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OPTN/SRTR 2020 Annual Data Report: Heart

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Abstract

As we enter the third year of the new adult heart allocation policy, we are faced with the new challenges of the COVID-19 pandemic. In 2020, new listings (adult and pediatric) decreased slightly, with 4000 new listings in 2020, compared with 4087 in 2019; however, the number of adult heart transplants performed continued to increase, to 3715 in 2020. The number of pediatric heart transplants declined from 509 in 2019 to 465 in 2020. One-year and six-month posttransplant mortality rates in adult recipients have increased slightly since 2015 but have not significantly changed over the past decade. Overall, posttransplant mortality rates for adult recipients were 7.4% at six months and 9.4% at one year for transplants in 2019, 14.0% at three years for transplants in 2017, and 19.1% at five years for transplants in 2015. Although shorter-term posttransplant mortality rates have slightly increased, there has been a steady downward trend in longer-term mortality. Mortality rates for pediatric recipients were 5.7% at six months and 8.1% at one year for transplants in 2019, 11.6% at three years for transplants in 2017, and 15.2% at five years for transplants in 2015.

Keywords: End-stage heart failure, heart transplant, transplant outcomes, ventricular assist device.

1 Introduction

This year marks the third year of the new adult heart allocation policy. The new policy provided increased risk stratification and sought to decrease wait-list mortality by prioritizing the most critically ill transplant candidates. In addition, in June 2019, the OPTN Board of Directors approved the elimination of donation service areas (DSA) as the first point of distribution in thoracic organ transplant (implemented 1/9/2020). DSAs were replaced with a 250-nautical mile (NM) fixed-distance circle from the donor hospital. The word "zone" was also eliminated and replaced with actual NM distance from the donor hospital. While more time may be needed to fully assess the impact of these changes, this year's ADR provides some insight into trends under the new policy. The heart transplant community was also affected by the COVID-19 pandemic, which influenced center practices and patient perceptions. Due to variability in how centers practiced during the crisis, the overall impact may be small but also may not be fully captured in this ADR.

2 Adult Heart Transplant

2.1 Waiting List Trends

From 2009 to 2020, the number of new listings for heart transplant increased 32.5%, from 3019 to 4000 (Figure HR 1). The number of candidates awaiting heart transplant also increased 34.1%, from 5506 to 7386. (Figure HR 2). From 2016 to 2020, there was a decline in new listings and in candidates on the waitlist. Notable demographic trends in heart transplant candidates since 2009 include an increase in candidates age 65 years and older (11.9% in 2009 to 15.9% in 2020) (Figure HR 3), stable proportions of women and men (Figure HR 4), an overall increase in non-White candidates with a substantial increase in Black candidates (19.5% in 2009 to 27.3% in 2020), and a decline in White candidates (70.4% in 2009 to 59.3% in 2020) (Figure HR 5). The proportion of candidates listed for heart transplant due to cardiomyopathy increased, while the proportion listed for coronary artery disease decreased substantially, and those listed for other causes remained stable (Figure HR 6). Cardiomyopathy remains the most common diagnosis among candidates, comprising 60% in 2020, and this trend is not expected to change. Despite the new listing policy for candidates with congenital heart disease, (i.e., candidates with specific congenital heart diseases as defined by the OPTN, can be listed as status 4) the proportion of candidates listed for this indication has not changed since 2009. The prevalence of obesity among heart transplant candidates has increased over the past 10 years, and in 2020, 41.9% of candidates had a body mass index (BMI) of 30 kg/m² or greater, compared with 35.9% in 2009. The proportion of candidates with BMI 18.5 to 25 decreased and the proportion of candidates with BMI 30 to 35 increased (Figure HR 10). Blood type O remains the most common blood type among heart transplant candidates; in

2020, 51% of candidates had blood type O (Figure HR 11). Retransplants have become less common, and in 2020, only 2.9% of heart transplant candidates had a prior heart transplant (Figure HR 12).

In 2020, 76% of candidates had been on the waiting list for less than 1 year, slightly less than the 77.8% in 2009. This was accompanied by a slight increase in the proportion of candidates awaiting transplant for one or two years, from 7.6% to 11.7% (Figure HR 7). The proportion of status 1A candidates awaiting transplant continued to increase from 2009 to 2018 (the last year of the prior heart allocation policy), while the proportion of status 1B candidates gradually increased, then declined slightly in 2018. Status 2 candidates decreased from 25.7% in 2009 to 14.4% in 2018 (Figure HR 8). Two-year comparison of the new heart allocation policy demonstrated no major shifts in status at listing between 2019 and 2020. The only change of note was a decrease in status 3 candidates from 19.5% to 15.6% (Figure HR 9).

The proportion of candidates with ventricular assist devices (VADs) at listing increased from 16.4% in 2010 to 36.4% in 2020 (Table HR 2). As of December 31, 2020, 85.6% of candidates resided in a metropolitan area, and 61.8% lived within 50 miles of the transplant center, compared with 59.1% in 2010 (Table HR 1). Numbers of candidates with a previous heart transplant declined from 3.7% in 2010 to 2.5% in 2020 (Table HR 3). At year-end 2020, 267 candidates were listed for heart-kidney transplant, a substantial increase since 2010. The number of heart-lung candidates remained stable over this period, with 68 candidates waiting in 2020 (Table HR 3).

From 2018 to 2020, the number of candidates removed from the waitlist increased, but fewer were removed due to death or being too ill for transplant (Table HR 5). Compared with 2018, 74 fewer candidates died on the waiting list in 2020.

The distribution of candidates by status on December 31, 2020, is shown in Table HR 2. At the end of 2020, four patients (0.1%) were listed as status 1 and 84 (2.7%) were status 2. Fewer patients were listed in the highest-urgency categories under the new allocation system, with 46.1% listed as status 4. The number of recipients who had any life support at time of transplant increased slightly, from 2438 in 2017 to 2549 in 2020, although they represented a smaller proportion in 2020 than in 2017 (Table HR 6). Of these, 1085 (33.4%) had left-VADs (LVADs), a decrease of 274 over the 3-year period. There was a shift toward intra-aortic balloon pumps (IABP) and extracorporeal membrane oxygenation (ECMO) and a substantial increase in ventilator support before transplant between 2017 and 2020. The number of recipients with previous RVAD also increased from 48 to 68 in 2020. That same year, recipients with IABP before transplant comprised 26% of all recipients with life support (Table HR 7).

Since 2009, heart transplant rates declined to 61 per 100 waitlist years in 2015 and rapidly increased to 101 in 2020 (Figure HR 13). Heart transplant rates have increased in all age-groups over the past decade; however, the greatest increase occurred in candidates 65 and older (from 94.2 in 2009 to

157.7 in 2020) (Figure HR 14). For most groups, transplant rates since 2009 reached a nadir between 2014 and 2015 and increased thereafter. Candidates whose race was categorized as “other” had the lowest transplant rate this decade, 40 per 100 waitlist years in 2011. Black candidates, who underwent transplant at a rate of 55 in 2014, had the second lowest transplant rate. Despite the transplant rate increasing at a similar rate in Black candidates as in other races, in 2020, Black candidates were given transplants at a substantially lower rate than other groups, 88.7 compared to 103.7 in White candidates, 105.6 in Hispanic candidates and candidates categorized as other, and 157.8 in Asian candidates. Transplant rates for Asians have consistently exceeded that of other racial groups (Figure HR 15).

Among diagnoses, transplant rates were lowest, at 79 per 100 waitlist years, among candidates with congenital heart disease, compared with 91 per 100 waitlist years for coronary artery disease, 104 per 100 waitlist years for other/unknown, 107 per 100 waitlist years for cardiomyopathy, and 118 per 100 waitlist years for valvular heart disease (Figure HR 16). Transplant rates for candidates with blood type AB have consistently far exceeded those of other blood types and rapidly increased since 2018. In 2020, the transplant rate for candidates with blood type AB was 291 per 100 waitlist years, compared with 157 for blood type B, 143 for blood type A, and 66 for blood type O (Figure HR 17). Since 2011, women have received heart transplants at a higher rate than men, at 117 vs. 96 in 2020 (Figure HR 18). As expected, candidates listed at the highest statuses received transplants at the highest rates. This was especially true under the new heart allocation system. While previous status 1A candidates had a transplant rate of 302 in 2018 (Figure HR 19), those listed as status 1 underwent transplant at a rate of 2086 per 100 waitlist years in 2020, status 2 candidates at 1264 per 100 waitlist years, and status 3 candidates at 263 per 100 waitlist years (Figure HR 20). Transplant rates increased for all statuses from 2019 to 2020. Transplant rates in metropolitan and non-metropolitan areas remained closely aligned. In 2020, the transplant rate was 100 per 100 waitlist years for those residing in metropolitan areas and 103 per 100 waitlist years in non-metropolitan areas (Figure HR 22).

The median time to transplant for candidates in 2019-2020 was 2.7 months, 4.6 months lower than the preceding period and a new decade low (Figure HR 24). Median time to transplant peaked during 2013 to 2014, at 11.9 months (Figure HR 24). Women typically had a shorter median wait than men, although median times to transplant were more closely aligned in 2019 to 2020 than in prior years, at 3.1 months for men and 2.1 months for women (Figure HR 24). While candidates with blood type O typically wait the longest for transplant compared with other blood types, there was a dramatic decline in wait time, to 7.0 months in 2019 to 2020, compared with 15.8 months in 2017 and 2018 (Figure HR 25). Candidates listed as status 6 had a longer median waiting time than those of other statuses, although there was a notable decline in median wait time for statuses 4 and 6 in 2020 compared with 2019, at 9.0 months versus 5.5 months and 11.3 months versus 9 months, respectively

(Figure HR 27). Candidates classified as obese (body mass index [BMI], 30 to 35 kg/m² and higher than 35 kg/m²) have traditionally experienced the longest wait times among BMI categories; however, there has been substantial decline in median wait times for all BMI categories, particularly higher-BMI groups. In 2019 and 2020, median wait times were more reasonable for these categories, at five months for BMI 30 to 35 and 6.3 months for BMI higher than 35, compared with 11.7 and 13 months in 2017 to 2018 and 14.2 and 41 months in 2009 to 2010 (Figure HR 28).

In 2019, 48.3% of candidates underwent heart transplant within three months of listing, compared with 38.2% in 2018, and for the first time in a decade, more than half (56.3%) underwent transplant within six months of listing (Figure HR 29). Since 2014, there has been a gradual increase in the proportion of candidates undergoing transplant within three months, six months, and one year of listing due to shorter wait times and increased transplant rates. Still, there is significant regional variability in wait times; the proportion of candidates undergoing heart transplant within one year of listing in 2019 ranged from 42.3% to 100% between donation service areas (DSAs) (Figure HR 31) and from 28.6% (Alaska) to 100% (Puerto Rico) between states (Figure HR 32). Three-year outcomes on the wait list of newly added candidates in 2015 to 2017 are shown in Figure HR 23. By one year, 28% of candidates remained on the transplant list, 54% had undergone transplant, 6% had died, and 11% were removed for reasons other than death or transplant. At three years, only 7% of candidates remained on the list, 65% had had been transplanted, 7% died, and 20% were removed from the list. Pretransplant mortality has declined since 2009, from 17% to 9%, despite a slight increase from 2019 to 2020 (Figure HR 33). Candidates older than 65 years have the highest pretransplant mortality, and despite an overall decline since 2009, there has been an increase in pretransplant mortality among this group from 2019 to 2020, from 13 per 100 waitlist years to 15 per 100 waitlist years (Figure HR 34). Pretransplant mortality was lowest for candidates 18 to 34 years (6.4 per 100 waitlist years) and 35 to 49 years (6.5 per 100), and those listed as status 4 (6.1 per 100) or status 6 (5.5 per 100) (Figure HR 34, Figure HR 39). Deaths on the waiting list gradually declined from 2009 to 2020 for Black, Hispanic, and White patients (Figure HR 35). In 2020, Asians had the highest pretransplant mortality, at 13.7 per 100 waitlist years, compared with other races (Figure HR 35). Among candidates classified as other race, pretransplant mortality peaked at 40.9 per 100 waitlist years in 2017, however, this value may be spurious and due to a small sample size (Figure HR 35). Aside from occasional fluctuations, pretransplant mortality rates have been similar between men and women, although they were slightly higher for women in 2020, at 9.5 per 100 waitlist years, compared with 8.7 per 100 waitlist years in men. (Figure HR 36). Candidates with cardiomyopathy had lower pretransplant mortality than those with other diagnoses in 2020, at 8.1 per 100 waitlist years (Figure HR 37).

One of the goals of the new adult heart allocation policy was to reduce pretransplant mortality among higher-urgency candidates. In 2017 to 2018, can-

didates listed as status 1A had a pretransplant mortality rate of 29.5 deaths per 100 waitlist years, while status 1B and 2 candidates were similar, at 8.5 deaths and 7.2 per 100, respectively (Figure HR 38). In 2019 to 2020, pretransplant mortality remained substantial for candidates listed as status 1, at 81.6 per 100 waitlist years, and status 2, at 32.5 per 100 waitlist years. Candidates listed as status 5 also had substantial pretransplant mortality in 2020, at 16.2 per 100 waitlist years (Figure HR 39). Since 2009, there has been a 51% decrease in pretransplant mortality among candidates residing in metropolitan areas, from 17.3 to 8.5 per 100 waitlist years in 2020, and a 26% decline in mortality among those in nonmetropolitan areas, from 15.7 to 11.6 in 2020. Pretransplant mortality among candidates in nonmetropolitan areas has exceeded that of candidates residing in metropolitan areas since 2017 (Figure HR 40). When stratified by DSA, pretransplant mortality varied from 0 to 44.6 per 100 waitlist years (Figure HR 41).

In 2020, 18.5% of candidates died within six months after removal from the waiting list (removal reasons were any reasons other than transplant or death), more than in the previous two years (Figure HR 42). After a peak in 2013, deaths within six months after removal from the list declined. Deaths within six months after removal declined most notably among candidates listed as status 3, from 31.8% in 2019 to 14.3% in 2020, and among those listed as status 5, from 23.8% in 2019 to 14.3% in 2020 (Figure HR 44).

2.2 Donor Trends

The number of deceased-donor hearts continued to increase, with 3761 in 2020, an increase of 65% since 2009 (Figure HR 46). The greatest increases occurred in donors 30 to 39 years, from 400 in 2009 to 1106 in 2020 (Figure HR 47); the highest proportion of deceased donors (36.2%) occurred in those 18 to 29 years, followed by 29.4% in those 30 to 39 in 2020. Donors 55 years and older comprised only 2% of donors (Figure HR 48). There has been little change in distribution of donor hearts by sex over the past decade, with women comprising about 30% of donors (Figure HR 49). Similarly, there has been little variation by race; most donors (60% are White, reflective of population demographics (Figure HR 50).

The discard rate (proportion of recovered hearts not transplanted), although slightly higher in 2020 at 1%, is extremely low and similar to that over the past decade (Figure HR 52). The discard rate for donors aged 55 and older has declined since 2016 and, in 2020 was zero, compared with 1.54 in donors aged 18 to 29. (Figure HR 53). Variations in discard rate may reflect a tendency toward more aggressive recovery of organs from younger donors, which may yield a higher proportion of unacceptable grafts. In addition, variations in center practices may affect fluctuations in discard rate. In 2020, anoxia surpassed head trauma as the most common cause of death among heart donors (45.9% vs 39.8%) (Figure HR 60).

2.3 Transplant Trends

The number of heart transplants performed in the United States continued to rise, to 3715 in 2020 (Figure HR 61). While most transplants (1558 in 2020) were performed in ages 50 to 65, the greatest increase in transplants (130% since 2009) occurred in candidates 65 or older (Figure HR 62).

The median per-center transplant volume has increased since 2009, from 13 to 23 in 2020 (Figure HR 69). As median volumes increased, the proportion of transplants performed at low-volume centers declined, and the proportion performed at median- to high-volume centers increased. In 2020, centers that performed in the fifth percentile (one to nine transplants) comprised 3.8% of all heart transplants, a decrease from 8.3% in 2009. Centers that performed 10 to 59 transplants accounted for the majority of heart transplants, 74%, (Figure HR 70); however, centers performing 10 to 29 transplants have performed proportionally fewer since 2009 (30.3% in 2020, compared with 55.7% in 2009), while centers performing 30 to 59 transplants are performing more (44% in 2020 vs 25% in 2009), but have stabilized since 2018. Large-volume centers performed 22% of heart transplants in 2020, compared to 10.8% in 2009.

The proportion of recipients on any type of life support, including inotropic support, declined from 85.8% in 2017 to 78.4% in 2020, although the absolute number increased; 67% of recipients were on circulatory support (LVAD, RVAD, IABP, ECMO, and TAH) before transplant (Tables HR 6 and 7). There has been a shift toward use of temporary circulatory support over previous years. Notably, LVAD at transplant declined from 47.8% to 33.4%, while IABP use increased from 8.3% to 26.0%, and ECMO increased from 1.2% to 5.4%. Ventilator use also increased, from 0.8% to 2.0% (Table HR 6). The typical heart transplant recipient in 2020 was a man (73.4%), White (60.6%), 50 to 64 years old (47.9%), had private insurance (46.9%), resided in a metropolitan area (83.9%), had cardiomyopathy (63.8%) and blood type O (39.7%), and was status 2 at transplant (44.2%) (Table HR 7, Table HR 8). From 2010 to 2020, proportions of women and Black patients increased from 24.7% to 26.6% and from 19.7 to 25.2%, respectively (Table HR 7).

2.4 Posttransplant Survival and Morbidity

Adult death rates have declined since 2009, although they increased compared with 2015. Of recipients who underwent heart transplant in 2019, 7.4% died by six months, and 9.4% died by one year; 1-year survival was 90.6%. Of those who underwent transplant in 2017, three-year mortality was 14% (Figure HR 71). In recipients who underwent transplant from 2013 to 2015, survival was similar among all age-groups; however, in those 65 and older, one-year survival rates declined slightly compared with younger groups. The one-year survival rate in recipients aged 35 to 49 was 91%. One-year survival was greatest in recipients aged 18 to 34, at 91.5%. By year 5, survival was comparable among all age-groups, although it was lowest in recipients 18 to 35, 77.4% (Figure HR 72).

Asian recipients had the best one-year survival (92.6%) (Figure HR 73), while Hispanic recipients fared worse, at 87.5%. By year 5, survival was comparable among the race categories, ranging from 77.5% in Blacks to 82.8% in Other. (Figure HR 73). Recipients with congenital heart disease had a rapid decline in survival early after transplant, to 87% at three months, followed by a slower but steady decline thereafter. One-, three-, and 5-year survival for recipients with congenital heart disease was 83%, 76%, and 73%, respectively (Figure HR 74). Five-year survival for recipients with congenital heart disease was substantially lower than other categories (ranging from 73.4% in congenital heart disease to 82.5% in valvular heart disease). Men and women had comparable survival at all time points (Figure HR 75). Three-month survival in recipients with prior VAD was slightly lower than that of recipients without prior VAD, at 93% versus 95%, and remained slightly lower; by year 5, survival in recipients with prior VAD was 78% versus 82% in recipients without prior VAD. (Figure HR 76). The number of surviving heart transplant recipients continued to increase, and on June 30, 2020, 37,419 recipients were alive with a functioning graft, versus 23,906 in 2009 (Figure HR 79). Growth was most notable in recipients 50 and older (Figure HR 79). Among recipients who underwent transplant in 2018 to 2019, acute rejection occurred in 23.6% by one-year posttransplant and was most common in adults aged 18 to 49 (28%) and least common, but still prevalent, in adults 65 or older (20.5%) (Figure HR 80). Recipients undergoing induction therapy with T cell depletion had less rejection, at 16%, compared with those who received IL2-RA (24%) or no induction (26.8%) (Figure HR 81). Of adult recipients undergoing heart transplant from 2014 to 2018, posttransplant lymphoproliferative disease (PTLD) remains uncommon, but occurred most often in recipients with negative Epstein-Barr virus (EBV) serology. By year 5, PTLD occurred in 0.9% of heart transplant recipients. In EBV-positive recipients, 0.69% developed PTLD, compared with 3% of EBV-negative recipients (Figure HR 82).

3 Pediatric Heart Transplant

3.1 Waiting List Trends

In 2020, 673 new pediatric candidates were added to the heart transplant waiting list, and a total of 1087 candidates 17 years or younger were awaiting heart transplant (Figure HR 83, 84). The largest pediatric age-groups on the waiting list in 2020 were younger than 1 year (32.5%), followed by 12-17 years (28.2%), 1-5 years (23.5%), and 6-11 years (15.9%) (Figure HR 85). Just over half of pediatric heart transplant candidates were White (51.4%), 22.2% were Black, 19.6% were Hispanic, and 3.6% were Asian (Figure HR 86). Congenital defects continued to be the leading diagnosis among pediatric heart transplant candidates, at 55.3% in 2020 (Figure HR 87). Over time, numbers of waitlisted candidates by age and race have remained relatively unchanged (Table HR 11). For candidates waiting on December 31, 2020, congenital defect was the leading cause

of heart disease, at 60.8%, compared with 48.9% in 2010 (Table HR 12). The proportion of candidates listed with a ventricular assist device (VAD) increased, from 2.7% in 2010 to 7.4% in 2020 (Table HR 12). A smaller proportion of candidates were listed for heart-lung transplant in 2020, at 1.7%, compared with 5.3% in 2010 (Table HR 13). Among the 643 candidates removed from the waiting list in 2020, 474 (73.7%) were removed due to undergoing transplant, 58 (9.0%) died, 48 (7.5%) were removed due to improved condition, and 32 (5.0%) were considered too sick to undergo transplant (Table HR 14, Table HR 15).

In 2020, most (71.4%) pediatric heart transplant candidates on the waiting list had been waiting for less than 90 days (Figure HR 89). Almost half (45.8%) of these candidates were Status 1A, with almost equal proportions listed as Status 1B (20.2%) and Status 2 (21.4%) in 2020 (Figure HR 90). Just over 70% of pediatric candidates newly listed in 2017 underwent transplant within 3 years, 10.9% died, 14.5% were removed from the list, and 4.0% were still waiting (Figure HR 91). The rate of heart transplant among pediatric waitlist candidates dropped to its lowest point in the past decade, at 107.7 per 100 waitlist years in 2020 (Figure HR 92). Transplant rates in 2020 varied by age, with the highest rates for candidates aged 12-17 years (137.4 transplants per 100 waitlist years), followed by those 6-11 years (108.1 transplants per 100 waitlist years), younger than 1 year (107.2 transplants per 100 waitlist years), and 1-5 years (79.3 transplants per 100 waitlist years) (Figure HR 93). Transplant rates in 2020 were similar among pediatric waitlist candidates by race (Figure HR 94). Pretransplant mortality decreased from 27.7 deaths per 100 waitlist years in 2009 to 12.6 in 2020 (Figure HR 96). Pretransplant mortality rates in 2020 varied by age, with the highest rates in candidates younger than 1 year, at 21.3 deaths per 100 waitlist years, followed by 10.2 for ages 1-5 years, 9.2 for 6-11 years, and 7.3 for 12-17 years (Figure HR 97). Pretransplant mortality was highest for Status 1A (36.4 deaths per 100 waitlist years) followed by Status 1B (4.0 deaths per 100 waitlist years) candidates and Status 2 candidates (4.2 deaths per 100 waitlist years) (Figure HR 100). Pretransplant mortality rates were similar for heart transplant candidates listed in metropolitan and nonmetropolitan areas in 2020 (Figure HR 101).

3.2 Transplant Trends

The number of pediatric heart transplants performed decreased to 465 in 2020 (Figure HR 102) with 156 (33.5%) in recipients 12-17 years, 124 (26.7%) in recipients younger than 1 year, 100 (21.5%) in recipients 1-5 years, and 85 (18.3%) in recipients 6-11 years (Figure HR 103). In 2020, 28 of 143 total heart transplant programs performed pediatric heart transplants exclusively, 87 performed adult heart transplants exclusively, and 25 performed both adult and pediatric heart transplants (Figure HR 104). In 2020, 6.0% of transplants in recipients younger than 10 years, 8.6% in recipients younger than 15 years, and 11.0% in recipients younger than 18 years were performed at programs with a volume of five or fewer pediatric transplants that year

(Figure HR 105). Over the past decade, the age, sex, and race/ethnicity of pediatric heart transplant recipients has remained similar (Table HR 16). Around half of pediatric heart transplant recipients in 2018-2020 listed congenital defect as their primary cause of disease (Table HR 17). The proportion who underwent transplant at Status 1A declined slightly, from 84.7% in 2008-2010 to 79.3% in 2018-2020, while the proportion at Status 1B increased from 8.2% to 16.9%, and the proportion at Status 2 declined from 7.0% to 3.8%. The proportion of heart transplant recipients with a VAD at transplant doubled, from 16.9% in 2008-2010 to 34.1% in 2018-2020 (Table HR 17). The proportion of ABO-incompatible transplants in 2018-2020 increased to 10.2%, from 4.3% a decade earlier (Table HR 18).

Over the past decade, induction therapy increased to 82.0% of pediatric heart transplant recipients in 2020 (Figure HR 106). The initial immunosuppression regimens used most commonly in 2020 were tacrolimus, mycophenolate mofetil (MMF), and steroids in 54.4%, and tacrolimus and MMF in 37.0%. (Figure HR 107).

3.3 Posttransplant Survival and Morbidity

Among 2018-2019 pediatric heart transplant recipients, the rate of acute rejection in the first year was 20.1% overall, ranging from 22.4% in recipients 6-10 years to 19.0% in those 11-17 years (Figure HR 109).

Recipient death occurred in 5.7% of patients at 6 months posttransplant and in 8.0% at 1 year among pediatric heart transplants performed in 2019, in 11.6% at 3 years for transplants performed in 2017, in 15.2% at 5 years for transplants performed in 2015, and in 27.2% at 10 years for transplants performed in 2010 (Figure HR 111). Overall, 1- and 5-year patient survival rates were 92.2% and 83.7%, respectively, among recipients who underwent transplant in 2013-2015 (Figure HR 112). By age, 5-year patient survival was 81.6% for recipients younger than 1 year, 84.1% for 1-5 years, 85.1% for 6-11 years, and 84.5% for 12-17 years (Figure HR 113).

Among pediatric heart transplant recipients in 2018-2020, a combination of a cytomegalovirus (CMV)-positive donor and CMV-negative recipient occurred in 29.0% of transplants; for Epstein-Barr virus (EBV), this combination occurred in 28.5% of transplants (Table HR 20). The overall incidence of posttransplant lymphoproliferative disease was 5.0% at 5 years; incidence was 6.2% among EBV-negative recipients and 3.7% among EBV-positive recipients (Figure HR 110).

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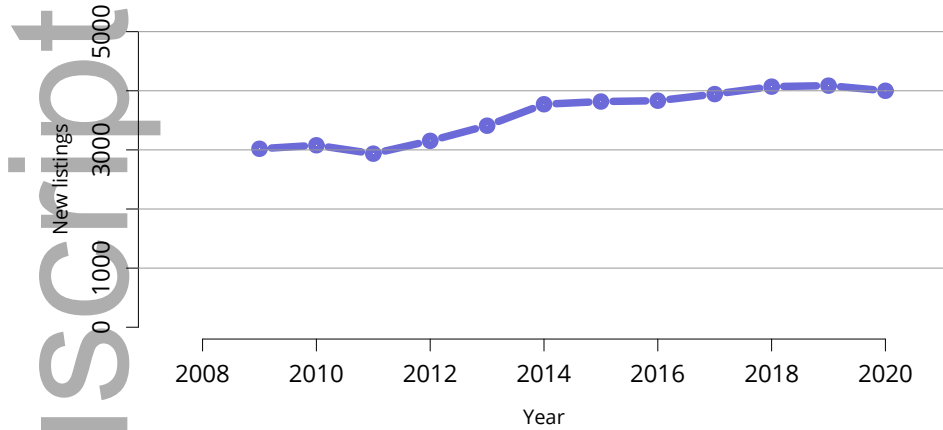


Figure HR 1. New candidates added to the heart transplant waiting list.

A new candidate is one who first joined the list during the given year, without having been listed in a previous year. Previously listed candidates who underwent transplant and subsequently relisted are considered new. Active and inactive patients are included.

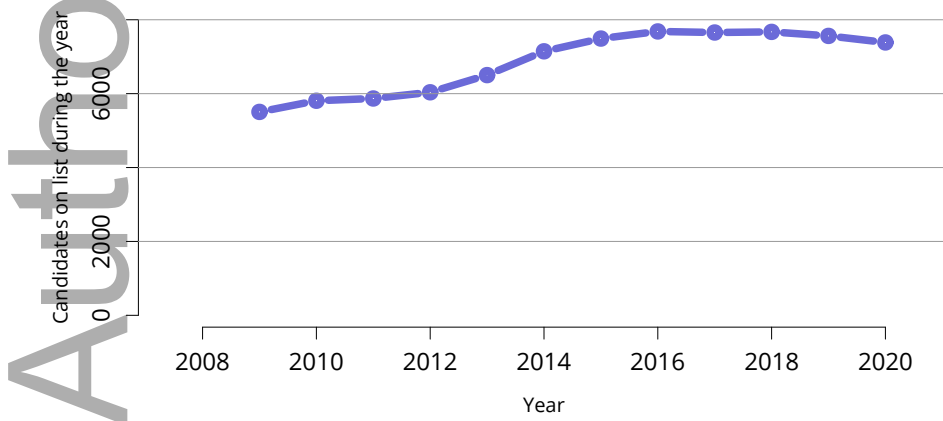


Figure HR 2. All adult candidates on the heart transplant waiting list.

