



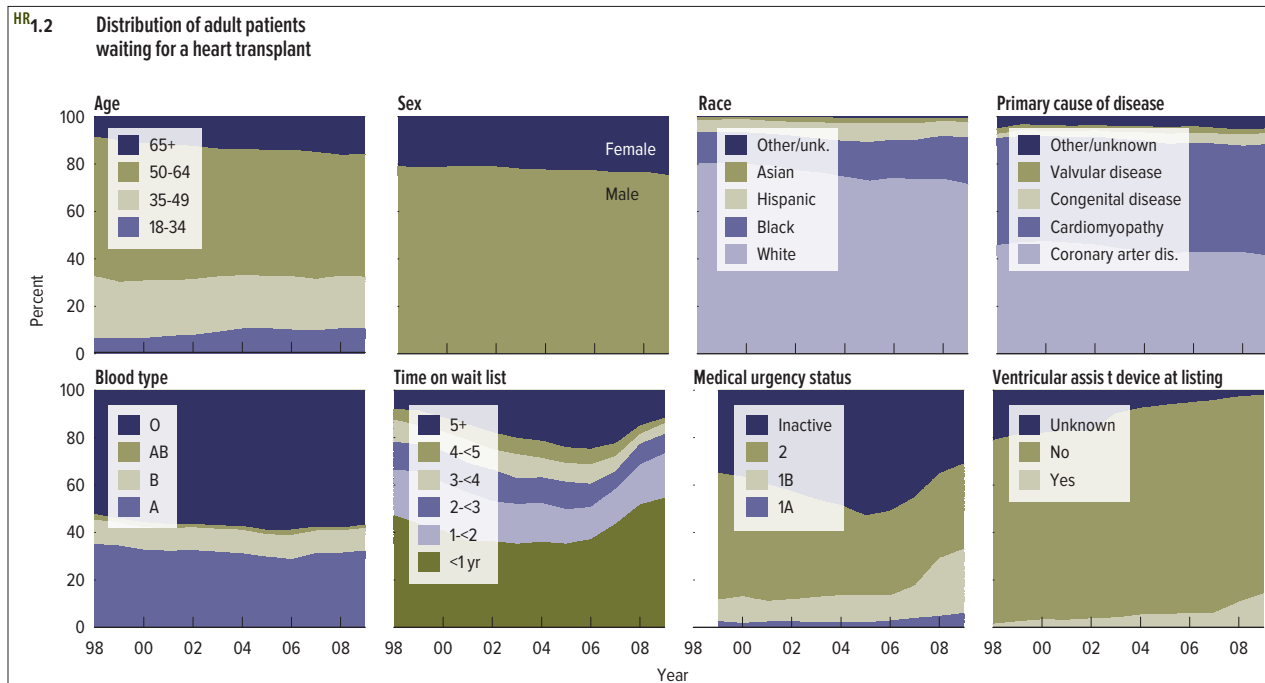
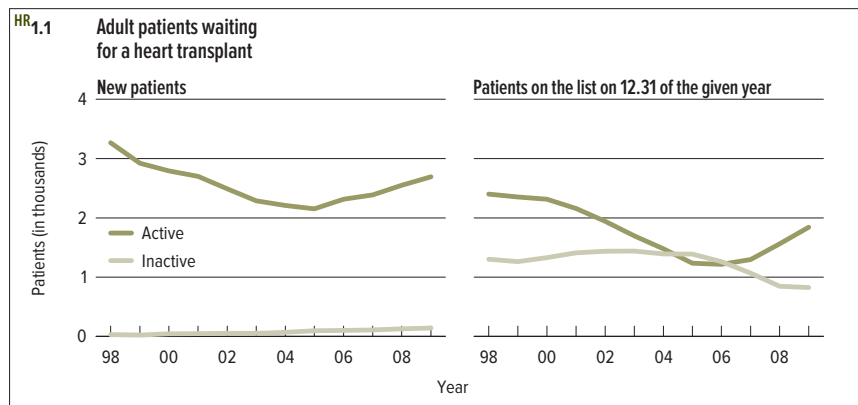
heart

Despite the availability of successful medical therapies for end-stage heart failure, and now of mechanical circulatory support, heart transplant remains the best option for appropriate candidates with end-stage heart failure. The total number of heart-alone transplants performed has varied over the past 12 years. Between 1998 and 2004, the number of heart transplants declined from 2,083 to 1,724; however, in 2005 the downward trend reversed, and numbers achieved a plateau between 2005 and 2009 (Figure 3.1). In 2009, 1,853 heart transplants were performed. Both short-term and long-term graft survival rates have improved over the past decade. In 2009, the 6-month graft survival rate was 91.6%; the 1-year rate was 88.6%. This trend toward improvement, however, is tempered by the fact that long-term graft survival remains poor; 10-year graft survival in 1999 transplants was 53% (Figure 5.1). Overall, the number of new patients added to the heart transplant waiting list declined over the past 12 years. This trend reached a nadir in 2005, and has reversed in more recent years (Figure 1.1). A similar trend was seen in the number of patients actively awaiting transplant. Despite downward trends in recovery rates and donations, and increased waiting time, the mortality rate on the waiting list declined over the past 12 years from 20.7% to 13.7% (Figure 1.10). Multi-organ transplants are increasing; in 2009, 2.77% of hearts were transplanted with a kidney and 0.58% were transplanted with a liver. The proportion of hearts transplanted with a lung has declined, continuing a decade-long trend (Figure 2.4). Finally, the standard immunosuppression regimen has changed; in 2008, the combination of tacrolimus and mycophenolate was used in 55.6% of heart transplant recipients at one year post-transplant (Figure 6.3).

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*This heart saved my life.
I am so grateful for my donor,
my angel in heaven.*

Sonja, heart recipient



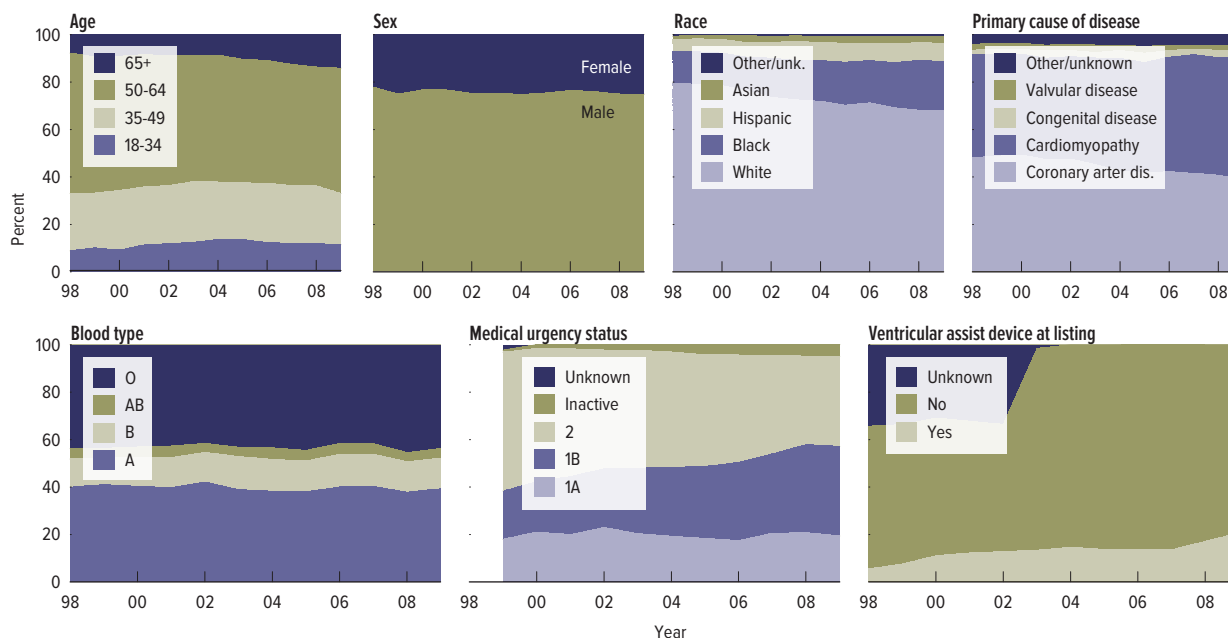
wait list Heart transplant remains the best option for many patients with end-stage heart failure. Although the prevalence of heart failure continues to increase, the number of new patients added to the active heart transplant waiting list declined from 3,265 to 2,153 between 1998 and 2005, resulting in a decline in the total number of patients on the waiting list during this period. Since 2006, however, there has been a resurgence in the number of additions to the waiting list (Figure 1.1), and in 2009 the number of new active patients totaled 2,692. In October, 2002, discontinuation of CMS requirements for reimbursement after implantation of a left-ventricular assist device (LVAD) likely resulted in an increase in the proportion of

patients initially listed as inactive (Figure 1.1). The changing trend in waiting list status may also reflect the practice of some centers to postpone actively listing potential recipients who have LVADs until their condition qualifies them for status 1A or 1B.

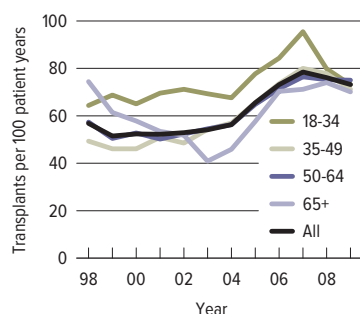
Nearly 52% of patients awaiting heart transplant are aged 50 to 64 years. This represents an overall decline in this age group since 1998 (Figure 1.2). The number of newly listed candidates aged 65 years or older almost doubled between 1998 and 2009 (Figure 1.3). Between 1998 and 2009, the proportion of whites on the waiting list gradually declined (Figure 1.2).

