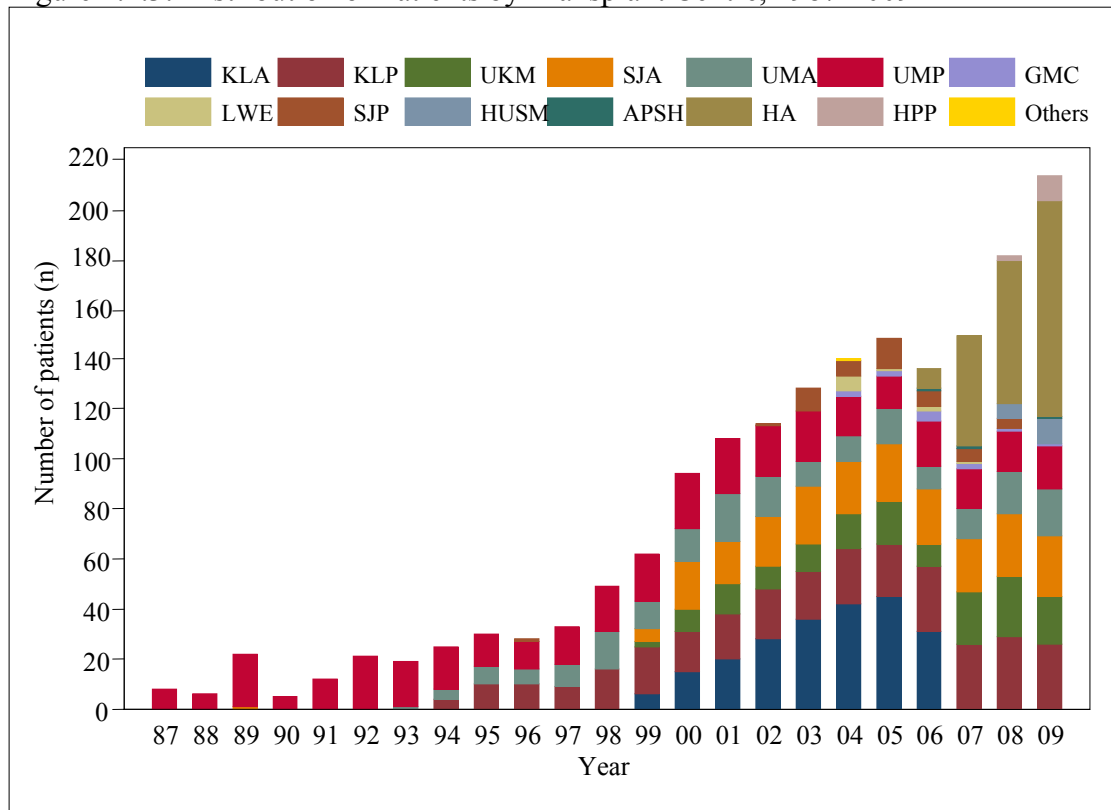
Year	2001		2002		2003		2004		2005		2006		2007	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	20	19	28	25	36	28	42	30	45	30	31	23	0	0
KLP	18	17	20	18	19	15	22	16	21	14	26	19	26	17
UKM	12	11	9	8	11	9	14	10	17	11	9	7	21	14
SJA	17	16	20	18	23	18	21	15	23	16	22	16	21	14
UMA	19	18	16	14	10	8	10	7	14	9	9	7	12	8
UMP	22	20	20	18	20	16	16	11	13	9	18	13	16	11
GMC	0	0	0	0	0	0	2	1	2	1	4	3	2	1
LWE	0	0	0	0	0	0	6	4	1	1	2	1	1	1
SJP	0	0	1	1	9	7	6	4	12	8	6	4	5	3
HUSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APSH	0	0	0	0	0	0	0	0	0	0	1	1	1	1
HA	0	0	0	0	0	0	0	0	0	0	8	6	44	30
HPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	1	1	0	0	0	0	0	0
<b>TOTAL</b>	<b>108</b>	<b>100</b>	<b>114</b>	<b>100</b>	<b>128</b>	<b>100</b>	<b>140</b>	<b>100</b>	<b>148</b>	<b>100</b>	<b>136</b>	<b>100</b>	<b>149</b>	<b>100</b>

Year	2008		2009		Total	
	No.	%	No.	%	No.	%
KLA	0	0	0	0	223	13
KLP	29	16	26	12	291	17
UKM	24	13	19	9	147	8
SJA	25	14	24	11	221	13
UMA	17	9	19	9	192	11
UMP	16	9	17	8	364	21
GMC	1	1	1	0	12	1
LWE	0	0	0	0	10	1
SJP	4	2	0	0	44	3
HUSM	6	3	10	5	16	1
APSH	0	0	1	0	3	0
HA	57	31	86	40	195	11
HPP	2	1	10	5	12	1
Others	0	0	0	0	1	0
<b>TOTAL</b>	<b>181</b>	<b>100</b>	<b>213</b>	<b>100</b>	<b>1731</b>	<b>100</b>

\*Others include Royal Perth Australia Hospital

KLA	Hospital Kuala Lumpur, (Adult)
KLP	Hospital Kuala Lumpur, Institute Paediatrics (Paed)
UKM	Hospital Universiti Kebangsaan Malaysia
SJA	Sime Darby Medical Centre, Subang Jaya (Adult)
UMA	University of Malaya Medical Centre (Adult)
UMP	University of Malaya Medical Centre (Paed)
GMC	Gleneagles Medical Centre, Penang
LWE	Lam Wah Ee Hospital, Penang
SJP	Sime Darby Medical Centre, Subang Jaya (Paed)
HUSM	Hospital Universiti Sains Malaysia
APSH	Ampang Puteri Specialist Hospital
HA	Hospital Ampang
HPP	Hospital Pulau Pinang

Figure 1.1.3: Distribution of Patients by Transplant Centre, 1987-2009





## 1.2 RECIPIENTS' CHARACTERISTICS

Out of the 213 HSCTs, there was a male preponderance, the male:female ratio being 58:42, which is similar to the cumulative gender ratio since 1987. The ethnic breakdown was 46%, 37%, 7%, 7% and 2% for Malay, Chinese, Indian, Bumiputra East Malaysians and Others respectively. The proportion of patients aged younger than 20 years transplanted was lower in 2009 compared with the previous year (29% vs. 37%). This is consistent with the trend to an increasing number of adults being transplanted over the years. The commonest indications for HSCT were acute leukaemia, lymphoma and hypoplastic anaemia. There has been a significant drop in the number of patients transplanted for chronic leukemia, probably reflecting the use of medical (TKI) therapy in this group of patients in preference to HSCT.

Table 1.2.1: Distribution of Patients by Gender, 1987-2009

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Gender	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	7	88	4	67	12	55	3	60	7	58	13	62	13	68	16	64
Female	1	13	2	33	10	45	2	40	5	42	8	38	6	32	9	36
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>22</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>19</b>	<b>100</b>	<b>25</b>	<b>100</b>

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Gender	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	11	37	15	54	18	55	33	67	36	58	54	57	66	61	62	54
Female	19	63	13	46	15	45	16	33	26	42	40	43	42	39	52	46
<b>TOTAL</b>	<b>30</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>62</b>	<b>100</b>	<b>94</b>	<b>100</b>	<b>108</b>	<b>100</b>	<b>114</b>	<b>100</b>

Year	2003		2004		2005		2006		2007		2008		2009		Total	
Gender	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	71	55	84	60	71	48	80	59	90	60	99	55	124	58	989	57
Female	57	45	56	40	77	52	56	41	59	40	82	45	89	42	742	43
<b>TOTAL</b>	<b>128</b>	<b>100</b>	<b>140</b>	<b>100</b>	<b>148</b>	<b>100</b>	<b>136</b>	<b>100</b>	<b>149</b>	<b>100</b>	<b>181</b>	<b>100</b>	<b>213</b>	<b>100</b>	<b>1731</b>	<b>100</b>

Figure 1.2.1: Distribution of Patients by Gender, 1987-2009

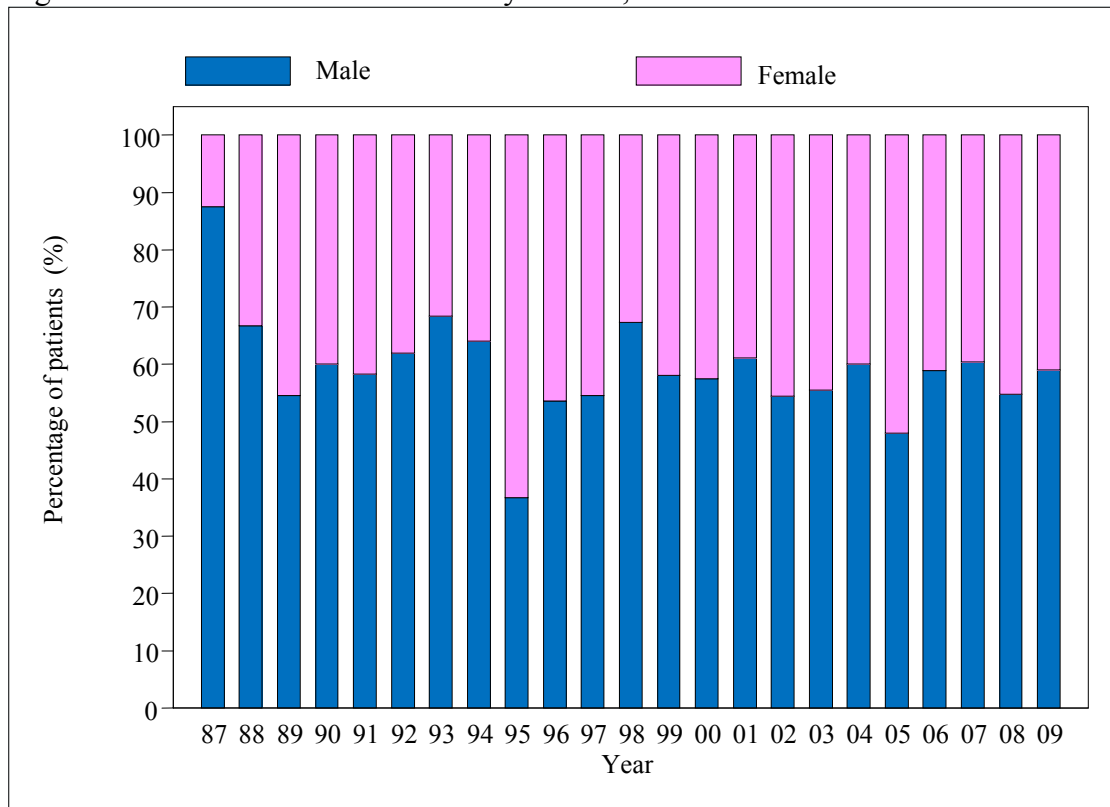


Table 1.2.2: Distribution of Patients by Ethnic Group, 1987-2009

Year	1987		1988		1989		1990		1991		1992		1993		1994	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Malay	2	25	4	67	13	59	2	40	4	33	4	19	3	16	9	36
Chinese	5	63	2	33	8	36	3	60	7	58	10	48	10	53	12	48
Indian	1	13	0	0	0	0	0	0	1	8	4	19	1	5	0	0
Bumiputra Sabah	0	0	0	0	1	5	0	0	0	0	2	10	3	16	4	16
Bumiputra Sarawak	0	0	0	0	0	0	0	0	0	0	0	0	2	10	0	0
Others	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>22</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>19</b>	<b>100</b>	<b>25</b>	<b>100</b>

Year	1995		1996		1997		1998		1999		2000		2001		2002	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Malay	7	23	8	29	9	27	20	41	31	50	33	35	47	44	37	32
Chinese	14	47	11	39	20	61	24	49	26	42	48	51	48	44	65	57
Indian	3	10	6	21	0	0	4	8	4	6	7	7	8	7	8	7
Bumiputra Sabah	1	3	0	0	1	3	0	0	0	0	3	3	1	1	1	1
Bumiputra Sarawak	0	0	3	11	0	0	0	0	0	0	0	0	1	1	1	1
Others	5	17	0	0	3	9	1	2	1	2	3	3	3	3	2	2
<b>TOTAL</b>	<b>30</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>62</b>	<b>100</b>	<b>94</b>	<b>100</b>	<b>108</b>	<b>100</b>	<b>114</b>	<b>100</b>

Year	2003		2004		2005		2006		2007		2008		2009		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Malay	46	36	51	36	53	36	61	45	59	40	77	43	99	46	679	39
Chinese	65	51	63	45	69	47	50	37	59	40	71	39	79	37	769	44
Indian	6	5	9	6	14	9	11	8	18	12	12	7	14	7	131	8
Bumiputra Sabah	4	3	9	6	5	3	7	5	6	4	14	8	9	4	71	4
Bumiputra Sarawak	4	3	7	5	5	3	2	1	1	1	5	3	7	3	38	2
Others	3	2	1	1	2	1	5	4	6	4	2	1	5	2	43	2
<b>TOTAL</b>	<b>128</b>	<b>100</b>	<b>140</b>	<b>100</b>	<b>148</b>	<b>100</b>	<b>136</b>	<b>100</b>	<b>149</b>	<b>100</b>	<b>181</b>	<b>100</b>	<b>213</b>	<b>100</b>	<b>1731</b>	<b>100</b>