Adult candidates on the list at any time during the year. Candidates listed at more than one center are counted once per listing.

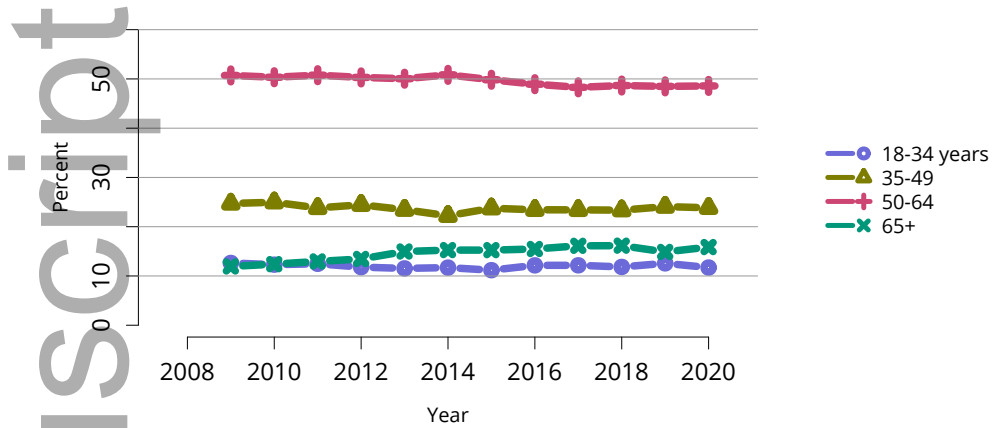


Figure HR 3. Distribution of adults waiting for heart transplant by age. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive candidates are included.

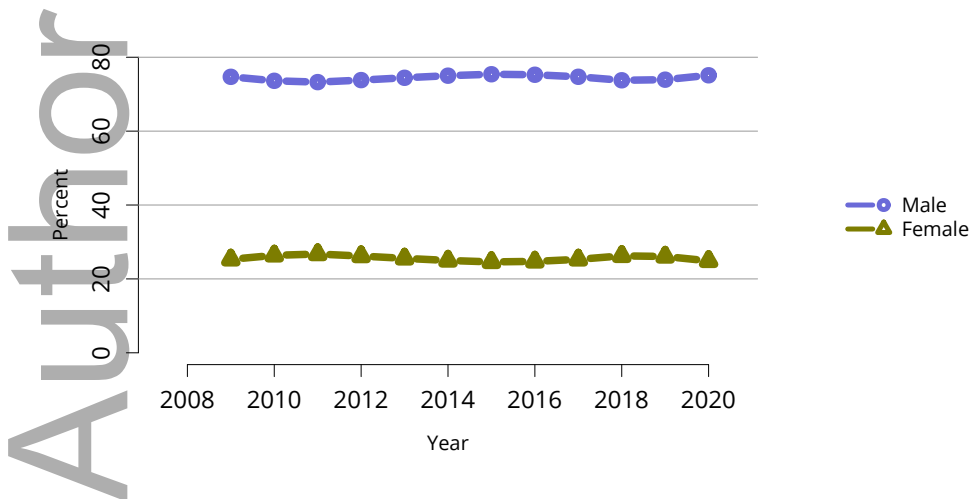


Figure HR 4. Distribution of adults waiting for heart transplant by sex. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive patients are included.

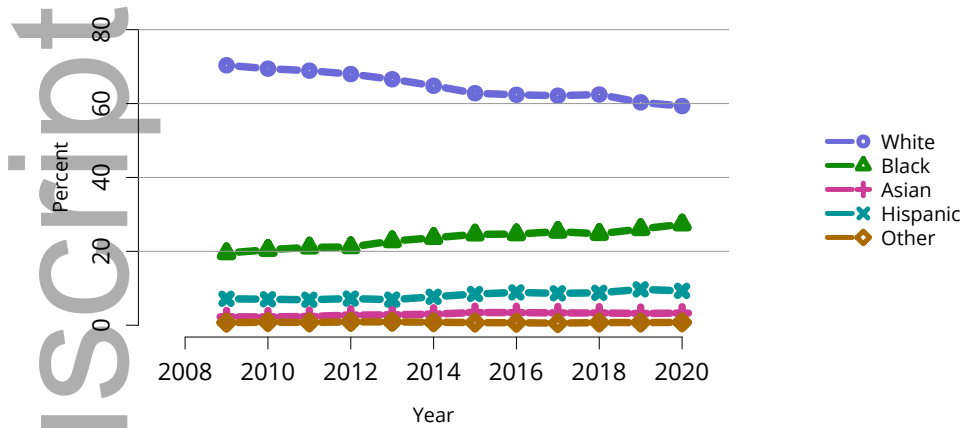


Figure HR 5. Distribution of adults waiting for heart transplant by race. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive patients are included.

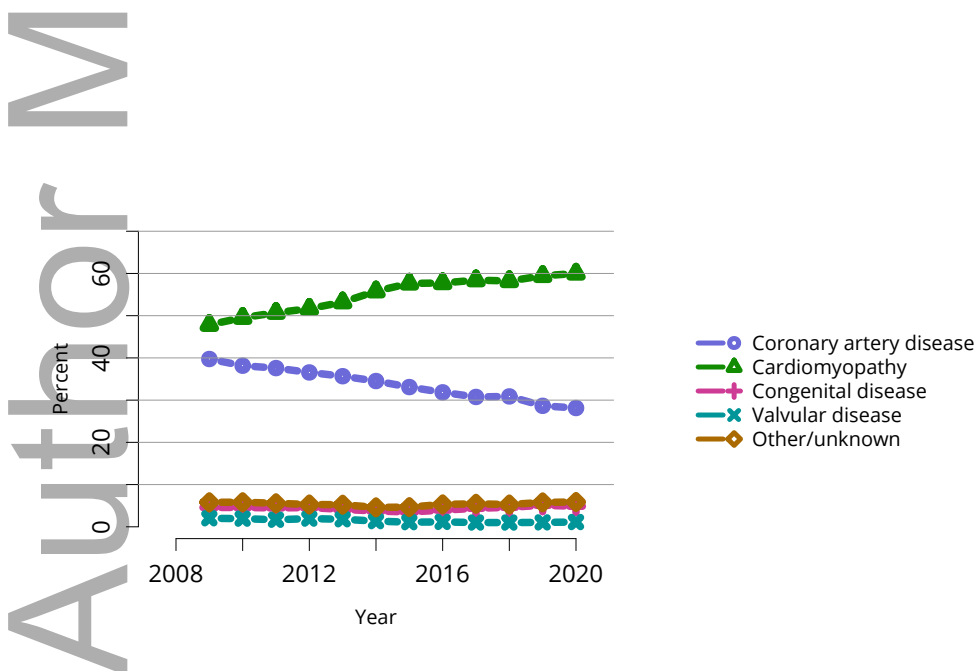


Figure HR 6. Distribution of adults waiting for heart transplant by diagnosis. Candidates waiting for transplant at any time in the given year. Active and inactive patients are included. Candidates listed at more than one center are counted once per listing.

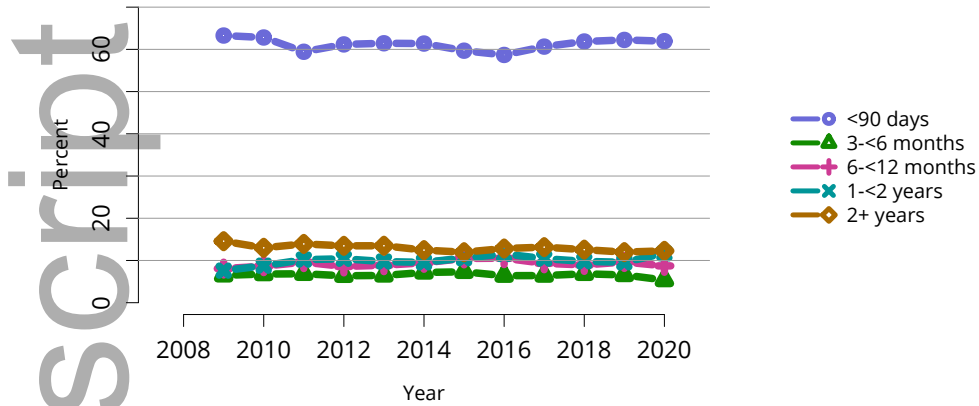


Figure HR 7. Distribution of adults waiting for heart transplant by waiting time. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Time on the waiting list is determined at the later of listing date or January 1 of the given year. Active and inactive candidates are included.

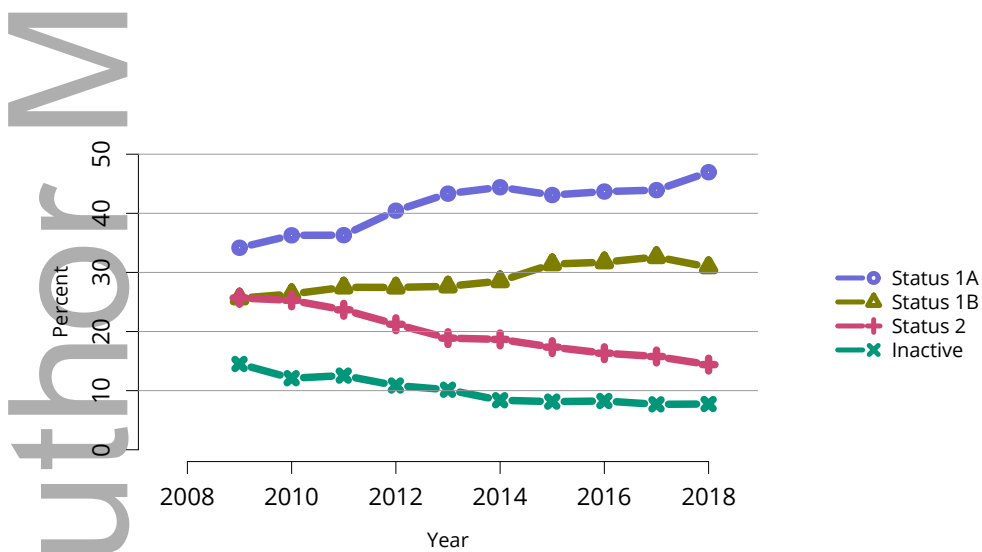


Figure HR 8. Distribution of adults waiting for heart transplant by old medical urgency, 2009-2018. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive candidates are included. The graph only goes through 2018, as the OPTN heart allocation policy changed the status groups in October, 2018. New status codes in use as of October 18, 2018 were converted to their old status equivalents for the 2018 data point.

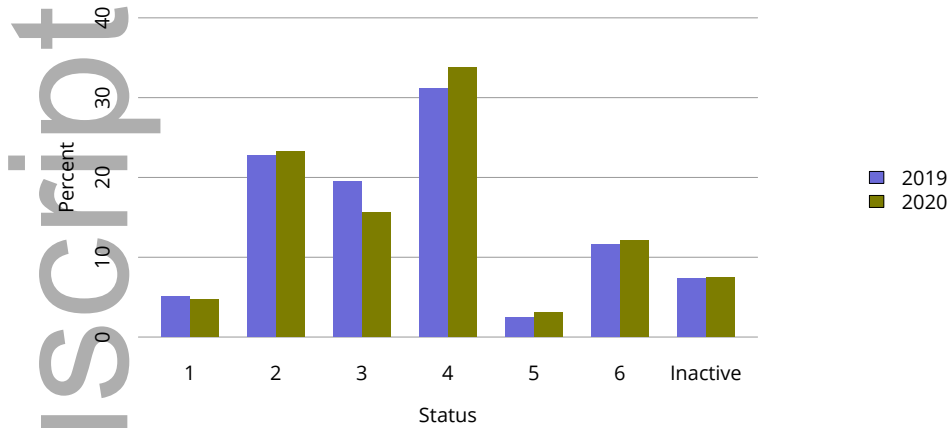


Figure HR 9. Distribution of adults waiting for heart transplant by new medical urgency, 2019-2020. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive candidates are included.

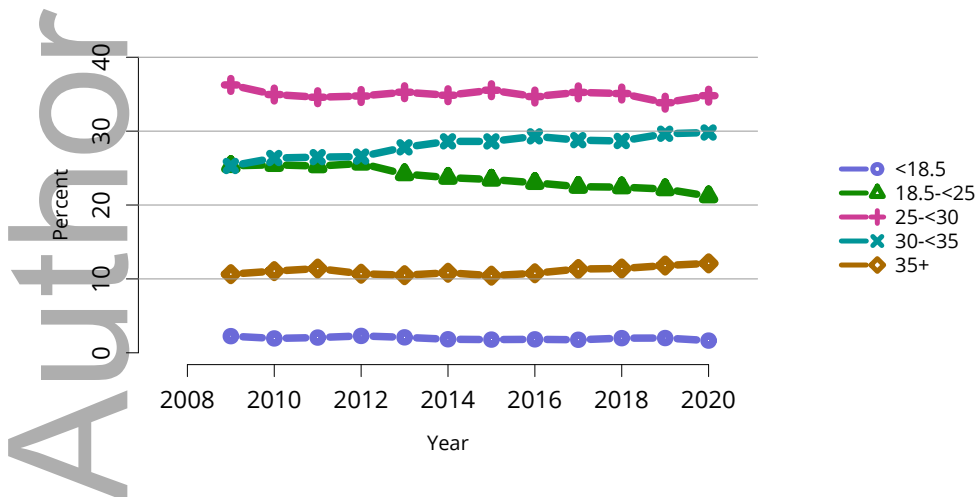


Figure HR 10. Distribution of adults waiting for heart transplant by BMI. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive patients are included.

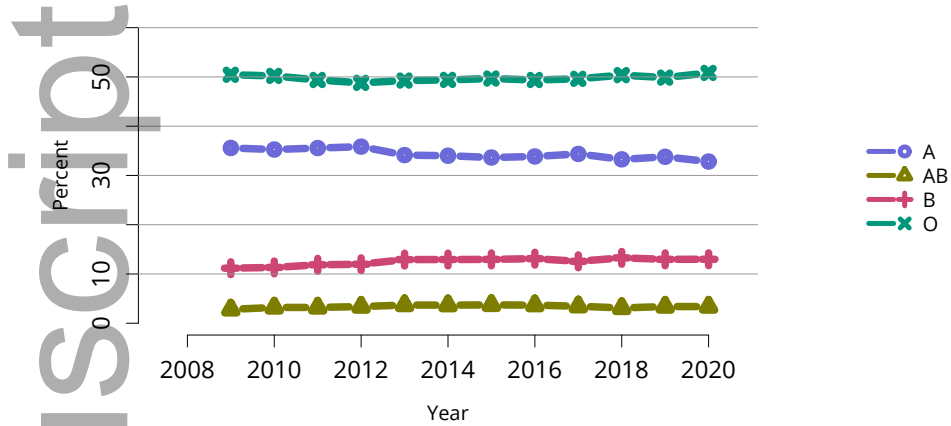


Figure HR 11. Distribution of adults waiting for heart transplant by blood type. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive patients are included.

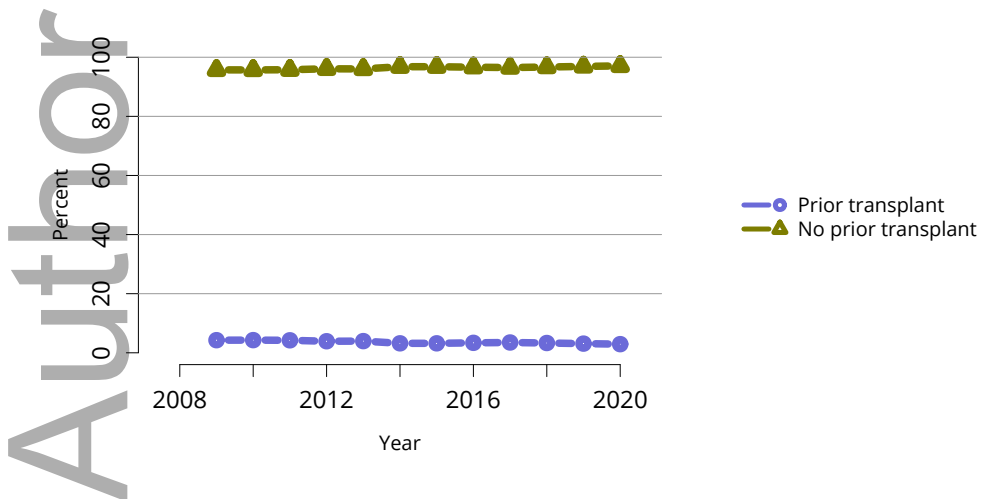


Figure HR 12. Distribution of adults waiting for heart transplant by prior transplant status. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive patients are included.

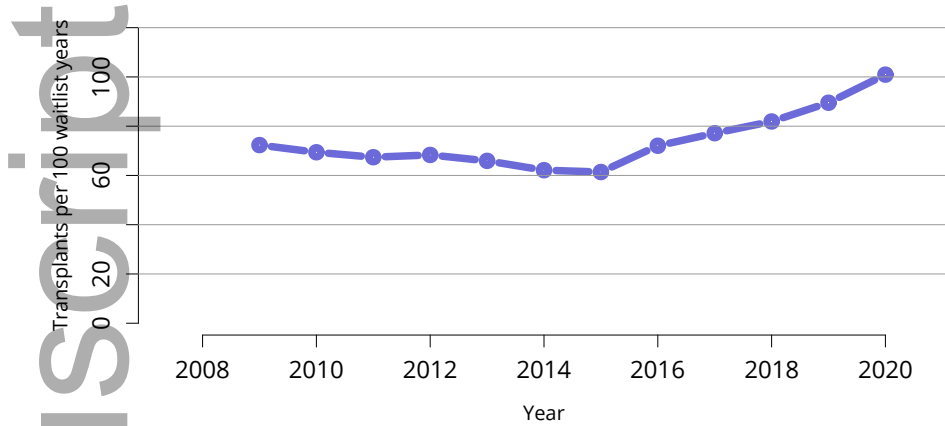


Figure HR 13. Overall deceased donor heart transplant rates among adult waitlist candidates. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately.

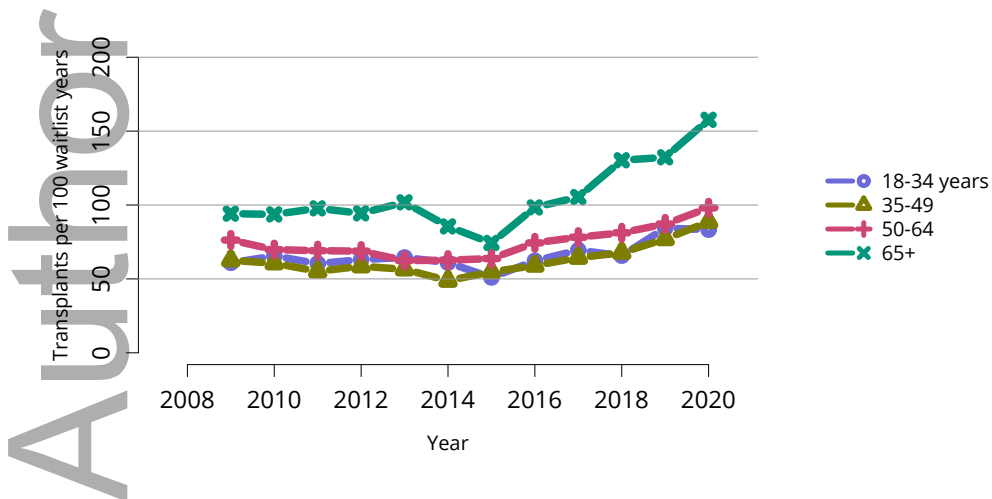


Figure HR 14. Deceased donor heart transplant rates among adult waitlist candidates by age. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately.

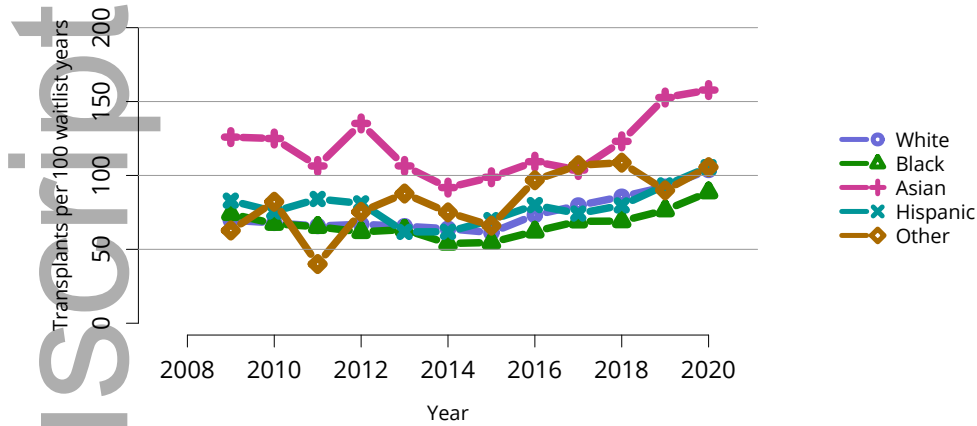


Figure HR 15. Deceased donor heart transplant rates among adult wait-list candidates by race. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately.

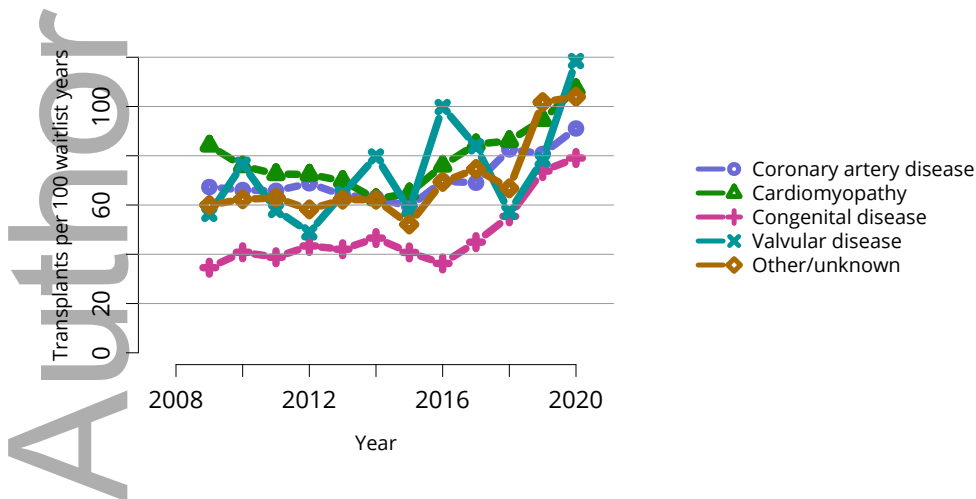


Figure HR 16. Deceased donor heart transplant rates among adult wait-list candidates by diagnosis. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately.

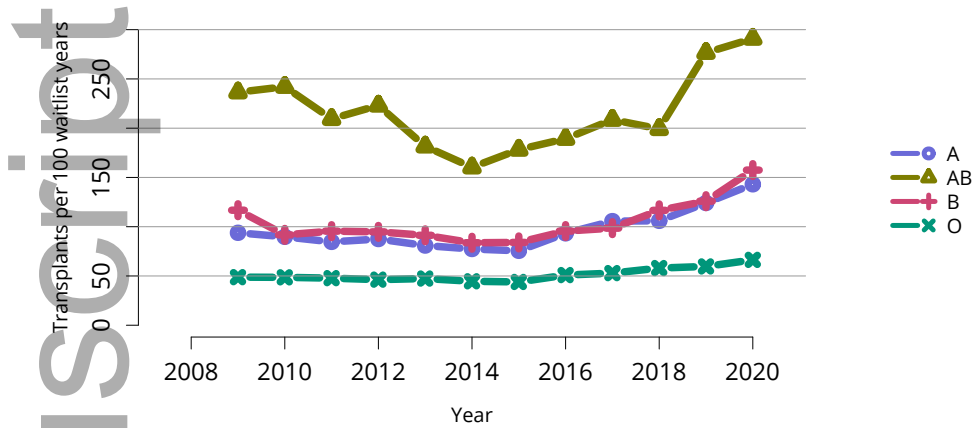


Figure HR 17. Deceased donor heart transplant rates among adult wait-list candidates by blood type. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately.

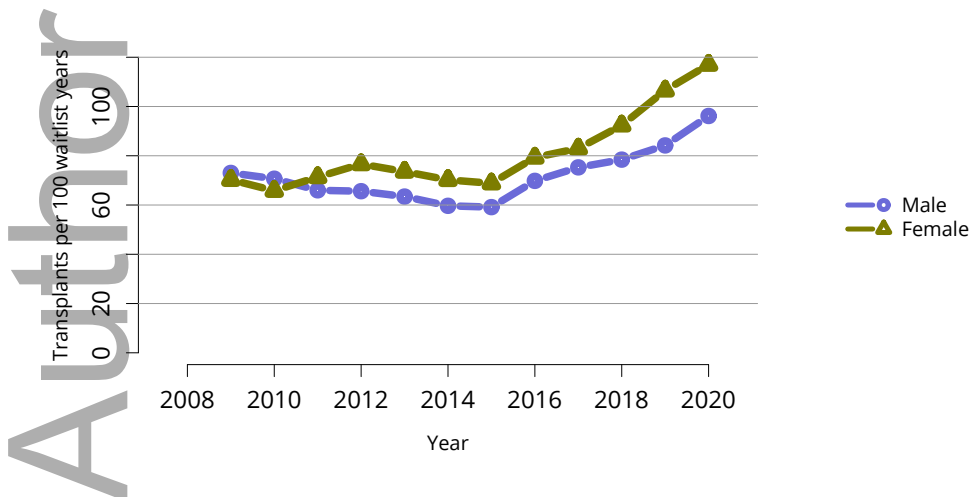


Figure HR 18. Deceased donor heart transplant rates among adult wait-list candidates by sex. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately.

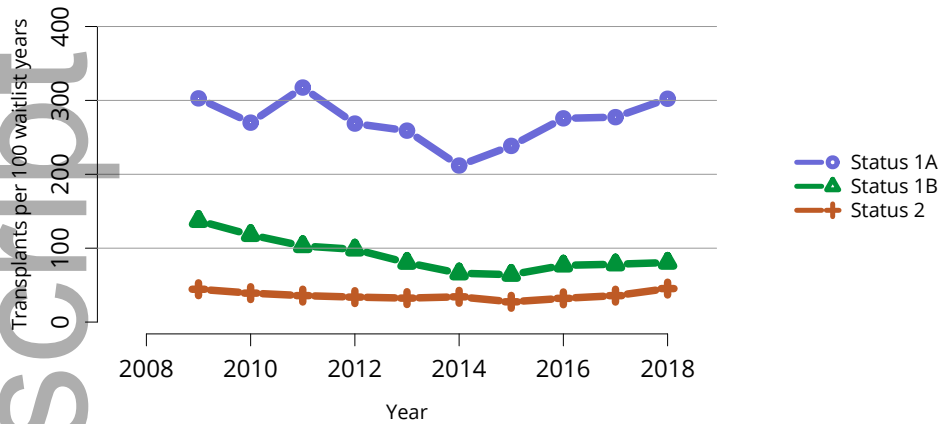


Figure HR 19. Deceased donor heart transplant rates among adult wait-list candidates by former medical urgency groups (Status 1A, 1B, 2), through 2018. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately. The graph only goes through 2018, as the OPTN heart allocation policy changed the status groups in October, 2018. Status groups for candidates in late 2018 were converted to old groupings. Medical urgency is determined at the later of listing date and January 1 of the year.

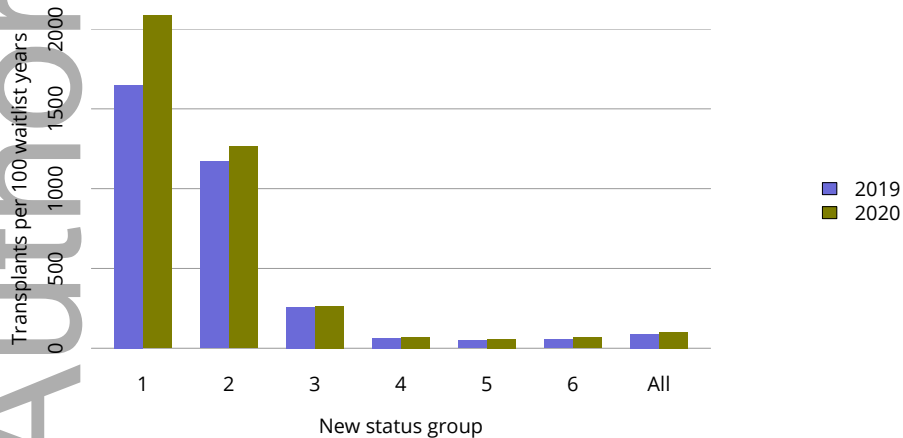


Figure HR 20. Deceased donor heart transplant rates among adult wait-list candidates by new medical urgency groups, 2019-2020. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time. Individual listings are counted separately. Medical urgency is determined at the later of listing date and January 1 of the year.