In 2009, 47.0% of patients awaiting transplant had cardiomyopathy, the most prevalent cause of end-stage heart failure among

HR1.3 Distribution of adult patients newly listed for a heart transplant



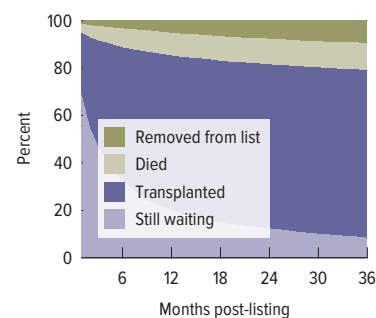
HR1.4 Transplant rates among adult patients wait-listed for a heart transplant, by age



HR1.5 Heart transplant waiting list activity among adult patients

	2007	2008	2009
Listings at start of year	2,478	2,361	2,413
Listings added during year	2,633	2,825	2,966
Listings removed during year	2,750	2,773	2,710
Listings at end of year	2,361	2,413	2,669
Removal reason			
Deceased donor transplant	1,879	1,804	1,855
Patient died	388	442	446
Too sick to transplant	39	38	68
Improved, tx not needed	300	246	193
Other	144	243	148

HR1.6 Heart tx waiting list status by month post-listing among new adult listings in 2006



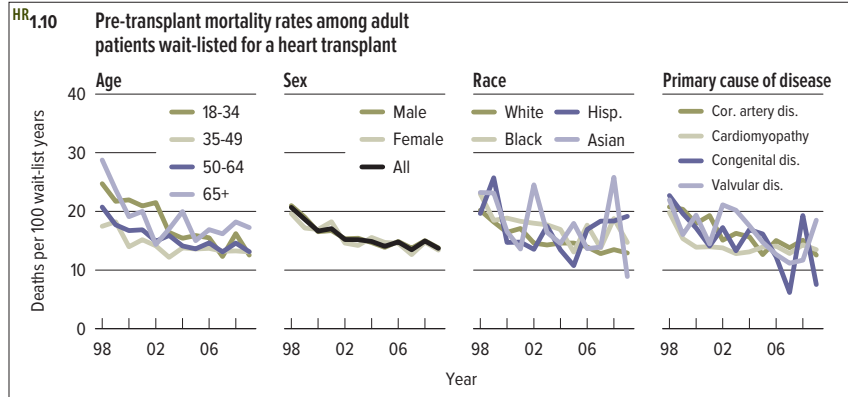
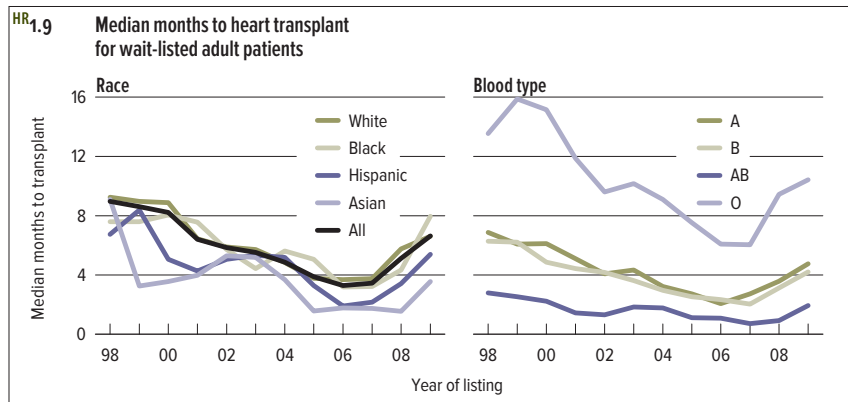
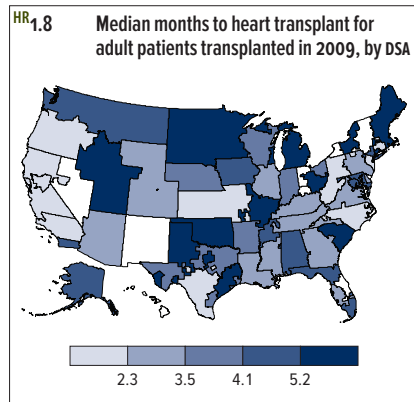
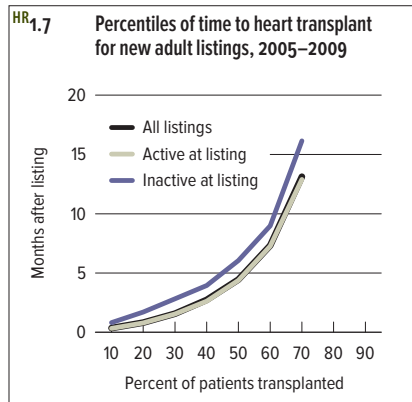
listed patients. The proportion with coronary artery disease, the most common reason for listing between 1998 and 2002, declined to 41.2% in 2009 (Figure 1.2).

In 2006, Organ Procurement and Transplantation Network (OPTN) policy changed to allow prioritization of zone A status 1A and 1B patients ahead of local status 2 patients. As a result, prevalence of patients waiting for more than 2 years has declined (Figure 1.2).

Prevalence of patients awaiting heart transplant as status 1B has grown substantially. This is most likely a reflection of growing LVAD use and the ability to more readily list these patients as 1B (Figures 1.2 and 1.3).

The rate of heart transplant (per 100 patient-years) has increased since 1998 from 56.9 to 73.3 in 2009. The transplant rate for patients aged 50 to 64 years, at 75.1, exceeded rates for other age groups (Figure 1.4). In 2009, 1,855 listings were removed from the list because the patient received a heart transplant; 446 died while awaiting transplant (Figure 1.5).

Among patients newly listed for heart transplant in 2006, 8% were still waiting, 71% had undergone transplant, and just over 11% had died by 3 years after listing. In 2006, the greatest proportion of heart transplants was performed during the first year of listing. The greatest proportion of deaths also occurred during the first year (Figure 1.6).



HR.1.11 Characteristics of adult patients on the heart tx waiting list on December 31, 2009

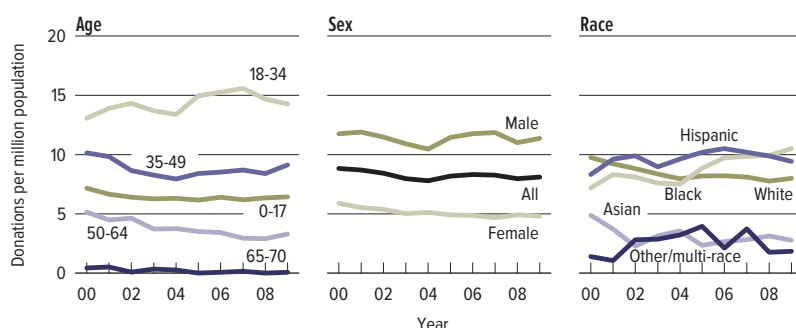
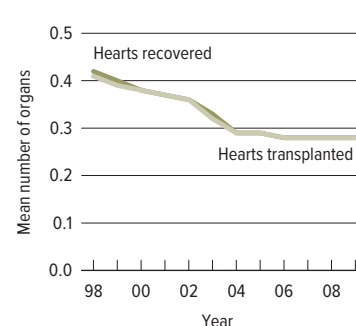
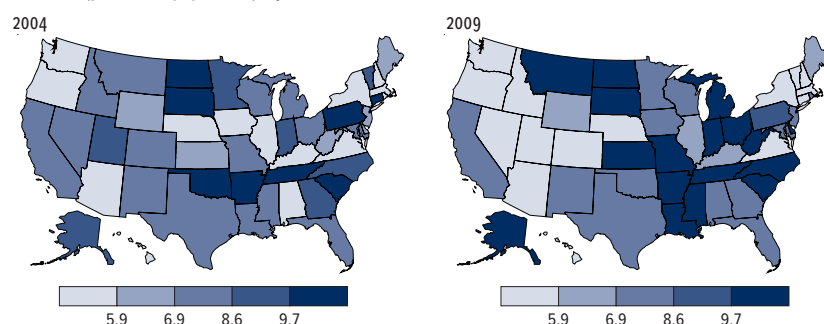
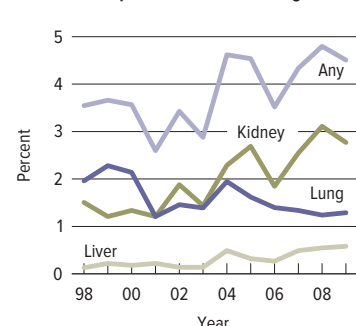
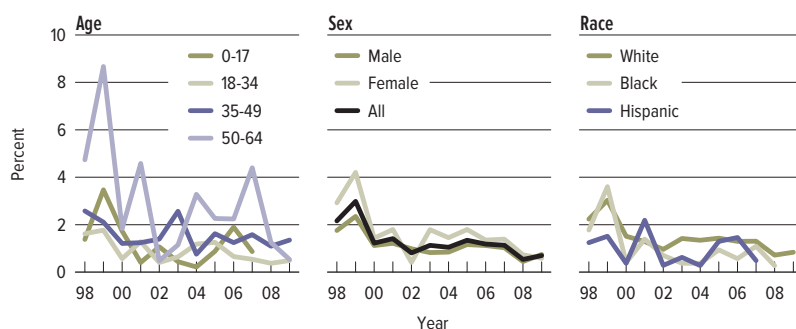
	Level	N	%
Age	18-34	279	10.5
	35-49	583	21.9
	50-64	1,378	51.7
	65+	426	16.0
Sex	Female	662	24.8
	Male	2,004	75.2
Race	White	1,905	71.5
	Black	520	19.5
	Hispanic	175	6.6
	Asian	46	1.7
	Other/unknown	20	0.8
Primary cause of disease	Cor. artery disease	1,099	41.2
	Cardiomyopathy	1,253	47.0
	Congenital disease	122	4.6
	Valvular disease	56	2.1
	Other/unknown	136	5.1
Transplant history	Listed for first tx	2,554	95.8
	Listed for subseq tx	112	4.2
Blood type	A	858	32.2
	B	254	9.5
	AB	40	1.5
	O	1,514	56.8
Time on wait list	<1 year	1,451	54.4
	1-<2	502	18.8
	2-<3	218	8.2
	3-<4	121	4.5
	4-<5	62	2.3
	5+	312	11.7
Medical urgency status	1A	157	5.9
	1B	724	27.2
	2	960	36.0
	Inactive	825	31.0