Figure 1.2.2: Distribution of Patients by Ethnic Group, 1987-2009

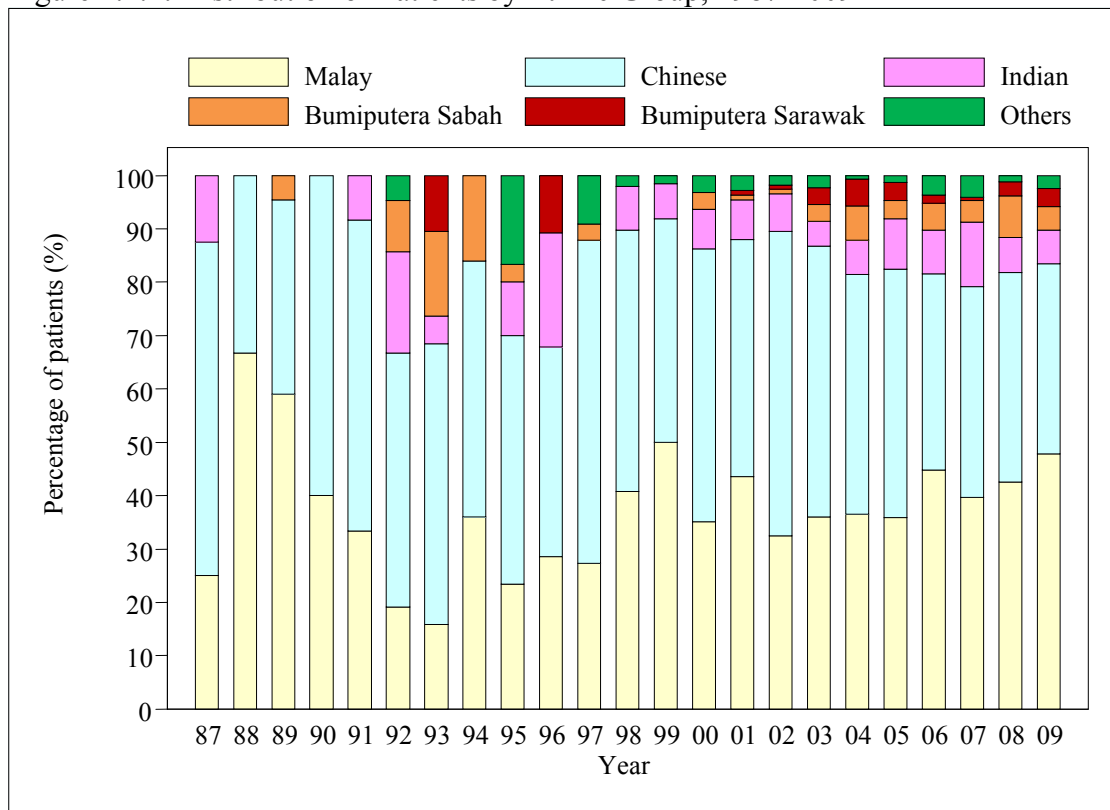


Table 1.2.3: Distribution of Patients by Age Group, 1987-2009

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Age group	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	4	50	4	67	17	77	5	100	10	83	15	71	9	47	11	44
10-19	4	50	2	33	5	23	0	0	2	17	6	29	10	53	11	44
20-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	12
40-59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
≥60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>22</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>19</b>	<b>100</b>	<b>25</b>	<b>100</b>
Mean	9		7		8		6		6		7		9		11	
SD	4		3		3		3		4		4		5		7	
Median	9		8		8		6		6		6		10		11	
Minimum	2		2		1		2		1		1		1		1	
Maximum	15		10		13		9		13		14		17		29	

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Age group	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	12	40	13	46	19	58	21	43	28	45	27	29	23	21	30	26
10-19	13	43	12	43	8	24	16	33	15	24	27	29	28	26	25	22
20-39	4	13	3	11	5	15	12	24	12	19	19	20	40	37	36	32
40-59	1	3	0	0	1	3	0	0	7	11	20	21	16	15	23	20
≥60	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
<b>TOTAL</b>	<b>30</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>62</b>	<b>100</b>	<b>94</b>	<b>100</b>	<b>108</b>	<b>100</b>	<b>114</b>	<b>100</b>
Mean	13		11		12		13		17		23		23		23	
SD	9		9		12		10		15		17		16		16	
Median	11		11		6		10		11		18		22		22	
Minimum	3		1		1		5 months		1		1		1 month		1	
Max	41		37		45		39		57		61		64		55	

Year	2003		2004		2005		2006		2007		2008		2009		Total	
Age group	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	42	33	26	19	29	20	40	29	38	26	25	14	36	17	484	28
10-19	18	14	41	29	32	22	29	21	22	15	42	23	26	12	394	23
20-39	47	37	52	37	50	34	38	28	35	23	63	35	76	36	495	29
40-59	21	16	19	14	36	24	25	18	43	29	47	26	67	31	326	19
≥60	0	0	2	1	1	1	4	3	11	7	4	2	8	4	32	2
<b>TOTAL</b>	<b>128</b>	<b>100</b>	<b>140</b>	<b>100</b>	<b>148</b>	<b>100</b>	<b>136</b>	<b>100</b>	<b>149</b>	<b>100</b>	<b>181</b>	<b>100</b>	<b>213</b>	<b>100</b>	<b>1731</b>	<b>100</b>
Mean	22		23		26		24		29		28		31		23	
SD	15		15		16		18		20		17		18		17	
Median	23		20		24		19		28		25		28		19	
Minimum	5 months		1		1		1		1		2		1		1 month	
Max	52		70		66		69		68		66		72		72	

Figure 1.2.3: Distribution of Patients by Age Group, 1987-2009

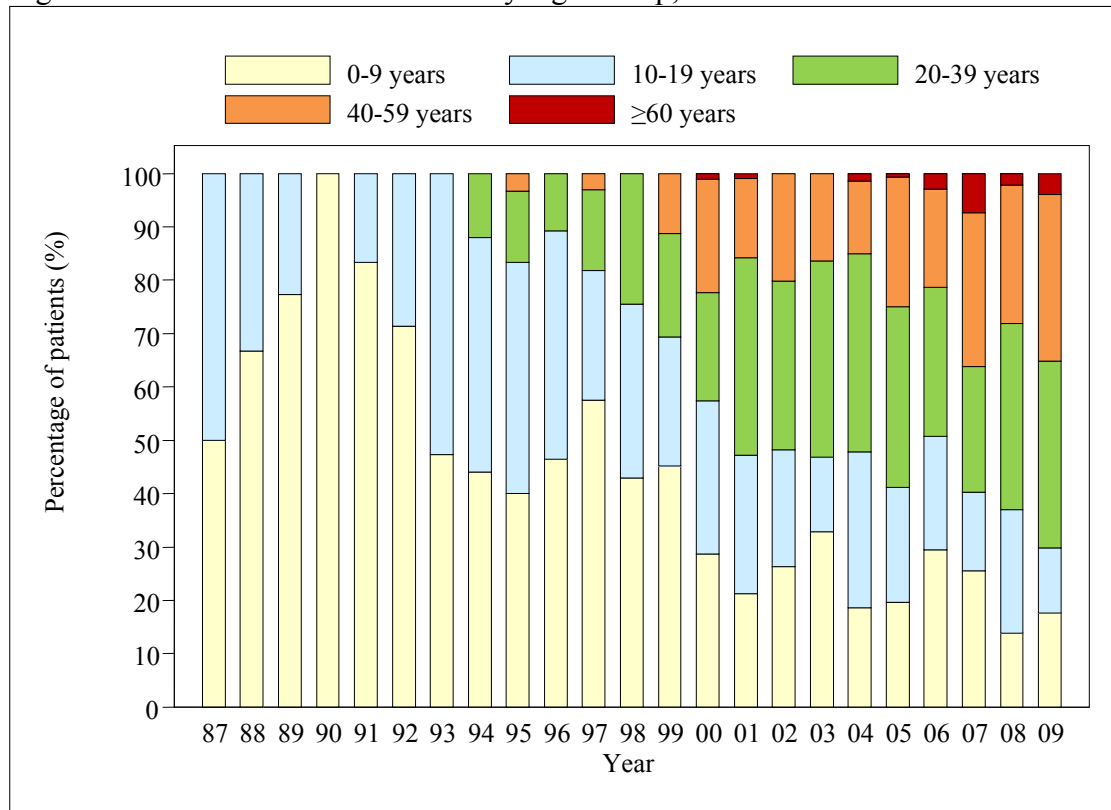


Table 1.2.4: Distribution of Patients by Primary Diagnosis, 1987-2009

Year	1987		1988		1989		1990		1991		1992		1993		1994	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acute leukaemia	5	63	4	67	8	36	2	40	1	8	4	19	6	32	8	32
Chronic leukaemia	0	0	0	0	1	5	1	20	1	8	4	19	2	11	4	16
Hypoplastic anaemia	2	25	0	0	4	18	0	0	4	33	5	24	4	21	5	20
Erythrocytic disorders	0	0	0	0	1	5	1	20	1	8	1	5	0	0	0	0
Lymphoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solid tumors	0	0	0	0	0	0	0	0	0	0	3	14	2	11	1	4
Myelodysplasia	0	0	0	0	0	0	0	0	0	0	0	0	1	5	2	8
Haemoglobinopathy	1	13	2	33	7	32	1	20	4	33	4	19	2	11	5	20
Multiple myeloma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	1	5	0	0	1	8	0	0	2	11	0	0
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>22</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>19</b>	<b>100</b>	<b>25</b>	<b>100</b>

Year	1995		1996		1997		1998		1999		2000		2001		2002	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acute leukaemia	10	33	13	46	11	33	23	47	28	45	37	39	48	44	48	42
Chronic leukaemia	5	17	5	18	6	18	7	14	7	11	13	14	18	17	19	17
Hypoplastic anaemia	8	27	4	14	5	15	4	8	5	8	11	12	7	6	5	4
Erythrocytic disorders	0	0	1	4	0	0	0	0	0	0	0	0	0	0	1	1
Lymphoma	0	0	0	0	2	6	5	10	6	10	19	20	23	21	20	18
Solid tumors	1	3	0	0	2	6	5	10	7	11	2	2	1	1	4	4
Myelodysplasia	0	0	0	0	0	0	1	2	0	0	1	1	4	4	4	4
Haemoglobinopathy	5	17	5	18	6	18	2	4	4	6	7	7	4	4	8	7
Multiple myeloma	0	0	0	0	0	0	0	0	3	5	1	1	1	1	4	4
Others	1	3	0	0	1	3	2	4	2	3	3	3	2	2	1	1
<b>TOTAL</b>	<b>30</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>62</b>	<b>100</b>	<b>94</b>	<b>100</b>	<b>108</b>	<b>100</b>	<b>114</b>	<b>100</b>

Year	2003		2004		2005		2006		2007		2008		2009		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acute leukaemia	44	34	46	33	58	39	45	33	57	38	68	38	83	39	657	38
Chronic leukaemia	18	14	22	16	13	9	9	7	7	5	4	2	9	4	175	10
Hypoplastic anaemia	5	4	12	9	6	4	15	11	13	9	19	10	13	6	156	9
Erythrocytic disorders	2	2	0	0	0	0	0	0	0	0	1	1	1	0	10	1
Lymphoma	28	22	36	26	38	26	33	24	36	24	50	28	69	32	365	21
Solid tumors	3	2	2	1	2	1	6	4	5	3	1	1	2	1	49	3
Myelodysplasia	3	2	5	4	4	3	3	2	2	1	6	3	3	1	39	2
Haemoglobinopathy	17	13	9	6	17	11	12	9	13	9	12	7	12	6	159	9
Multiple myeloma	5	4	3	2	8	5	10	7	16	11	18	10	17	8	86	5
Others	3	2	5	4	2	1	3	2	0	0	2	1	4	2	35	2
<b>TOTAL</b>	<b>128</b>	<b>100</b>	<b>140</b>	<b>100</b>	<b>148</b>	<b>100</b>	<b>136</b>	<b>100</b>	<b>149</b>	<b>100</b>	<b>181</b>	<b>100</b>	<b>213</b>	<b>100</b>	<b>1731</b>	<b>100</b>

	<b>Diagnosis</b>	<b>Categorisation</b>
1	Acute leukaemia, unclassified	Acute leukaemia
2	Acute undifferentiated leukaemia	
3	Acute Lymphocytic Leukaemia (ALL)	
4	Acute Myelogenous Leukaemia (AML) denovo	
5	AML post-chemotherapy	
6	AML post-MDS	
7	Chronic lymphocytic leukaemia	Chronic leukaemia
8	Chronic myeloid leukaemia	
9	Aplastic anaemia	Hypoplastic anaemia
10	Fanconi's anaemia	
11	Diamond-Blackfan anaemia	Erythrocytic Disorders
12	Congenital Dyserythropoietic Anaemia (CDA)	
13	Hodgkin's lymphoma	Lymphoma
14	Non-Hodgkin's lymphoma, Aggressive	
15	Non-Hodgkin's lymphoma, Indolent	
16	Carcinoma, breast	Solid tumors
17	Carcinoma, ovary	
18	Germ Cell Tumour (GCT)-testicular	
19	GCT-primary non-testis	
20	Ewing's sarcoma	
21	Glioma	
22	Hepatoblastoma	
23	Neuroblastoma	
24	Rhabdomyosarcoma	
25	Soft tissue sarcoma (non-RMS)	
26	Wilms tumour	
27	Primitive Neuroectodermal Tumour (NET)	
28	Juvenile Myelomonocytic leukaemia	Myelodysplasia
29	Myelodysplastic syndrome (MDS)	
30	Myelofibrosis	
31	Thalassaemia major	Haemoglobinopathy
32	Sickle Cell Anaemia	
33	Multiple myeloma	Multiple myeloma
34	Haemophagocytic Lymphohistiocytosis Syndrome	Others
35	Congenital Immunodeficiencies	
36	Osteopetrosis	
37	Others	



### 1.3 TRANSPLANT PRACTICES

There was a jump in the number of autologous transplants seen in 2009, the allogeneic:autologous ratio declining from 64:36 in 2008 to 52:48 in 2009. The commonest stem cell source was peripheral blood stem cells (PBSC) which formed 85% of HSCT done. Bone marrow and cord blood stem cells contributed 11% and 4% to the total, respectively.