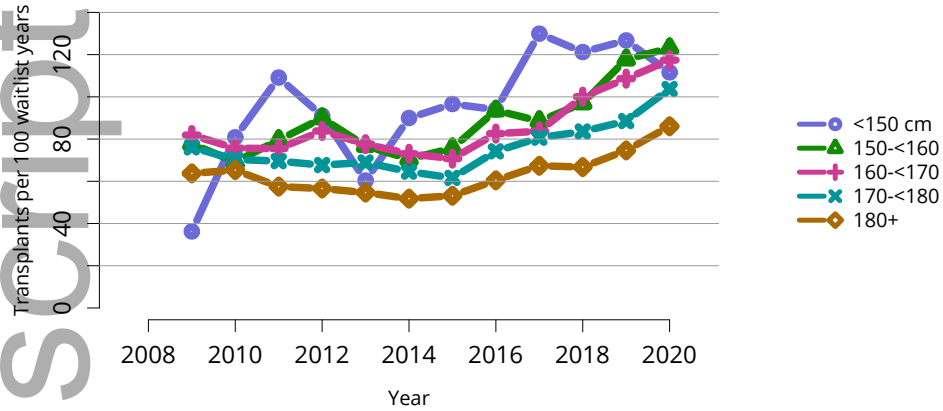


Figure HR 21. Deceased donor heart transplant rates among adult wait-list candidates by height. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately.

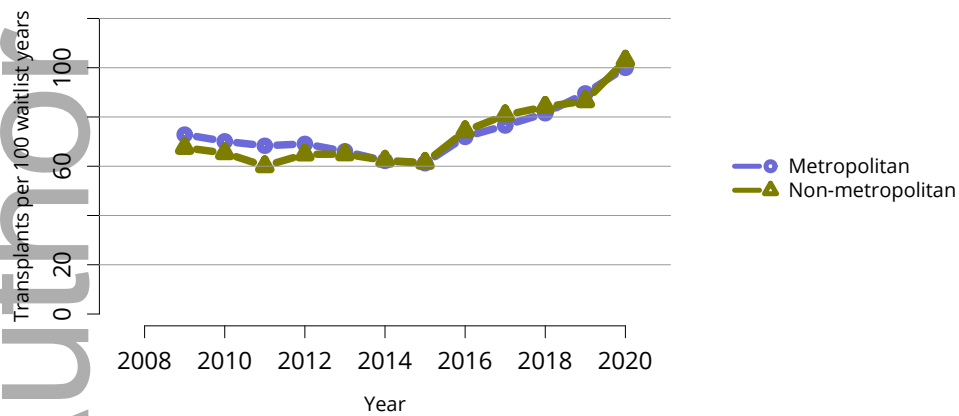


Figure HR 22. Deceased donor heart transplant rates among adult wait-list candidates by metropolitan vs. non-metropolitan residence. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of wait time in a given year. Individual listings are counted separately. Urban/rural determination is made using the RUCA (Rural-Urban Commuting Area) designation of the candidate’s permanent zip code.

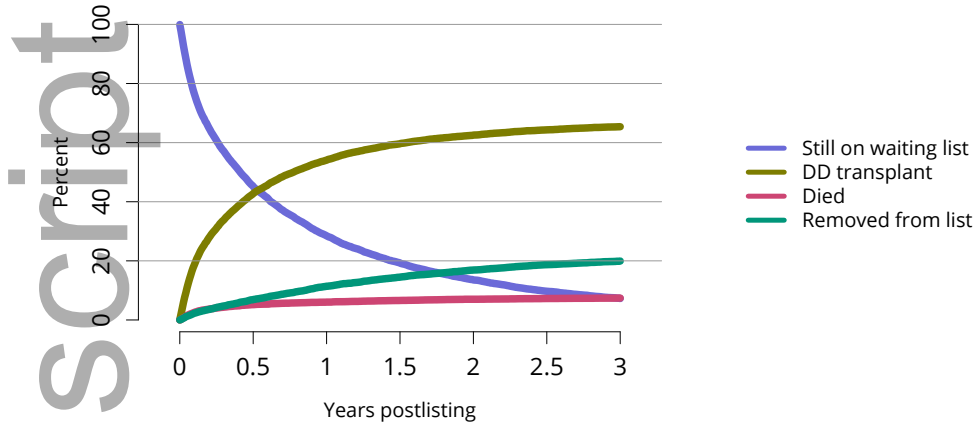


Figure HR 23. Three-year outcomes for adults waiting for heart transplant, new listings in 2015-2017. Candidates listed at more than one center are counted once per listing. Removed from list includes all reasons except transplant and death. DD, deceased donor.

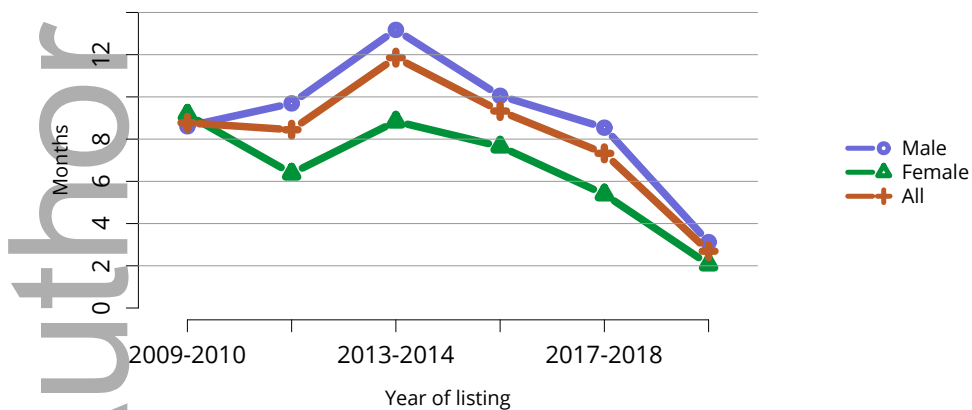


Figure HR 24. Median months to heart transplant for waitlisted adults by sex. Observations censored on December 31, 2020; Kaplan-Meier competing risk methods used to estimate time to transplant. Analysis performed per listing. If an estimate is not plotted, 50% of the cohort listed in that year had not undergone transplant by the censoring date. Only the first transplant is counted.

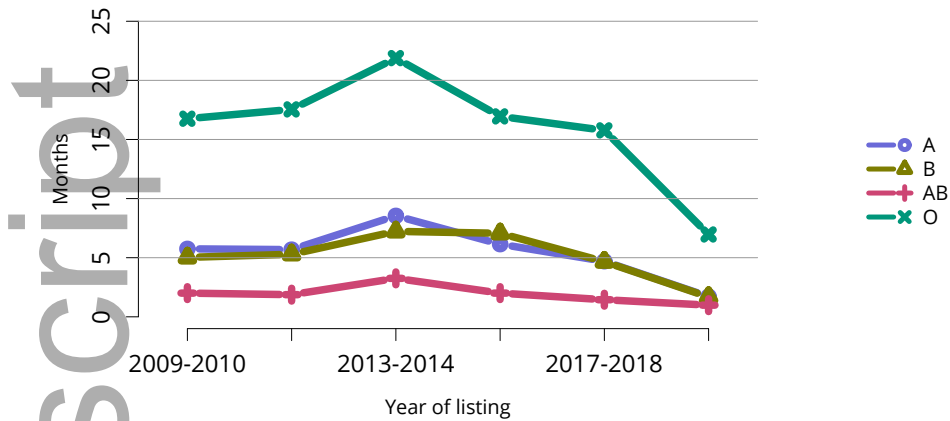


Figure HR 25. Median months to heart transplant for waitlisted adults by blood type. Observations censored on December 31, 2020; Kaplan-Meier competing risk methods used to estimate time to transplant. Analysis performed per listing. If an estimate is not plotted, 50% of the cohort listed in that year had not undergone transplant by the censoring date. Only the first transplant is counted.

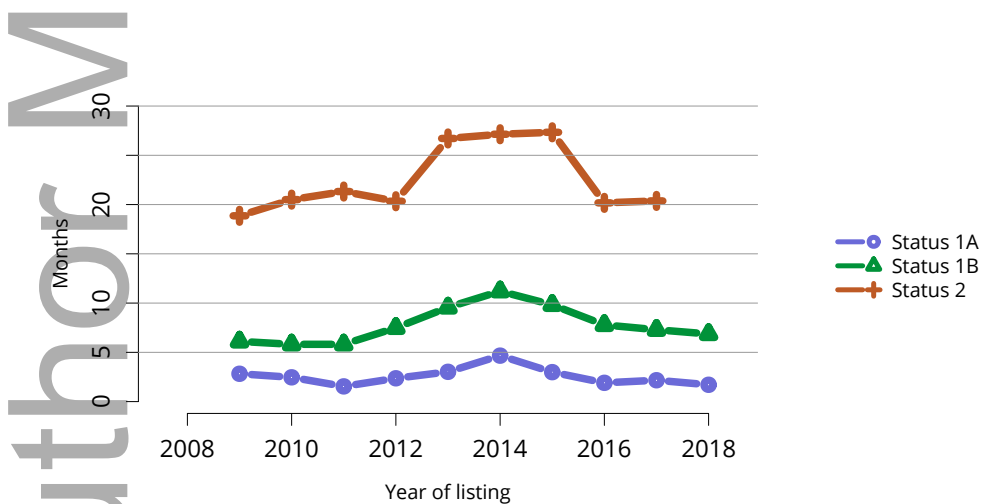


Figure HR 26. Median months to heart transplant for waitlisted adults by old medical urgency at listing. Observations censored on December 31, 2018; Kaplan-Meier competing risk methods used to estimate time to transplant. Analysis performed per listing. If an estimate is not plotted, 50% of the cohort listed in that year had not undergone transplant by the censoring date. Only the first transplant is counted. The graph only goes through 2018, as the OPTN heart allocation policy changed the status groups in October, 2018. New status codes in use as of October 18, 2018 were converted to their old status equivalents for the 2018 data point.

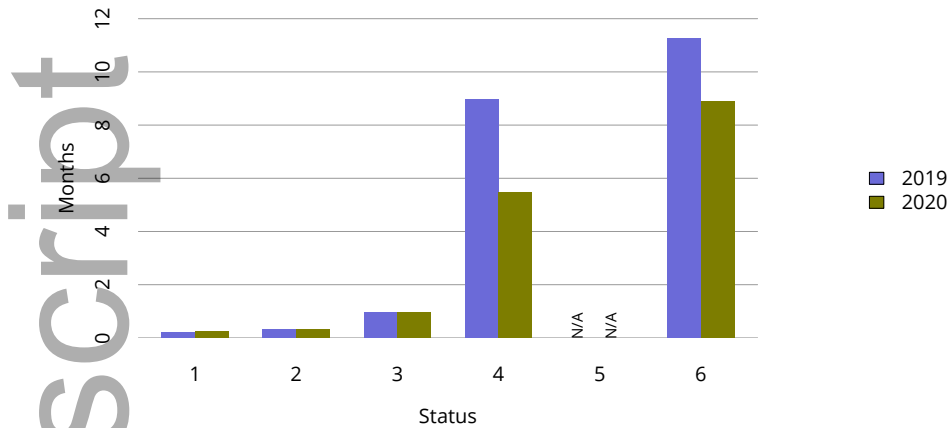


Figure HR 27. Median months to heart transplant for waitlisted adults by new medical urgency at listing. Observations censored on December 31, 2020; Kaplan-Meier competing risk methods used to estimate time to transplant. Analysis performed per listing. No estimate is plotted for status 5 because <50% of the cohort listed in that year has not undergone transplant by the censoring date. Only the first transplant is counted. Candidates listed January 1, 2019 - December 31, 2020 are included.

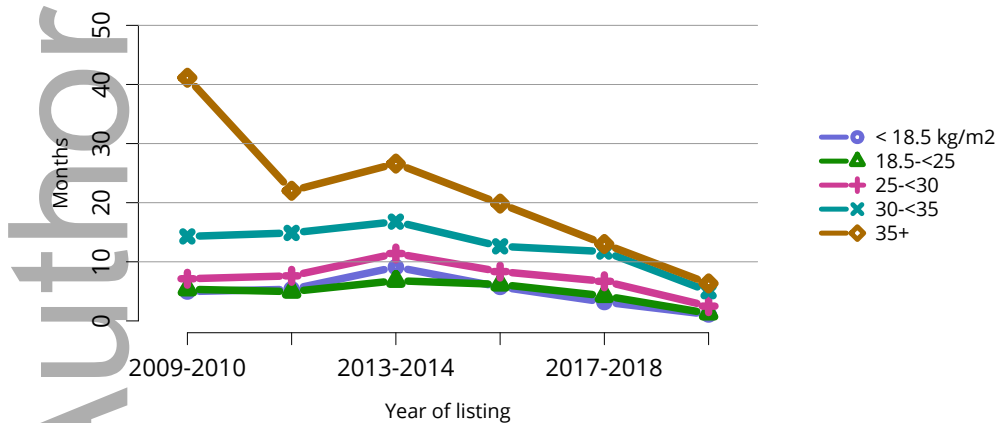


Figure HR 28. Median months to heart transplant for waitlisted adults by BMI at listing. Observations censored on December 31, 2020; Kaplan-Meier competing risk methods used to estimate time to transplant. Analysis performed per listing. If an estimate is not plotted, 50% of the cohort listed in that year had not undergone transplant by the censoring date. Only the first transplant is counted.

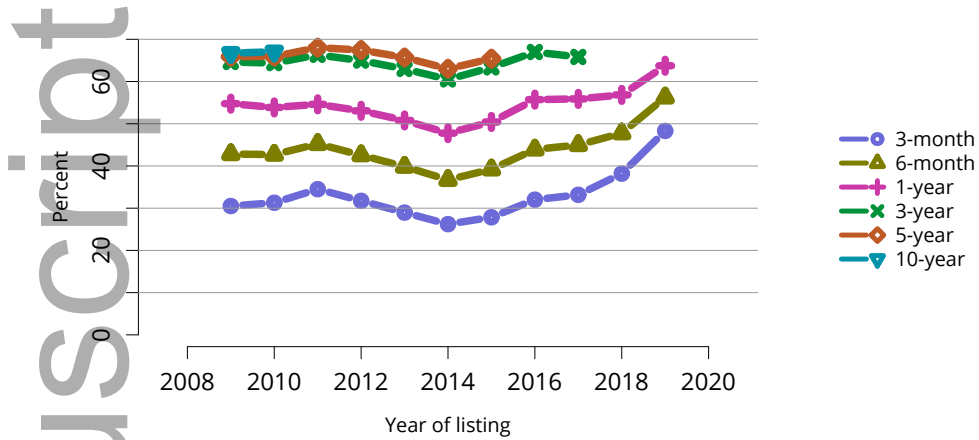


Figure HR 29. Percentage of adults who underwent deceased donor heart transplant within a given time period of listing. Candidates listed at more than one center are counted once per listing.

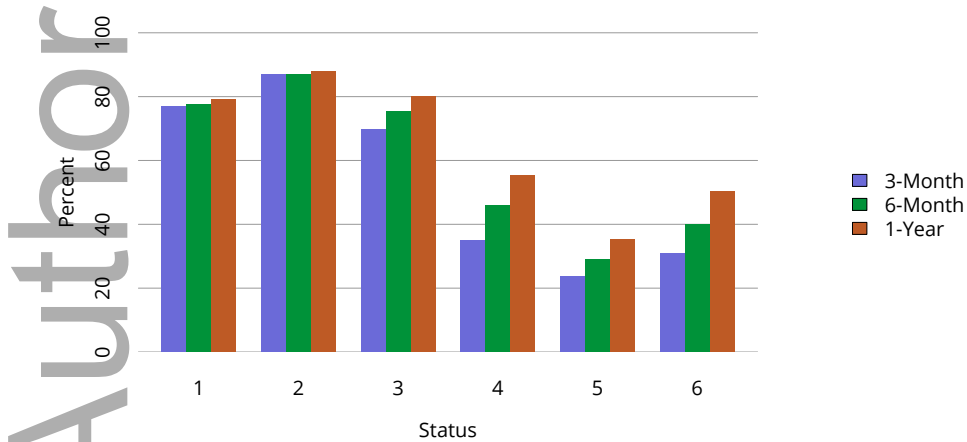


Figure HR 30. Percentage of adults who received transplant within 3, 6, and 12 months from listing, by status. Candidates listed at more than one center are counted once per listing. Candidates newly listed January 1, 2019-September 30, 2020 within the interval.

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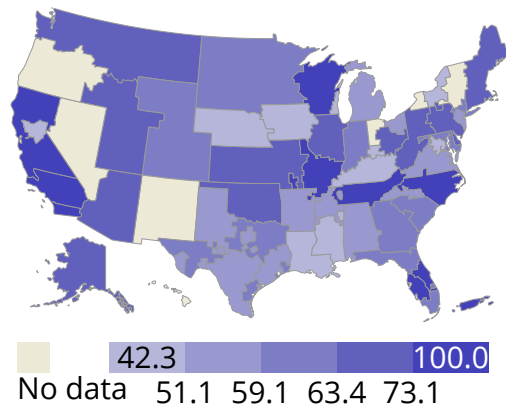


Figure HR 31. Percentage of adults who underwent deceased donor heart transplant within 1 year of listing, 2019, by DSA. Candidates listed at more than one center are counted once per listing.

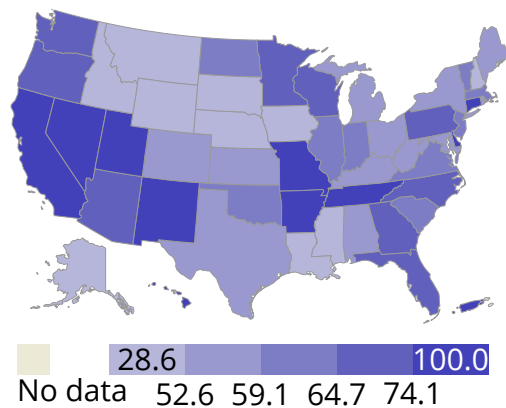


Figure HR 32. Percentage of adults who underwent deceased donor heart transplant within 1 year of listing, 2019, by state. Candidates listed at more than one center are counted once per listing. State is candidate's home state.

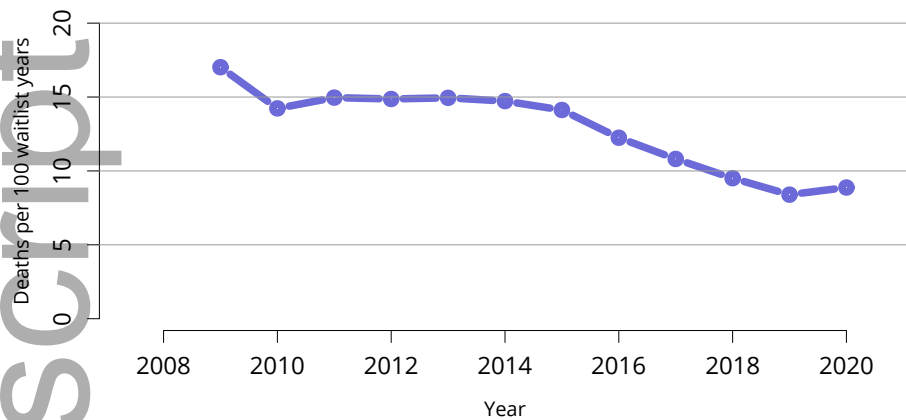


Figure HR 33. Overall pretransplant mortality rates among adults waitlisted for heart transplant. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

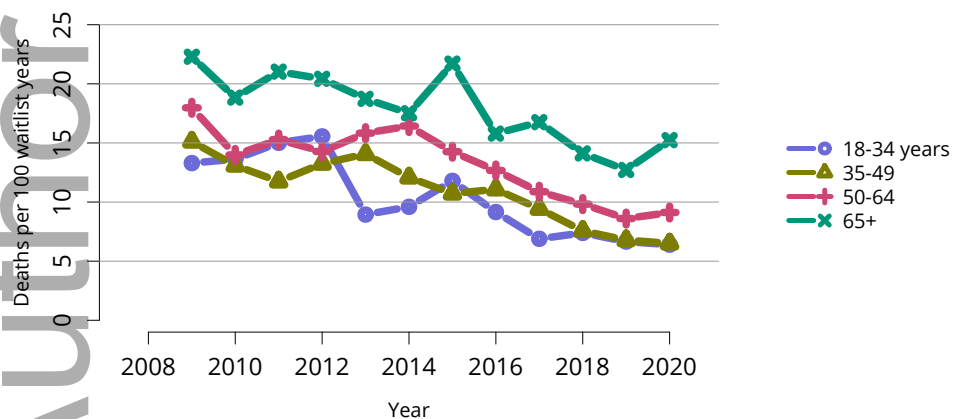


Figure HR 34. Pretransplant mortality rates among adults waitlisted for heart transplant by age. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

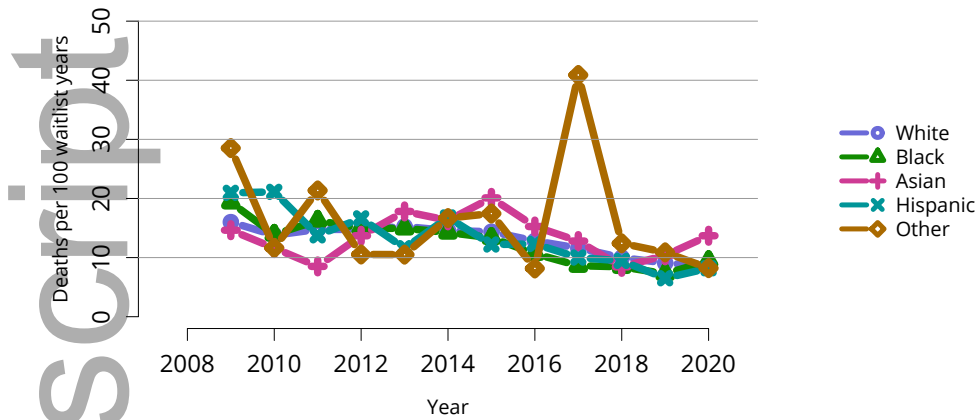


Figure HR 35. Pretransplant mortality rates among adults waitlisted for heart transplant by race. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

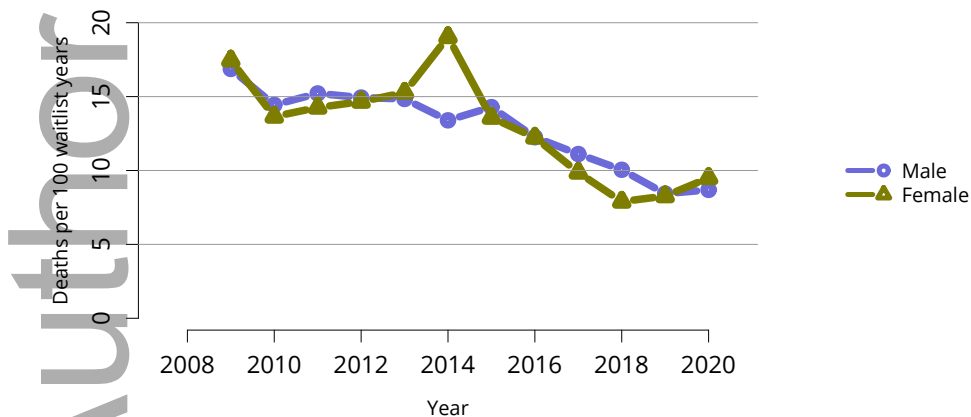


Figure HR 36. Pretransplant mortality rates among adults waitlisted for heart transplant by sex. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

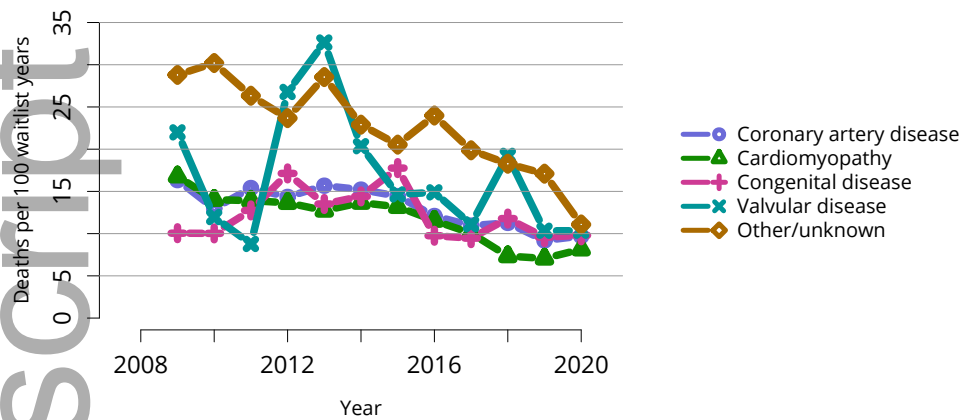


Figure HR 37. Pretransplant mortality rates among adults waitlisted for heart transplant by diagnosis. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

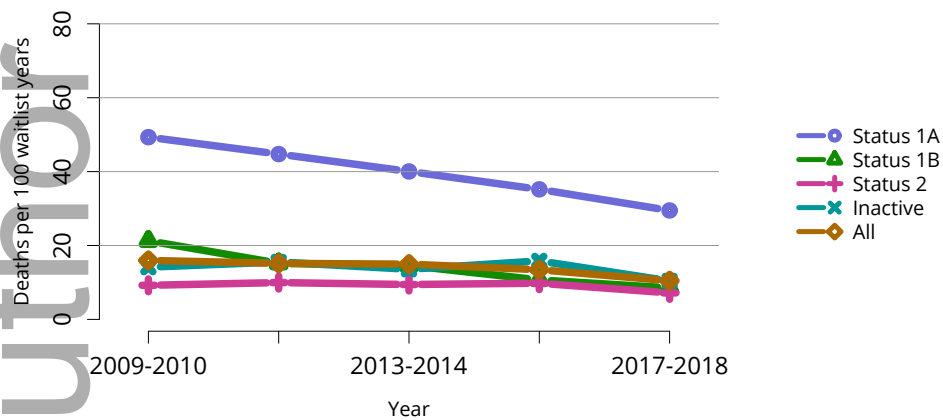


Figure HR 38. Pretransplant mortality rates among adults waitlisted for heart transplant by former medical urgency groups (Status 1A, 1B, 2, Inactive), through 2018. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately. Medical urgency is determined at the later of listing date and January 1 of the year.

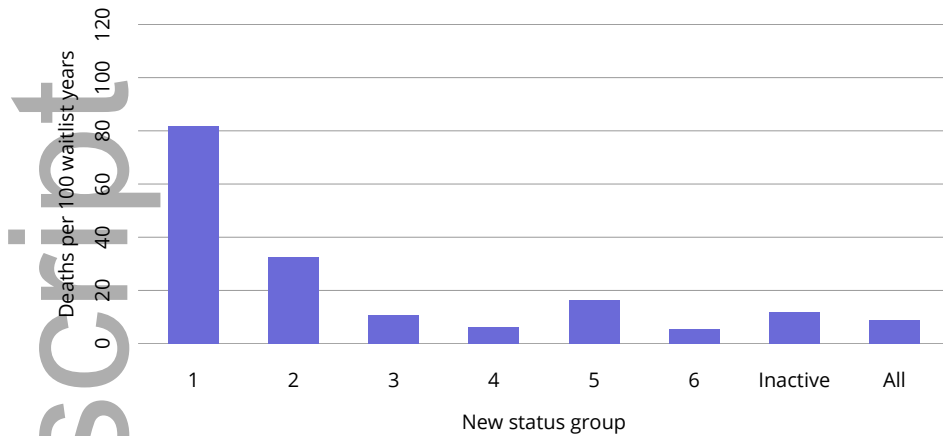


Figure HR 39. Pretransplant mortality rates among adults waitlisted for heart transplant by new medical urgency groups, 2019-2020. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately. Medical urgency is determined at the later of listing date and January 1 of the year.

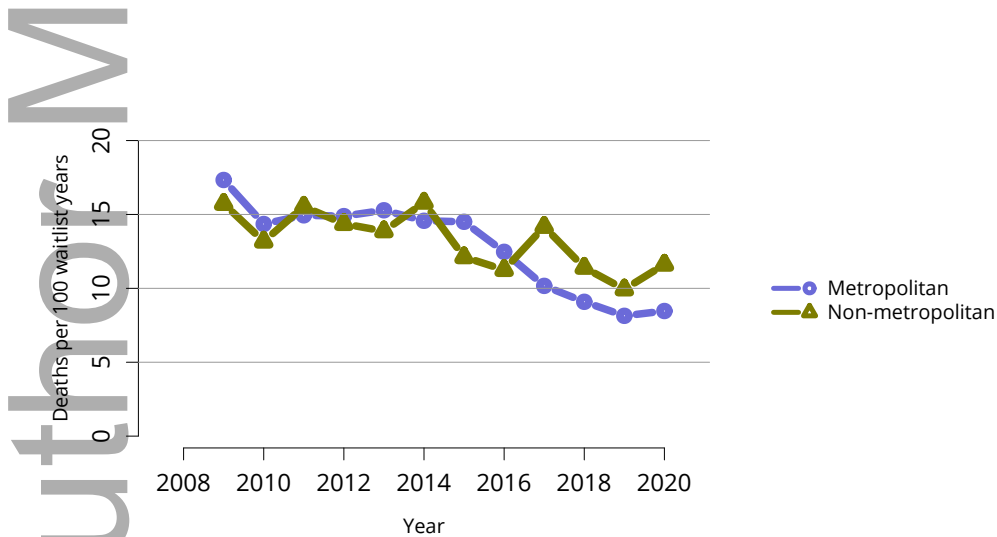


Figure HR 40. Pretransplant mortality rates among adults waitlisted for heart transplant by metropolitan vs. non-metropolitan residence. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately. Urban/rural determination is made using the RUCA (Rural-Urban Commuting Area) designation of the candidate's permanent zip code.