wait list Among candidates wait-listed for heart transplant in 2005–2009, 50% underwent transplant in less than 5 months. The median time to transplant was 135 days (Figure 1.7). For patients who underwent transplant in 2009, the median waiting time by donor service area ranged from 1.1 months to 12.4 months (Figure 1.8).

In 2009, the median waiting time was shortest for Asians, at 3.6 months; median waiting time for blacks was 8 months. The overall median waiting time has increased to 6.6 months, despite a decline of almost two-thirds between 1998 and 2006. This increase was more pronounced in racial minority groups, which experienced a more than 2-fold increase between 2006 and 2009 (Figure 1.9).

The pre-transplant mortality rate (per 100 wait-list years) has fluctuated since 1998 within age and race groups, and in 2009 was highest for patients aged 65 years or older and Hispanics (Figure 1.10).

On December 31, 2009, 52% of patients on the waiting list were aged 50 to 64 years, 22% were aged 35 to 49 years, and 16% were aged 65 years or older; 72% were white, 20% were black, approximately 7% were Hispanic, and nearly 2% were Asian. Ninety-six percent were listed for a first heart transplant and 4% for a subsequent transplant. Fifty-four percent had been waiting less than 1 year and 12% for 5 years or more. Only 6% were listed as status 1A; 36% were listed as status 2 (Figure 1.11).

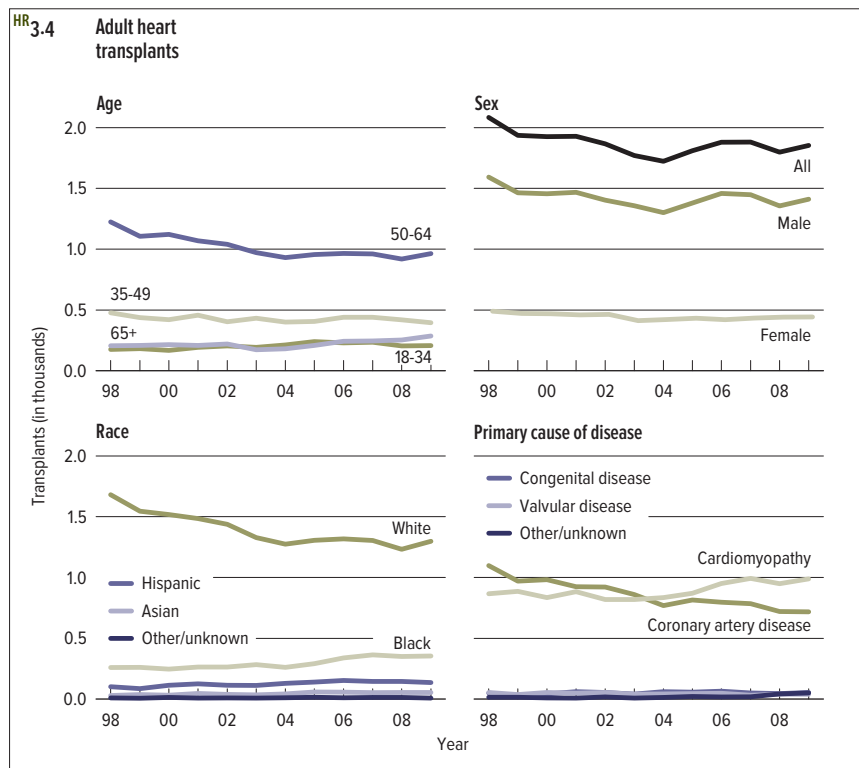
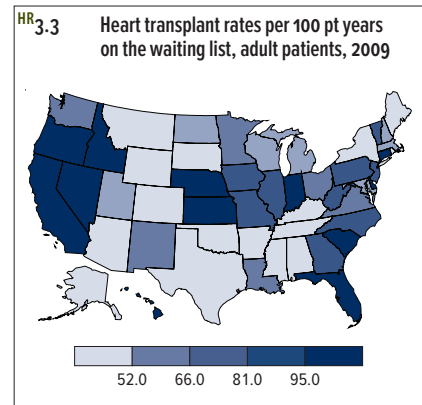
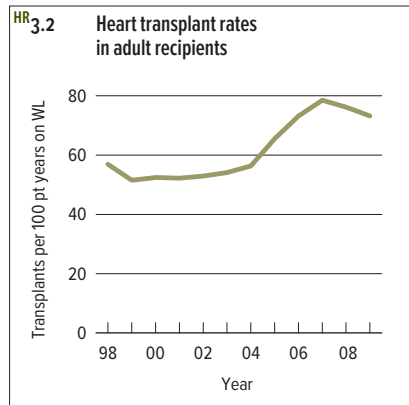
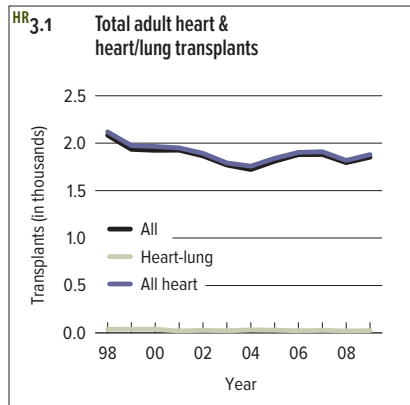
HR 2.1 Heart donations from deceased donors per million population**HR 2.2** Hearts recovered per donor & hearts transplanted per donor**HR 2.3** Deceased donor heart donation rates (per million population), by state**HR 2.4** Deceased donor hearts transplanted with another organ**HR 2.5** Discard rates for hearts recovered for transplant

deceased donation Overall, heart donations have dropped from 8.83 per million population (pmp) to 8.11 pmp since 2000 (Figure 2.1). Deceased donations pmp have been consistently highest in patients aged 18 to 34 years. Heart donation rates tend to be higher in men than in women. Donation rates for blacks increased substantially between 2000 and 2009, from 7.18 pmp to 10.5 pmp (Figure 2.1). Considerable geographic variation in deceased heart donation remains (Figure 2.3).

The transplant rate of hearts per donor has been nearly identical to the rate of recovery, reflecting optimal use of recovered hearts (Figure 2.2). Among 2009 heart recipients, 4.5% have at

least one other transplanted organ, part of an increasing trend over the past 12 years primarily due to a rise in simultaneous kidney and simultaneous liver transplants (Figure 2.4). Kidneys were the most common organs transplanted with hearts, reaching a peak of 3.1% in 2008. Simultaneous lung transplants reached a plateau over the past 5 years (Figure 2.4).

The low discard rate for deceased donor hearts trended downward between 2005 and 2008. Discard rates were lowest for heart donors aged 34 years or younger. In general, male hearts were discarded less frequently than female hearts except in 2002, when the discard rate of female hearts appeared to decline substantially (Figure 2.5).

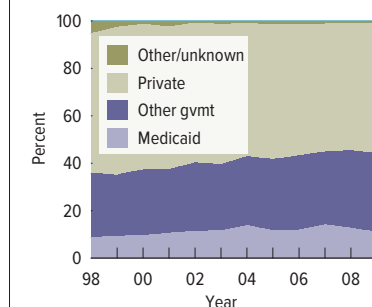


transplant The number of heart and heart/lung transplants has decreased by 11% since 1998 (Figure 3.1). In 2009, 1,853 heart transplants and 26 heart/lung transplants were performed. The rate of heart transplants (per 100 patient-years on the waiting list) has increased notably, from 56.9 in 1998 to 73.3 in 2009 (Figure 3.2). Geographic variation is wide (Figure 3.3). More than half of all transplant recipients were aged 50 to 64 years. Men underwent heart transplant more than 3 times more frequently than women. The proportion of white recipients decreased from 80.7% of all recipients in 1998 to 70.0% in 2009. In contrast, the proportions of racial minor-

ity groups have increased; between 1998 and 2009, proportions of blacks increased from 12.5% to 19.2%, Hispanics from 4.9% to 7.4%, and Asians from 1.4% to 2.9%. Cardiomyopathy was the single most important reason for heart transplant (53.4%), followed by coronary artery disease (38.7%). Valvular disease was an infrequent reason for transplant (2.2%) (Figure 3.4). The proportion of patients with valvular heart disease who experienced pre-transplant mortality has increased since 2008 (Figure 1.10).