Of the 110 allogeneic HSCT performed in 2009, 104 (95%) were HLA-identical donors, the vast majority being sibling matched donors. The recourse to unrelated donors remains low at 10% in Malaysia compared with Japan, Singapore and Hong Kong where 40-60% of HSCT used unrelated donors.

Table 1.3.1: Distribution of Patients by Graft Number, 1987-2009

Year	1987		1988		1989		1990		1991		1992		1993		1994	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	8	100	6	100	19	86	4	80	9	75	19	91	18	95	24	96
2	0	0	0	0	2	9	1	20	3	25	2	10	1	5	1	4
3	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>22</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>19</b>	<b>100</b>	<b>25</b>	<b>100</b>

Year	1995		1996		1997		1998		1999		2000		2001		2002	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	29	97	28	100	31	94	47	96	61	98	91	97	103	95	113	99
2	1	3	0	0	1	3	1	2	1	2	3	3	5	5	1	1
3	0	0	0	0	1	3	1	2	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>30</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>62</b>	<b>100</b>	<b>94</b>	<b>100</b>	<b>108</b>	<b>100</b>	<b>114</b>	<b>100</b>

Year	2003		2004		2005		2006		2007		2008		2009		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	125	98	135	98	137	99	132	98	122	98	159	92	205	97	1625	97
2	3	2	3	2	2	1	2	2	2	2	13	8	6	3	54	3
3	0	0	0	0	0	0	1	1	0	0	0	0	0	0	4	0
<b>TOTAL</b>	<b>128</b>	<b>100</b>	<b>138</b>	<b>100</b>	<b>139</b>	<b>100</b>	<b>135</b>	<b>100</b>	<b>124</b>	<b>100</b>	<b>172</b>	<b>100</b>	<b>211</b>	<b>100</b>	<b>1683</b>	<b>100</b>

Note: Data not available for graft number = 48 cases (3%)

Figure 1.3.1: Distribution of Patients by Graft Number, 1987-2009

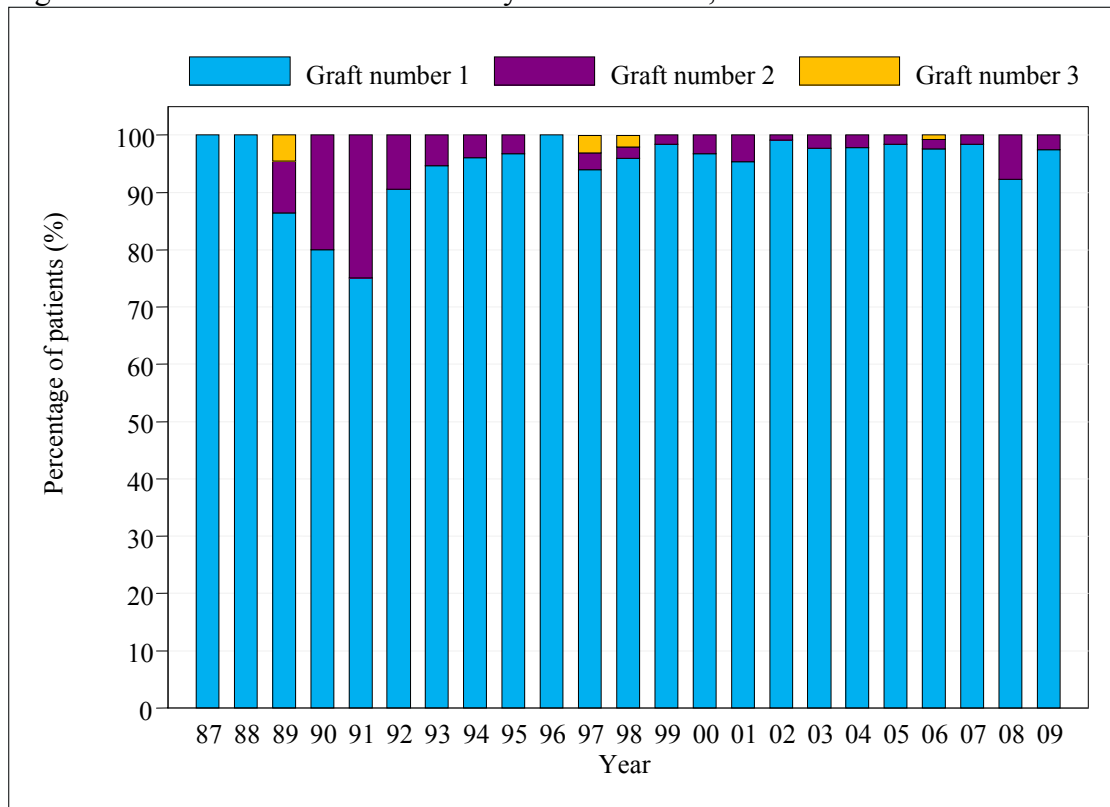


Table 1.3.2: Distribution of Patients by Transplantation Type, 1987-2009

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Type of transplant	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	8	100	6	100	21	95	5	100	12	100	20	95	18	95	24	96
Autologous	0	0	0	0	1	5	0	0	0	0	1	5	1	5	1	4
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>22</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>19</b>	<b>100</b>	<b>25</b>	<b>100</b>

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Type of transplant	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	29	97	26	93	27	82	32	65	44	71	56	60	75	69	75	66
Autologous	1	3	2	7	6	18	17	35	18	29	38	40	33	31	39	34
<b>TOTAL</b>	<b>30</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>62</b>	<b>100</b>	<b>94</b>	<b>100</b>	<b>108</b>	<b>100</b>	<b>114</b>	<b>100</b>

Year	2003		2004		2005		2006		2007		2008		2009		Total	
Type of transplant	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	83	65	90	64	91	61	87	64	75	50	115	64	110	52	1129	65
Autologous	45	35	50	36	57	39	49	36	74	50	66	36	103	48	602	35
<b>TOTAL</b>	<b>128</b>	<b>100</b>	<b>140</b>	<b>100</b>	<b>148</b>	<b>100</b>	<b>136</b>	<b>100</b>	<b>149</b>	<b>100</b>	<b>181</b>	<b>100</b>	<b>213</b>	<b>100</b>	<b>1731</b>	<b>100</b>

Figure 1.3.2: Distribution of Patients by Transplantation Type, 1987-2009

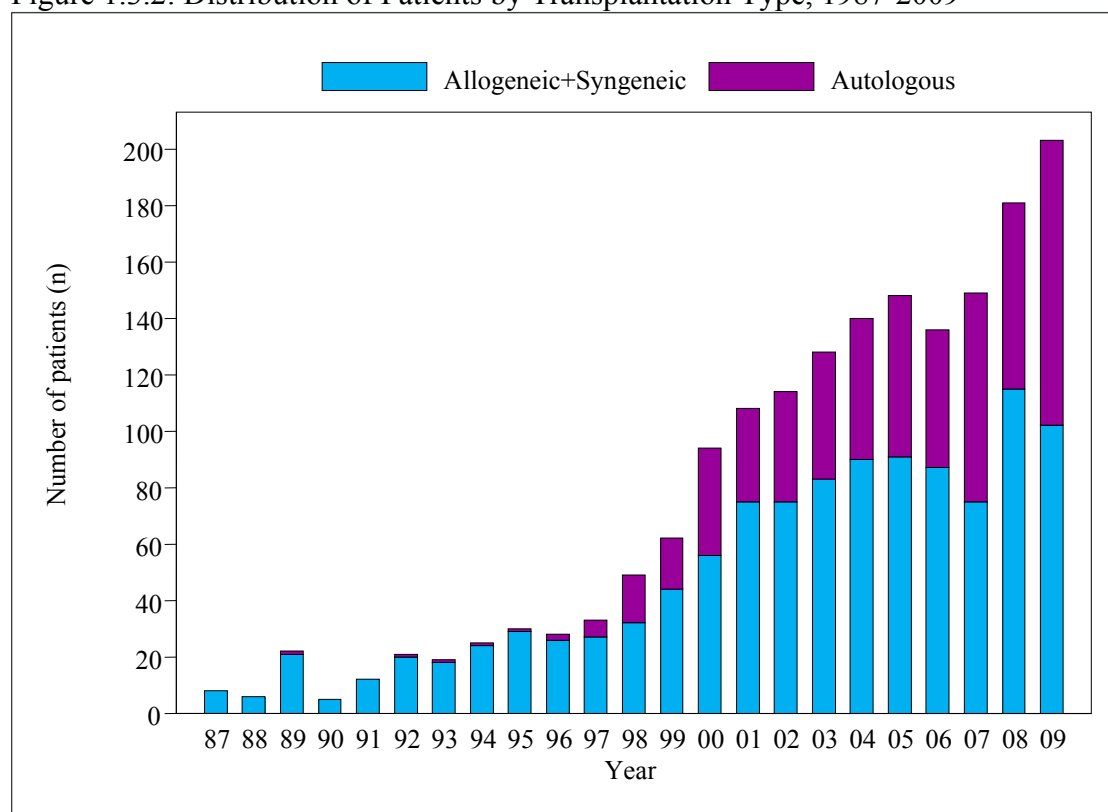


Table 1.3.3: Type of Transplant by Centre, 1987-2009

Type of transplant Centre	Allogeneic + Syngeneic		Autologous		TOTAL	
	No.	%	No.	%	No.	%
KLA	112	10	111	18	223	13
KLP	262	23	29	5	291	17
UKM	75	7	72	12	147	8
SJA	84	7	137	23	221	13
UMA	131	12	61	10	192	11
UMP	321	28	43	7	364	21
GMC	5	0	7	1	12	1
LWE	9	1	1	0	10	1
SJP	38	3	6	1	44	3
HUSM	0	0	16	3	16	1
APSH	2	0	1	0	3	0
HA	89	8	106	18	195	11
HPP	0	0	12	2	12	1
Other	1	0	0	0	1	0
<b>TOTAL</b>	<b>1129</b>	<b>100</b>	<b>602</b>	<b>100</b>	<b>1731</b>	<b>100</b>

Figure 1.3.3: Type of Transplant by Centre, 1987-2009

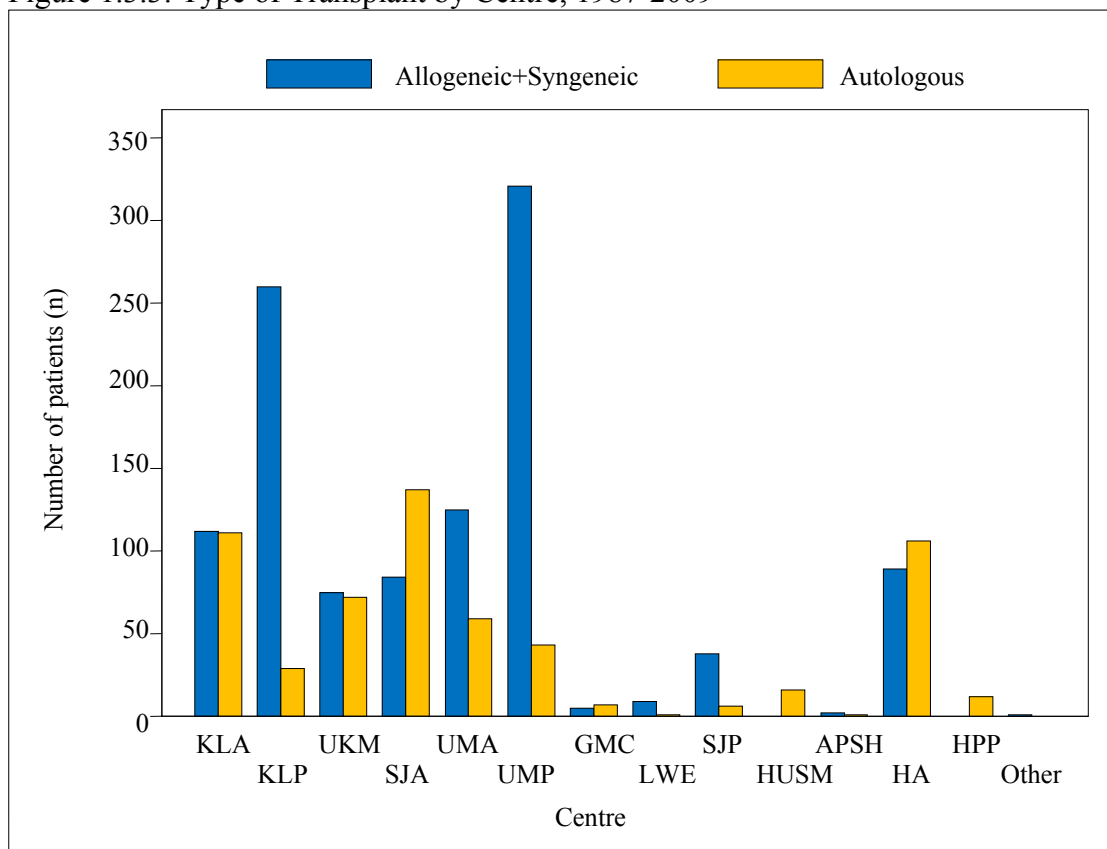


Table 1.3.4: Source of Stem Cells, 1987-2009

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Transplant source	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Marrow	8	100	6	100	22	100	5	100	12	100	21	100	19	100	25	100
PBSC / Marrow + PBSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cord blood / Marrow + cord	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>22</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>19</b>	<b>100</b>	<b>25</b>	<b>100</b>

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Transplant source	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Marrow	30	100	28	100	24	73	25	51	37	60	31	33	30	28	31	27
PBSC / Marrow + PBSC	0	0	0	0	7	21	23	47	23	37	57	61	74	69	79	69
Cord blood / Marrow + cord	0	0	0	0	2	6	1	2	2	3	6	6	4	4	4	4
<b>TOTAL</b>	<b>30</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>62</b>	<b>100</b>	<b>94</b>	<b>100</b>	<b>108</b>	<b>100</b>	<b>114</b>	<b>100</b>