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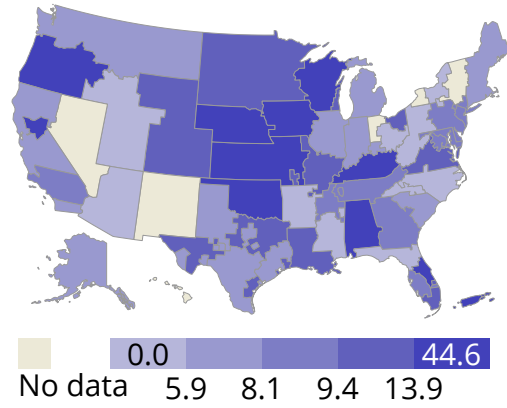


Figure HR 41. Pretransplant mortality rates among adults waitlisted for heart transplant in 2020 by DSA. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

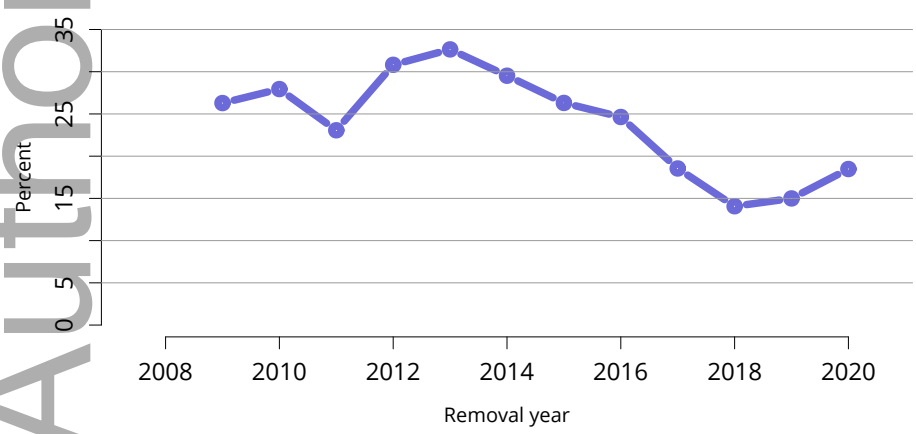


Figure HR 42. Deaths within six months after removal among adult heart waitlist candidates, overall. Denominator includes only candidates removed from the waiting list for reasons other than transplant or death while on the list.

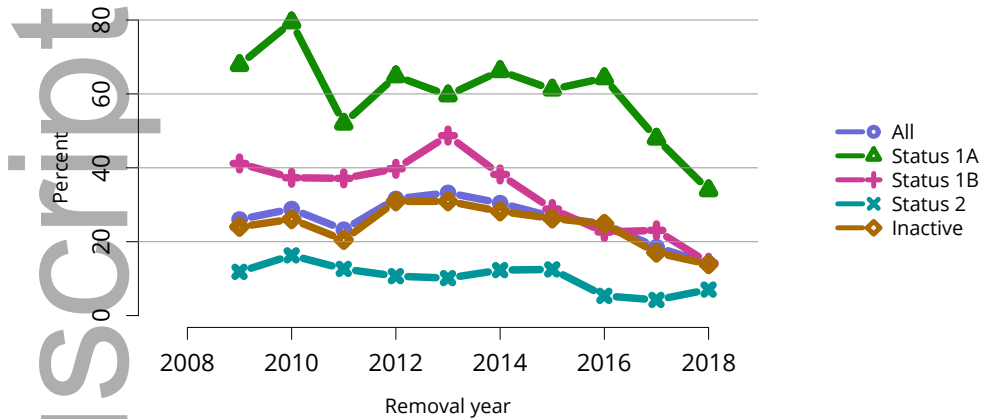


Figure HR 43. Deaths within six months after removal among adult heart waitlist candidates, by status at removal, 2009-2018. Denominator includes only candidates removed from the waiting list for reasons other than transplant or death while on the list.

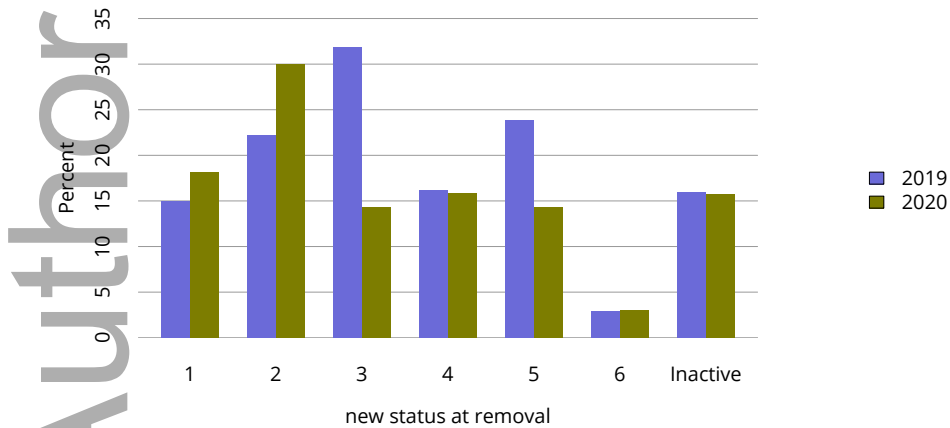


Figure HR 44. Deaths within six months after removal among adult heart waitlist candidates, by new status at removal, 2019-2020. Denominator includes only candidates removed from the waiting list for reasons other than transplant or death while on the list. Data for 2020 includes those removed from January 1-June 30, 2020.

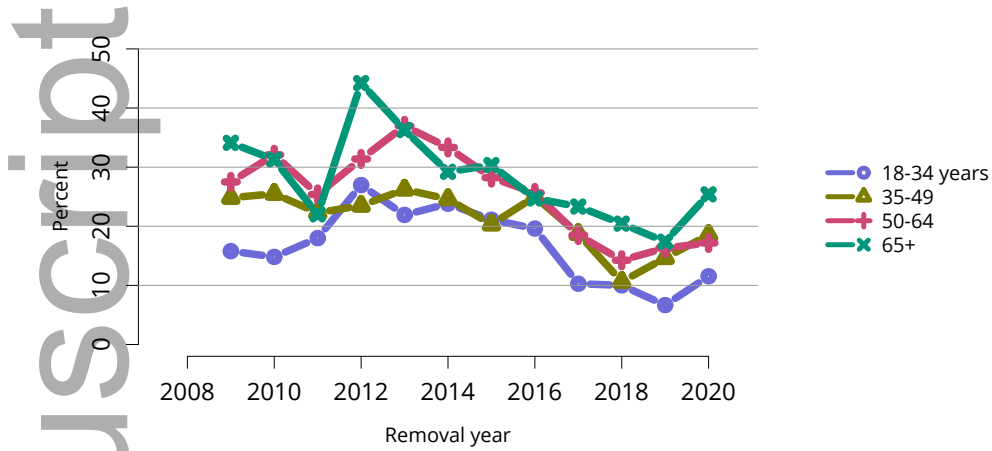


Figure HR 45. Deaths within six months after removal among adult heart waitlist candidates, by age. Denominator includes only candidates removed from the waiting list for reasons other than transplant or death while on the list.

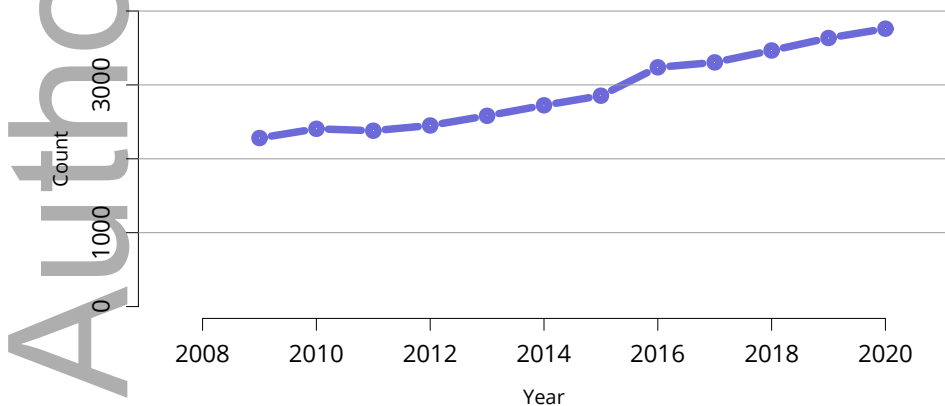


Figure HR 46. Overall deceased heart donor count. Count of deceased donors whose hearts were recovered for transplant.

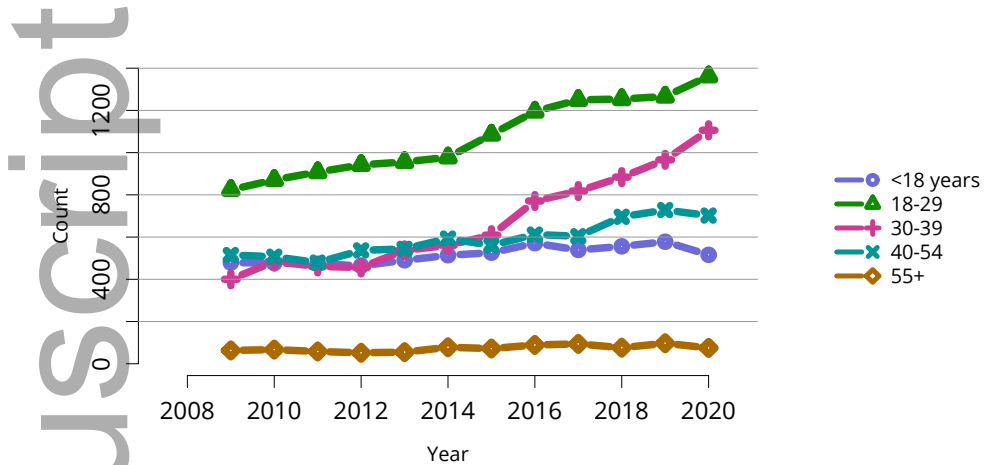


Figure HR 47. Deceased heart donor count by age. Count of deceased donors whose hearts were recovered for transplant.

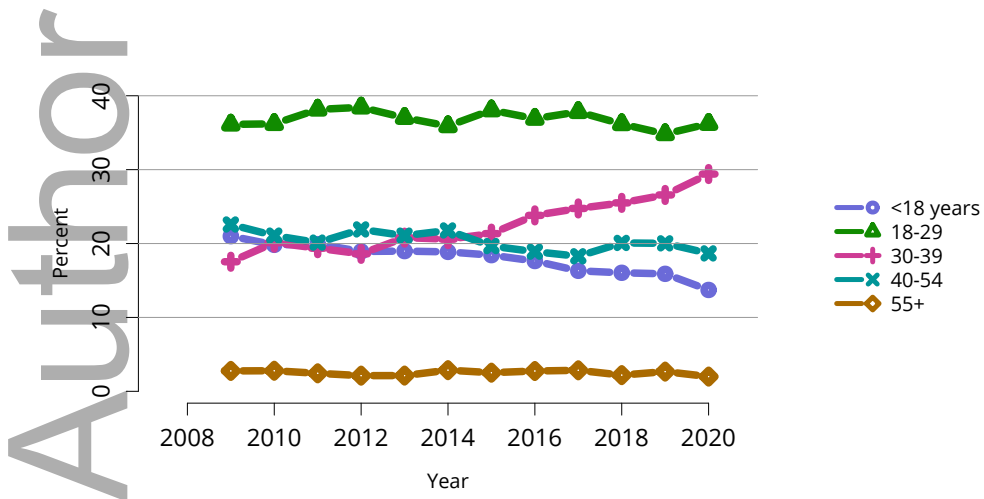


Figure HR 48. Distribution of deceased heart donors by age. Deceased donors whose hearts were recovered for transplant.

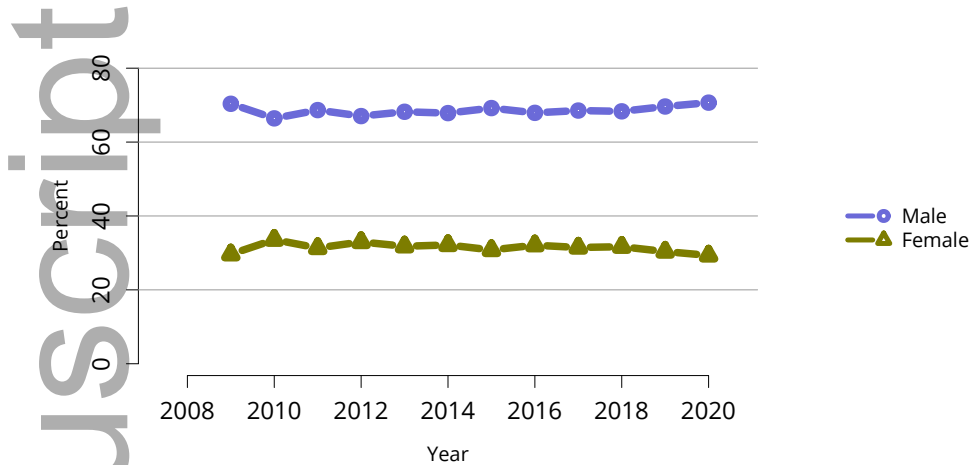


Figure HR 49. Distribution of deceased heart donors by sex. Deceased donors whose hearts were recovered for transplant.

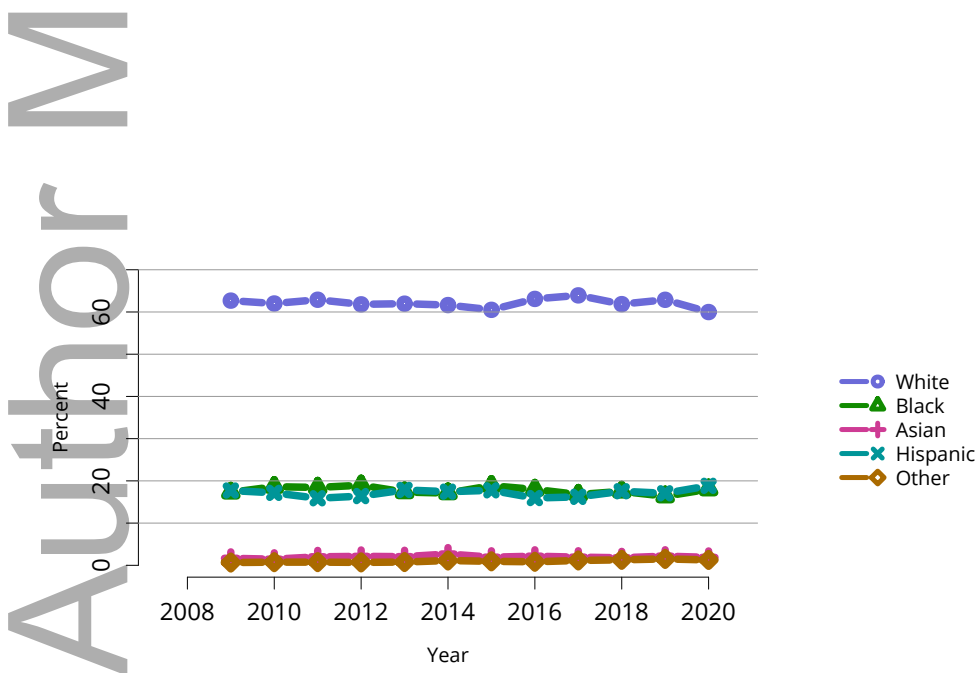


Figure HR 50. Distribution of deceased heart donors by race. Deceased donors whose hearts were recovered for transplant.

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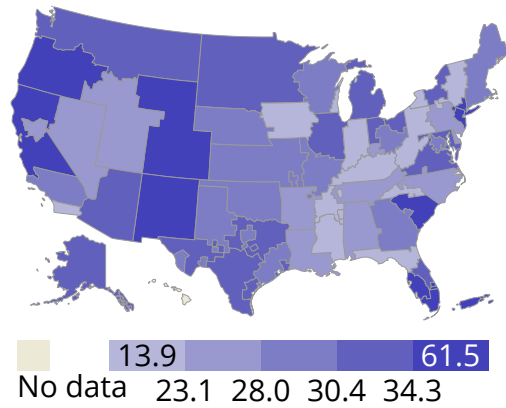


Figure HR 51. Percent of pediatric donor hearts allocated to adult recipients, by DSA of donor hospital, 2016-2020. Numerator: pediatric donor hearts donors allocated to adult recipients. Denominator: total pediatric donor hearts.

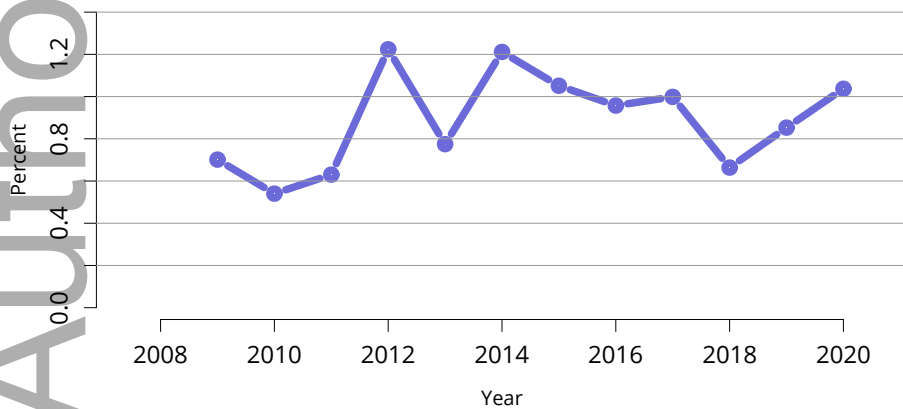


Figure HR 52. Overall percent of hearts recovered for transplant and not transplanted. Percentages of hearts not transplanted out of all hearts recovered for transplant.

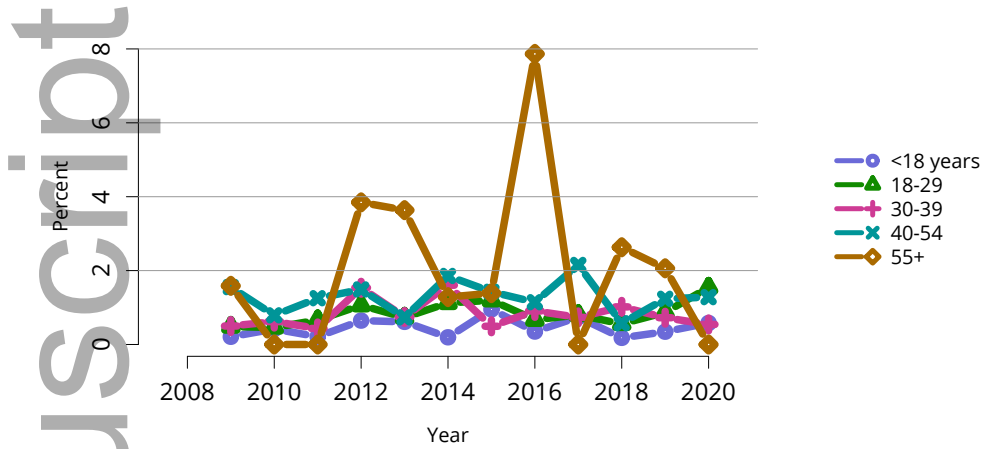


Figure HR 53. Percent of hearts recovered for transplant and not transplanted by donor age. Percentages of hearts not transplanted out of all hearts recovered for transplant.

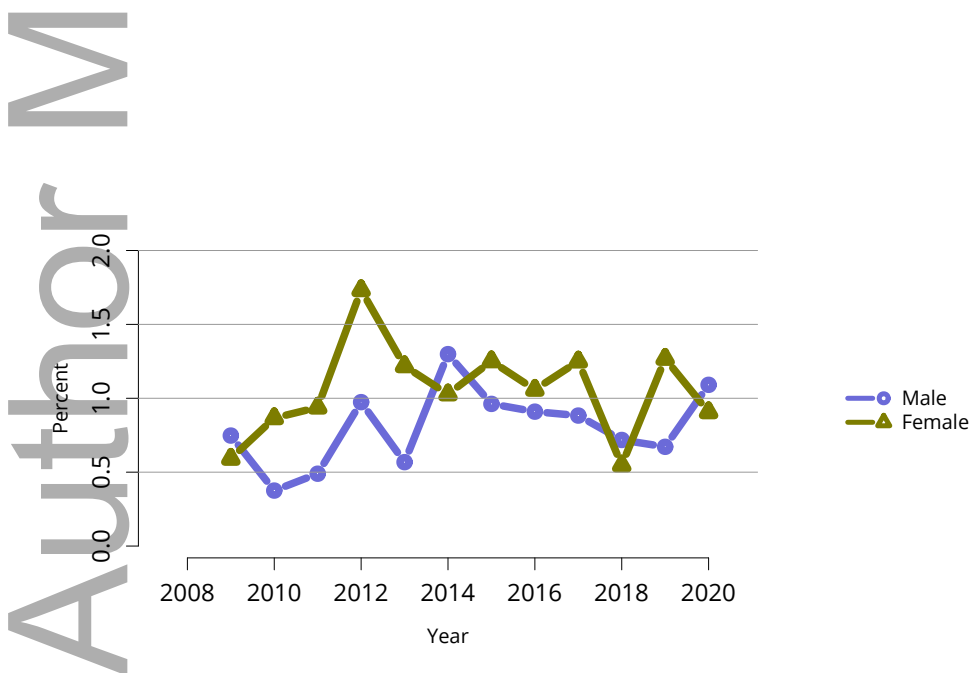


Figure HR 54. Percent of hearts recovered for transplant and not transplanted by donor sex. Percentages of hearts not transplanted out of all hearts recovered for transplant.

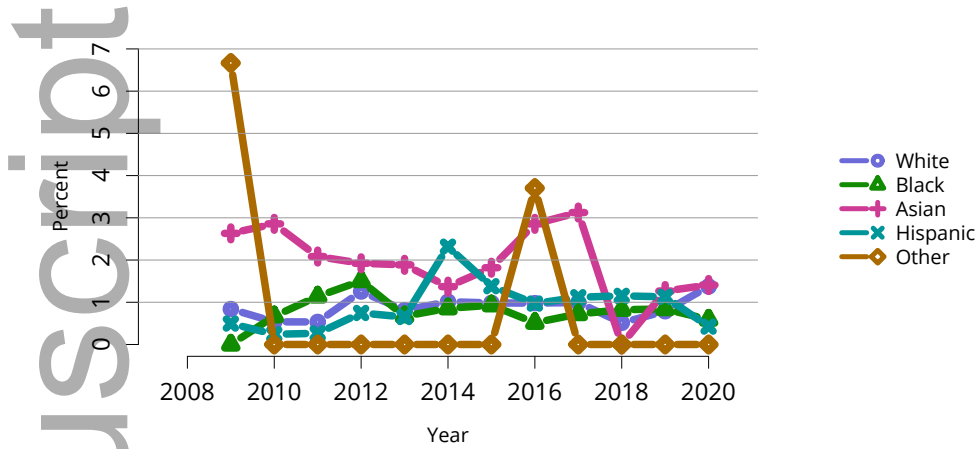


Figure HR 55. Percent of hearts recovered for transplant and not transplanted by donor race. Percentages of hearts not transplanted out of all hearts recovered for transplant.

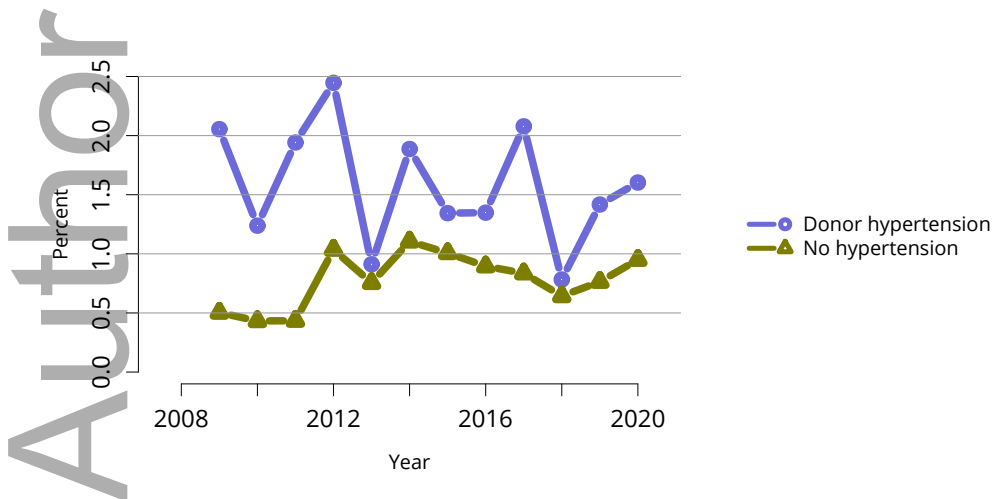


Figure HR 56. Percent of hearts recovered for transplant and not transplanted by donor hypertension status. Percentages of hearts not transplanted out of all hearts recovered for transplant.

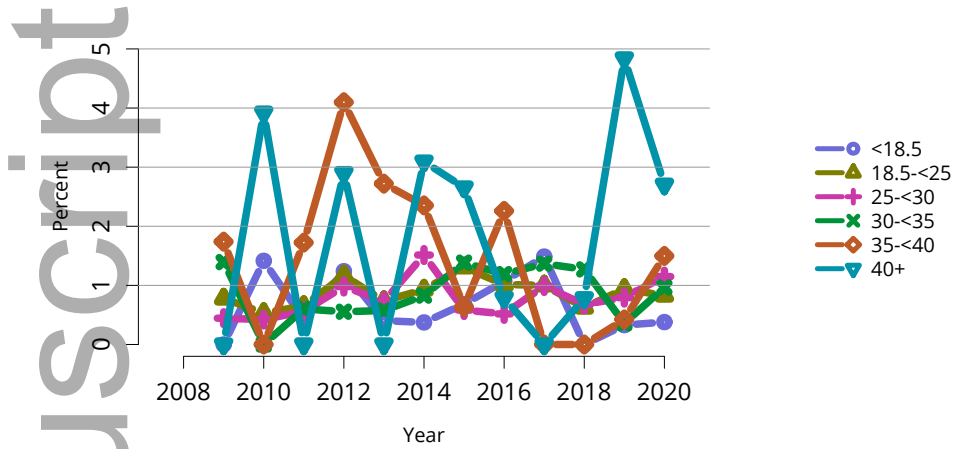


Figure HR 57. Percent of hearts recovered for transplant and not transplanted by donor BMI. Percentages of hearts not transplanted out of all hearts recovered for transplant.

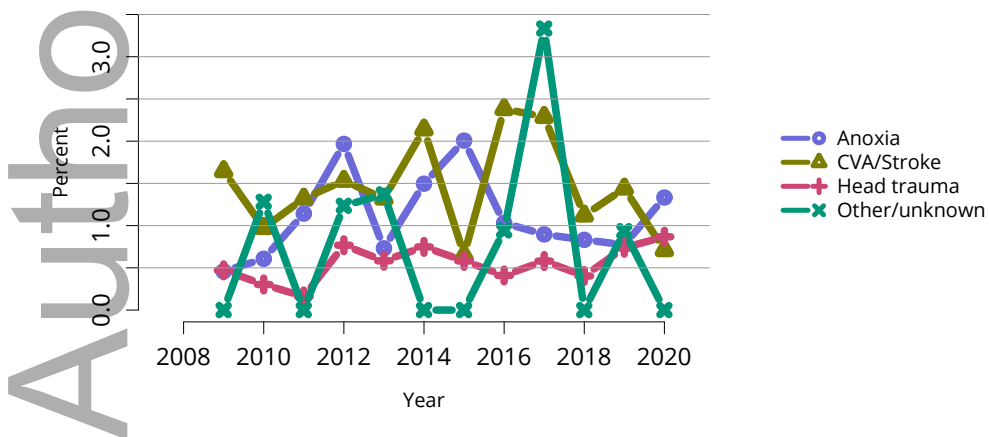


Figure HR 58. Percent of hearts recovered for transplant and not transplanted by donor cause of death. Percentages of hearts not transplanted out of all hearts recovered for transplant. CVA, cerebrovascular accident.