The percentage of heart transplant recipients with Medicaid or other government health care coverage has increased, although most recipients are still insured by private insurance (Figure 3.5).

HR 3.5 Insurance coverage among adult heart transplant patients at time of transplant



In 2009, 11.0% of patients had Medicaid as primary insurance at the time of transplant, 33.1% had another government source, and 55.0% had private insurance.

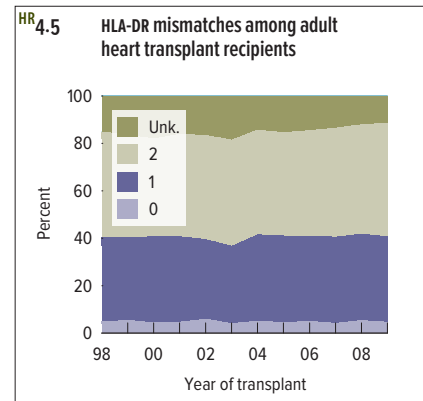
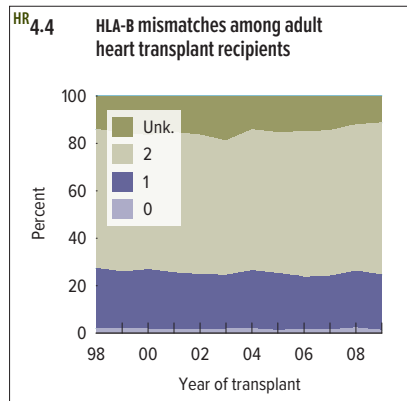
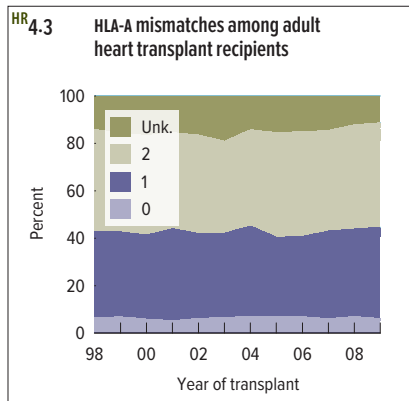
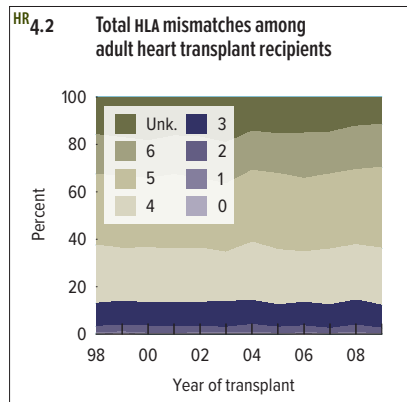
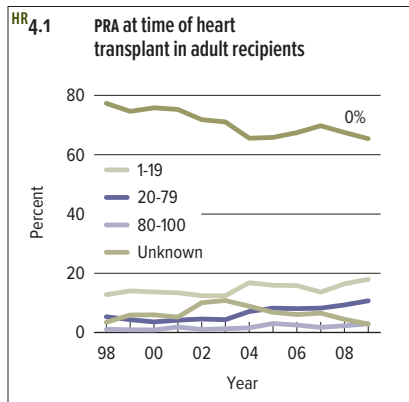
Of the 1,853 heart transplants performed in 2009, 52.0% of recipients were aged 50 to 64 years, and 15.5% were aged 65 years or older; 23.9% of recipients were women, and 70.0% were white (Figure 3.6). Cardiomyopathy was the primary cause of end-stage heart failure for most patients (53.4%). Most patients (96.5%) underwent transplant for the first time and 3.5% underwent subsequent transplant. Blood group A was the most common blood group. Waiting time was less than 1 month for 24.3% of patients,

HR 3.6 Characteristics of adult heart transplant recipients, 2009

	Level	N	%
Age	18-34	207	11.2
	35-49	395	21.3
	50-64	964	52.0
	65+	287	15.5
Sex	Female	443	23.9
	Male	1,410	76.1
Race	White	1,298	70.0
	Black	355	19.2
	Hispanic	137	7.4
	Asian	55	2.9
	Other/unlk.	8	0.5
Primary cause of disease	Cor. artery disease	718	38.7
	Cardiomyopathy	989	53.4
	Congenital dis.	54	2.9
	Valvular disease	40	2.2
	Other/unlk.	52	2.8
Transplant number	First	1,789	96.5
	Subsequent	64	3.5
Blood type	A	772	41.7
	B	276	14.9
	AB	89	4.8
	O	716	38.6
Primary payer	Private	1,020	55.0
	Medicaid	203	11.0
	Other government	614	33.1
	Other/Unknown	16	0.9
Time on wait list	<30 days	450	24.3
	31-60 days	260	14.0
	61-90 days	187	10.1
	3-<6 months	369	19.9
	6-<12 months	321	17.3
	1-<2 years	175	9.4
	2-<3 years	42	2.3
	3+ years	49	2.6
Medical urgency status	1A	964	52.0
	1B	744	40.2
	2	145	7.8
Reported history of cigarette smoking at listing	No	964	52.0
	Yes	869	46.9
	Unknown	20	1.1
Patient on VAD at transplant	No	1,135	61.3
	Yes	718	38.7
Total		1,853	100.0

and only 2.6% experienced waiting times of 3 or more years. Most patients were status 1A at the time of transplant, 46.9% were reported to be smokers at the time of listing, and 38.7% were receiving VAD support.

Thus, the typical patient who underwent heart transplant in 2009 was a white, nonsmoking man, aged 50 to 64 years, with a history of nonischemic cardiomyopathy as the reason for transplant. His blood group was A, he had private insurance, and he was listed as status 1A at the time of transplant. He waited less than 30 days (Figure 3.6).



donor-recipient matching

Prevalence of sensitized patients undergoing heart transplant with panel reactive antibody (PRA) between 20% and 79% increased substantially between 1998 and 2009, from 5.3% of patients to 10.7%. The percentage of highly sensitized patients (PRA 80% to 100%) remains low, at 3.0%; however, the overall prevalence of this high-risk group has almost tripled since 1998, from 1.1% to 3.0%. Virtual cross-matching is increasing in adult heart transplant programs and has allowed consideration of sensitized patients who might have previously been excluded (Figures 4.1 and 4.2).

Human leukocyte antigen (HLA) matching is not used in allocation for heart transplant. As a result, HLA mismatches are common (Figures 4.2–4.5); 76.3% of heart transplant recipients have 4 or more mismatches. Multiple HLA-B mismatches were most common; 64.1% of recipients have 2 HLA-B mismatches. This represented a 9.2% increase since 1998. Smaller increases in mismatches were seen for HLA-A and HLA-DR also.

Cytomegalovirus (CMV) infection is associated with significant morbidity after heart transplant and with development of cardiac allograft vasculopathy. The greatest risk of CMV infection occurs with CMV transmission to a recipient who is seronegative. Previous exposure to CMV, however, is common in the general popula-

HR 4.6 Adult heart donor-recipient cytomegalovirus (CMV) serology matching, 2005–2009

RECIPIENT	DONOR			Total
	Negative	Positive	Unknown	
Negative	13.4	21.6	0.1	35.0
Positive	21.3	37.4	0.3	59.0
Unknown	2.4	3.5	0.0	5.9
Total	37.1	62.5	0.4	100

HR 4.7 Adult heart donor-recipient Epstein-Barr virus (EBV) serology matching, 2005–2009

RECIPIENT	DONOR			Total
	Negative	Positive	Unknown	
Negative	0.7	8.8	3.0	12.5
Positive	3.3	42.3	19.3	65.0
Unknown	0.8	13.3	8.3	22.5
Total	4.8	64.5	30.7	100

HR 4.8 Adult heart donor-recipient hepatitis B core antibody (HBcAb) serology matching, 2005–2009

RECIPIENT	DONOR			Total
	Negative	Positive	Unknown	
Negative	75.6	1.7	0.3	77.6
Positive	3.9	0.2	0.0	4.2
Unknown	17.9	0.3	0.1	18.2
Total	97.5	2.2	0.3	100

HR 4.9 Adult heart donor-recipient hepatitis B surface antigen (HBsAg) serology matching, 2005–2009

RECIPIENT	DONOR			Total
	Negative	Positive	Unknown	
Negative	89.4	0.0	0.2	89.6
Positive	1.7	0.0	0.0	1.7
Unknown	8.7	0.0	0.0	8.7
Total	99.8	0.0	0.2	100

