

MELD 3.0 and PELD-CR Six Month Monitoring Report

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By:
Erin Schnellinger, PhD
UNOS Research Department

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Executive Summary

This report provides a review of the first six months under the Improving Liver Allocation: MELD, PELD, Status 1A, Status 1B policy. After six months of implementation of this policy:

MELD 3.0:

- Deceased donor transplant was the most common reason for removal from the waiting list among liver candidates aged 12 years and older at removal. The proportion of females removed for deceased donor transplant increased pre- to post-policy.
- There were no statistically significant changes in waiting list removal rates due to death or too sick pre- to post-policy.
- Overall transplant rates significantly increased post-policy. When examined by sex, the transplant rate for females increased significantly pre- to post-policy, whereas the transplant rate for males remained roughly the same pre- to post-policy.
- Within each sex, the median allocation MELD score at transplant remained the same pre- to post-policy, although it was higher for females compared to males.
- Transplant rates became more equal across height groups (and, to a lesser extent, body surface area groups) post-policy compared to pre-policy.

PELD-Cr:

- Deceased donor transplant was the most common reason for removal from the waiting list among liver candidates aged 0-11 years at removal.
- There were no statistically significant changes in transplant rates and waiting list removal rates due to death or too sick pre- to post-policy.
- The median PELD score at transplant decreased across policy eras, as did the interquartile range and extent of skewness.

Status 1A and 1B:

- Deceased donor transplant was the most common reason for removal from the waiting list among pediatric (age <18 years at removal) liver candidates with Status 1A or 1B, both overall and by diagnosis (chronic liver disease, hepatoblastoma, metabolic disease, other).
- The number of pediatric Status 1A and 1B liver transplants decreased pre- to post-policy.
- In both policy eras, pediatric Status 1A and 1B recipients with chronic liver disease made up the largest proportion of transplants, while pediatric Status 1A and 1B recipients in the "Other" diagnosis category made up the smallest proportion of transplants.
- The number of pediatric Status 1B cases that did not meet standard criteria decreased pre- to post-policy, and the number of those cases that were not approved decreased as well.

Background/Purpose

The Model for End Stage Liver Disease (MELD) score is used to prioritize liver transplant candidates who are 12 years of age or older, while the Pediatric End Stage Liver Disease (PELD) score prioritizes liver transplant candidates who are less than 12 years old. MELD and PELD are measures of medical urgency that are calculated based on clinical data. The original MELD and PELD scores were incorporated into OPTN policy in 2002. MELD was subsequently updated in 2016 to include serum sodium in the calculation (MELD-Na), whereas PELD was never updated.

Research suggests that MELD-Na disadvantages female candidates because MELD-Na uses creatinine to predict waiting list mortality. More specifically, creatinine tends to be underestimated among female candidates due to their lower muscle mass, which implies that MELD-Na might not capture their medical urgency accurately. Similarly, research also suggests that PELD tends to under-predict pediatric candidates' risk of waiting list mortality. There were also concerns about how PELD handles pediatric candidates who have growth failure as measured by the Centers for Disease Control and Prevention's (CDC) growth failure charts but who do not meet the growth failure criteria in PELD to warrant additional PELD points. Finally, some concerns arose regarding the criteria used to identify Status 1A and 1B candidates.

To address these concerns, on July 13, 2023, the OPTN implemented the "Improving Liver Allocation: MELD, PELD, Status 1A, Status 1B" policy. This policy:

- Updated the coefficients of the existing MELD score variables, added albumin, sex, and interaction terms to the MELD model, and lowered the maximum creatinine value from 4.0 to 3.0 mg/dL. The new model is hereafter referred to as MELD 3.0.
- Updated the coefficients of the existing PELD score variables, converted the age and growth failure variables from categorical to continuous, added creatinine to the model, adjusted the model so that the risk of waiting list mortality at a given PELD score aligns with the risk of waiting list mortality for an 18-year-old candidate with an equivalent MELD score, and floored the PELD score at 6. The new model is hereafter referred to as PELD-Cr.
- Updated the Status 1A criteria for pediatric candidates with fulminant liver failure by aligning the definition for hepatic encephalopathy with the definition developed by the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition.
- Removed the MELD/PELD 25 threshold from Status 1B criteria for liver-intestine and liver-alone candidates with chronic liver disease; updated the gastro-intestinal bleeding threshold for liver-alone candidates to align with the definition for persistent mild shock or moderate shock; removed the Glasgow Coma Score (GCS) criteria from the Status 1B definition for liver-alone and liver-intestine candidates; and improved the sorting of Status 1B candidates by assigning diagnosis points so that candidates with diagnoses that have the highest risk of waiting list mortality receive better priority.

For more details on this policy change, please see the Improving Liver Allocation: MELD, PELD, Status 1A, Status 1B briefing paper .