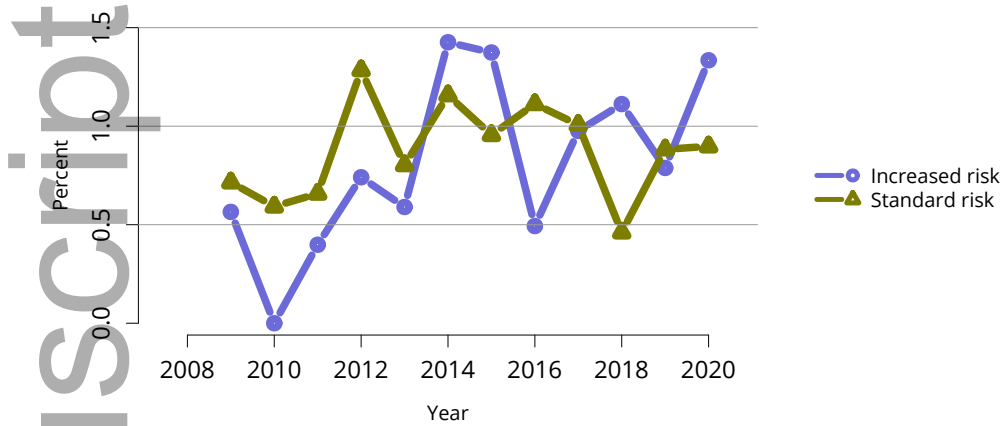


Figure HR 59. Percent of hearts recovered for transplant and not transplanted, by donor risk of disease transmission. Percentages of hearts not transplanted out of all hearts recovered for transplant. "Increased risk" is defined by criteria from the US Public Health Service Guidelines for increased risk for HIV, hepatitis B and hepatitis C transmission.

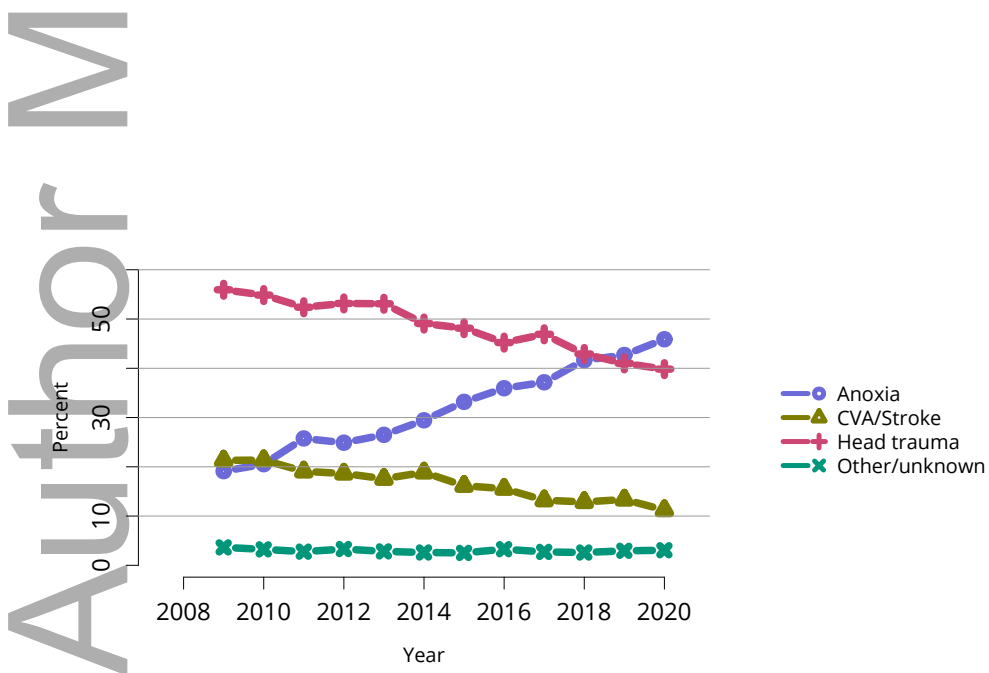


Figure HR 60. Cause of death among deceased heart donors. Deceased donors with a heart recovered for the purposes of transplant. CVA, cerebrovascular accident.

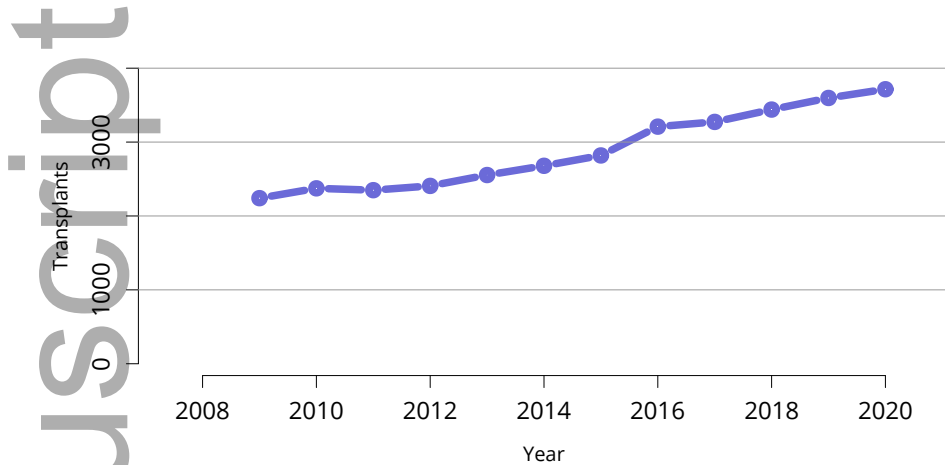


Figure HR 61. Overall heart transplants. All heart transplant recipients, including adult and pediatric, retransplant, and multi-organ recipients.

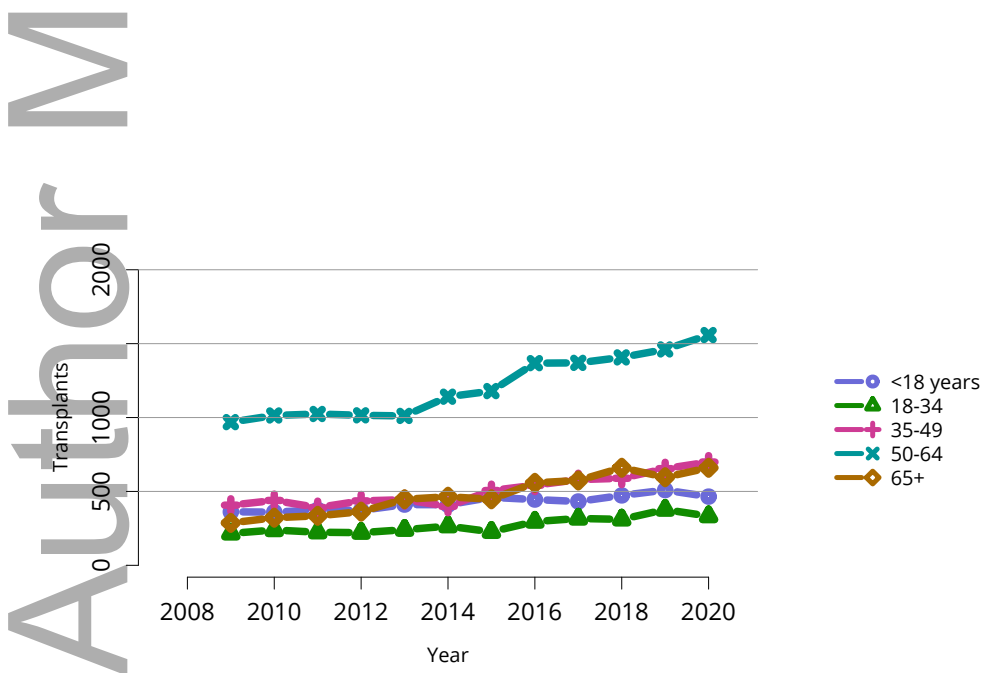


Figure HR 62. Total heart transplants by age. All heart transplant recipients, including adult and pediatric, retransplant, and multi-organ recipients.

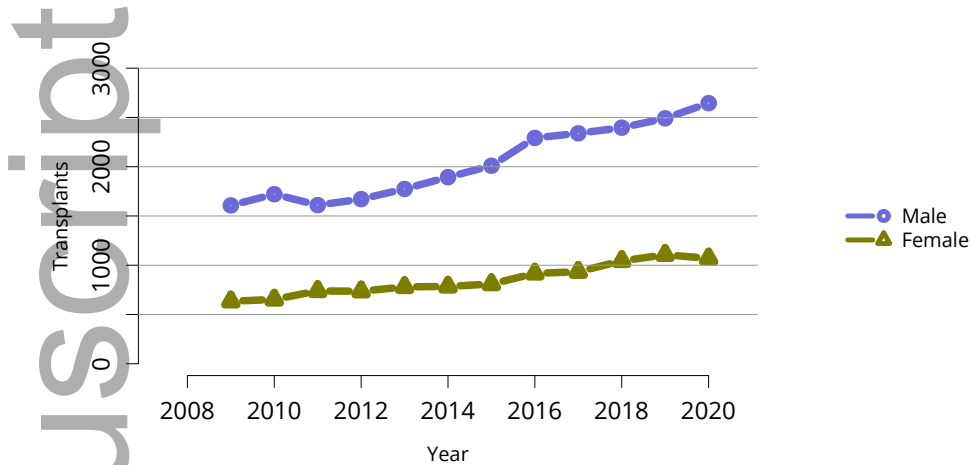


Figure HR 63. Total heart transplants by sex. All heart transplant recipients, including adult and pediatric, retransplant, and multi-organ recipients.

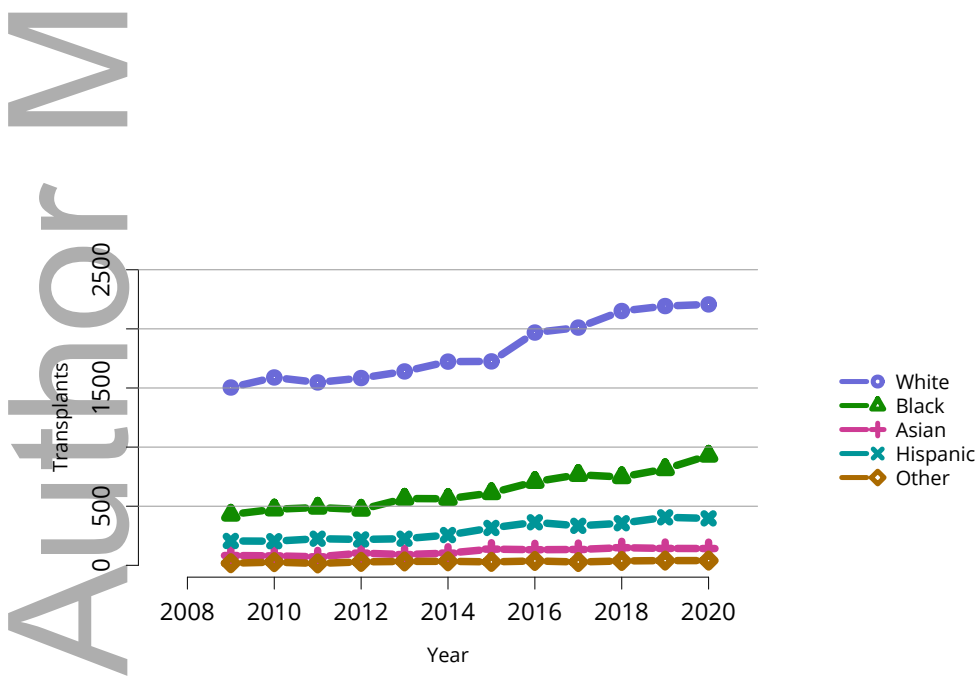


Figure HR 64. Total heart transplants by race. All heart transplant recipients, including adult and pediatric, retransplant, and multi-organ recipients.

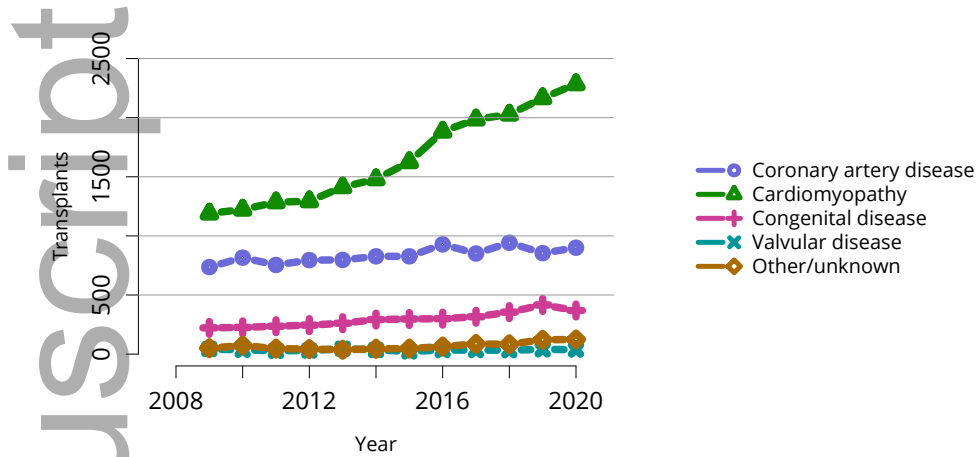


Figure HR 65. Total heart transplants by diagnosis. All heart transplant recipients, including adult and pediatric, retransplant, and multi-organ recipients.

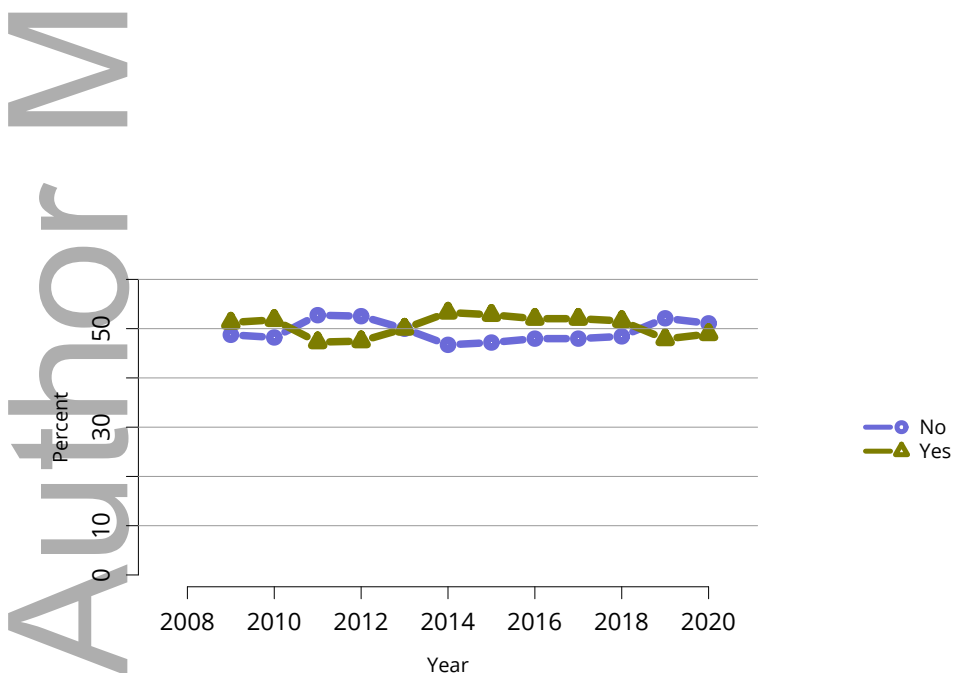


Figure HR 66. Induction agent use in adult heart transplant recipients. Immunosuppression at transplant reported to the OPTN.

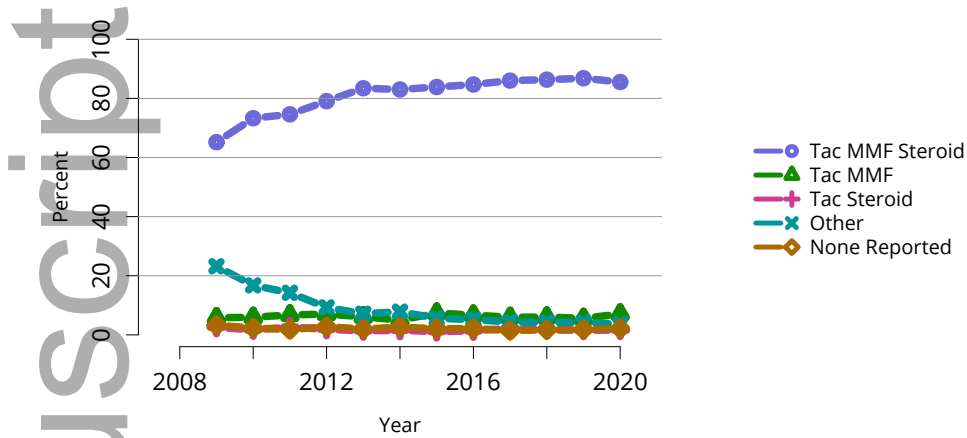


Figure HR 67. Immunosuppression regimen use in adult heart transplant recipients. Immunosuppression regimen at transplant reported to the OPTN. Tac, tacrolimus. MMF, all mycophenolate agents.

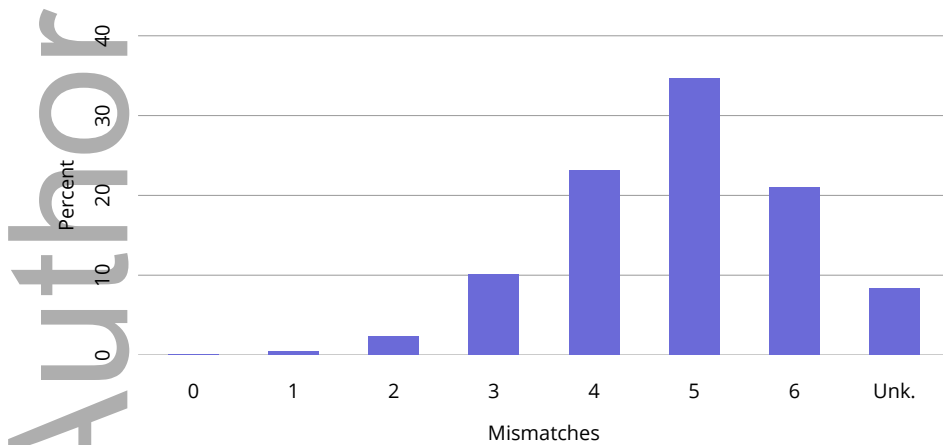


Figure HR 68. Total HLA A, B, and DR mismatches among adult deceased donor heart transplant recipients, 2016-2020. Donor and recipient antigen matching is based on OPTN antigen values and split equivalences policy as of 2018.

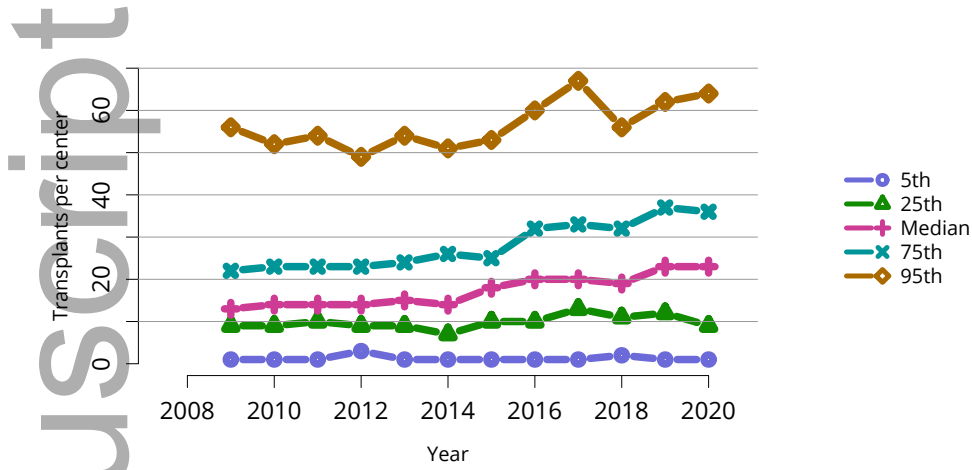


Figure HR 69. Annual adult heart transplant center volumes by percentile. Annual volume data are limited to recipients aged 18 years or older.

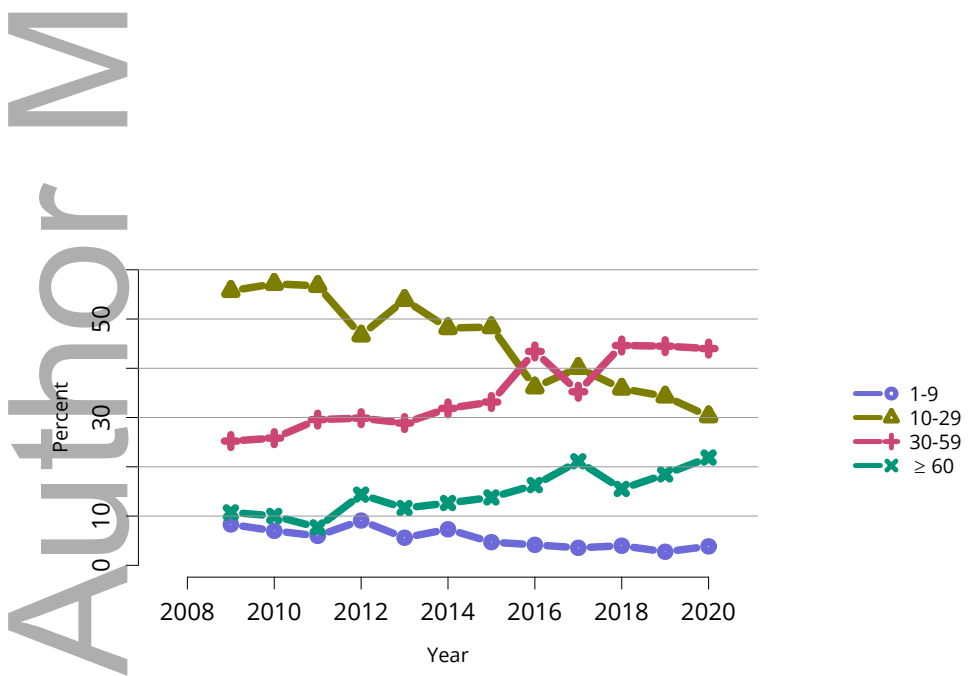


Figure HR 70. Distribution of adult heart transplants by annual center volume. Based on annual volume data among recipients aged 18 or older.

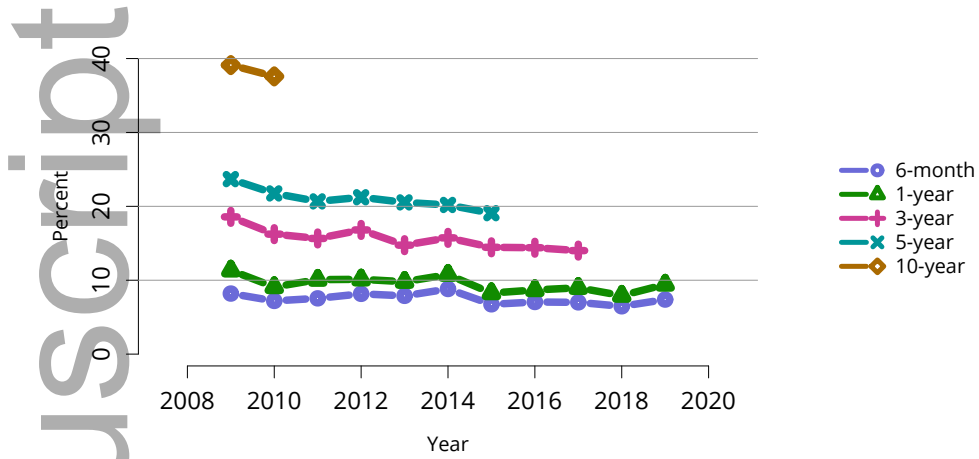


Figure HR 71. Patient death among adult heart transplant recipients. All adult recipients of deceased donor hearts, including multi-organ transplants.

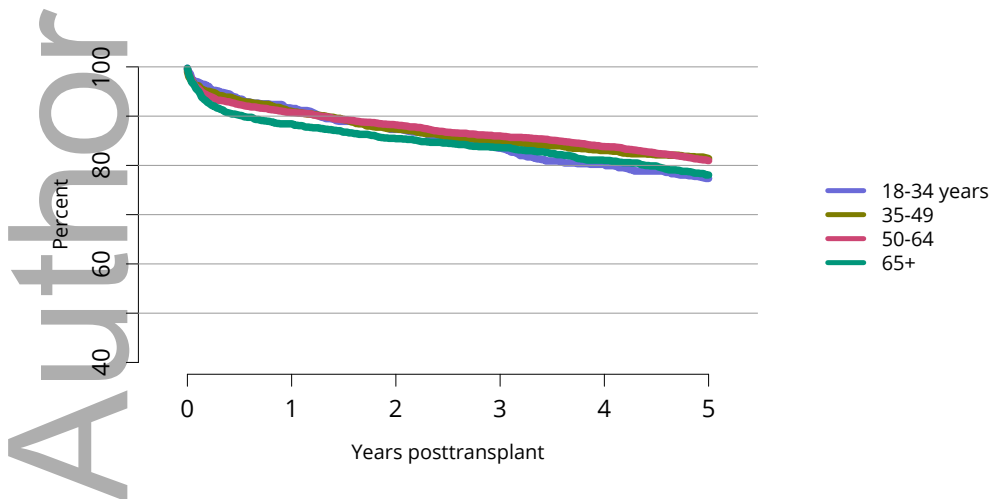


Figure HR 72. Patient survival among adult heart transplant recipients, 2013-2015, by age. Patient survival estimated using unadjusted Kaplan-Meier methods.

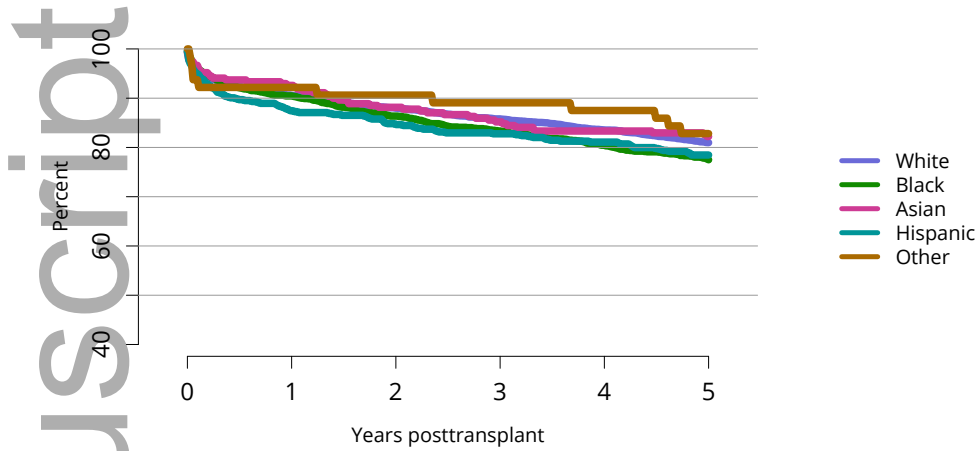


Figure HR 73. Patient survival among adult heart transplant recipients, 2013-2015, by race. Patient survival estimated using unadjusted Kaplan-Meier methods.

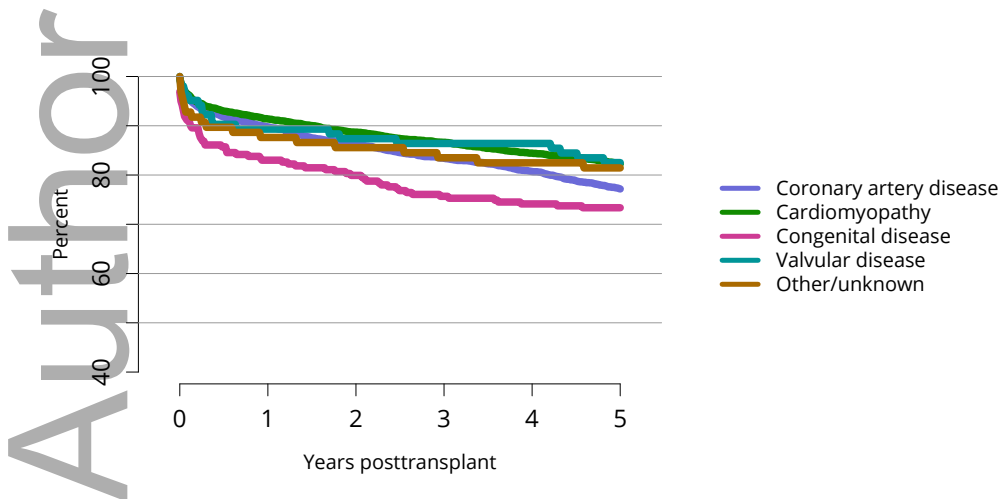


Figure HR 74. Patient survival among adult heart transplant recipients, 2013-2015, by diagnosis group. Patient survival estimated using unadjusted Kaplan-Meier methods.