HR 4.10 Adult heart donor-recipient hepatitis C serology matching, 2005–2009

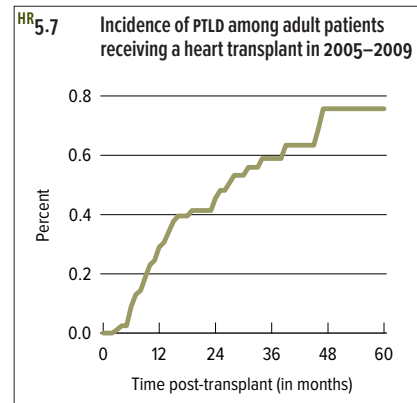
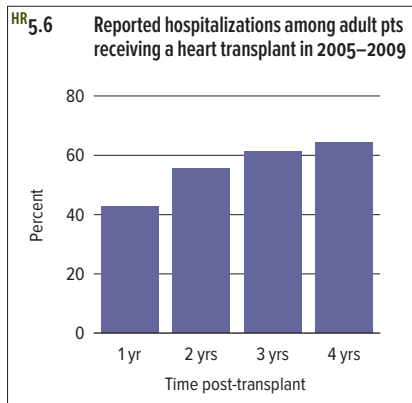
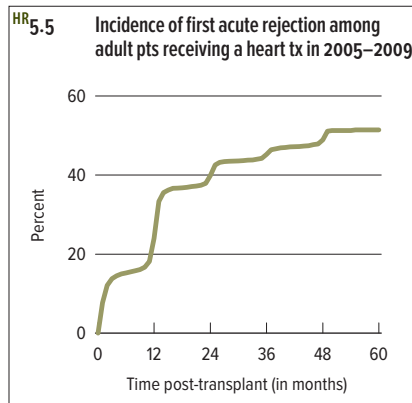
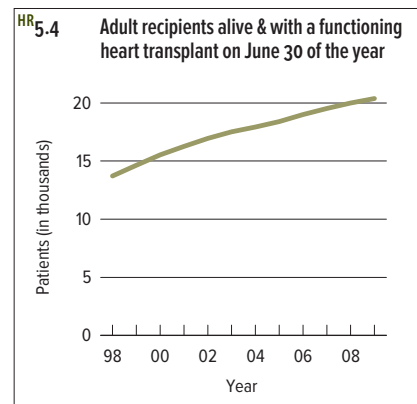
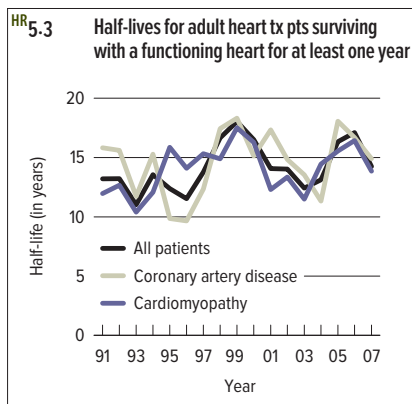
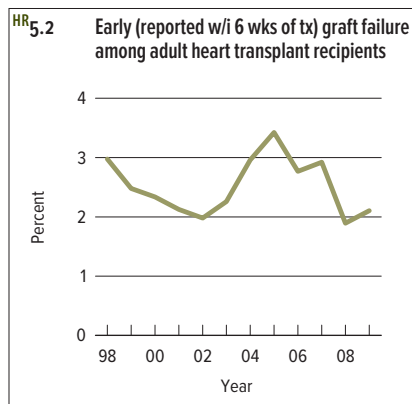
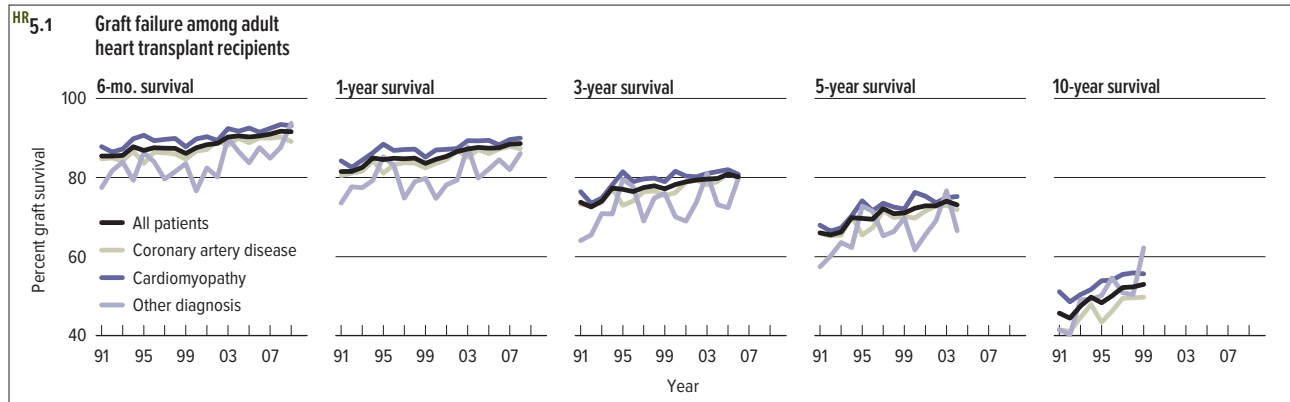
RECIPIENT	DONOR			Total
	Negative	Positive	Unknown	
Negative	86.7	0.2	0.2	87.1
Positive	1.9	0.0	0.0	1.9
Unknown	10.9	0.0	0.0	11.0
Total	99.6	0.2	0.2	100

HR 4.11 Adult heart donor-recipient human immunodeficiency virus (HIV) serology matching, 2005–2009

RECIPIENT	DONOR			Total
	Negative	Positive	Unknown	
Negative	86.3	0.0	0.1	86.4
Positive	0.1	0.0	0.0	0.1
Unknown	13.5	0.0	0.0	13.5
Total	99.9	0.0	0.1	100

tion, and between 2005 and 2009, 62.5% of donors and 59.0% of recipients were seropositive; 21.6% of recipients were in the high-risk category of donor antibody positive and recipient antibody negative (D+/R-) (Figure 4.6). Epstein-Barr virus (EBV) is also of great concern due to its association with post-transplant lymphoproliferative disorders (PTLD); 8.8% of recipients were high-risk EBV mismatches, that is, D+/R- (Figure 4.7). Prior hepatitis B infection was relatively uncommon; only 2.2% of donors whose serostatus was known had previous evidence of infection, that

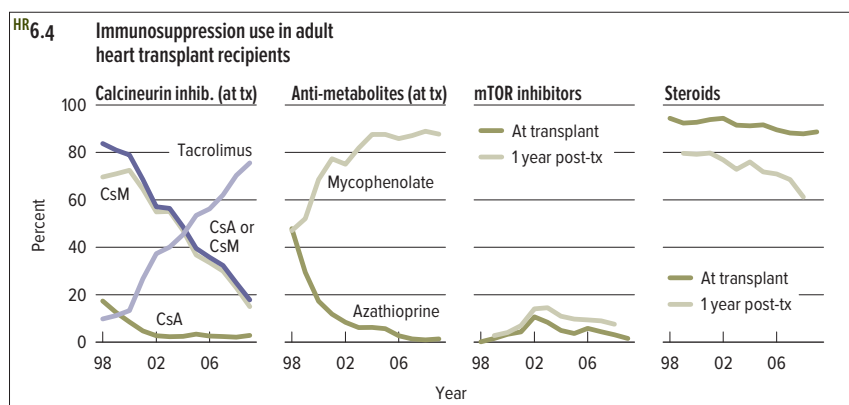
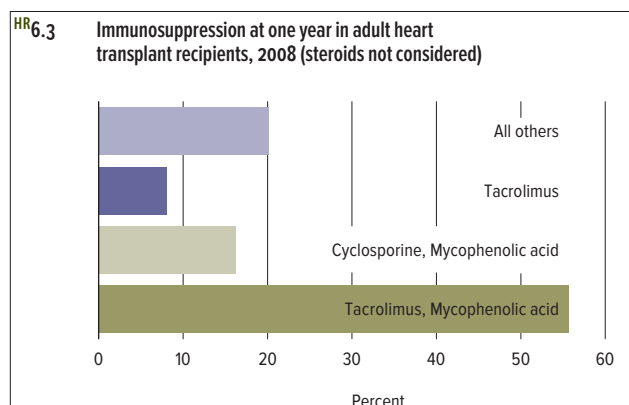
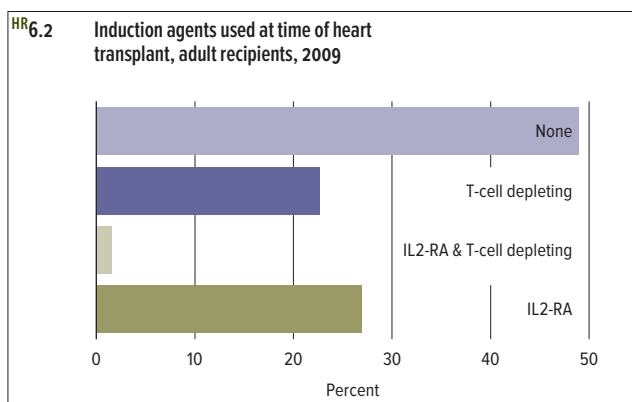
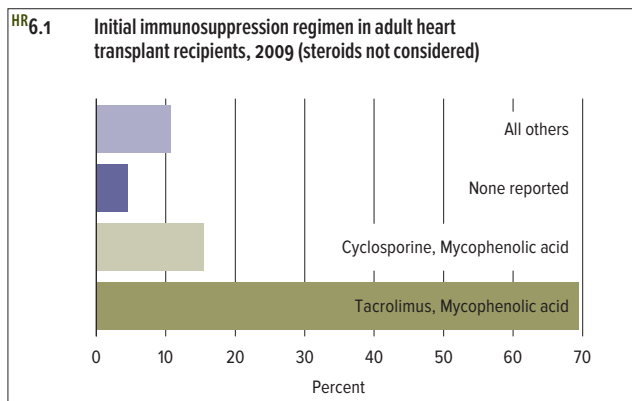
is, positive hepatitis B core antibody, and 1.7% of recipients were at high risk of transmission from a positive donor (Figure 4.8). None of the donors demonstrated immunity to hepatitis B (positive hepatitis B surface antibody) (Figure 4.9). Hepatitis C seropositivity among donors was extremely uncommon, at 0.2%, but all hearts from these donors were transplanted into seronegative recipients (Figure 4.10). Human immunodeficiency virus (HIV) serostatus was known for 99.9% of all donors; none were HIV positive (Figure 4.11)



outcomes One-year graft survival increased from 81.5% to 88.6% between 1991 and 2008 (Figure 5.1). Six-month graft survival improved from 86.1% to 91.6% between 1999 and 2009. Cardiac allograft vasculopathy, PTLD, and malignancy continue to be major contributors to reduced long-term survival. Nevertheless, five-year graft survival increased from 66.2% to 73.1% between 1993 and 2004. Ten-year graft survival also increased, from 45.7% to 53% between 1991 and 1999. Aside from minor fluctuations, trends in improved survival have been similar for patients with different diagnoses.