Year	2003		2004		2005		2006		2007		2008		2009		Total	
Transplant source	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Marrow	44	34	30	21	25	17	17	13	23	15	20	11	23	11	536	31
PBSC / Marrow + PBSC	79	62	101	72	116	78	109	80	119	80	152	84	181	85	1120	65
Cord blood / Marrow + cord	5	4	9	6	7	5	10	7	7	5	9	5	9	4	75	4
<b>TOTAL</b>	<b>128</b>	<b>100</b>	<b>140</b>	<b>100</b>	<b>148</b>	<b>100</b>	<b>136</b>	<b>100</b>	<b>149</b>	<b>100</b>	<b>181</b>	<b>100</b>	<b>213</b>	<b>100</b>	<b>1731</b>	<b>100</b>

Figure 1.3.4: Source of Stem Cells, 1987-2009

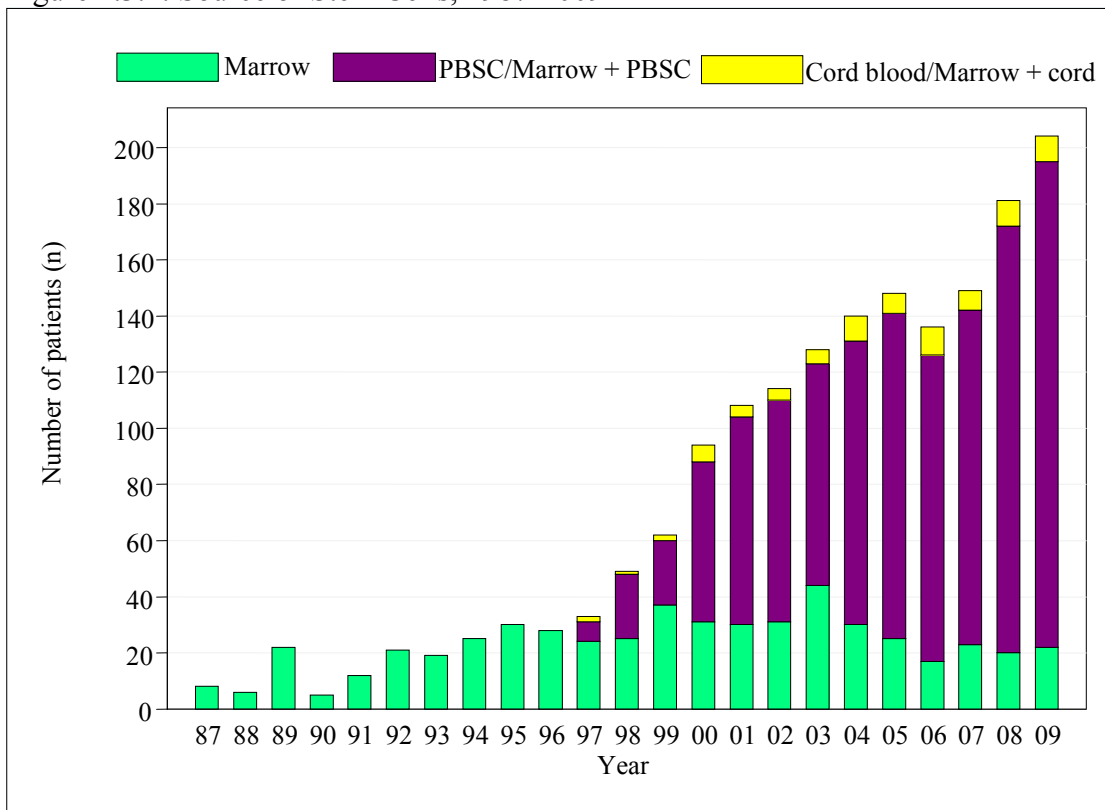


Table 1.3.5: Distribution of Patients by HLA Match, 1987-2009

Year	1987		1988		1989		1990		1991	
	No.	%	No.	%	No.	%	No.	%	No.	%
Identical	8	100	6	100	21	100	5	100	12	100
1 AG	0	0	0	0	0	0	0	0	0	0
2 AG	0	0	0	0	0	0	0	0	0	0
≥3 AG Disparate	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>

Year	1992		1993		1994		1995		1996	
	No.	%	No.	%	No.	%	No.	%	No.	%
Identical	20	100	18	100	23	96	29	100	26	100
1 AG	0	0	0	0	1	4	0	0	0	0
2 AG	0	0	0	0	0	0	0	0	0	0
≥3 AG Disparate	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>18</b>	<b>100</b>	<b>24</b>	<b>100</b>	<b>29</b>	<b>100</b>	<b>26</b>	<b>100</b>

Year	1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%
Identical	25	93	31	97	40	91	52	93	69	92
1 AG	2	7	0	0	3	7	0	0	4	5
2 AG	0	0	1	3	1	2	4	7	1	1
≥3 AG Disparate	0	0	0	0	0	0	0	0	1	1
<b>TOTAL</b>	<b>27</b>	<b>100</b>	<b>32</b>	<b>100</b>	<b>44</b>	<b>100</b>	<b>56</b>	<b>100</b>	<b>75</b>	<b>100</b>

Year	2002		2003		2004		2005		2006	
	No.	%	No.	%	No.	%	No.	%	No.	%
Identical	70	93	78	94	83	92	86	95	81	93
1 AG	3	4	3	4	3	3	4	4	4	5
2 AG	2	3	2	2	4	4	1	1	2	2
≥3 AG Disparate	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>75</b>	<b>100</b>	<b>83</b>	<b>100</b>	<b>90</b>	<b>100</b>	<b>91</b>	<b>100</b>	<b>87</b>	<b>100</b>

Year	2007		2008		2009		Total	
	No.	%	No.	%	No.	%	No.	%
Identical	68	91	102	89	104	95	1057	94
1 AG	4	5	7	6	2	2	40	4
2 AG	2	3	6	5	3	3	29	3
≥3 AG Disparate	1	1	0	0	1	1	3	0
<b>TOTAL</b>	<b>75</b>	<b>100</b>	<b>115</b>	<b>100</b>	<b>110</b>	<b>100</b>	<b>1129</b>	<b>100</b>

Table 1.3.6: Distribution of Patients by Allogeneic Donor Relationship, 1987-2009

Year	1987		1988		1989		1990		1991	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%	No.	%
Sibling	8	100	6	100	21	100	5	100	11	92
Unrelated	0	0	0	0	0	0	0	0	0	0
▪ Marrow	0	0	0	0	0	0	0	0	0	0
▪ PBSC / Marrow + PBSC	0	0	0	0	0	0	0	0	0	0
▪ Cord blood / Marrow + cord	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	1	8
<b>TOTAL</b>	<b>8</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>12</b>	<b>100</b>

Year	1992		1993		1994		1995		1996	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%	No.	%
Sibling	20	100	18	100	22	92	29	100	26	100
Unrelated	0	0	0	0	0	0	0	0	0	0
▪ Marrow	0	0	0	0	0	0	0	0	0	0
▪ PBSC / Marrow + PBSC	0	0	0	0	0	0	0	0	0	0
▪ Cord blood / Marrow + cord	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	2	8	0	0	0	0
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>18</b>	<b>100</b>	<b>24</b>	<b>100</b>	<b>29</b>	<b>100</b>	<b>26</b>	<b>100</b>

Year	1997		1998		1999		2000		2001	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%	No.	%
Sibling	26	96	32	100	44	100	55	98	72	96
Unrelated	1	4	0	0	0	0	1	2	3	4
▪ Marrow	0	0	0	0	0	0	0	0	0	0
▪ PBSC / Marrow + PBSC	0	0	0	0	0	0	0	0	0	0
▪ Cord blood / Marrow + cord	1	100	0	0	0	0	1	100	3	100
Others	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>27</b>	<b>100</b>	<b>32</b>	<b>100</b>	<b>44</b>	<b>100</b>	<b>56</b>	<b>100</b>	<b>75</b>	<b>100</b>

Year	2002		2003		2004		2005		2006	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%	No.	%
Sibling	71	95	80	96	81	90	83	91	76	87
Unrelated	4	5	3	4	9	10	8	9	11	13
▪ Marrow	0	0	0	0	1	11	2	25	2	18
▪ PBSC / Marrow + PBSC	0	0	0	0	2	22	1	13	1	9
▪ Cord blood / Marrow + cord	4	100	3	100	6	67	5	63	8	73
Others	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>75</b>	<b>100</b>	<b>83</b>	<b>100</b>	<b>90</b>	<b>100</b>	<b>91</b>	<b>100</b>	<b>87</b>	<b>100</b>

Year	2007		2008		2009		Total	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%
Sibling	65	87	102	89	98	89	1051	93
Unrelated	10	13	13	11	11	10	74	7
▪ Marrow	1	10	0	0	0	0	6	8
▪ PBSC / Marrow + PBSC	2	20	5	38	2	18	13	18
▪ Cord blood / Marrow + cord	7	70	8	62	9	82	55	74
Others	0	0	0	0	1	1	4	0
<b>TOTAL</b>	<b>75</b>	<b>100</b>	<b>115</b>	<b>100</b>	<b>110</b>	<b>100</b>	<b>1129</b>	<b>100</b>

\*excluding autologous, including syngeneic



## 1.4 TRANSPLANT OUTCOMES

A total of 43 deaths were reported for the 213 HSCT in 2009 making the mortality rate 20%. Underlying disease contributed to 63% of these deaths followed by sepsis in 28% and graft-versus-host disease in 2%.

Paediatric patients had better survival rates as shown in Figure 1.4.3. The survival curve for the most recent transplants (Figure 1.4.1 1987-2009) compared with the previous decade is inferior most probably because of a higher proportion of older patients and poorer risk (e.g. more advanced disease) had access to HSCT and more complicated unrelated donor HSCT had been undertaken.

Table 1.4.1: Distribution of Patients by Cause of Death, 1987-2009

Year	1987		1988		1989		1990		1991	
	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	1	100	0	0	0	0	0	0	1	100
GVHD	0	0	0	0	0	0	1	17	0	0
Underlying disease	0	0	0	0	6	100	5	83	0	0
Haemorrhage	0	0	1	100	0	0	0	0	0	0
VOD	0	0	0	0	0	0	0	0	0	0
Organ Failure	0	0	0	0	0	0	0	0	0	0
Interstitial pneumonitis	0	0	0	0	0	0	0	0	0	0
Secondary malignancy	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>1</b>	<b>100</b>	<b>1</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>1</b>	<b>100</b>

Year	1992		1993		1994		1995		1996	
	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	1	50	2	22	1	20	4	24	6	55
GVHD	0	0	0	0	0	0	4	24	0	0
Underlying disease	0	0	6	67	3	60	3	18	3	27
Haemorrhage	0	0	1	11	0	0	2	12	1	9
VOD	0	0	0	0	0	0	1	6	1	9
Organ Failure	1	50	0	0	1	20	2	12	0	0
Interstitial pneumonitis	0	0	0	0	0	0	0	0	0	0
Secondary malignancy	0	0	0	0	0	0	1	6	0	0
Others	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>2</b>	<b>100</b>	<b>9</b>	<b>100</b>	<b>5</b>	<b>100</b>	<b>17</b>	<b>100</b>	<b>11</b>	<b>100</b>

Year	1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	5	33	1	6	6	38	2	6	4	9
GVHD	0	0	2	12	1	6	2	6	4	9
Underlying disease	9	60	11	65	7	44	22	71	33	70
Haemorrhage	0	0	1	6	0	0	3	10	2	4
VOD	0	0	0	0	0	0	1	3	2	4
Organ Failure	1	7	0	0	1	6	0	0	0	0
Interstitial pneumonitis	0	0	1	6	0	0	1	3	2	4
Secondary malignancy	0	0	0	0	0	0	0	0	0	0
Others	0	0	1	6	1	6	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>15</b>	<b>100</b>	<b>17</b>	<b>100</b>	<b>16</b>	<b>100</b>	<b>31</b>	<b>100</b>	<b>47</b>	<b>100</b>

Year	2002		2003		2004		2005		2006	
	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	6	18	15	27	11	21	14	22	8	19
GVHD	3	9	5	9	9	17	7	11	2	5
Underlying disease	21	62	31	55	28	54	35	56	28	67
Haemorrhage	0	0	0	0	2	4	2	3	1	2
VOD	0	0	0	0	0	0	0	0	3	7
Organ Failure	3	9	2	4	0	0	2	3	0	0
Interstitial pneumonitis	0	0	1	2	0	0	2	3	0	0
Secondary malignancy	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0
Unknown	1	3	2	4	2	4	1	2	0	0
<b>TOTAL</b>	<b>34</b>	<b>100</b>	<b>56</b>	<b>100</b>	<b>52</b>	<b>100</b>	<b>63</b>	<b>100</b>	<b>42</b>	<b>100</b>

Year	2007		2008		2009		Total	
	No.	%	No.	%	No.	%	No.	%
Sepsis	10	20	14	20	12	28	124	21
GVHD	3	6	7	10	1	2	51	9
Underlying disease	29	58	37	53	27	63	344	58
Haemorrhage	1	2	5	7	1	2	23	4
VOD	0	0	3	4	0	0	11	2
Organ Failure	0	0	0	0	1	2	14	2
Interstitial pneumonitis	0	0	2	3	1	2	10	2
Secondary malignancy	0	0	0	0	0	0	1	0
Others	6	12	1	1	0	0	9	2
Unknown	1	2	1	1	0	0	8	1
<b>TOTAL</b>	<b>50</b>	<b>100</b>	<b>70</b>	<b>100</b>	<b>43</b>	<b>100</b>	<b>595</b>	<b>100</b>