The purpose of this report is to assess the impact of MELD 3.0, PELD-Cr, and the updated Status 1A/1B criteria on waiting list mortality and transplant rates. More specifically, this report aims to determine whether MELD 3.0 reduced the disparity in waiting list removal rates for death or too sick to transplant and liver transplant rates between males and females; and whether PELD-Cr and the Status 1A and 1B changes reduced pediatric waiting list mortality.

Monitoring Plan

Monitoring of the effect of the Improving Liver Allocation: MELD, PELD, Status 1A, Status 1B policy implemented on July 13, 2023 will be performed at approximately 3 months, 6 months, 1 year, and 2 years post-implementation. Overall results will be provided and some analyses will be stratified by candidate or recipient sex, age group (i.e., 0-2, 3-11, 12-17, 18+ years old), and other features (e.g., height, exception type) as appropriate.

Part 1: To monitor if MELD 3.0 reduced the disparity in waitlist removal rates for death or too sick to transplant and liver transplant rates between males and females, a pre- and post-policy implementation analysis of liver candidates and transplant recipients (age 12 years and older) will include:

- Changes in the number and percent of liver transplants, overall and by recipient sex
- Changes in the median allocation Model for End-Stage Liver Disease (MELD) score at transplant, overall and by recipient sex
- Changes in the number of liver candidates removed from the waitlist by reported removal reason, overall and by candidate sex
- Changes in waitlist removal rates for death or too sick to transplant, overall and by recipient sex (as sample size allows)
- Changes in transplant rates, overall and by recipient sex (as sample size allows)
- The above metrics will be stratified by age group (12-17 years vs. 18+ years), as appropriate
- The above metrics will be stratified by height and/or exception type (no exception, HCC exception, non-HCC exception), as appropriate.
- Beginning with the 6-month report, the above metrics will also be stratified by body surface area (BSA) when appropriate, as per the Committee's request.

Part 2: To monitor if PELD Cr reduced pediatric waitlist mortality, a pre- and post-policy implementation analysis of liver candidates and transplant recipients (age 0-11 years) will include:

- Changes in the number and percent of liver transplants, overall and by age group
- Changes in the median allocation Pediatric End-Stage Liver Disease (PELD) score at transplant, overall and by age group
- Changes in the number of liver candidates removed from the waitlist by reported removal reason, overall and by candidate age group
- Changes in waitlist removal rates for death or too sick to transplant, overall and by age group (as sample size allows)
- Changes in transplant rates, overall and by age group (as sample size allows)
- The above metrics will be stratified by exception type as appropriate.

Part 3: To monitor if the Status 1A and 1B policy changes reduced pediatric waitlist mortality, a pre- and post-policy implementation analysis will include:

- Changes in the number of pediatric Status 1A and 1B transplants, overall and by diagnosis
- Changes in the number of pediatric liver candidates with Status 1A and 1B removed from the waitlist by reported removal reason, overall and by diagnosis
- Changes in the number of pediatric Status 1B cases that did not meet standard criteria by case outcome and turnaround reason

Key results can be found in the main report. Supporting figures and tables can be found in the Appendix.

Data and Methods

Data Sources:

These analyses use data from the OPTN Waiting List, Transplant Candidate Registration (TCR), Transplant Recipient Registration (TRR), Transplant Recipient Followup (TRF), and Deceased Donor Registration (DDR) forms. The report also includes liver MELD and PELD exception request forms submitted during the time frames

noted below. Analyses are based on OPTN data as of May 17, 2024 and are subject to change based on future data submission or correction.

Cohorts

This report includes cohorts of liver-alone registrations ever waiting during 01/11/2023 - 07/12/2023 (pre-policy) and 07/13/2023 - 01/11/2024 (post-policy) for waiting list removal due to death or too sick to transplant and transplant rates. Multi-organ listings are excluded.

The report also includes liver MELD and PELD exception request forms submitted during 01/11/2023 - 07/12/2023 (pre-policy) and 07/13/2023 - 01/11/2024 (post-policy).

Deceased donor, liver-alone transplant cohorts are defined based on transplant date as 01/11/2023 - 07/12/2023 (pre-policy) and 07/13/2023 - 01/11/2024 (post-policy).

Waiting list removal cohorts are defined based on removal date as 01/11/2023 - 07/12/2023 (pre-policy) and 07/13/2023 - 01/11/2024 (post-policy).

Analyses are based on OPTN data as of May 17, 2024 and are subject to change based on future data submission or correction.

Methods

Counts and percentages were used to summarize categorical variables or characteristics, while density curves and distribution summaries (minimum, maximum, mean, median, percentiles) were provided for continuous characteristics. If statistical tests of comparison were performed, Chi-Square tests were used for categorical comparisons pre- versus post-policy, and either t-tests or Kolmogorov-Smirnov tests were used for continuous variable comparisons pre- versus post-policy, as appropriate for differences in mean values or full distributions.