Incidence of early graft failure, which peaked at 3.4% in 2005, declined 38.5% since 2005 (Figure 5.2). Overall, the median sur-

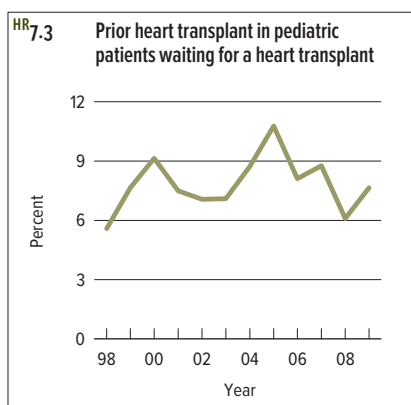
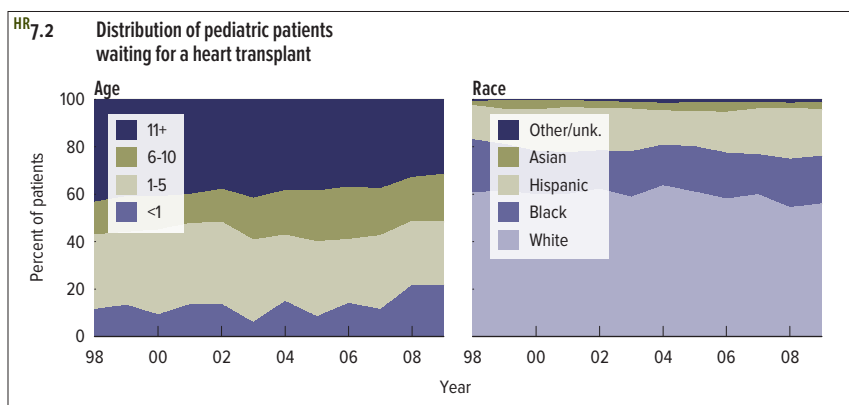
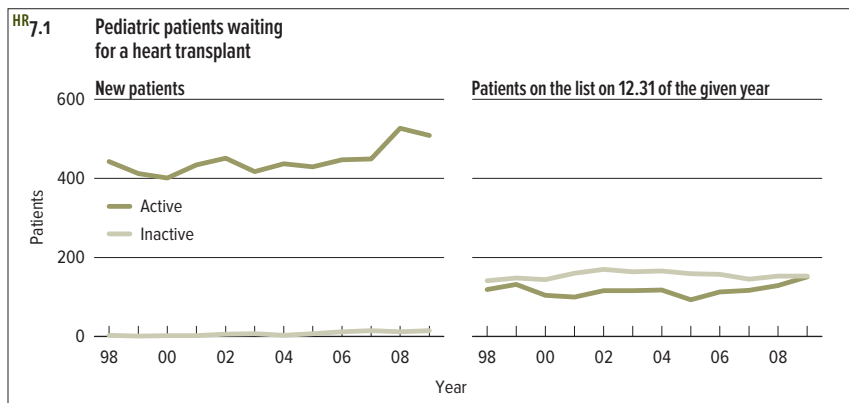
vival for recipients with a functioning graft 1 year post-transplant has trended upward (Figure 5.3). The number of heart transplant recipients who are alive with functioning grafts increased almost 50% from 13,715 in 1998 to 20,369 in 2009 (Figure 5.4). Acute rejection after heart transplant remains a challenge; 24.0% of patients who underwent transplant between 2005 and 2009 experienced a first rejection during the first year post-transplant, and by year 5, 51.4% experienced at least 1 episode (Figure 5.5). Hospitalizations are also common; by the fourth year post-transplant, nearly two-thirds of patients have been hospitalized (Figure 5.6). PTLD in adult heart transplant recipients is rare, occurring in less than 1%. More than one-third of cases occurred during the first post-transplant year (Figure 5.7).



immunosuppression

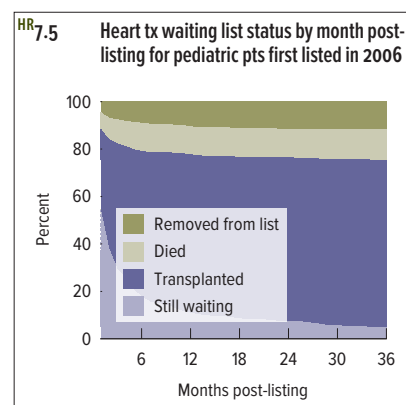
In 2009, 69.5% of heart transplant recipients received tacrolimus and mycophenolate as initial maintenance immunosuppression (Figure 6.1). Induction agents were used with approximately one-half of heart transplant recipients in 2009; 26.9% received an interleukin-2 (IL2-RA) receptor antagonist and 22.6% received a T-cell depleting agent (Figure 6.2). At 1 year post-transplant, 55.6% of patients were receiving tacrolimus and mycophenolate, and 16.2% were receiving cyclosporine A and mycophenolate. Interestingly, 8.0% were receiving tacrolimus as monotherapy within the first year post-transplant (Figure 6.3).

Over the past 12 years, tacrolimus has emerged as the calcineurin inhibitor of choice (Figure 6.4). Between 1998 and 2009, azathioprine use declined from 47.9% to 1.4%, and mycophenolate use increased from 47.0% to 87.7%. The use of mammalian target of rapamycin (mTOR) inhibitors as initial immunosuppression peaked at 10.8% in 2002, and declined to 1.6% in 2009. A similar peak was seen in the use of mTOR inhibitors at 1 year post-transplant, 14.5% in 2003 and declining to 7.5% in 2008. Corticosteroid use at the time of transplant declined slightly to 88.3% in 2007, but use has been stable since then. Maintenance corticosteroid use at 1 year remains common, but has declined in recent years from nearly 80% in 1999 to 61.2% in 2008 (Figure 6.4).



HR 7.4 Heart transplant waiting list activity among pediatric patients

	2007	2008	2009
Listings at start of year	269	263	282
Listings added during year	479	558	549
Listings removed during year	485	539	529
Listings at end of year	263	282	302
Removal reason			
Received a transplant	332	368	364
Patient died	67	102	83
Patient refused transplant	2	0	1
Transferred to another ctr	2	3	9
Improved, tx not needed	64	34	47
Too sick to transplant	14	28	23
Other	4	4	2



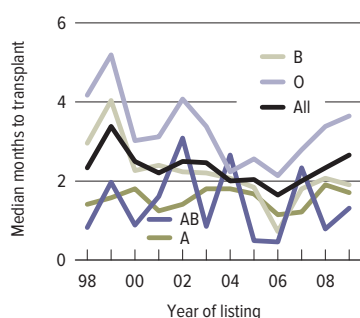
pediatric transplant

Since 1998, the number of new pediatric patients waiting for heart transplants has increased slightly (Figure 7.1). The number of prevalent patients has remained stable at approximately 250 to 300, with almost equal numbers of active and inactive patients. The percentage of patients on the waiting list aged younger than 1 year increased from 11.3% in 1998 to 21.7% in 2009 (Figure 7.2). The percentage of patients waiting for re-transplant has ranged between 5.6% and 10.8% over the past 12 years (Figure 7.3). Death was the second most common reason for removal from the waiting list, occurring in 13.8% to 18.9% of listings in 2007–2009 (Figure 7.4).

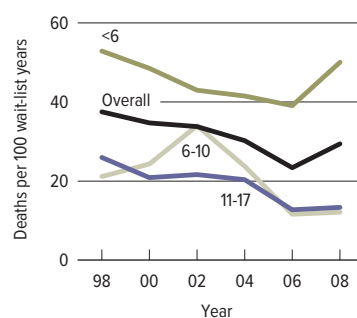
In the 2006 waiting list cohort, after 3 years, 70.9% underwent transplant, 12.7% died, 11.6% were removed from the list, and 4.8% were still waiting (Figure 7.5).