Figure 1.4.1: Patient Survival by Year of Transplant, 1987-2009

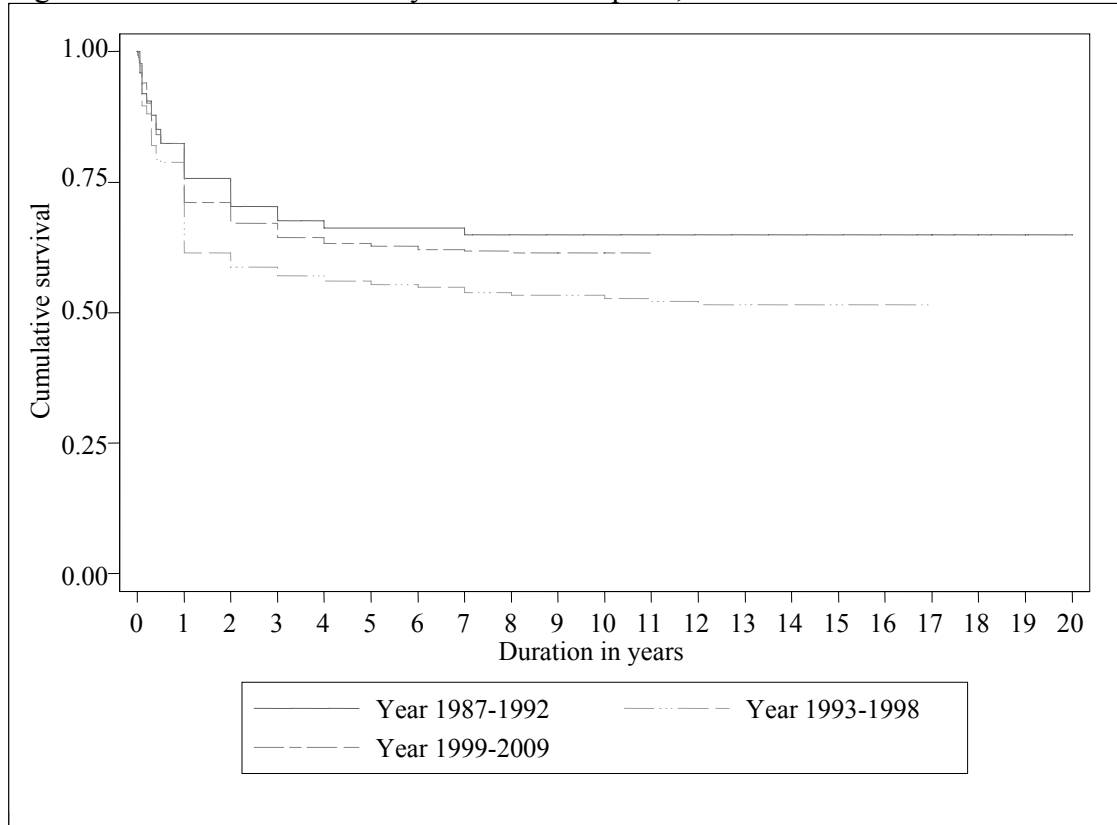


Figure 1.4.2: Patient Survival by Gender, 1987-2009

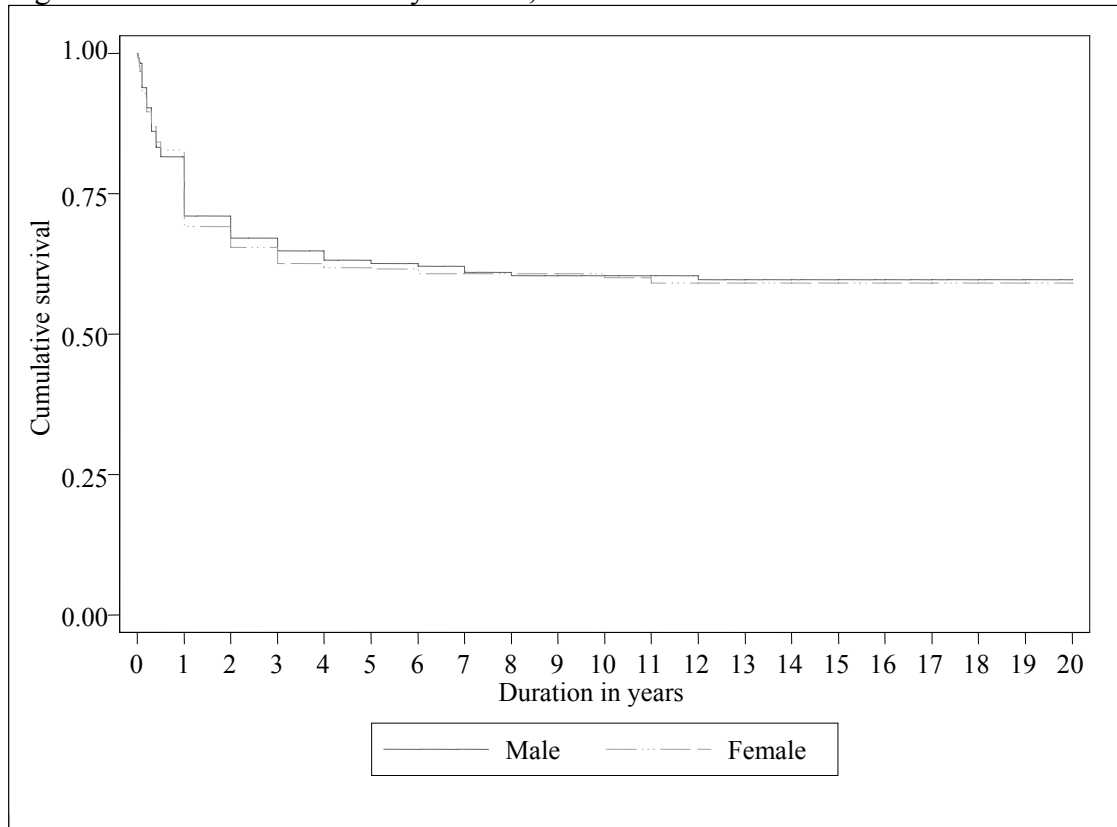


Figure 1.4.3: Patient Survival by Age Group, 1987-2009

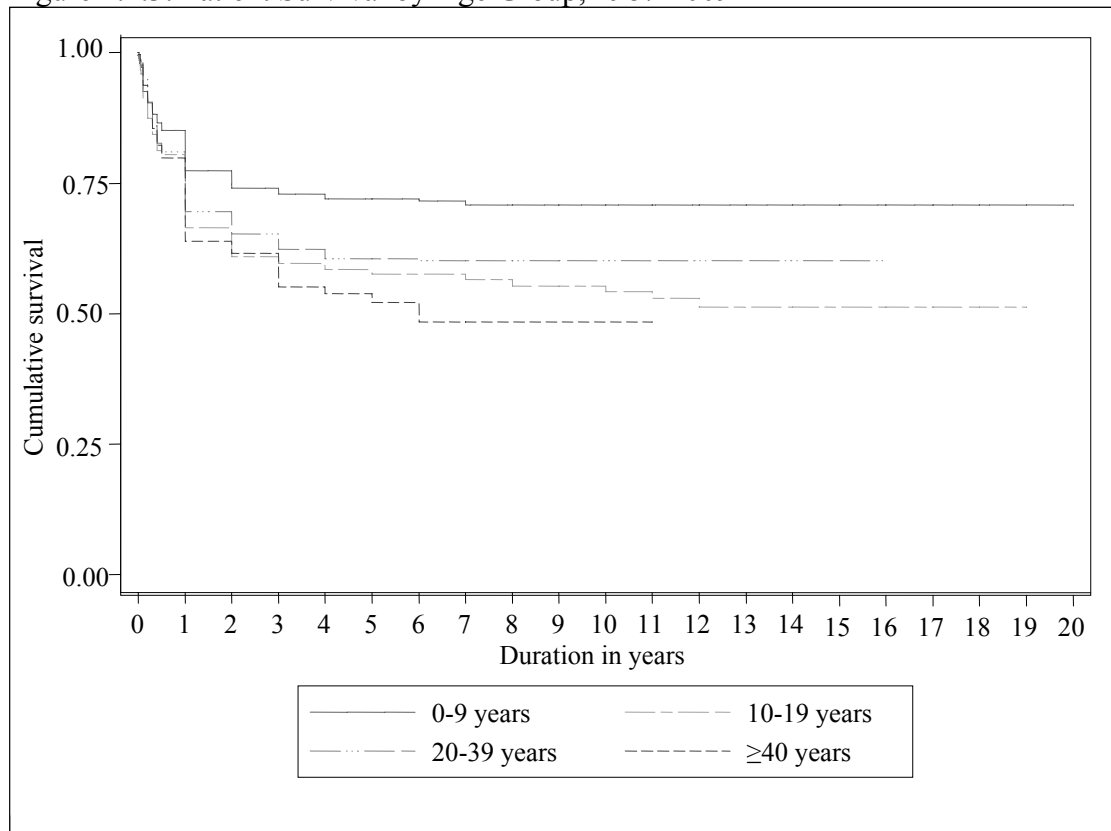
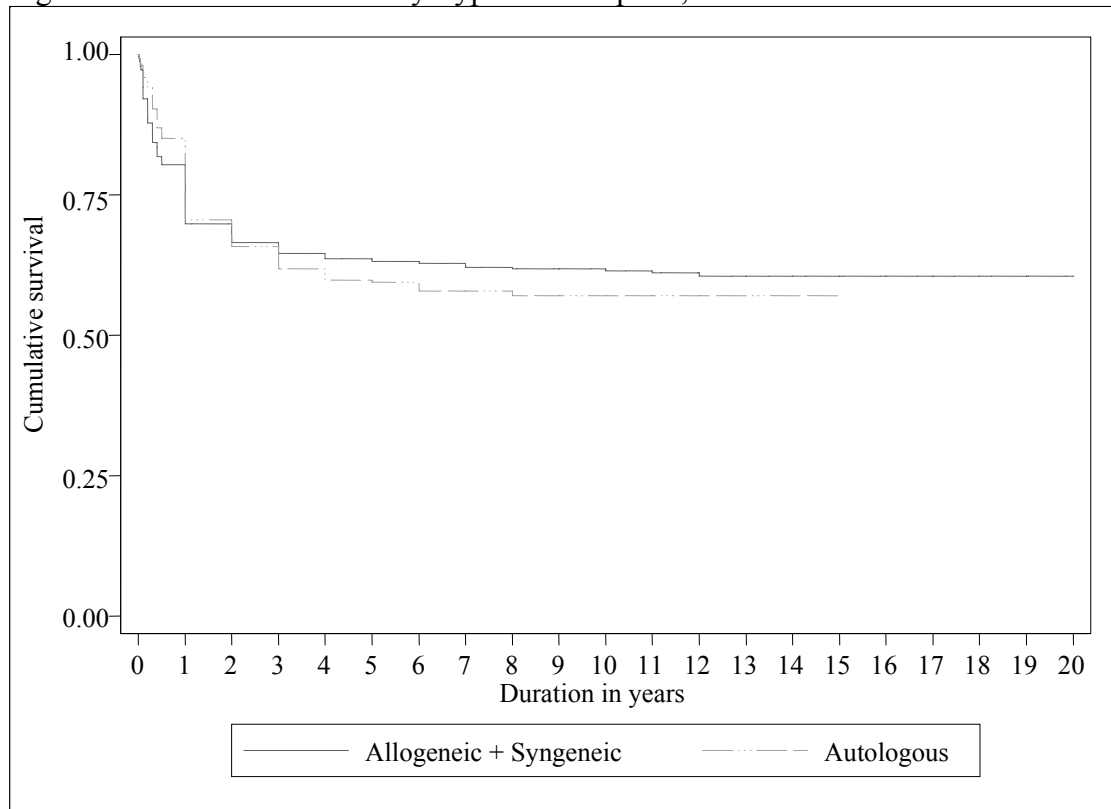


Figure 1.4.4: Patient Survival by Type of Transplant, 1987-2009



### 1.5 DISEASE-FREE SURVIVAL

Figures 1.5.1 to 1.5.7 show the disease free survival for individual diseases while Figures 1.5.8 to 1.5.13 show the breakdown between paediatric and adult patients.

It is difficult to interpret the survival curves for individual diseases (e.g. allogeneic vs autologous in AML and NHL) without analyses according to stage of disease (CR1 vs CR2) and prognostic risk factors. Similarly it is difficult to interpret differences in survival curves between paediatric and adult DFS curves e.g. the unexpected better adult survival in ALL. The survival data could be better analysed in the future when there is more detailed information on disease characteristics (particularly prognostic sub-groups) of the transplanted patients.