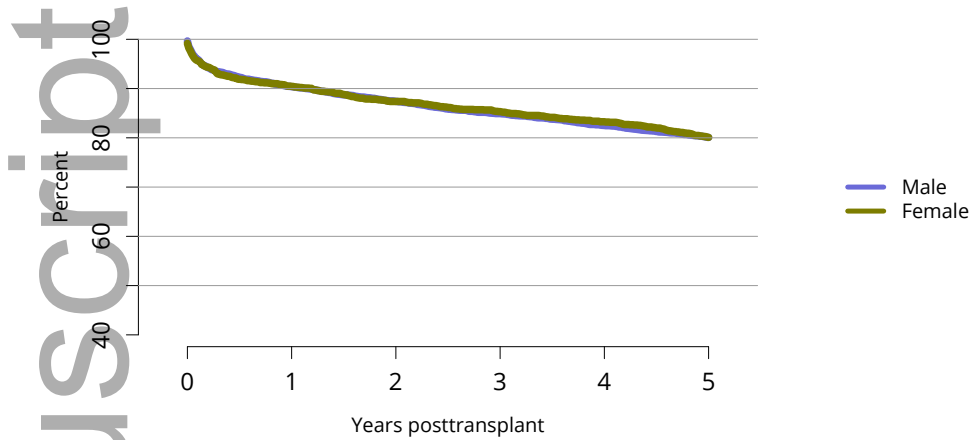


Figure HR 75. Patient survival among adult heart transplant recipients, 2013-2015, by sex. Patient survival estimated using unadjusted Kaplan-Meier methods.

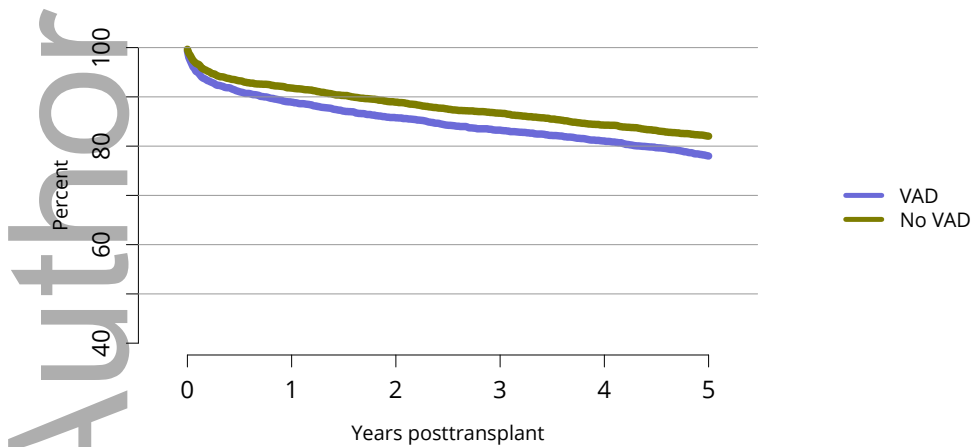


Figure HR 76. Patient survival among adult heart transplant recipients, 2013-2015, by VAD status. Patient survival estimated using unadjusted Kaplan-Meier methods. Ventricular assist device (VAD) status at time of transplant.

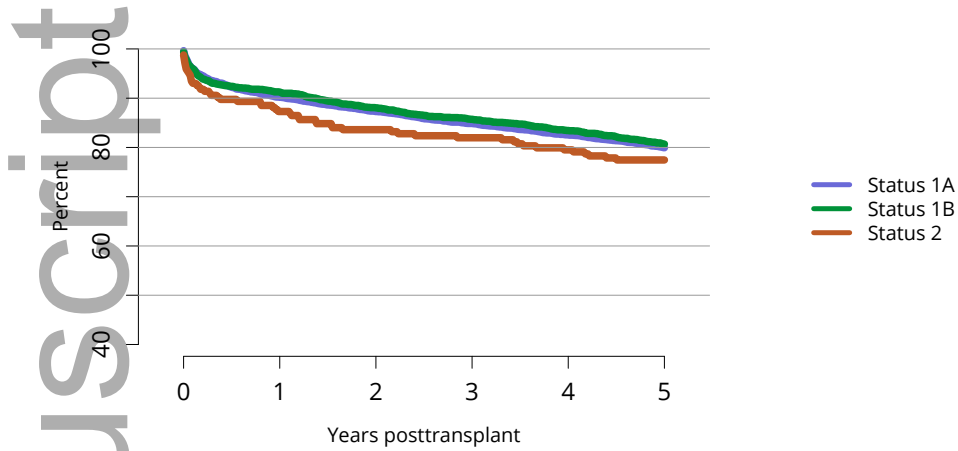


Figure HR 77. Patient survival among adult heart transplant recipients, 2013-2015, by medical urgency. Patient survival estimated using unadjusted Kaplan-Meier methods.

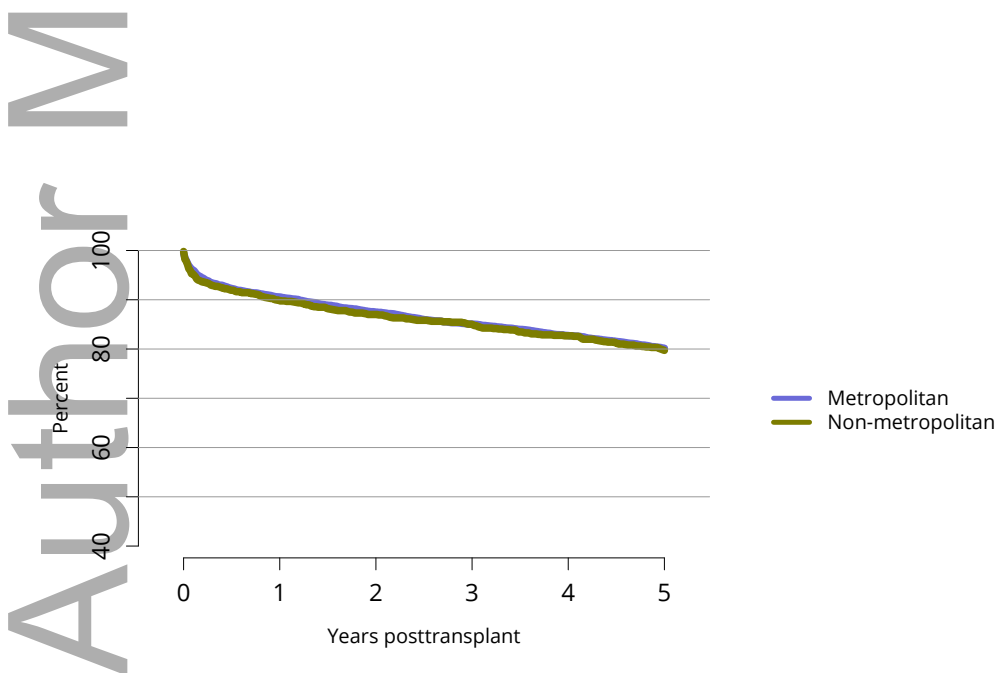


Figure HR 78. Patient survival among adult heart transplant recipients, 2013-2015, by metropolitan vs. non-metropolitan recipient residence. Patient survival estimated using unadjusted Kaplan-Meier methods.

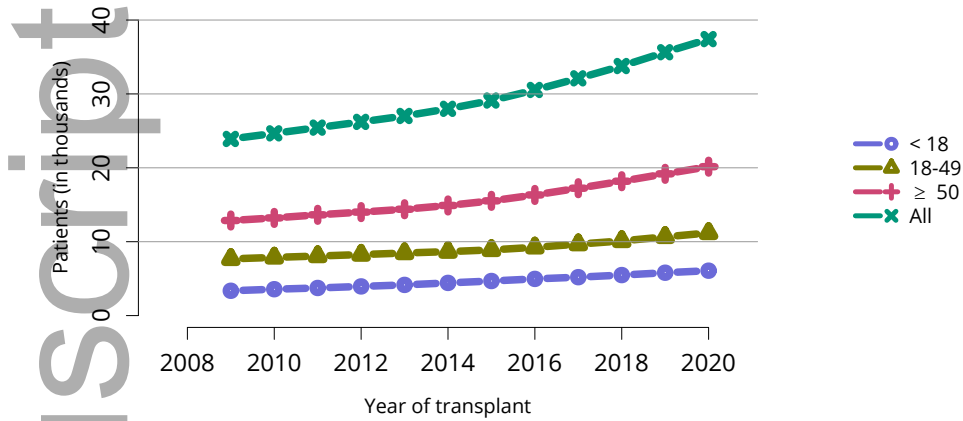


Figure HR 79. Recipients alive with a functioning heart graft on June 30 of the year, by age at transplant. Recipients are assumed to be alive with function unless a death or graft failure is recorded. A recipient may experience a graft failure and be removed from the cohort, undergo retransplant, and re-enter the cohort.

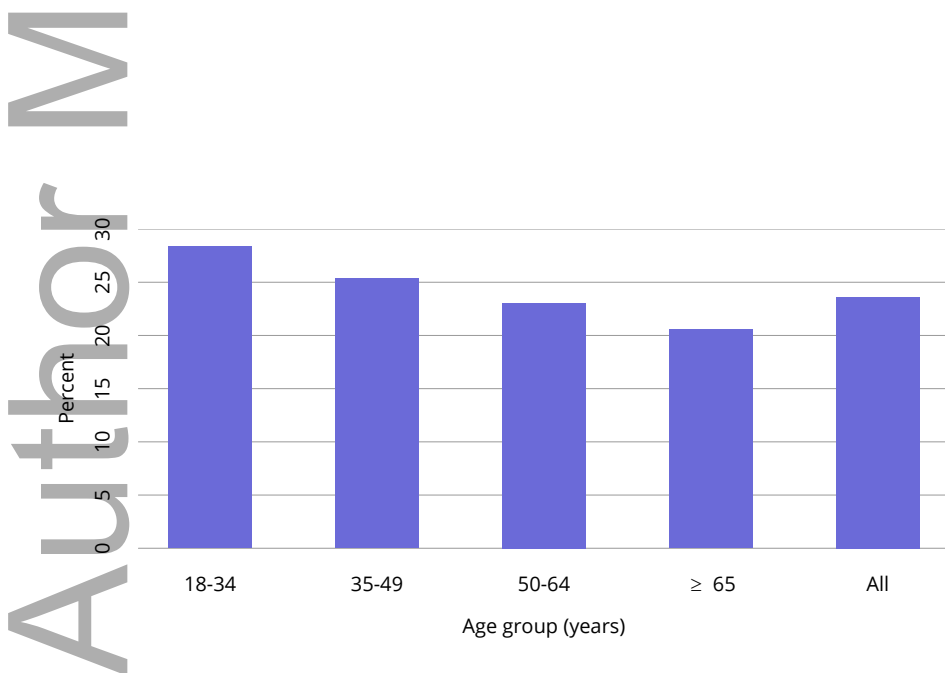


Figure HR 80. Incidence of acute rejection by 1 year posttransplant among adult heart transplant recipients by age, 2018-2019. Only the first reported rejection event is counted. Cumulative incidence is estimated using the Kaplan-Meier method.

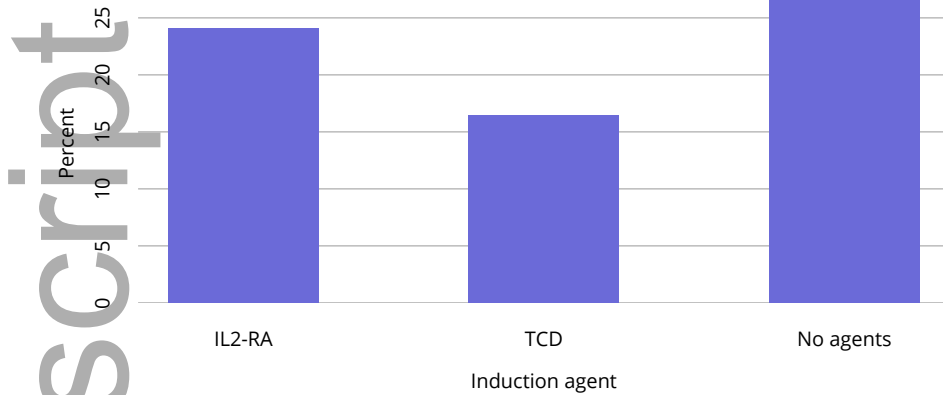


Figure HR 81. Incidence of acute rejection by 1 year posttransplant among adult heart transplant recipients by induction agent, 2018-2019. Only the first reported rejection event is counted. Cumulative incidence is estimated using the Kaplan-Meier method. IL2-RA, interleukin-2 receptor agonist; TCD, T-cell depleting.

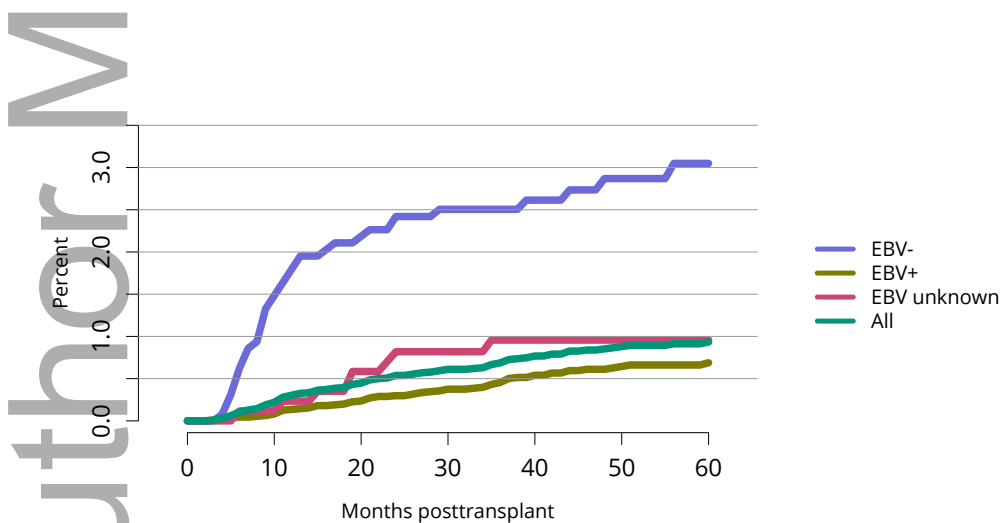


Figure HR 82. Incidence of PTLD among adult heart transplant recipients by recipient EBV status at transplant, 2014-2018. Cumulative incidence is estimated using the Kaplan-Meier method. PTLD is identified as a reported complication or cause of death on the OPTN Transplant Recipient Follow-up Form or the Posttransplant Malignancy Form as polymorphic PTLD, monomorphic PTLD, or Hodgkin’s disease. Only the earliest date of PTLD diagnosis is considered. EBV, Epstein-Barr virus; PTLD, posttransplant lymphoproliferative disorder.

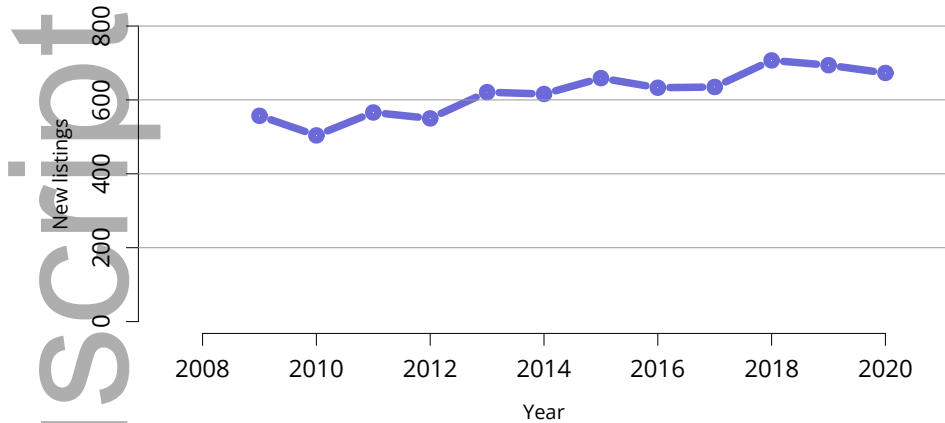


Figure HR 83. New pediatric candidates added to the heart transplant waiting list. A new candidate is one who first joined the list during the given year, without having been listed in a previous year. Previously listed candidates who underwent transplant and subsequently relisted are considered new. Candidates listed at more than one center are counted once per listing. Active and inactive patients are included.

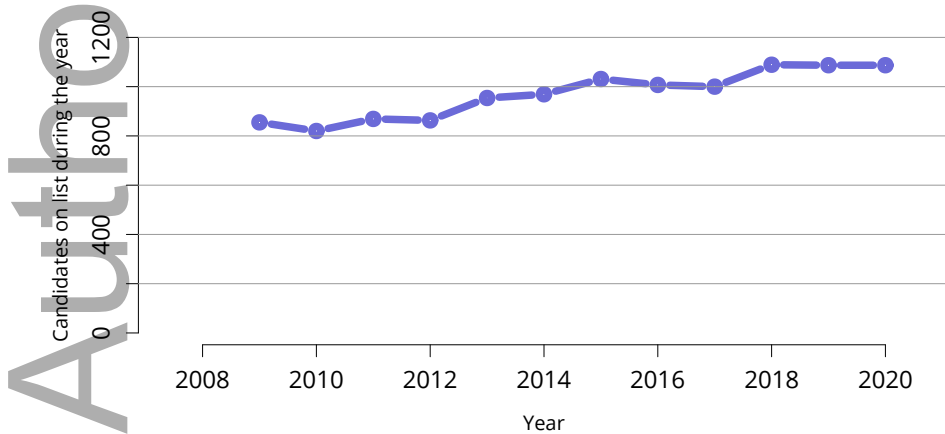


Figure HR 84. All pediatric candidates on the heart transplant waiting list. Pediatric candidates listed at any time during the year. Candidates listed at more than one center are counted once per listing.

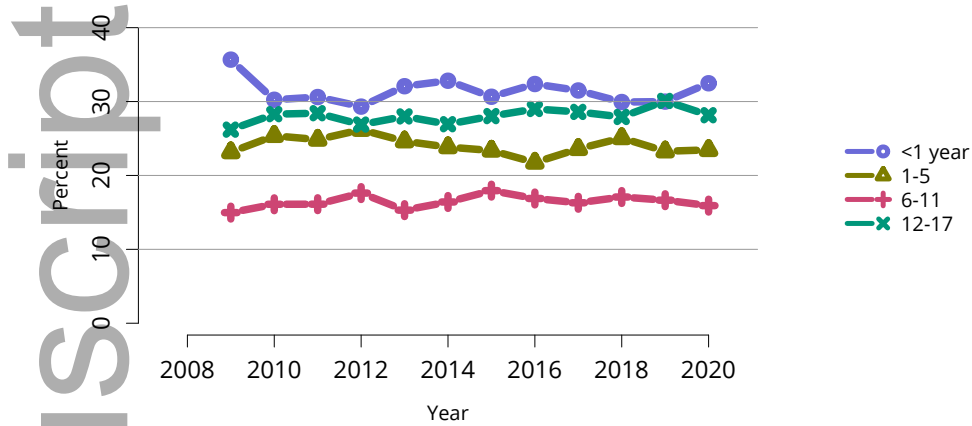


Figure HR 85. Distribution of pediatric candidates waiting for heart transplant by age. Candidates waiting for transplant at any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive candidates are included.

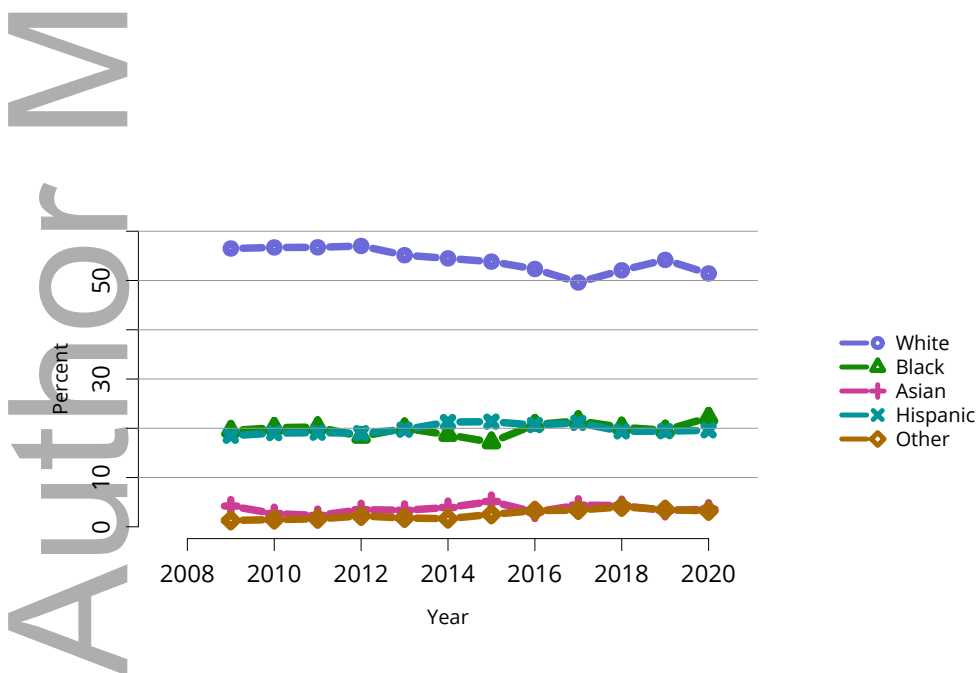


Figure HR 86. Distribution of pediatric candidates waiting for heart transplant by race. Candidates waiting for transplant any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive candidates are included.

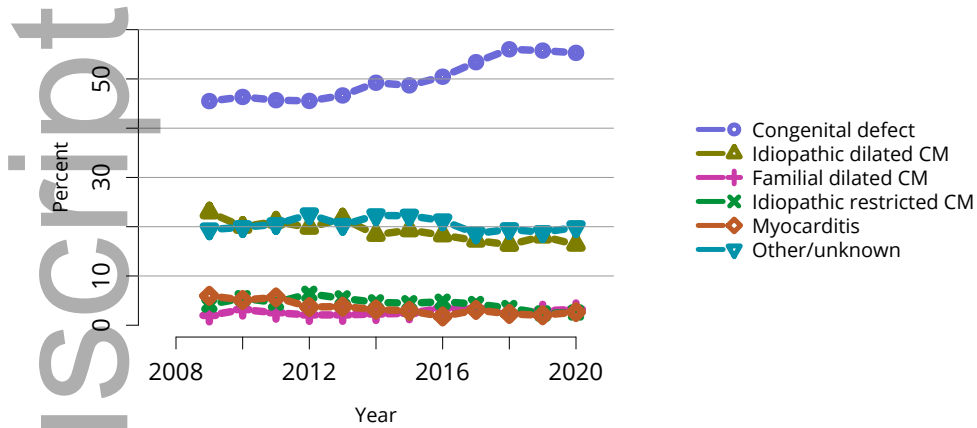


Figure HR 87. Distribution of pediatric candidates waiting for heart transplant by diagnosis. Candidates waiting for transplant any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive candidates are included. CM, cardiomyopathy.

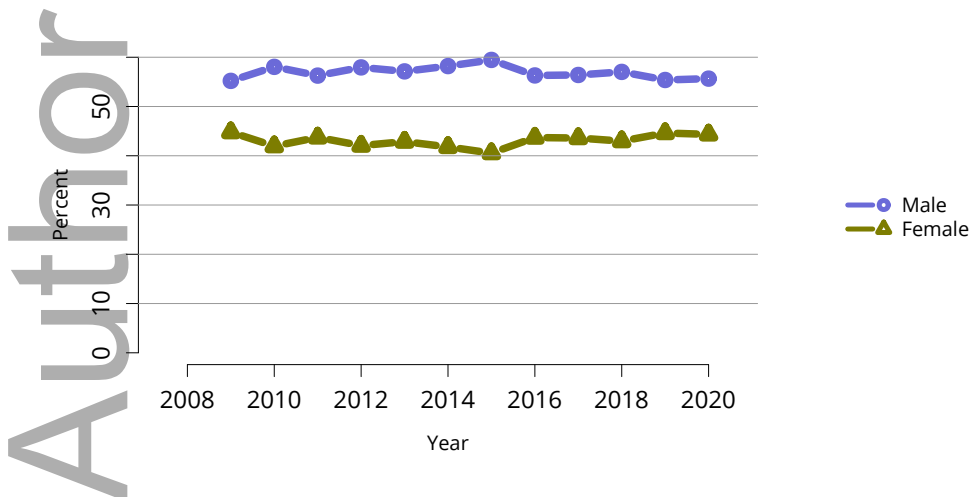


Figure HR 88. Distribution of pediatric candidates waiting for heart transplant by sex. Candidates waiting for transplant any time in the given year. Candidates listed at more than one center are counted once per listing. Active and inactive patients are included.

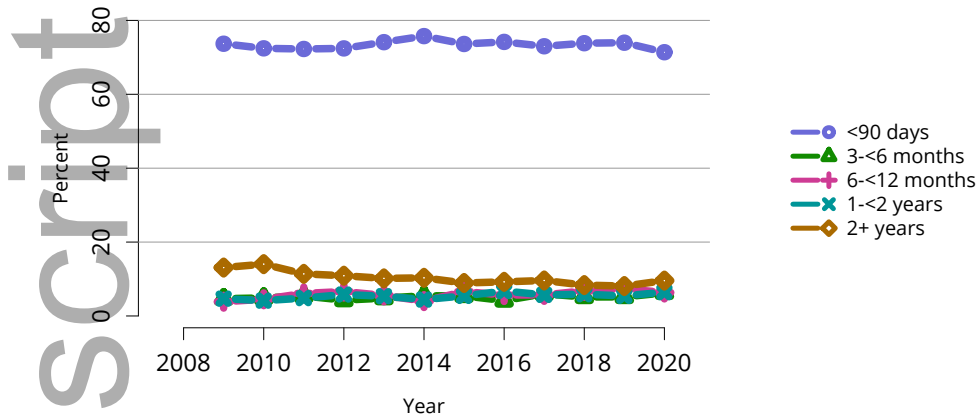


Figure HR 89. Distribution of pediatric candidates waiting for heart transplant by waiting time. Candidates waiting for transplant any time in the given year. Candidates listed at more than one center are counted once per listing. Time on the waiting list is determined at the later of listing date or January 1 of the given year. Active and inactive candidates are included.

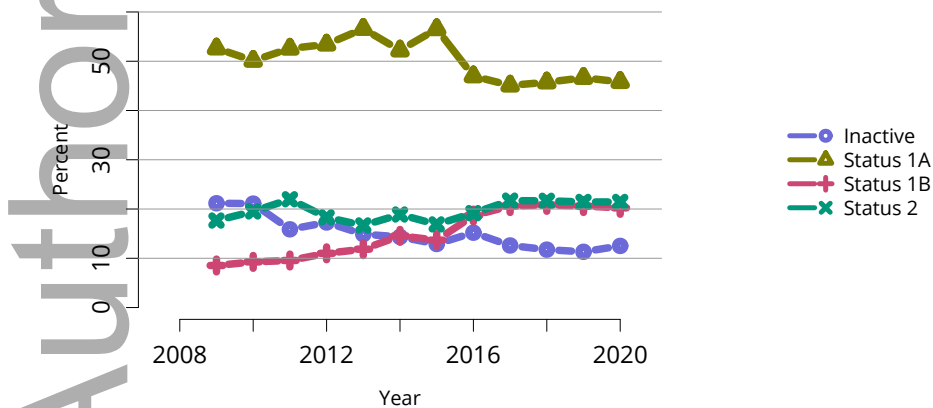


Figure HR 90. Distribution of pediatric candidates waiting for heart transplant by medical urgency. Candidates waiting for transplant any time in the given year. Candidates listed at more than one center are counted once per listing. Medical urgency status is the most severe during the year. Active and inactive patients are included.

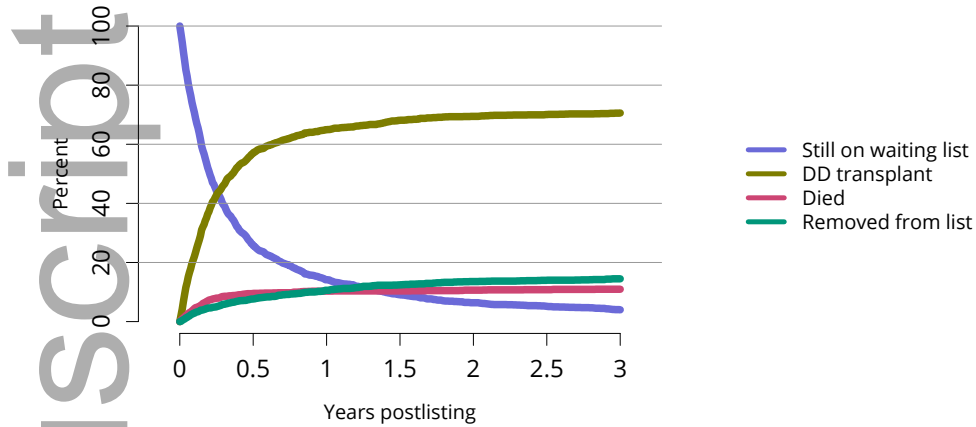


Figure HR 91. Three-year outcomes for newly listed pediatric candidates waiting for heart transplant, 2015-2017. Pediatric candidates who joined the waitlist in 2015-2017. Pediatric candidates listed at more than one center are counted once per listing. Removed from list includes all reasons except transplant and death. DD, deceased donor.