The median number of months waiting for a heart transplant was 2.7 in 2009 (Figure 7.6). Pre-transplant mortality for patients wait-listed for heart transplant declined from 37.5 deaths per 100 wait-list years in 1998 to 29.4 in 2008. Patients on the waiting list aged younger than 6 years consistently have the highest death rate, with 50.1 deaths per 100 wait-list years in 2008 (Figure 7.7). In 2009, numbers of heart transplants (including heart-lung) were 116 in patients aged younger than 1 year, 83 in patients aged 1 to 5 years, 60 in patients aged 6 to 11 years, and 103 in patients

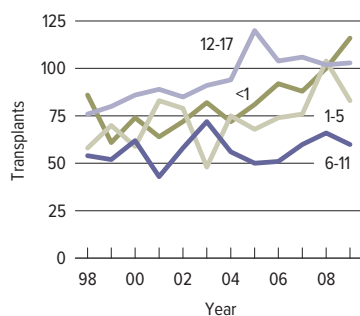
HR 7.6 Median months to heart transplant for wait-listed pediatric patients, by blood type



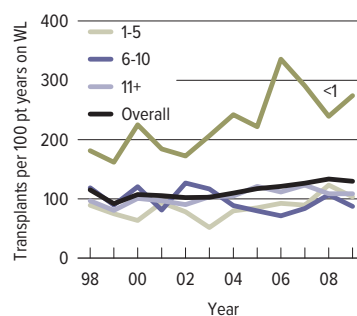
HR 7.7 Pre-tx mortality rates among pediatric patients wait-listed for a heart transplant



HR 7.8 Pediatric heart transplants (including heart-lung), by age



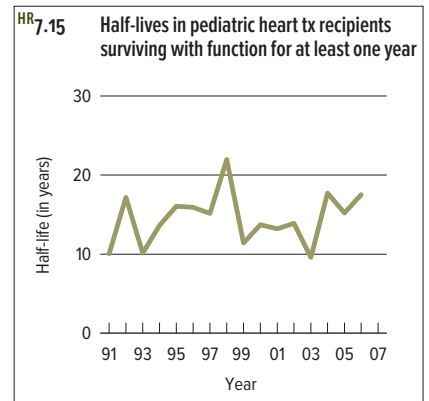
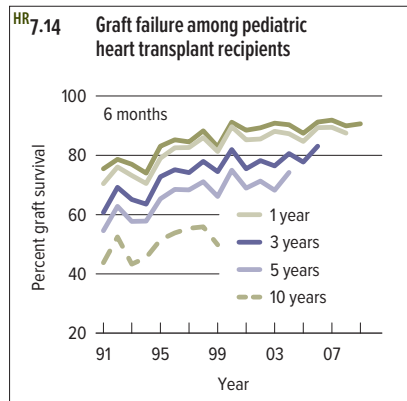
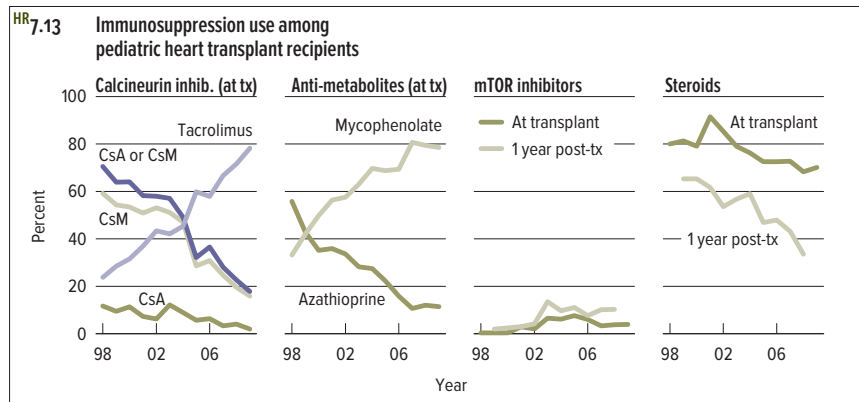
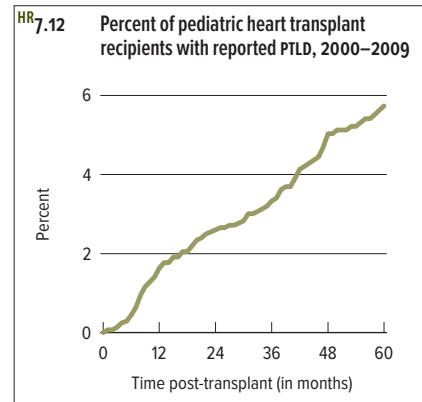
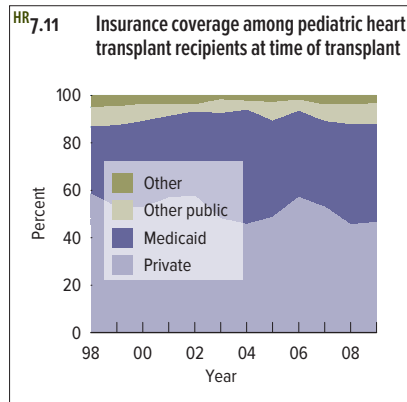
HR 7.9 Pediatric heart transplant rates, by age



HR 7.10 Characteristics of pediatric heart transplant recipients, 2007–2009

	Level	N	%
Age	<1	303	28.8
	1-5	259	24.6
	6-10	151	14.4
	11-17	339	32.2
Sex	Female	477	45.3
	Male	575	54.7
Race	White	560	53.2
	Black	211	20.1
	Hispanic	196	18.6
	Asian	62	5.9
	Other/unkn.	23	2.2
Primary cause of disease	Congenital defect	444	42.2
	Dilated myopathy: idiopathic	317	30.1
	Restr. myopathy: idiopathic	69	6.6
	Dil. myopathy: myocarditis	49	4.7
	All others	173	16.4
Transplant history	First transplant	978	93.0
	Subsequent	74	7.0
Blood type	A	379	36.0
	B	146	13.9
	AB	41	3.9
	O	486	46.2
Primary payer	Private	507	48.2
	Medicaid	421	40.0
	Other public	85	8.1
	Other	39	3.7
Time on wait list	<30 days	436	41.4
	31-60 days	203	19.3
	61-90 days	124	11.8
	3-<6 months	151	14.4
	6-<12 months	96	9.1
	1-<2 years	24	2.3
	2-<3 years	12	1.1
	3+ years	6	0.6
Status	1A	867	82.4
	1B	111	10.6
	2	74	7.0
Patient on VAD	No	885	84.1
	Yes	167	15.9
All patients	--	1,052	1,052

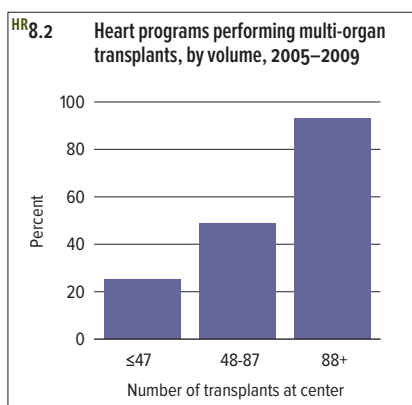
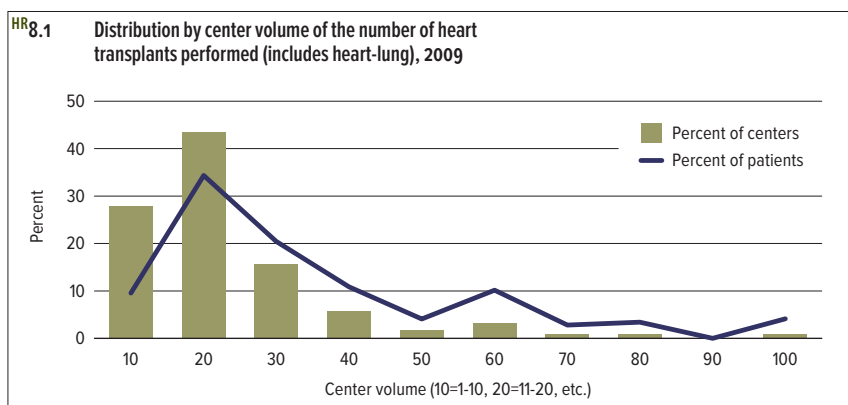
aged 12 to 17 years (Figure 7.8). Rates of pediatric heart transplants per 100 patient-years on the waiting list have increased since 1998 to the current rate of 129.7; the highest rate is for patients aged younger than 1 year, at 274.1 (Figure 7.9). Among heart transplant recipients in 2007–2009, 28.8% were aged younger than 1 year, 24.6% 1 to 5 years, 14.4% 6 to 10 years, and 32.2% 11 to 17 years (Figure 7.10). Whites accounted for more than half of recipients (53.2%) followed by blacks (20.1%) and Hispanics (18.6%). The most common etiology of heart disease was congenital defects, in 42.2% of patients. Forty-one percent of patients underwent transplant in less than 30 days; 82.4% were status 1A, and 15.9% were on a VAD.



pediatric transplant

Private insurance coverage for pediatric heart transplant recipients declined from 58.5% of patients in 1998 to 46.5% in 2009, with a corresponding increase in Medicaid coverage from 28.3% to 41.5% (Figure 7.11). For children and adolescents who underwent transplant in 2000–2009, the incidence of PTLD was 0.44% at 6 months, 1.63% at 1 year, 2.60% at 2 years, 3.33% at 3 years, 5.03% at 4 years, and 5.74% at 5 years (Figure 7.12). Substantial changes in maintenance immunosuppression have occurred. Tacrolimus use increased from 23.8% in 1998 to 78.3% in 2009. Mycophenolate use increased from 33.2% in 1998 to 78.6% in 2009. In 2009, mTOR in-