Figure 1.5.1: Disease-free Survival for Acute Myeloid Leukaemia, 1987-2009 (Allogeneic vs. Autologous)

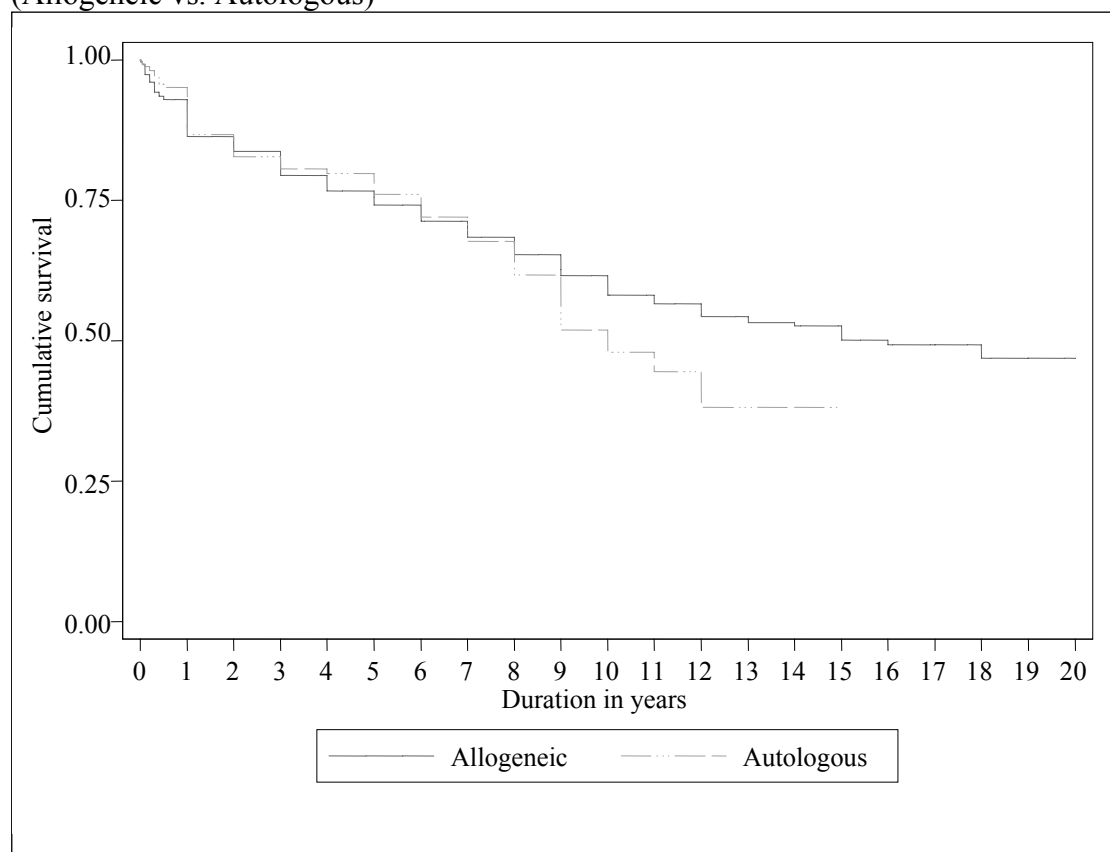


Figure 1.5.2: Disease-free Survival for Acute Lymphoblastic Leukaemia, 1987-2009 (Allogeneic)

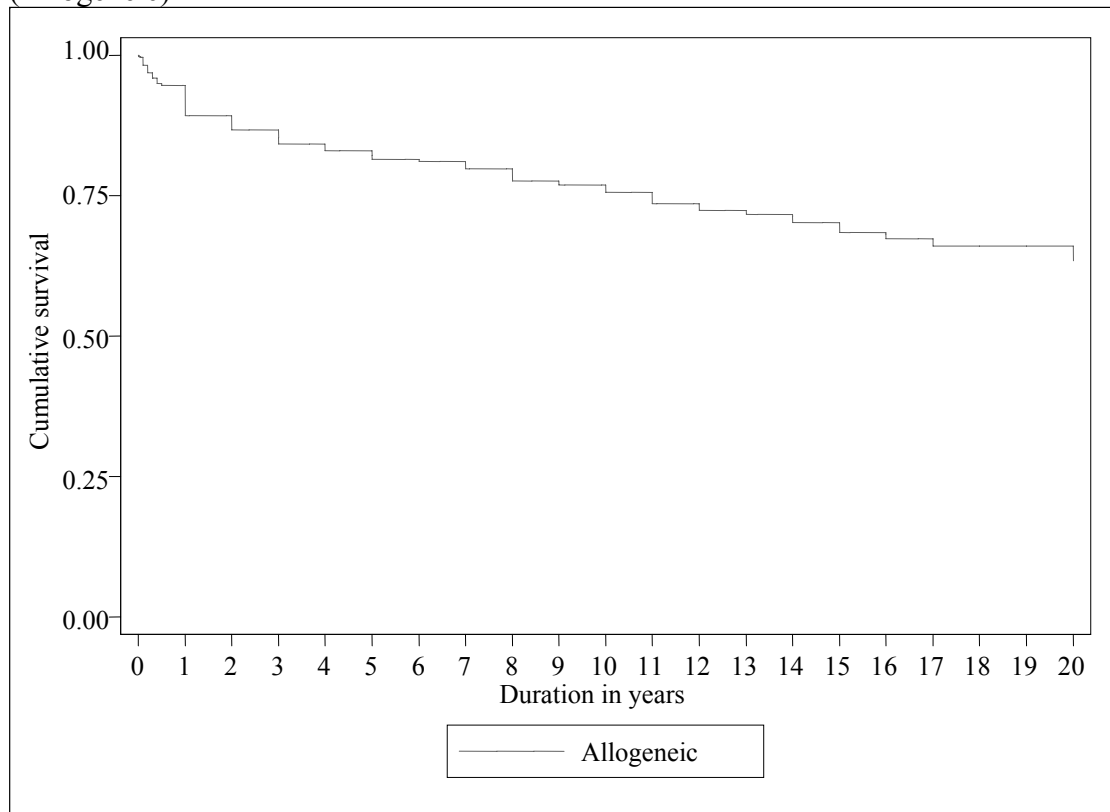


Figure 1.5.3: Disease-free Survival for Thalassaemia, 1987-2009 (Allogeneic)

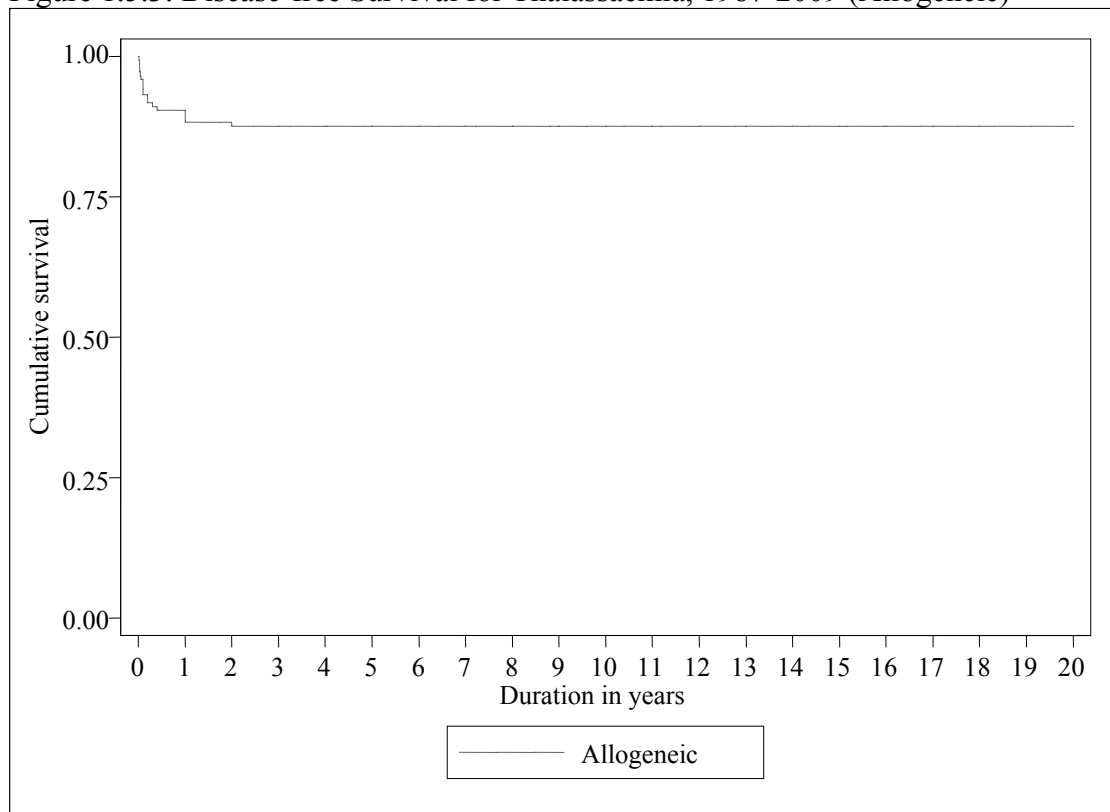


Figure 1.5.4: Disease-free Survival for Non-Hodgkin's Lymphoma, 1987-2009  
(Allogeneic vs. Autologous)

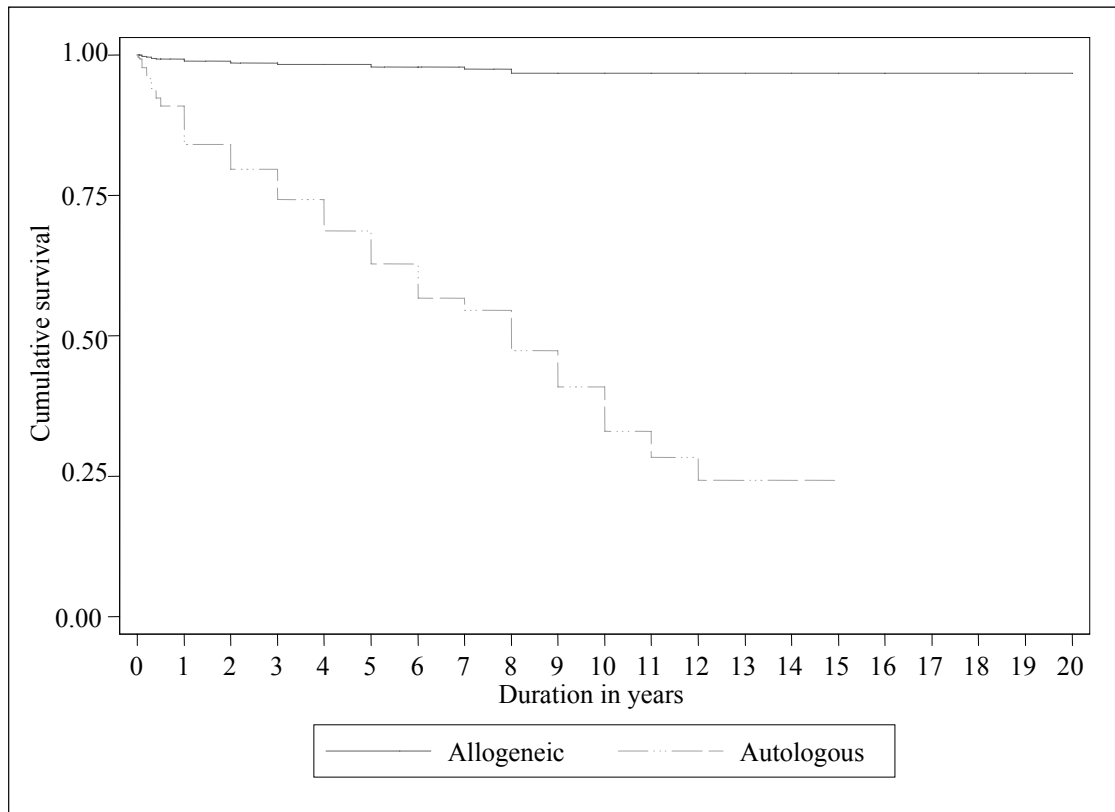


Figure 1.5.5 Disease-free Survival for Hodgkin's Disease, 1987-2009 (Autologous)

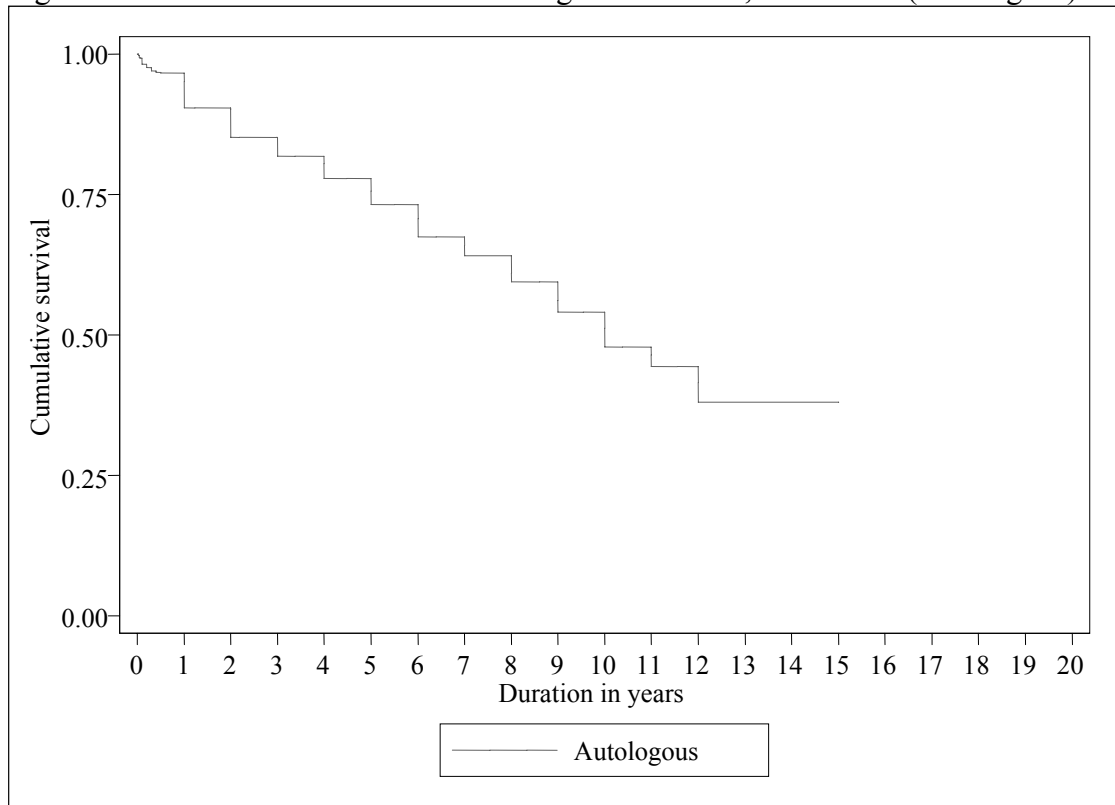


Figure 1.5.6: Disease-free Survival for Chronic Myeloid Leukaemia, 1987-2009 (Allogeneic)