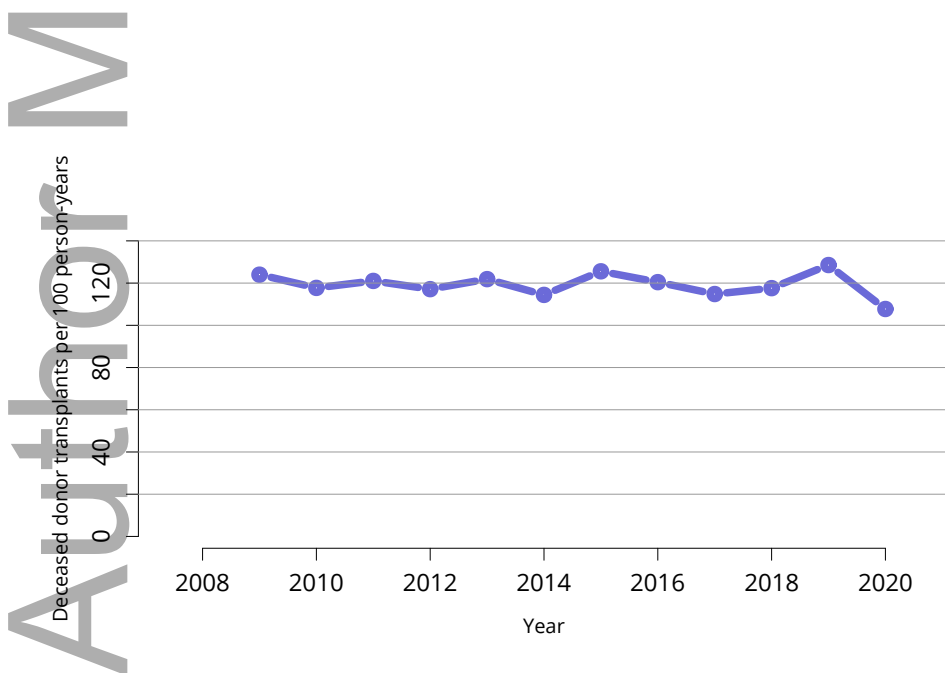


Figure HR 92. Overall deceased donor heart transplant rates among pediatric waitlist candidates. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of waiting in a given year. Individual listings are counted separately.

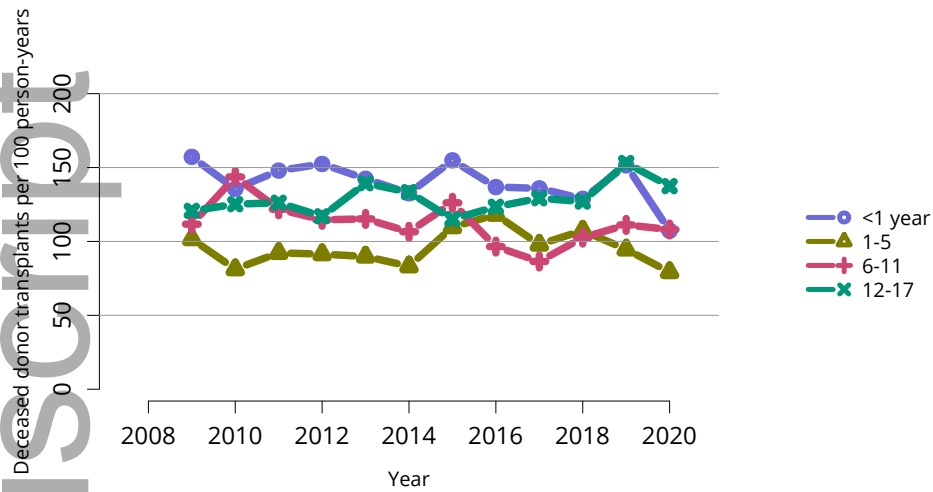


Figure HR 93. Deceased donor heart transplant rates among pediatric waitlist candidates by age. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of waiting in a given year. Individual listings are counted separately.

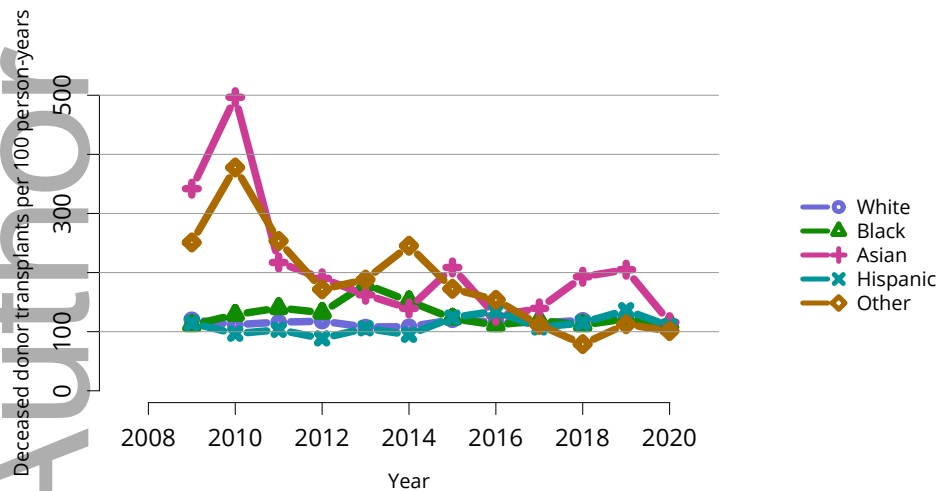


Figure HR 94. Deceased donor heart transplant rates among pediatric waitlist candidates by race. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of waiting in a given year. Individual listings are counted separately.

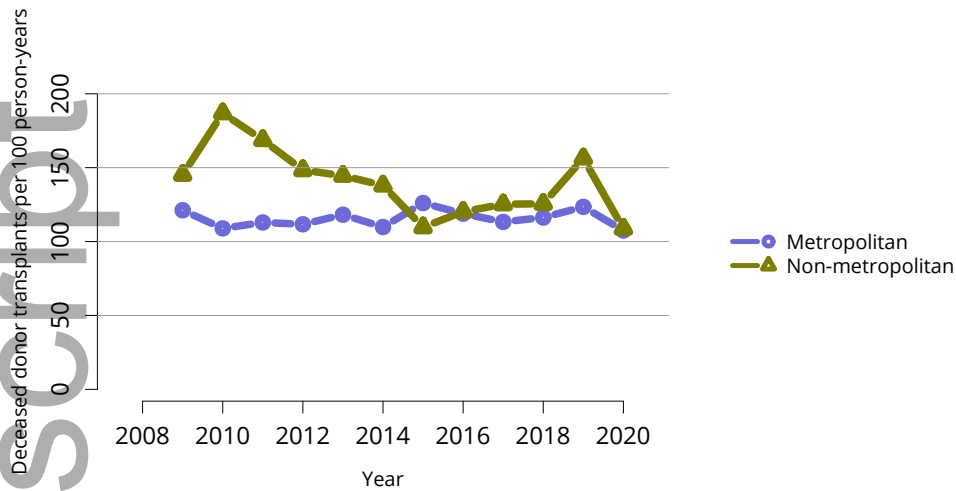


Figure HR 95. Deceased donor heart transplant rates among pediatric waitlist candidates by metropolitan vs. non-metropolitan residence. Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of waiting in a given year. Individual listings are counted separately.

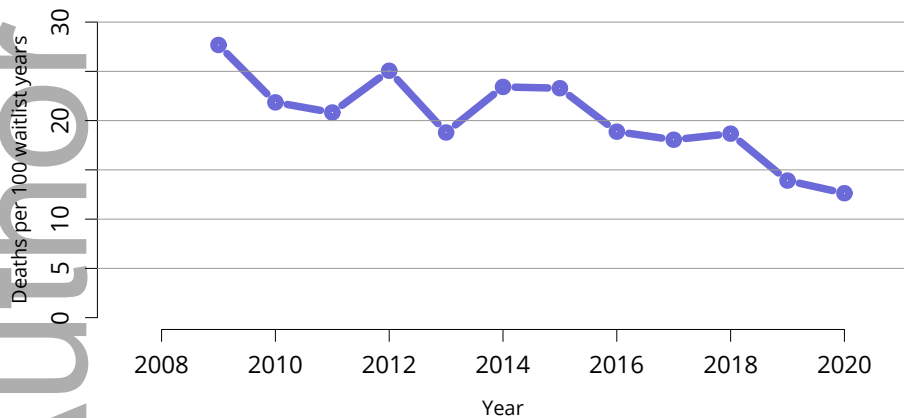


Figure HR 96. Overall pretransplant mortality rates among pediatric candidates waitlisted for heart. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

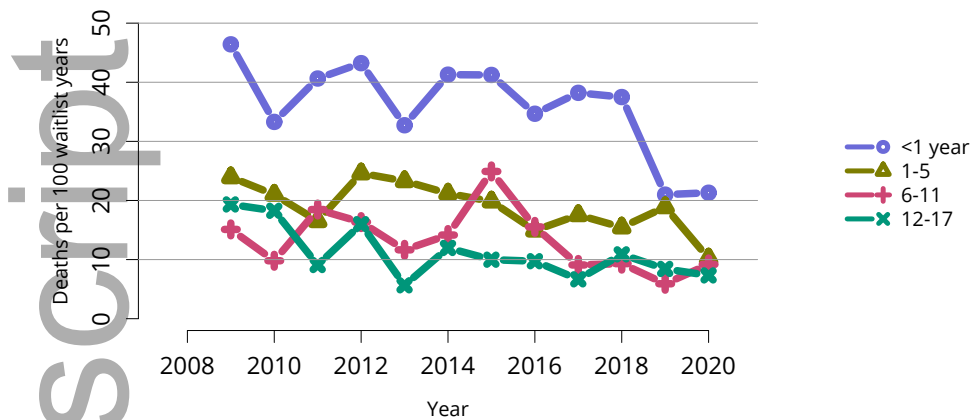


Figure HR 97. Pretransplant mortality rates among pediatric candidates waitlisted for heart transplant by age. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

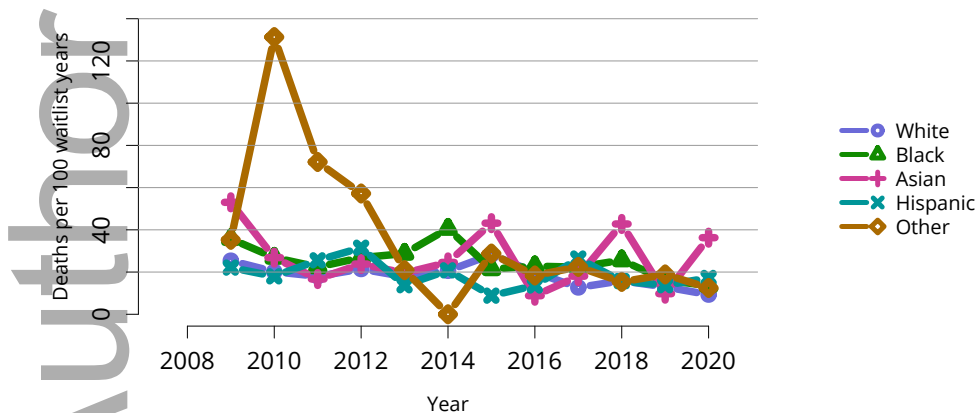


Figure HR 98. Pretransplant mortality rates among pediatric candidates waitlisted for heart transplant by race. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

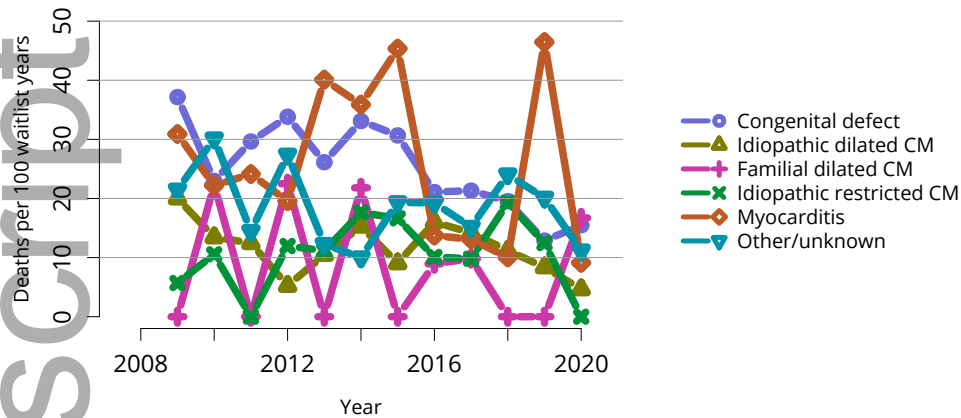


Figure HR 99. Pretransplant mortality rates among pediatric waitlisted for heart transplant by diagnosis. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately. CM, cardiomyopathy.

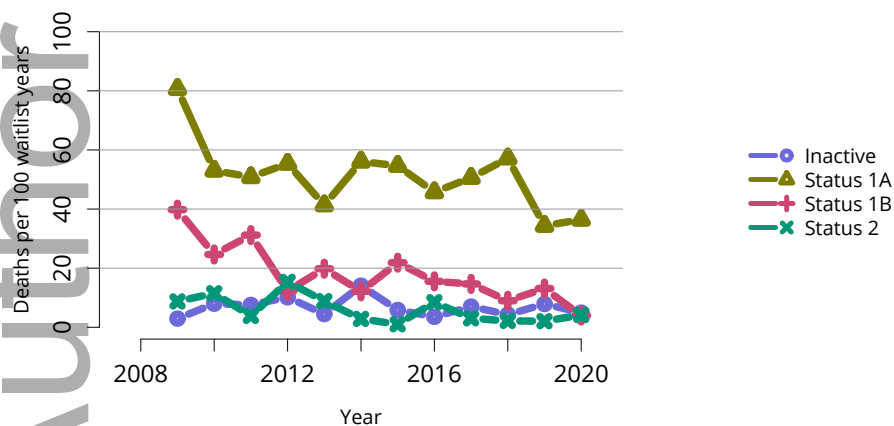


Figure HR 100. Pretransplant mortality rates among pediatric waitlisted for heart transplant by medical urgency. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately.

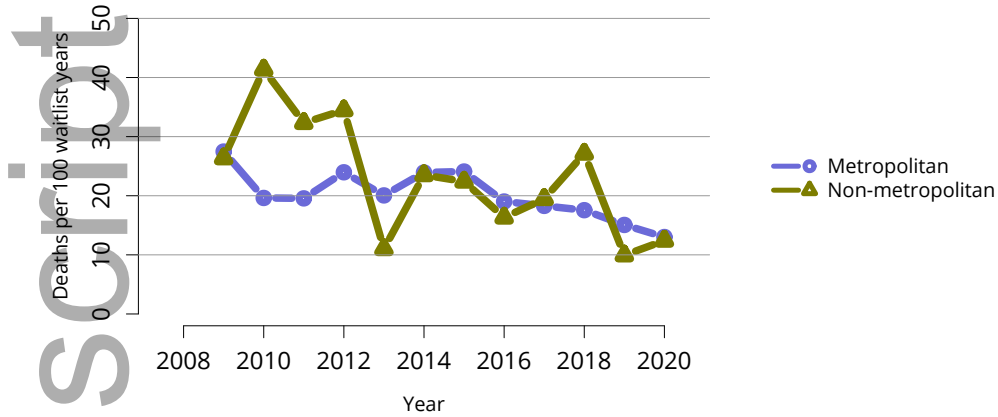


Figure HR 101. Pretransplant mortality rates among pediatric candidates waitlisted for heart transplant by metropolitan vs. non-metropolitan residence. Mortality rates are computed as the number of deaths per 100 patient-years of waiting in the given year. Waiting time is censored at transplant, death, transfer to another program, removal because of improved condition, or end of cohort. Individual listings are counted separately. Urban/rural determination is made using the RUCA (Rural-Urban Commuting Area) designation of the candidate’s permanent zip code.

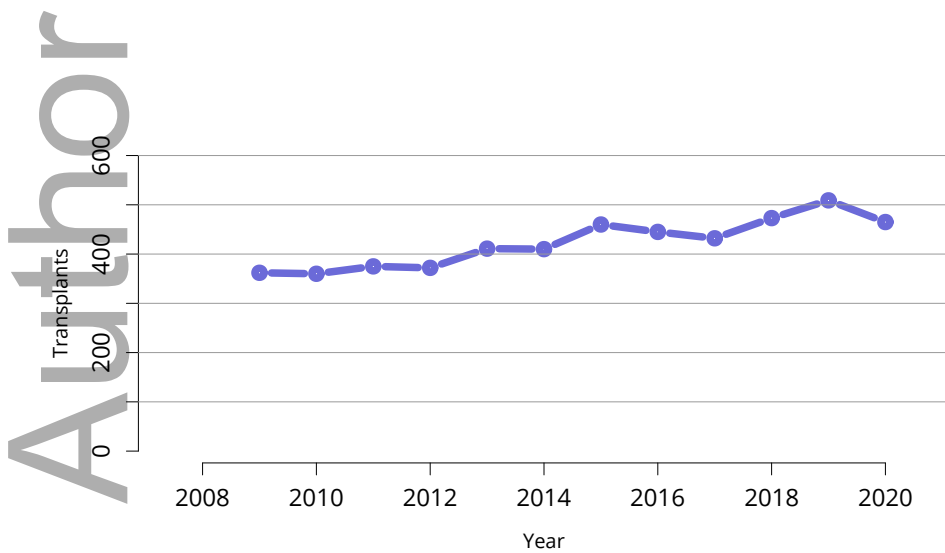


Figure HR 102. Overall pediatric heart transplants. All pediatric heart transplant recipients, including retransplant, and multi-organ recipients.

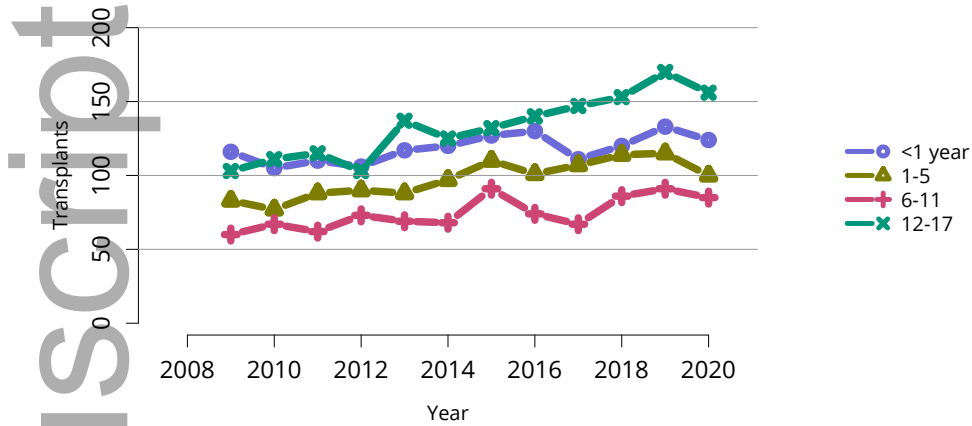


Figure HR 103. Pediatric heart transplants by recipient age. All pediatric heart transplant recipients, including retransplant, and multi-organ recipients.

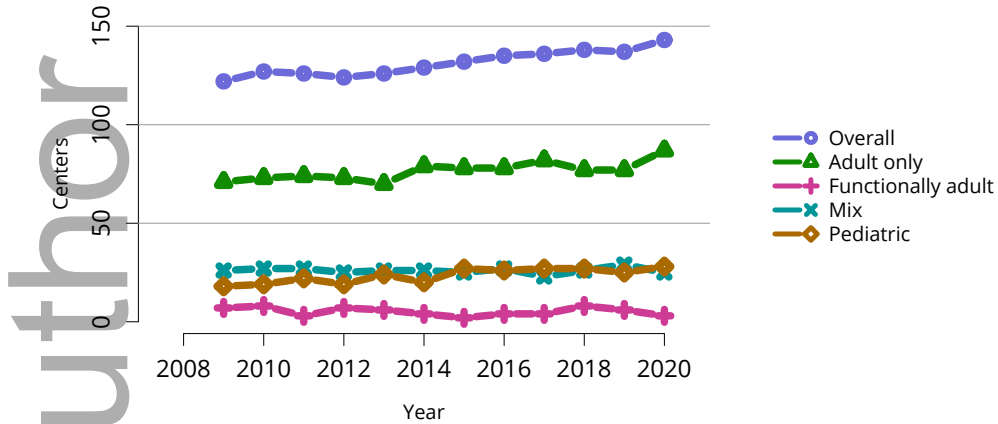


Figure HR 104. Number of centers performing pediatric and adult heart transplants by center's age mix. Adult centers transplanted only recipients aged 18 years or older. Functionally adult centers transplanted 80% adults or more, and the remainder were children aged 15-17 years. Mixed included adults and children of any age groups. Pediatric center transplanted recipients aged 0-17 years, and a small number of adults up to age 21 years.

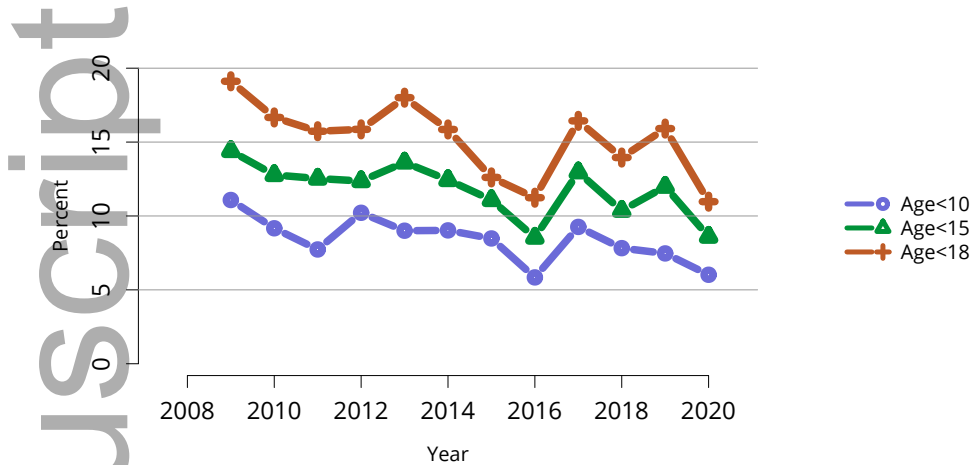


Figure HR 105. Pediatric heart recipients at programs that perform 5 or fewer pediatric transplants annually. Age groups are cumulative.

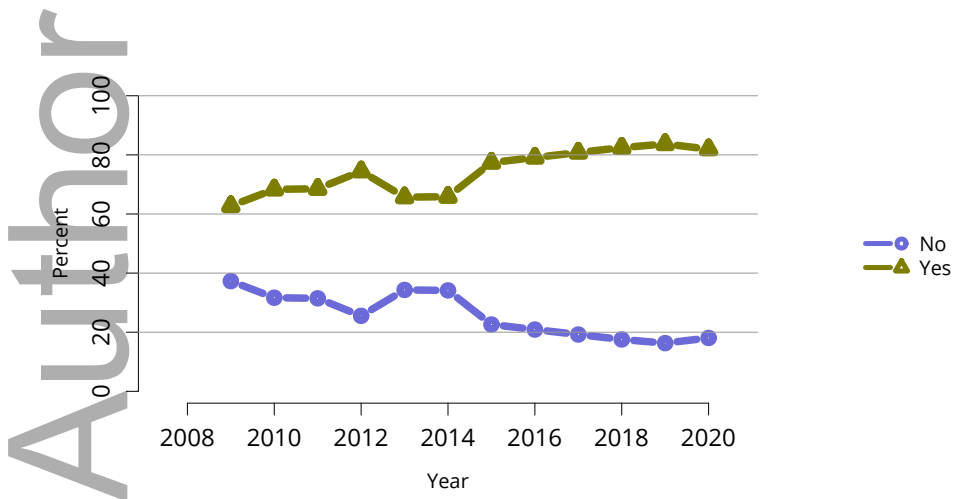


Figure HR 106. Induction agent use in pediatric heart transplant recipients. Immunosuppression at transplant reported to the OPTN.

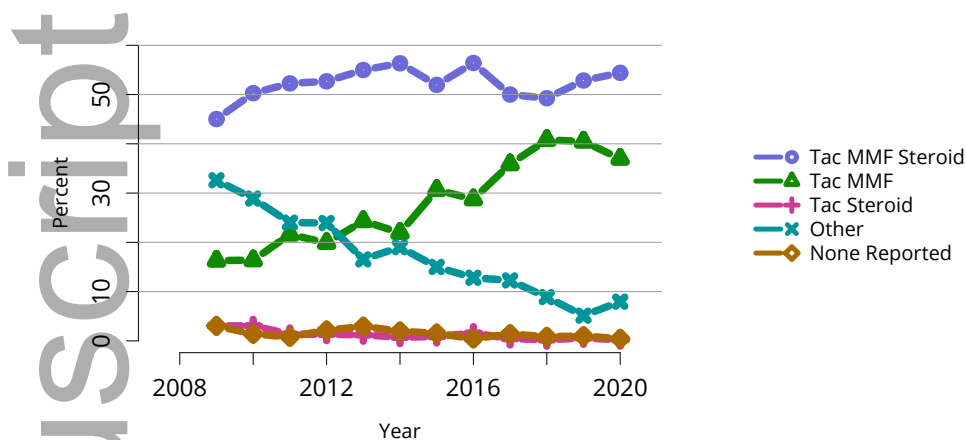


Figure HR 107. Immunosuppression regimen use in pediatric heart transplant recipients. Immunosuppression regimen at transplant reported to the OPTN. Tac, tacrolimus. MMF, all mycophenolate agents.

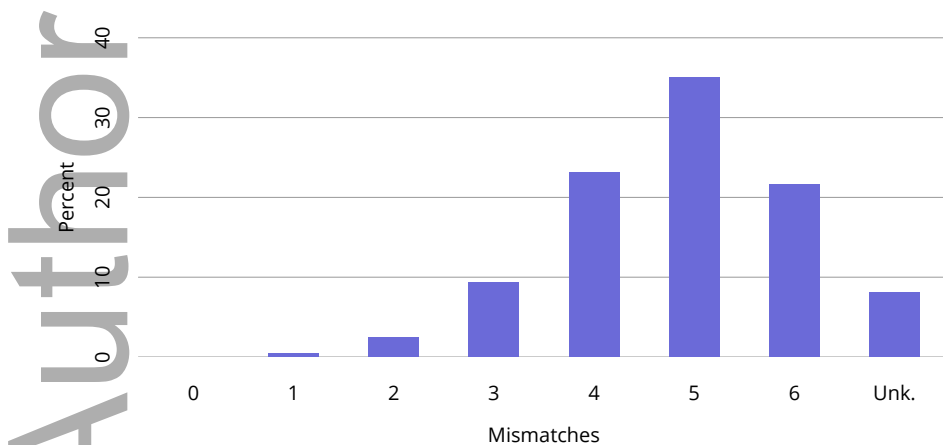


Figure HR 108. Total HLA A, B, and DR mismatches among pediatric deceased donor heart transplant recipients, 2016-2020. Donor and recipient antigen matching is based on OPTN antigen values and split equivalences policy as of 2018.

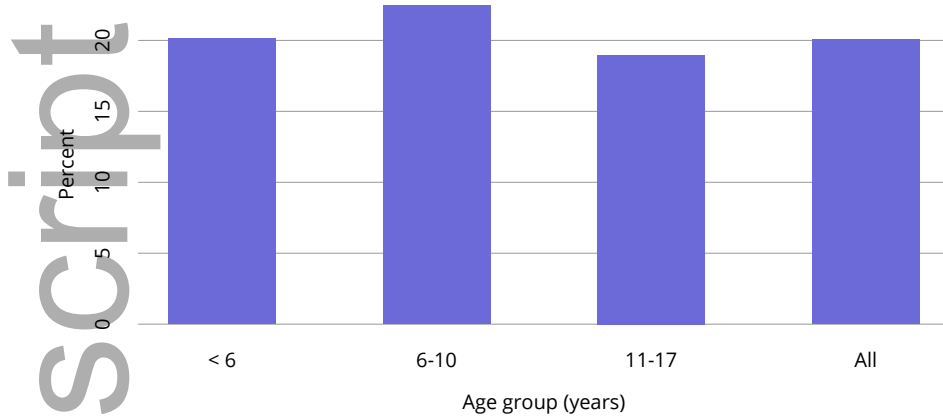


Figure HR 109. Incidence of acute rejection by 1 year posttransplant among pediatric heart transplant recipients by age, 2018-2019. Only the first reported rejection event is counted. Cumulative incidence is estimated using the Kaplan-Meier method.

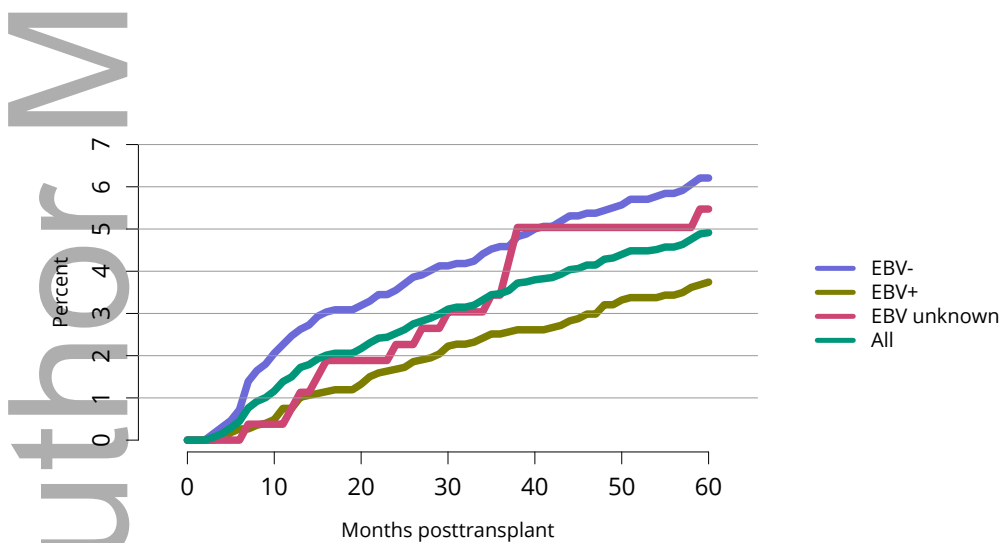


Figure HR 110. Incidence of PTLD among pediatric heart transplant recipients by recipient EBV status at transplant, 2008-2018. Cumulative incidence is estimated using the Kaplan-Meier method. PTLD is identified as a reported complication or cause of death on the OPTN Transplant Recipient Follow-up Form or on the Posttransplant Malignancy Form as polymorphic PTLD, monomorphic PTLD, or Hodgkin’s disease. Only the earliest date of PTLD diagnosis is considered. EBV, Epstein-Barr virus.