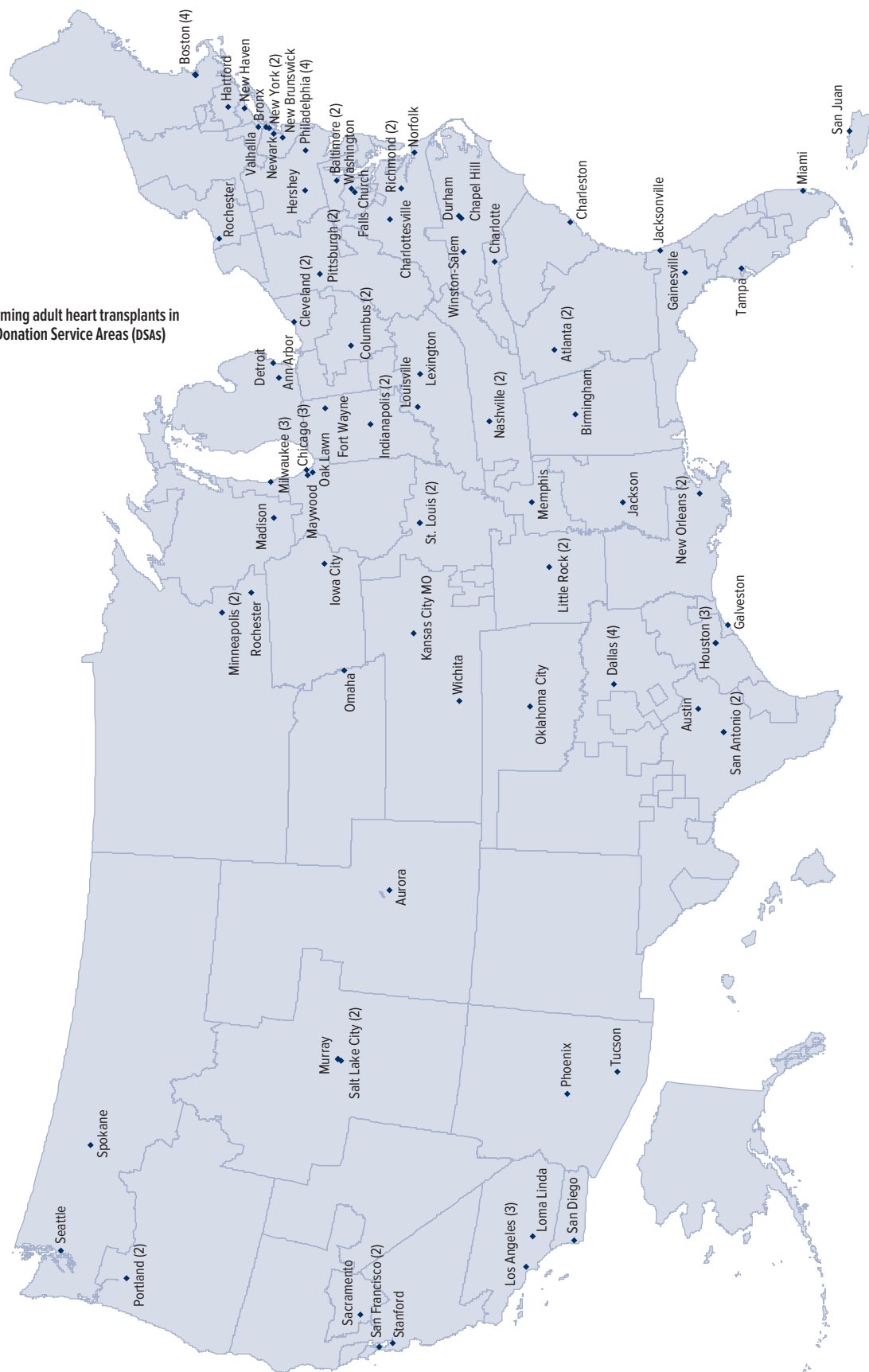
hibitors were used in 3.9% of patients at the time of transplant and 10.3% at 1 year post-transplant. Steroids were used in 70.2% of patients at the time of transplant in 2009, and use decreased to 33.5% at 1 year (Figure 7.13). Graft survival has continued to improve. Graft survival for heart transplants in 2009 was 90.6% at 6 months; for transplants in 2008, 87.5% at 1 year; for transplants in 2006, 83.0% at 3 years; for transplants in 2004, 74.3% at 5 years; and for transplants in 1999, 49.8% at 10 years (Figure 7.14). The rate of late graft failure is traditionally measured by the graft half-life conditional on 1-year survival, defined as the time to when half of grafts surviving at least 1 year are still functioning. For heart transplants performed in 2007, the graft half-life was 33.9 years (Figure 7.15).



center characteristics In 2009, nearly 28% of heart transplant centers performed 10 or fewer adult and pediatric heart transplants. Forty-three percent of centers performed 11 to 20 transplants per year, and 15.6% performed 21 to 30 transplants per year. In contrast, only 2.5% of centers performed more than 60 transplants per year (Figure 8.1). Between 2005 and 2009, among heart transplant programs, one-third of centers performed fewer than 47 heart transplants per year, one-third between 48 and 87, and one-third more than 87. Among centers in the lowest tertile of center volume, 25.5% performed multi-organ transplants; 93.3% of centers in the highest tertile performed multi-organ transplants (Figure 8.2). Thus, higher-volume centers are more likely than lower-volume centers to perform multi-organ transplants that include a heart transplant.

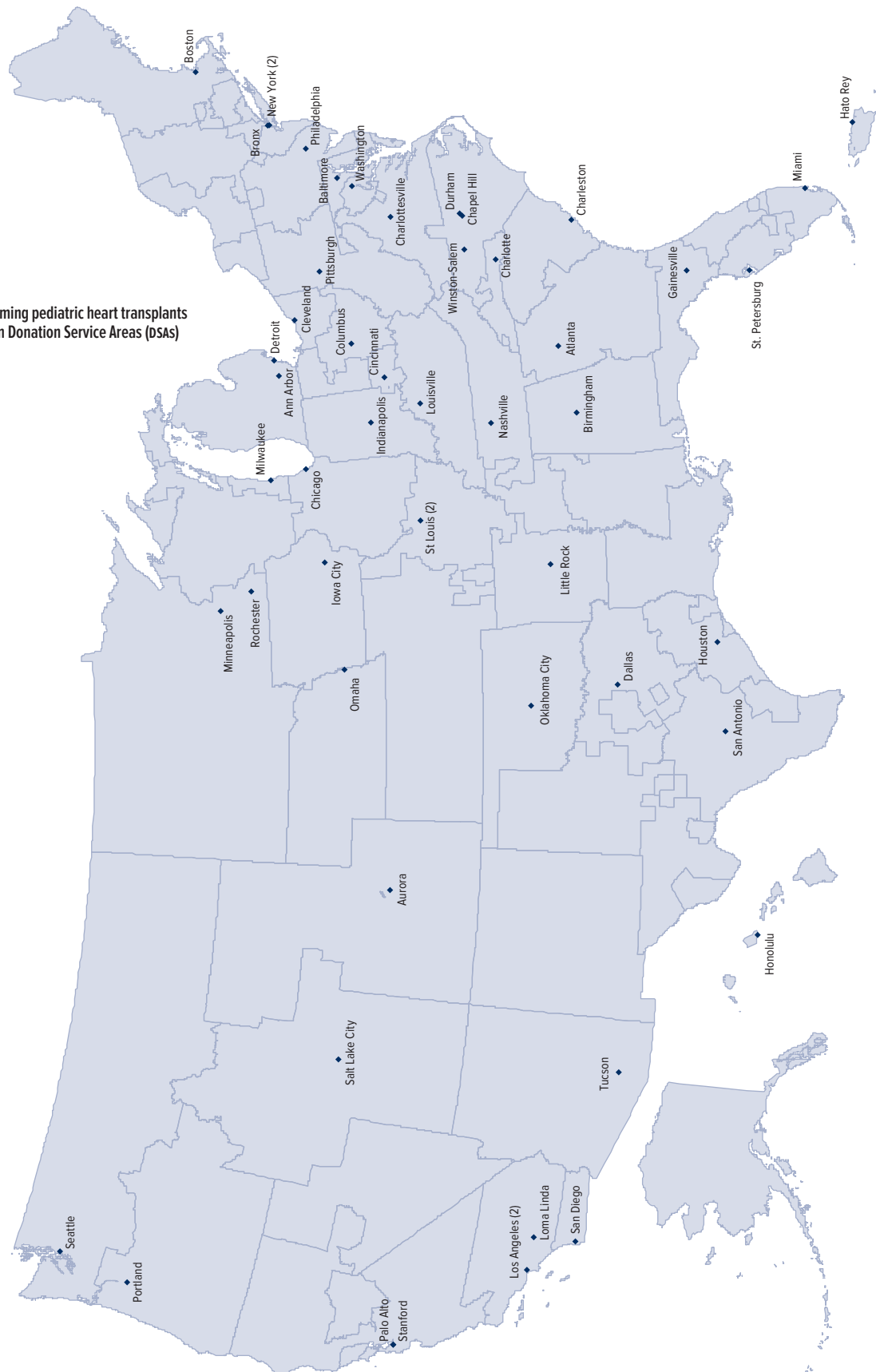
HR9.1

Centers performing adult heart transplants in
2009, within Donation Service Areas (DSAs)



HRg.2

Centers performing pediatric heart transplants
in 2009, within Donation Service Areas (DSAs)



HR 9.3

Centers performing adult heart transplants in 2009, within OPTN regions