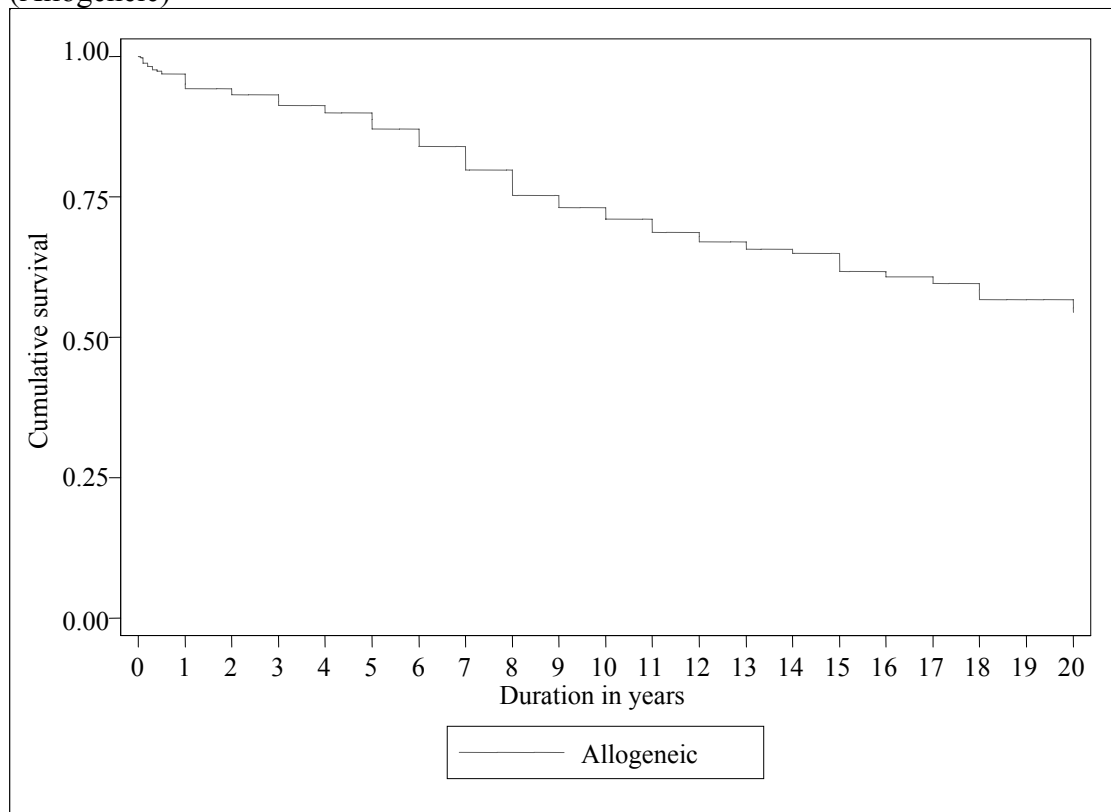


Figure 1.5.7: Disease-free Survival for Aplastic Anaemia, 1987-2009 (Allogeneic)

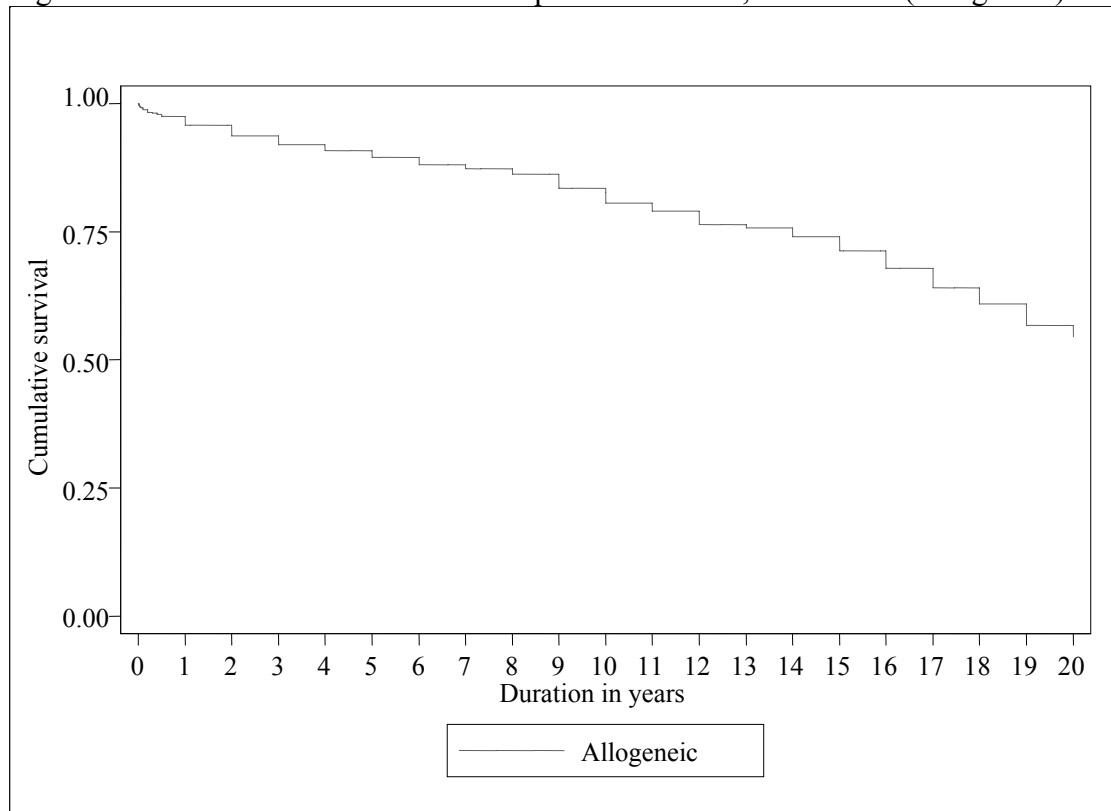
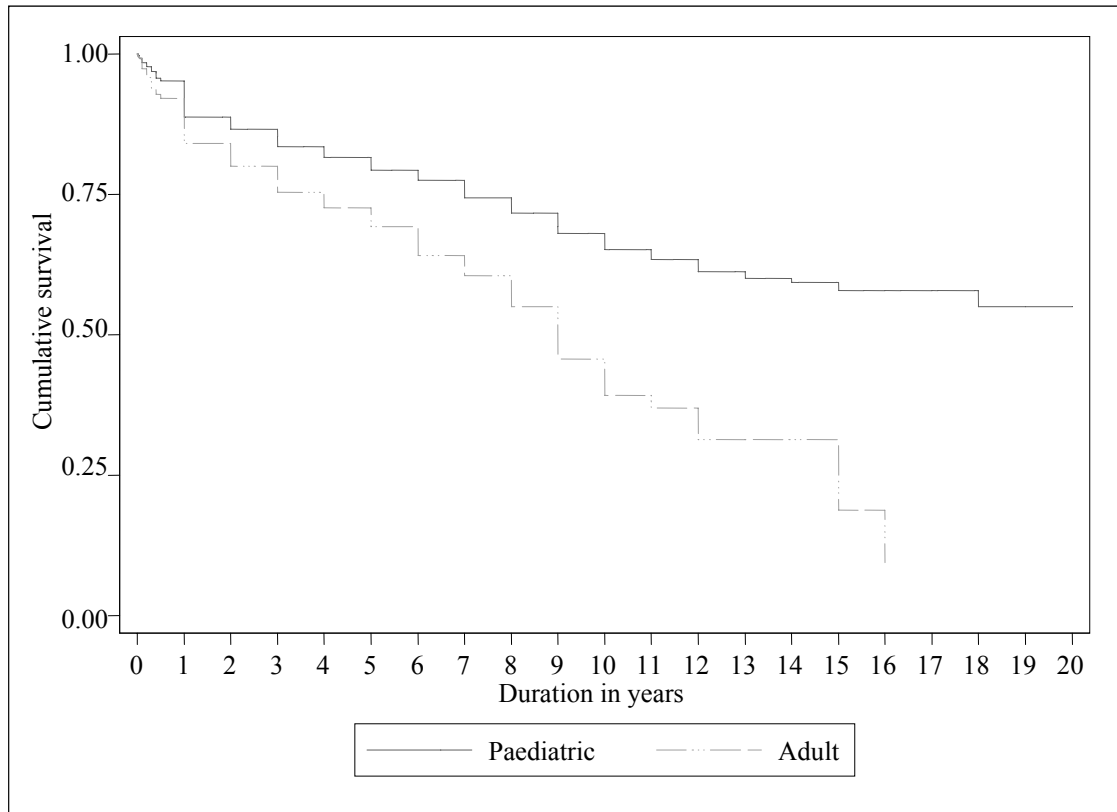


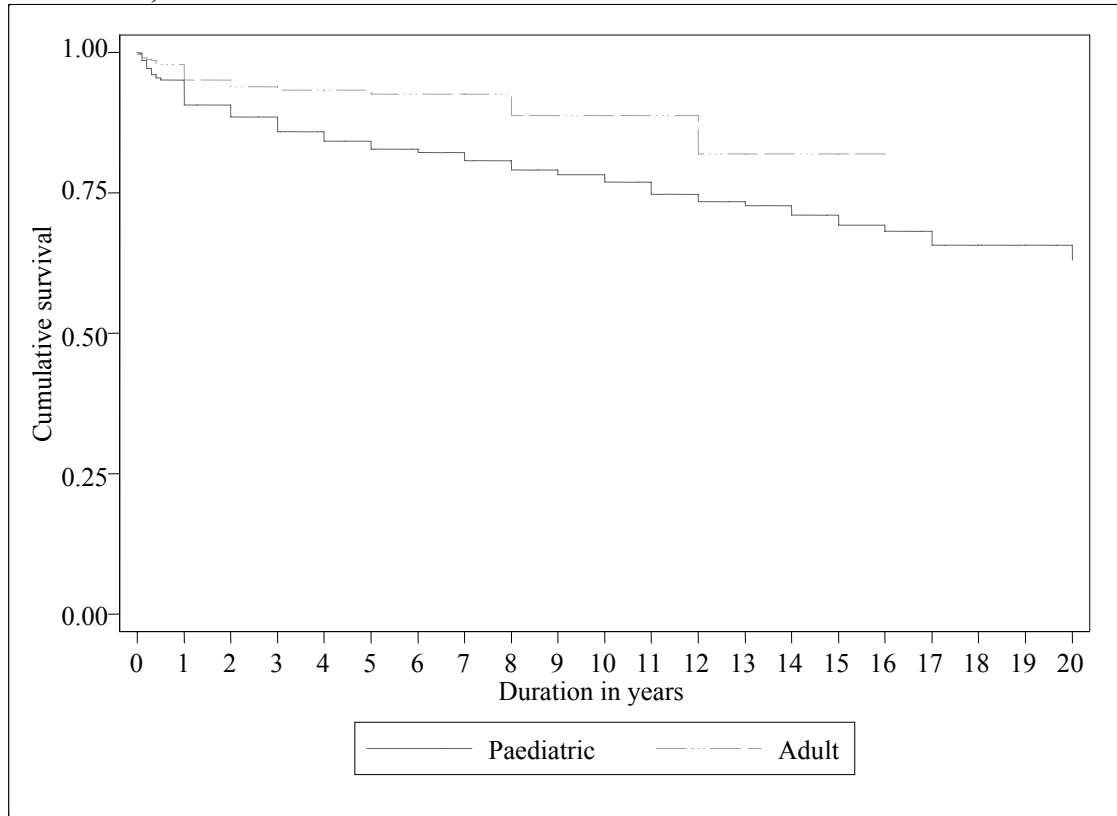


Figure 1.5.8: Disease-free Survival by Age Group for Acute Myeloid Leukaemia, 1987-2009



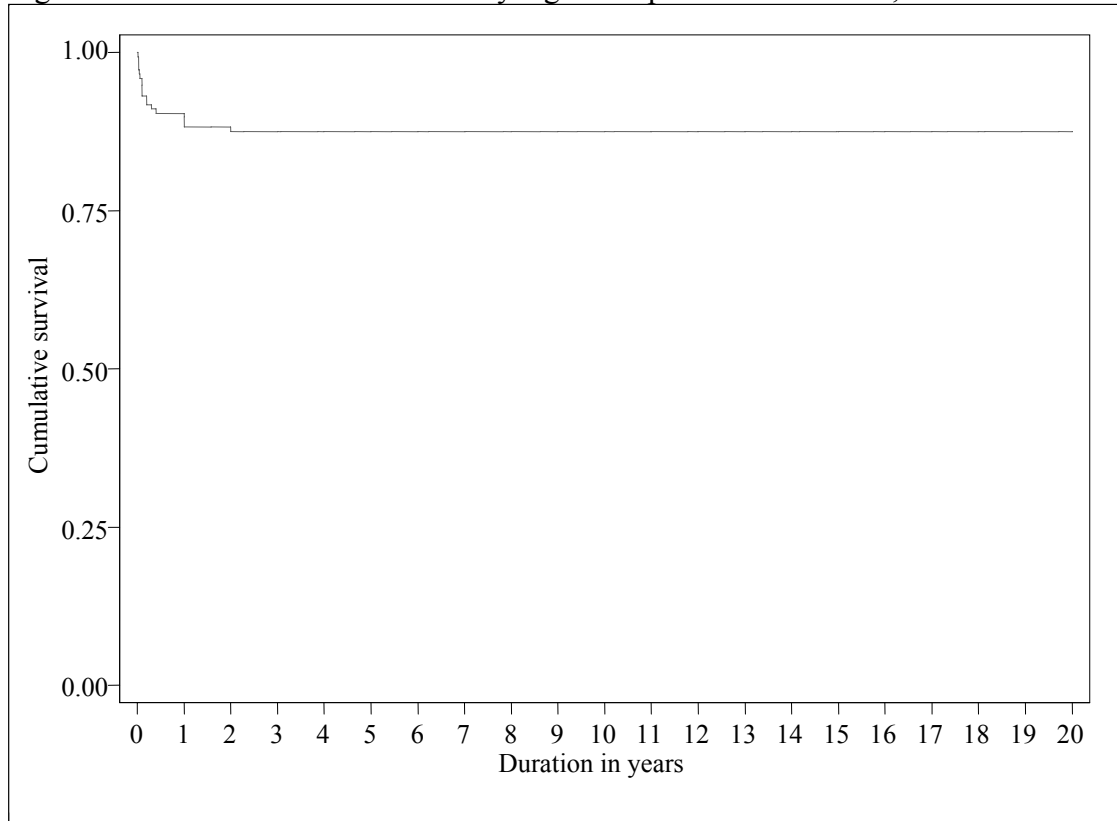
Paediatric is defined as age  $\leq 18$  years and adult age  $> 18$  years