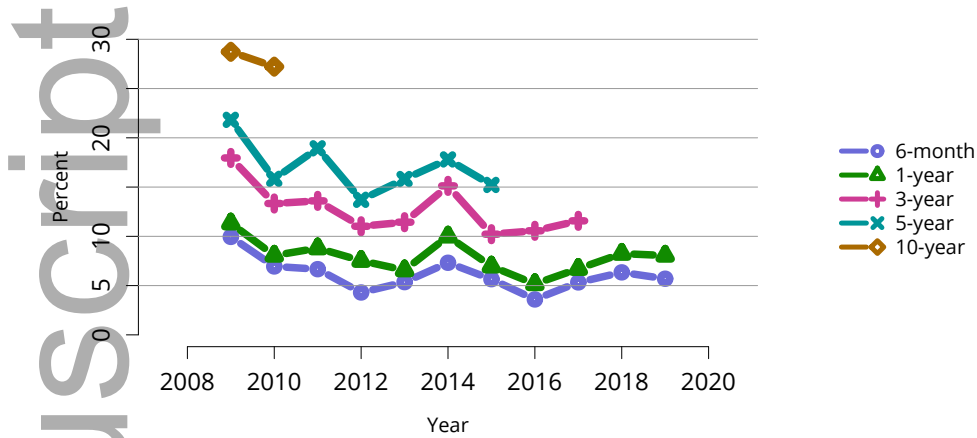


Figure HR 111. Patient death among pediatric heart transplant recipients. All pediatric recipients of deceased donor hearts, including multi-organ transplants. Estimates are unadjusted, computed using unadjusted Kaplan-Meier methods.

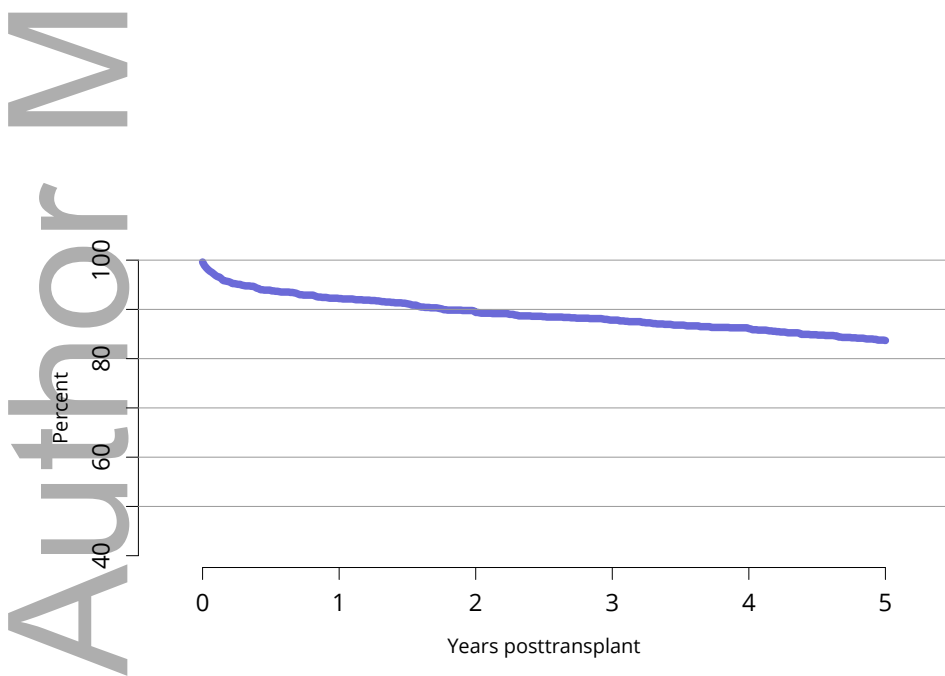


Figure HR 112. Overall patient survival among pediatric deceased donor heart transplant recipients, 2013-2015. Recipient survival estimated using unadjusted Kaplan-Meier methods.

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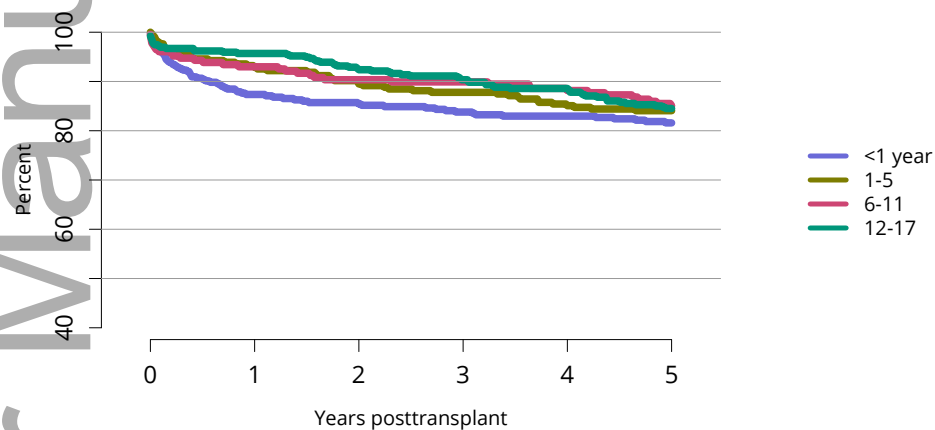


Figure HR 113. Patient survival among pediatric deceased donor heart transplant recipients, 2013-2015, by recipient age. Recipient survival estimated using unadjusted Kaplan-Meier methods.

Characteristic	2010		2020	
	N	Percent	N	Percent
Age				
18-34 years	292	10.0%	344	10.9%
35-49 years	679	23.2%	707	22.5%
50-64 years	1498	51.1%	1529	48.6%
≥ 65 years	464	15.8%	565	18.0%
Sex				
Female	787	26.8%	707	22.5%
Male	2146	73.2%	2438	77.5%
Race/ethnicity				
White	2048	69.8%	1843	58.6%
Black	624	21.3%	919	29.2%
Hispanic	185	6.3%	276	8.8%
Asian	54	1.8%	81	2.6%
Other/unknown	22	0.8%	26	0.8%
Geography				
Metropolitan	2453	83.6%	2692	85.6%
Non-metro	480	16.4%	453	14.4%
Distance				
< 50 miles	1734	59.1%	1945	61.8%
50-<100 miles	482	16.4%	505	16.1%
100-<150 miles	275	9.4%	296	9.4%
150-<250 miles	232	7.9%	207	6.6%
≥ 250 miles	193	6.6%	180	5.7%
Unknown	17	0.6%	12	0.4%
All candidates	2933	100.0%	3145	100.0%

Table HR 1 Demographic characteristics of adults on the heart transplant waiting list on December 31, 2010 and December 31, 2020. Candidates waiting for transplant on December 31 of the given year, regardless of first listing date. Distance is computed from candidate's home zip code to the transplant center.

Characteristic	2010		2020	
	N	Percent	N	Percent
Diagnosis				
Coronary artery disease	1140	38.9%	925	29.4%
Cardiomyopathy	1429	48.7%	1845	58.7%
Congenital disease	158	5.4%	163	5.2%
Valvular disease	54	1.8%	30	1.0%
Other/unknown	152	5.2%	182	5.8%
Blood type				
A	940	32.0%	846	26.9%
B	307	10.5%	310	9.9%
AB	51	1.7%	54	1.7%
O	1635	55.7%	1935	61.5%
Medical urgency				
Former Status 1A	161	5.5%	0	0.0%
Former Status 1B	857	29.2%	0	0.0%
Former Status 2	1042	35.5%	0	0.0%
New Status 1	0	0.0%	4	0.1%
New Status 2	0	0.0%	84	2.7%
New Status 3	0	0.0%	169	5.4%
New Status 4	0	0.0%	1451	46.1%
New Status 5	0	0.0%	117	3.7%
New Status 6	0	0.0%	525	16.7%
Inactive	873	29.8%	795	25.3%
VAD at listing	482	16.4%	1145	36.4%
All candidates	2933	100.0%	3145	100.0%

Table HR 2 Clinical characteristics of adults on the heart transplant waiting list on December 31, 2010 and December 31, 2020. Candidates waiting for transplant on December 31 of the given year, regardless of first listing date. VAD, ventricular assist device.

Characteristic	2010		2020	
	N	Percent	N	Percent
Transplant history				
First	2824	96.3%	3067	97.5%
Retransplant	109	3.7%	78	2.5%
Wait time				
< 1 year	1520	51.8%	1419	45.1%
1-< 2 years	598	20.4%	684	21.7%
2-< 3 years	279	9.5%	487	15.5%
3-< 4 years	136	4.6%	221	7.0%
4-< 5 years	99	3.4%	132	4.2%
≥ 5 years	301	10.3%	202	6.4%
Tx type				
Heart only	2752	93.8%	2766	87.9%
Heart-kidney	89	3.0%	267	8.5%
Heart-lung	65	2.2%	68	2.2%
Other	27	0.9%	44	1.4%
All candidates	2933	100.0%	3145	100.0%

Table HR 3 Listing characteristics of adults on the heart transplant waiting list on December 31, 2010 and December 31, 2020. Candidates waiting for transplant on December 31 of the given year, regardless of first listing date.

Waiting list state	2018	2019	2020
Patients at start of year	3591	3467	3379
Patients added during year	4072	4088	4000
Patients removed during year	4187	4169	4233
Patients at end of year	3476	3386	3146

Table HR 4 Heart transplant waitlist activity among adults. Candidates listed at more than one center are counted once per listing. Candidates who are listed, undergo transplant, and are relisted are counted more than once. Candidates are not considered to be on the list on the day they are removed; counts on January 1 may differ from counts on December 31 of the prior year. Candidates listed for multi-organ transplants are included.

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Removal reason	2018	2019	2020
Deceased donor transplant	2948	3066	3234
Patient died	273	201	199
Patient refused transplant	27	25	19
Improved, transplant not needed	183	163	147
Too sick for transplant	280	261	234
Other	476	453	400

Table HR 5 Removal reason among adult heart transplant candidates. Removal reason as reported to the OPTN. Candidates with death dates that precede removal dates are assumed to have died waiting.

Author Manuscript

Support	2017		2020	
	N	Percent	N	Percent
Any life support	2438	85.8%	2549	78.4%
Left ventricular assist device	1359	47.8%	1085	33.4%
Intravenous inotropes	1027	36.1%	1224	37.7%
Intra-aortic balloon pump	235	8.3%	844	26.0%
Right ventricular assist device	48	1.7%	68	2.1%
Extra corporeal membrane oxygenation	34	1.2%	177	5.4%
Total artificial heart	23	0.8%	6	0.2%
Ventilator	22	0.8%	64	2.0%
Inhaled NO	5	0.2%	15	0.5%
Prostaglandins	1	0.0%	1	0.0%

Table HR 6 Adult heart recipients on life support before transplant. Patients may have more than one type of life support. Circulatory support: LVAD, RVAD, total artificial heart, ECMO, and IABP.

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Characteristic	2010		2020	
	N	Percent	N	Percent
Age				
18-34 years	239	11.9%	333	10.2%
35-49 years	439	21.8%	699	21.5%
50-64 years	1014	50.3%	1558	47.9%
≥ 65 years	322	16.0%	660	20.3%
Sex				
Female	498	24.7%	865	26.6%
Male	1516	75.3%	2385	73.4%
Race/ethnicity				
White	1393	69.2%	1969	60.6%
Black	396	19.7%	818	25.2%
Hispanic	142	7.1%	312	9.6%
Asian	64	3.2%	126	3.9%
Other/unknown	19	0.9%	25	0.8%
Insurance				
Private	1041	51.7%	1524	46.9%
Medicare	668	33.2%	1090	33.5%
Medicaid	241	12.0%	464	14.3%
Other government	48	2.4%	106	3.3%
Unknown	16	0.8%	66	2.0%
Geography				
Metropolitan	1702	84.5%	2726	83.9%
Non-metro	312	15.5%	524	16.1%
Distance				
< 50 miles	1229	61.0%	1930	59.4%
50-<100 miles	350	17.4%	523	16.1%
100-<150 miles	194	9.6%	322	9.9%
150-<250 miles	134	6.7%	224	6.9%
≥ 250 miles	92	4.6%	191	5.9%
Unknown	15	0.7%	60	1.8%
All recipients	2014	100.0%	3250	100.0%

Table HR 7 Demographic characteristics of adult heart transplant recipients, 2010 and 2020. Heart transplant recipients, including retransplants. Distance is computed from recipient's home zip code to the transplant center.

Characteristic	2010		2020	
	N	Percent	N	Percent
Diagnosis				
Coronary artery disease	809	40.2%	891	27.4%
Cardiomyopathy	1041	51.7%	2073	63.8%
Congenital disease	67	3.3%	144	4.4%
Valvular disease	36	1.8%	36	1.1%
Other/unknown	61	3.0%	106	3.3%
Blood type				
A	842	41.8%	1279	39.4%
B	273	13.6%	510	15.7%
AB	112	5.6%	170	5.2%
O	787	39.1%	1291	39.7%
On VAD	814	40.4%	1147	35.3%
CPRA				
< 1%	1145	56.9%	1463	45.0%
1-< 20%	404	20.1%	343	10.6%
20-< 80%	338	16.8%	473	14.6%
80-< 98%	70	3.5%	89	2.7%
98-100%	30	1.5%	43	1.3%
Unknown	27	1.3%	839	25.8%
Medical urgency				
Former Status 1A	1083	53.8%	0	0.0%
Former Status 1B	770	38.2%	0	0.0%
Former Status 2	161	8.0%	0	0.0%
New Status 1	0	0.0%	264	8.1%
New Status 2	0	0.0%	1435	44.2%
New Status 3	0	0.0%	592	18.2%
New Status 4	0	0.0%	741	22.8%
New Status 5	0	0.0%	46	1.4%
New Status 6	0	0.0%	171	5.3%
Inactive	0	0.0%	1	0.0%
All recipients	2014	100.0%	3250	100.0%

Table HR 8 Clinical characteristics of adult heart transplant recipients, 2010 and 2020. Heart transplant recipients, including retransplants. Ventricular assist device (VAD) information is from the OPTN Transplant Recipient Registration Form and includes left VAD, right VAD, total artificial heart, and left + right VAD. Collection of calculated PRA (CPRA) began March 31, 2015. Prior to that, PRA class I and II values were used.

Characteristic	2010		2020	
	N	Percent	N	Percent
Wait time				
< 31 days	509	25.3%	1591	49.0%
31-60 days	277	13.8%	359	11.0%
61-90 days	191	9.5%	187	5.8%
3-< 6 months	372	18.5%	297	9.1%
6-< 12 months	351	17.4%	306	9.4%
1-< 2 years	206	10.2%	280	8.6%
≥ 2 years	108	5.4%	230	7.1%
Transplant history				
First	1944	96.5%	3147	96.8%
Retransplant	70	3.5%	103	3.2%
Tx type				
Heart only	1905	94.6%	2866	88.2%
Heart-lung	39	1.9%	53	1.6%
Heart-kidney	57	2.8%	285	8.8%
Heart-liver	12	0.6%	42	1.3%
Other	1	0.0%	4	0.1%
All recipients	2014	100.0%	3250	100.0%

Table HR 9 Transplant characteristics of adult heart transplant recipients, 2010 and 2020. Heart transplant recipients, including retransplants.

Donor	Recipient	CMV	EBV	HIV
D-	R-	17.1%	1.0%	97.6%
D-	R+	20.3%	7.5%	0.5%
D-	R unk	0.7%	0.4%	1.9%
D+	R-	25.8%	8.3%	0.0%
D+	R+	34.7%	78.0%	0.0%
D+	R unk	1.0%	4.6%	0.0%
D unk	R-	0.2%	0.1%	0.0%
D unk	R+	0.2%	0.2%	0.0%
D unk	R unk	0.0%	0.0%	0.0%

Table HR 10 Adult heart donor-recipient serology matching, 2018-2020.

Donor serology is reported on the OPTN Donor Registration Form and recipient serology on the OPTN Transplant Recipient Registration Form. There may be multiple fields per serology. Any evidence for a positive serology is treated as positive for that serology. CMV, cytomegalovirus; EBV, Epstein-Barr virus; HIV, human immunodeficiency virus.

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Characteristic	2010		2020	
	N	Percent	N	Percent
Age				
< 1 year	30	11.4%	66	16.4%
1-5 years	98	37.1%	159	39.5%
6-10 years	47	17.8%	63	15.6%
11-17 years	89	33.7%	115	28.5%
Sex				
Female	111	42.0%	174	43.2%
Male	153	58.0%	229	56.8%
Race/ethnicity				
White	153	58.0%	213	52.9%
Black	47	17.8%	85	21.1%
Hispanic	61	23.1%	81	20.1%
Asian	2	0.8%	13	3.2%
Other/unknown	1	0.4%	11	2.7%
Geography				
Metropolitan	232	87.9%	328	81.4%
Non-metro	32	12.1%	75	18.6%
Distance				
< 50 miles	129	48.9%	198	49.1%
50-<100 miles	45	17.0%	83	20.6%
100-<150 miles	29	11.0%	49	12.2%
150-<250 miles	32	12.1%	34	8.4%
≥ 250 miles	27	10.2%	34	8.4%
Unknown	2	0.8%	5	1.2%
All candidates	264	100.0%	403	100.0%

Table HR 11 Demographic characteristics of pediatric candidates on the heart transplant waiting list on December 31, 2010 and December 31, 2020. Candidates aged younger than 18 years waiting for transplant on December 31 of given year, regardless of first listing date. Age calculated at snapshot. Candidates listed as children who turned 18 before the cohort date are excluded. Distance is computed from candidate's home zip code to the transplant center.

Characteristic	2010		2020	
	N	Percent	N	Percent
Diagnosis				
Congenital defect	129	48.9%	245	60.8%
Idiopathic dilated CM	49	18.6%	61	15.1%
Familial dilated CM	3	1.1%	7	1.7%
Idiopathic restrictive CM	18	6.8%	12	3.0%
Myocarditis	13	4.9%	10	2.5%
Other/unknown	52	19.7%	68	16.9%
Blood type				
A	89	33.7%	121	30.0%
B	19	7.2%	45	11.2%
AB	7	2.7%	7	1.7%
O	149	56.4%	230	57.1%
Medical urgency				
Status 1A	68	25.8%	109	27.0%
Status 1B	20	7.6%	82	20.3%
Status 2	79	29.9%	92	22.8%
Inactive status	97	36.7%	120	29.8%
VAD at listing	7	2.7%	30	7.4%
All candidates	264	100.0%	403	100.0%

Table HR 12 Clinical characteristics of pediatric candidates on the heart transplant waiting list on December 31, 2010 and December 31, 2020. Candidates aged younger than 18 years waiting for transplant on December 31 of the given year, regardless of first listing date. Candidates listed as children who turned 18 before the cohort date are excluded. CM, cardiomyopathy; VAD, ventricular assist device.

Characteristic	2010		2020	
	N	Percent	N	Percent
Transplant history				
First	245	92.8%	383	95.0%
Retransplant	19	7.2%	20	5.0%
Wait time				
< 1 year	159	60.2%	243	60.3%
1-< 2 years	35	13.3%	72	17.9%
2-< 3 years	19	7.2%	37	9.2%
3-< 4 years	13	4.9%	23	5.7%
4-< 5 years	5	1.9%	13	3.2%
≥ 5 years	33	12.5%	15	3.7%
Tx type				
Heart only	247	93.6%	389	96.5%
Heart-kidney	2	0.8%	2	0.5%
Heart-lung	14	5.3%	7	1.7%
Other	1	0.4%	5	1.2%
All candidates	264	100.0%	403	100.0%

Table HR 13 Listing characteristics of pediatric candidates on the heart transplant waiting list on December 31, 2010 and December 31, 2020. Candidates aged younger than 18 years waiting for transplant on December 31 of the given year, regardless of first listing date. Candidates listed as children who turned 18 before the cohort date are excluded.

Waiting list state	2018	2019	2020
Patients at start of year	382	392	412
Patients added during year	707	694	674
Patients removed during year	696	672	643
Patients at end of year	393	414	443

Table HR 14 Heart transplant waitlist activity among pediatric candidates. Candidates who are listed, undergo transplant, and are relisted are counted more than once. Candidates are not considered to be on the list on the day they are removed; counts on January 1 may differ from counts on December 31 of the prior year. Candidates listed for multi-organ transplants are included.

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Removal reason	2018	2019	2020
Deceased donor transplant	484	519	474
Patient died	80	55	58
Patient refused transplant	2	3	2
Improved, transplant not needed	62	43	48
Too sick for transplant	31	28	32
Other	37	24	29

Table HR 15 Removal reason among pediatric heart transplant candidates. Removal reason as reported to the OPTN. Candidates with death dates that precede removal dates are assumed to have died waiting.

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Characteristic	2008-10		2018-20	
	N	Percent	N	Percent
Age				
< 1 year	321	29.3%	377	26.1%
1-5 years	264	24.1%	329	22.7%
6-10 years	163	14.9%	214	14.8%
11-17 years	346	31.6%	527	36.4%
Sex				
Female	489	44.7%	638	44.1%
Male	605	55.3%	809	55.9%
Race/ethnicity				
White	577	52.7%	755	52.2%
Black	230	21.0%	302	20.9%
Hispanic	198	18.1%	282	19.5%
Asian	63	5.8%	63	4.4%
Other/unknown	26	2.4%	45	3.1%
Insurance				
Private	521	47.6%	563	38.9%
Medicaid	457	41.8%	727	50.2%
Other government	81	7.4%	120	8.3%
Unknown	35	3.2%	37	2.6%
Geography				
Metropolitan	914	83.5%	1166	80.6%
Non-metro	180	16.5%	281	19.4%
Distance				
< 50 miles	568	51.9%	762	52.7%
50-<100 miles	158	14.4%	243	16.8%
100-<150 miles	113	10.3%	161	11.1%
150-<250 miles	103	9.4%	131	9.1%
≥ 250 miles	132	12.1%	124	8.6%
Unknown	20	1.8%	26	1.8%
All recipients	1094	100.0%	1447	100.0%

Table HR 16 Demographic characteristics of pediatric heart transplant recipients, 2008-2010 and 2018-2020. Pediatric heart transplant recipients, including retransplants. Distance is computed from recipient's home zip code to the transplant center.

Characteristic	2008-10		2018-20	
	N	Percent	N	Percent
Diagnosis				
Congenital defect	482	44.1%	729	50.4%
Idiopathic dilated CM	311	28.4%	321	22.2%
Familial dilated CM	47	4.3%	67	4.6%
Idiopathic restrictive CM	58	5.3%	62	4.3%
Myocarditis	49	4.5%	46	3.2%
Other/unknown	147	13.4%	222	15.3%
Blood type				
A	388	35.5%	525	36.3%
B	155	14.2%	194	13.4%
AB	53	4.8%	80	5.5%
O	498	45.5%	648	44.8%
Medical urgency				
Status 1A	927	84.7%	1147	79.3%
Status 1B	90	8.2%	245	16.9%
Status 2	77	7.0%	55	3.8%
On VAD	185	16.9%	494	34.1%
CPRA				
< 1%	564	51.6%	586	40.5%
1-< 20%	194	17.7%	149	10.3%
20-< 80%	177	16.2%	259	17.9%
80-< 98%	51	4.7%	74	5.1%
98-100%	33	3.0%	46	3.2%
Unknown	75	6.9%	333	23.0%
All recipients	1094	100.0%	1447	100.0%

Table HR 17 Clinical characteristics of pediatric heart transplant recipients, 2008-2010 and 2018-2020. Pediatric heart transplant recipients, including retransplants. Collection of calculated PRA (CPRA) began March 31, 2015. Prior to that, measured PRA values were used. CM, cardiomyopathy; VAD, ventricular assist device.

Characteristic	2008-10		2018-20	
	N	Percent	N	Percent
Wait time				
< 31 days	414	37.8%	420	29.0%
31-60 days	218	19.9%	240	16.6%
61-90 days	141	12.9%	195	13.5%
3-< 6 months	181	16.5%	302	20.9%
6-< 12 months	94	8.6%	173	12.0%
1-< 2 years	25	2.3%	81	5.6%
≥ 2 years	21	1.9%	36	2.5%
ABO				
Compatible/identical	1047	95.7%	1299	89.8%
Incompatible	47	4.3%	148	10.2%
Transplant history				
First	1029	94.1%	1385	95.7%
Retransplant	65	5.9%	62	4.3%
Tx type				
Heart only	1071	97.9%	1421	98.2%
Other	2	0.2%	0	0.0%
Heart-lung	10	0.9%	11	0.8%
Heart-kidney	7	0.6%	11	0.8%
Heart-liver	4	0.4%	4	0.3%
All recipients	1094	100.0%	1447	100.0%

Table HR 18 Transplant characteristics of pediatric heart transplant recipients, 2008-2010 and 2018-2020. Pediatric transplant recipients, including retransplants.

Support	2015		2020	
	N	Percent	N	Percent
Any life support	317	68.9%	309	66.5%
Intravenous inotropes	225	48.9%	168	36.1%
Left ventricular assist device	99	21.5%	154	33.1%
Ventilator	61	13.3%	43	9.2%
Extra corporeal membrane oxygenation	18	3.9%	11	2.4%
Right ventricular assist device	15	3.3%	27	5.8%
Prostaglandins	9	2.0%	11	2.4%
Total artificial heart	2	0.4%	0	0.0%
Inhaled NO	1	0.2%	8	1.7%
Intra-aortic balloon pump	0	0.0%	2	0.4%

Table HR 19 Pediatric heart recipients on life support before transplant.

Patients may have more than one type of life support. Circulatory support: LVAD, RVAD, total artificial heart, ECMO, and IABP.

Donor	Recipient	CMV	EBV
D-	R-	33.2%	15.9%
D-	R+	16.1%	15.1%
D-	R unk	1.2%	1.4%
D+	R-	29.0%	28.5%
D+	R+	18.8%	36.4%
D+	R unk	1.2%	2.3%
D unk	R-	0.5%	0.1%
D unk	R+	0.1%	0.3%
D unk	R unk	0.0%	0.1%

Table HR 20 Pediatric heart donor-recipient serology matching, 2018-2020. Donor serology is reported on the OPTN Donor Registration Form and recipient serology on the OPTN Transplant Recipient Registration Form. There may be multiple fields per serology. Any evidence for a positive serology is treated as positive for that serology. CMV, cytomegalovirus; EBV, Epstein-Barr virus.

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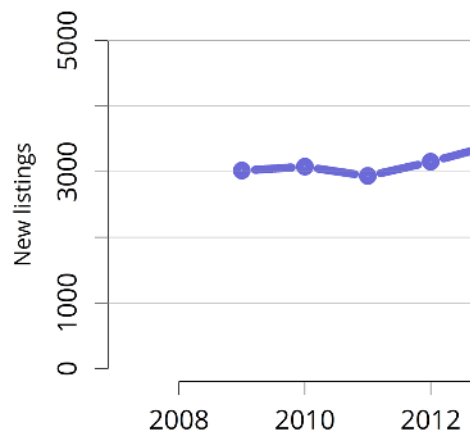
Figure HR 1. N

A new candida

Year	overall
2009	3019
2010	3078
2011	2936
2012	3153
2013	3409
2014	3772
2015	3818
2016	3832
2017	3944
2018	4070
2019	4087
2020	4000

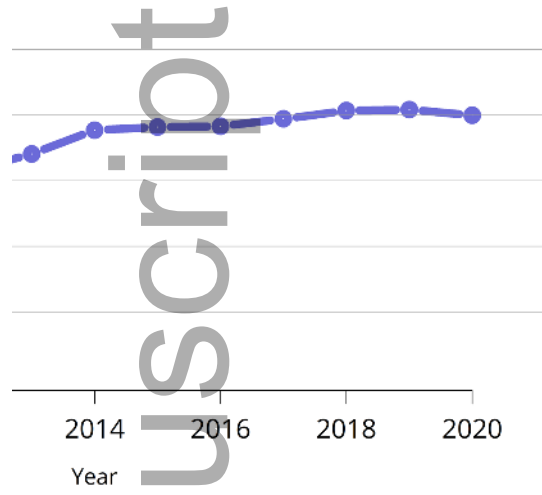
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Figure 1. New candidates added



OPTN/SRTR 2020 Annual Data Report

to the heart transplant waiting list



eport