Figure 1.5.9: Disease-free Survival by Age Group for Acute Lymphoblastic Leukaemia, 1987-2009



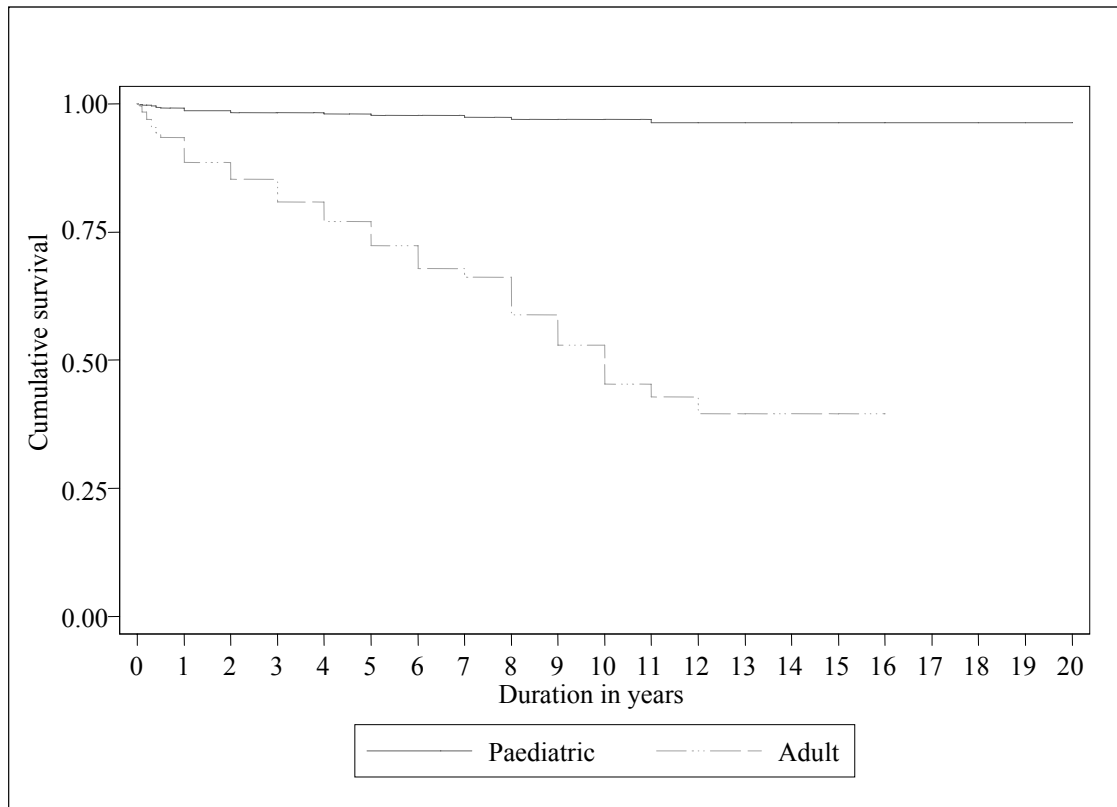
Pediatric is defined as age  $\leq 18$  years and adult age  $> 18$  years

Figure 1.5.10: Disease-free Survival by Age Group for Thalassaemia, 1987-2009



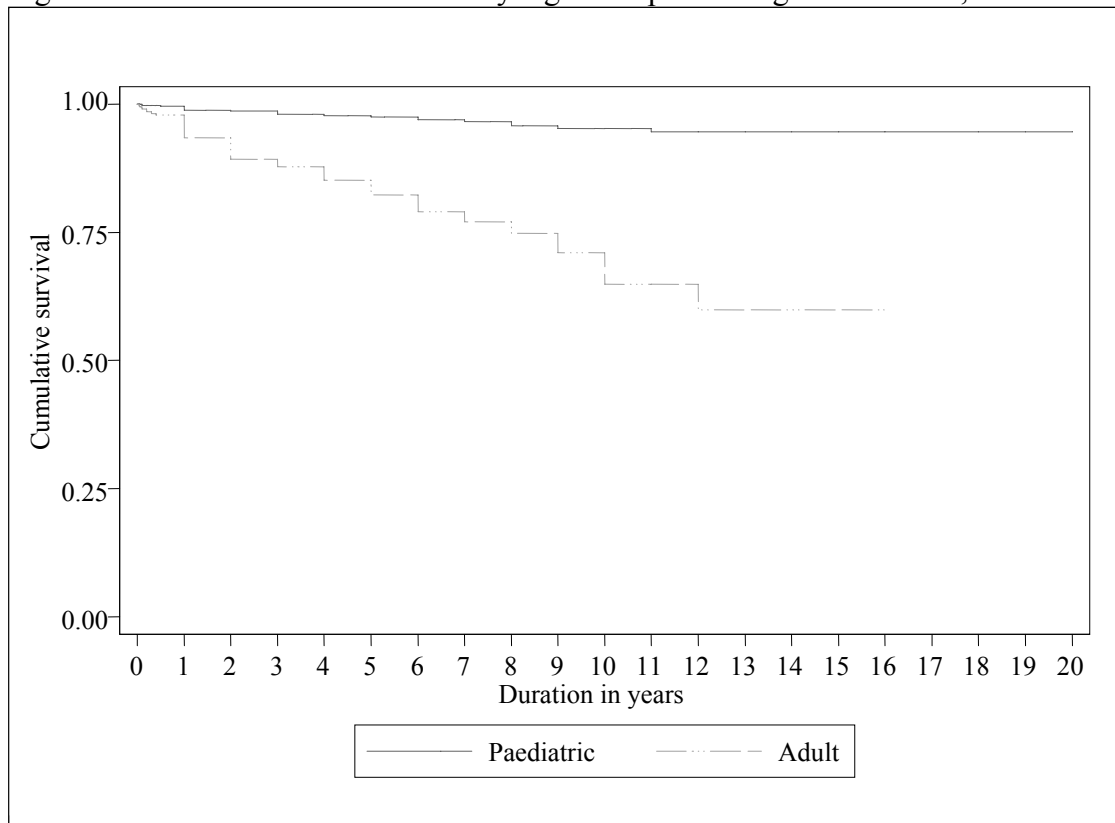
\*No adult cases reported for Thalassaemia

Figure 1.5.11: Disease-free Survival by Age Group for Non-Hodgkin’s Lymphoma, 1987-2009



Pediatric is defined as age  $\leq 18$  years and adult age  $> 18$  years

Figure 1.5.12: Disease-free Survival by Age Group for Hodgkin's Disease, 1987-2009



Paediatric is defined as age  $\leq 18$  years and adult age  $> 18$  years

Figure 1.5.13: Disease-free Survival by Age Group for Chronic Myeloid Leukaemia, 1987-2009

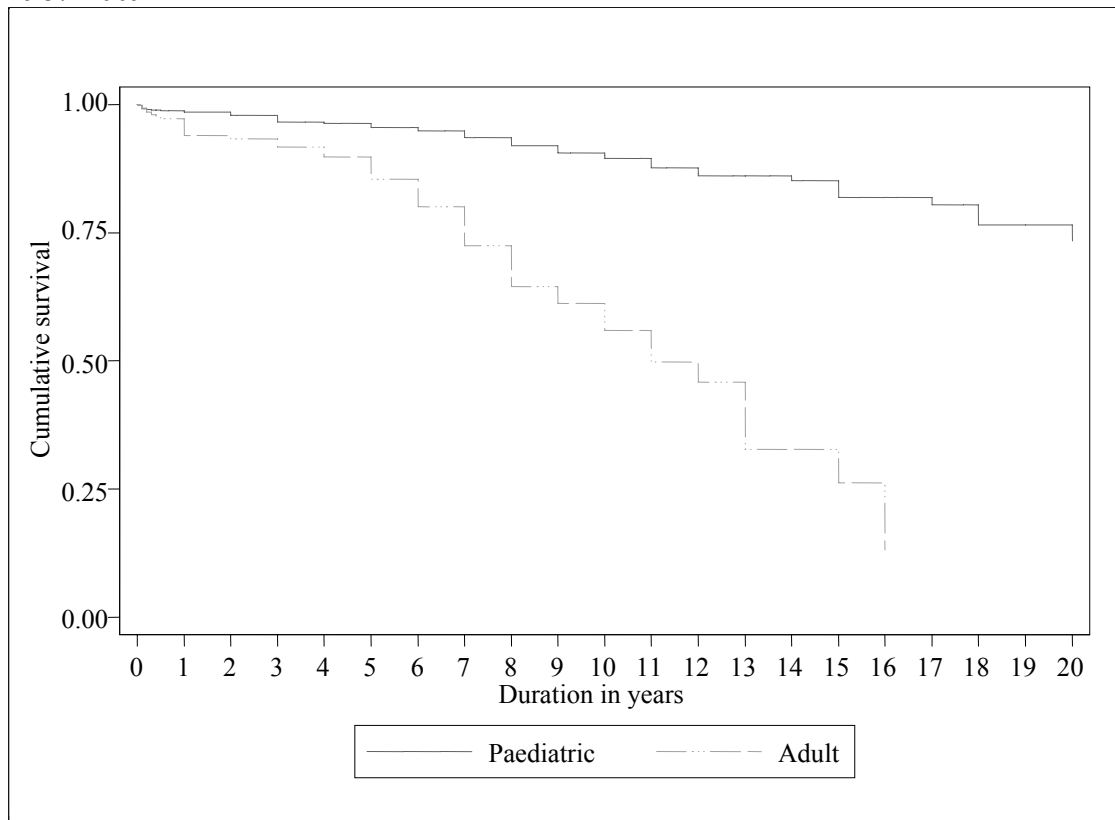
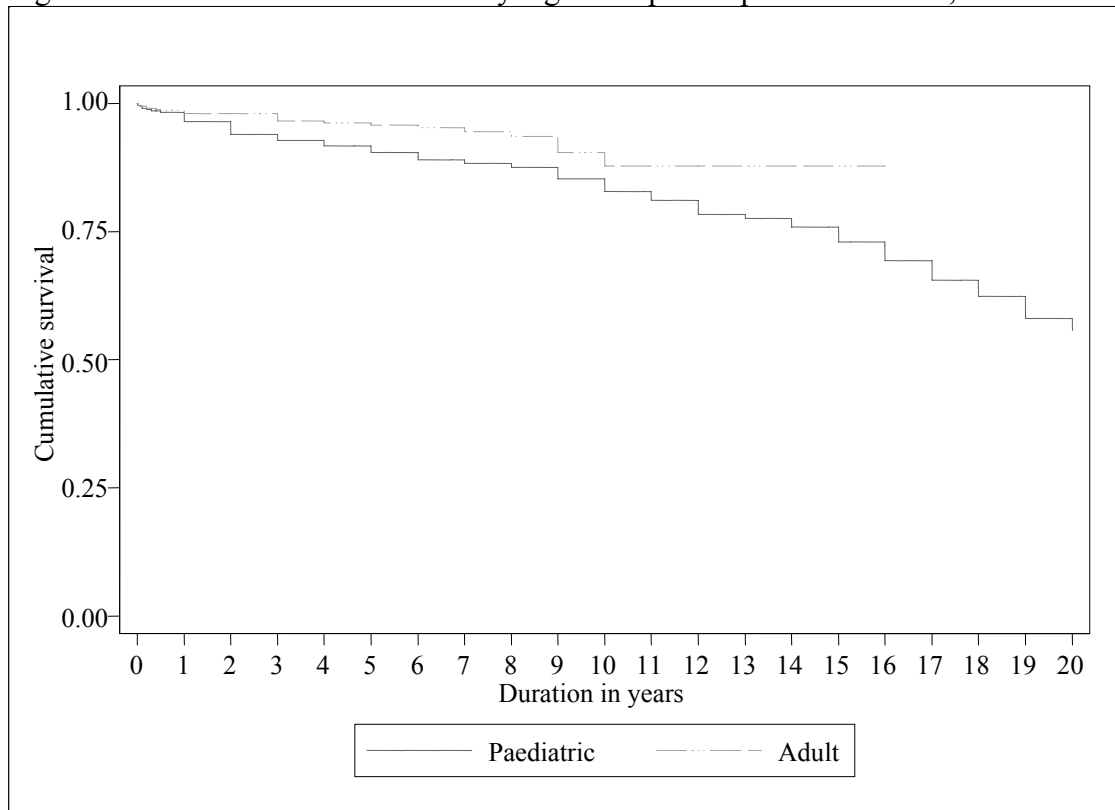


Figure 1.5.14: Disease-free Survival by Age Group for Aplastic Anaemia, 1987-2009



Paediatric is defined as age  $\leq 18$  years and adult age  $> 18$  years