Removal rates as expressed by removals per 100 person-years were calculated by dividing the number of removals for death or too sick to transplant by the number of years patients spent waiting (expressed per 100 person-years). Dividing by the number of person-years serves to normalize the rates to account for differences in the number of candidates and duration of time waited within each era by different patient characteristics. For each time interval, all waiting time (active and inactive) within the interval analyzed was used for the person-years calculation. Since some candidates may spend several months or years on the waiting list, a candidate may contribute waiting time to both eras, but a removal is attributed only to the era and characteristic group in which it occurred. Some candidates may also be multi-listed at a number of transplant programs and thus have multiple registrations. Waiting time for each registration is contributed for each candidate, but only one removal per candidate is included in the calculation.

Transplant rates as expressed by transplants per 100 active person-years were calculated by dividing the number of deceased donor liver-alone transplants by the number of active years patients spent waiting (expressed per 100 person-years). For each time interval, only active waiting time within the interval analyzed was used for the person-years calculation since candidates may only receive offers and thus transplants when in an active status. Since some candidates may spend several months or years on the waiting list, a candidate may contribute waiting time to both eras, but a transplant is attributed only to the era and characteristic group in which it occurred.

Note that this policy introduced a new field, "Sex for the purposes of adult MELD calculation", to the TCR form for calculating MELD scores. This field is required for candidates who are at least 18 years of age at the time of registration, and should be filled out in consultation with the candidate and consistent with the following: a) select Female if the candidate's sex recorded at birth is female, or if the candidate's sex recorded at birth was male, and, for example, the candidate is currently taking feminizing gender affirming hormone therapy to align with their gender identity; b) select Male if the candidate's sex recorded at birth is male, or if the candidate's sex recorded at birth was female, and, for example, the candidate is currently taking masculinizing gender affirming hormone therapy to align with their gender identity. This field was optional for candidates who were registered on the waiting list prior to the implementation of this policy, and is optional for pediatric candidates. Some of the MELD 3.0 analyses are stratified by sex. For these analyses, the "Sex for the purposes of adult MELD calculation" field is used when available; when this field is missing, candidates' birth sex is used, consistent with how the OPTN

Computer System computes MELD scores. If PELD-Cr analyses are stratified by sex, birth sex is used, consistent with the fact that birth sex is used to calculate PELD scores.

Note that when rates were stratified by exception type, the associated waiting time from a candidate registration was attributed to the person-years under “HCC exception” if there was ever an approved liver MELD or PELD exception request for an HCC diagnosis within that era. Similarly, associated waiting time for a candidate registration was attributed to the person-years under “non-HCC exception” if an approved liver MELD or PELD exception request for a diagnosis other than HCC occurred within that era. If a registration had multiple forms submitted within an era for both HCC and non-HCC exception types, the first submitted form was used. All other candidates’ person-years waiting was attributed to the non-exception group. This exception type definition differs from that used in counts of transplants, where group membership is defined as the exception status at the time of event rather than ever during the policy period; thus, counts may not align with events from rates based on these definitions.

Some MELD 3.0 analyses are stratified by height or body surface area (BSA). Height groupings are defined based on Bernards et al. (Bernards S, Lee E, Leung N, et al. Awarding additional MELD points to the shortest waitlist candidates improves sex disparity in access to liver transplant in the United States. *Am J Transplant*. 2022; 22: 2912-2920. doi: 10.1111/ajt.17159). BSA is calculated using Mosteller’s equation and depends on both candidate height and candidate weight (Mosteller RD. Simplified calculation of body-surface area. *N Engl J Med*. 1987; 317(17): 1098. doi: 10.1056/NEJM198710223171717). BSA groupings are defined based on Kling et al. (Kling CE, Biggins SW, Bambha KM, et al. Association of Body Surface Area with Access to Deceased Donor Liver Transplant and Novel Allocation Policies. *JAMA Surg*. 2023; 158(6): 610-616. doi: 10.1001/jamasurg.2023.0191). Note that while Bernards et al. and Kling et al. restricted their analyses of height and BSA, respectively, to candidates aged 18 years and older, the height and BSA analyses in this report include candidates aged 12 years and older, as MELD 3.0 scores are applied to all candidates aged 12 years and older in the OPTN allocation system. For rate analyses, waiting list registration and history data are used to capture changes in height or BSA measurements that may have occurred during the candidate’s waiting period; registrations with missing height or BSA measurements at a particular time were omitted at that time. For waiting list removal analyses, height or BSA measurements are taken at the time of removal. For transplant analyses, height or BSA measurements are taken at the time of transplant. Registrations with missing height or BSA measurements at time of removal or time of transplant are excluded from the respective plots.

Due to the small number of pediatric Status 1B cases sent to the Pediatric Review Board that closed without a majority or that were disapproved, turndown reasons for these cases are not summarized in this report. A summary of the reasons for criteria not met for cases that were ultimately approved is shown instead.

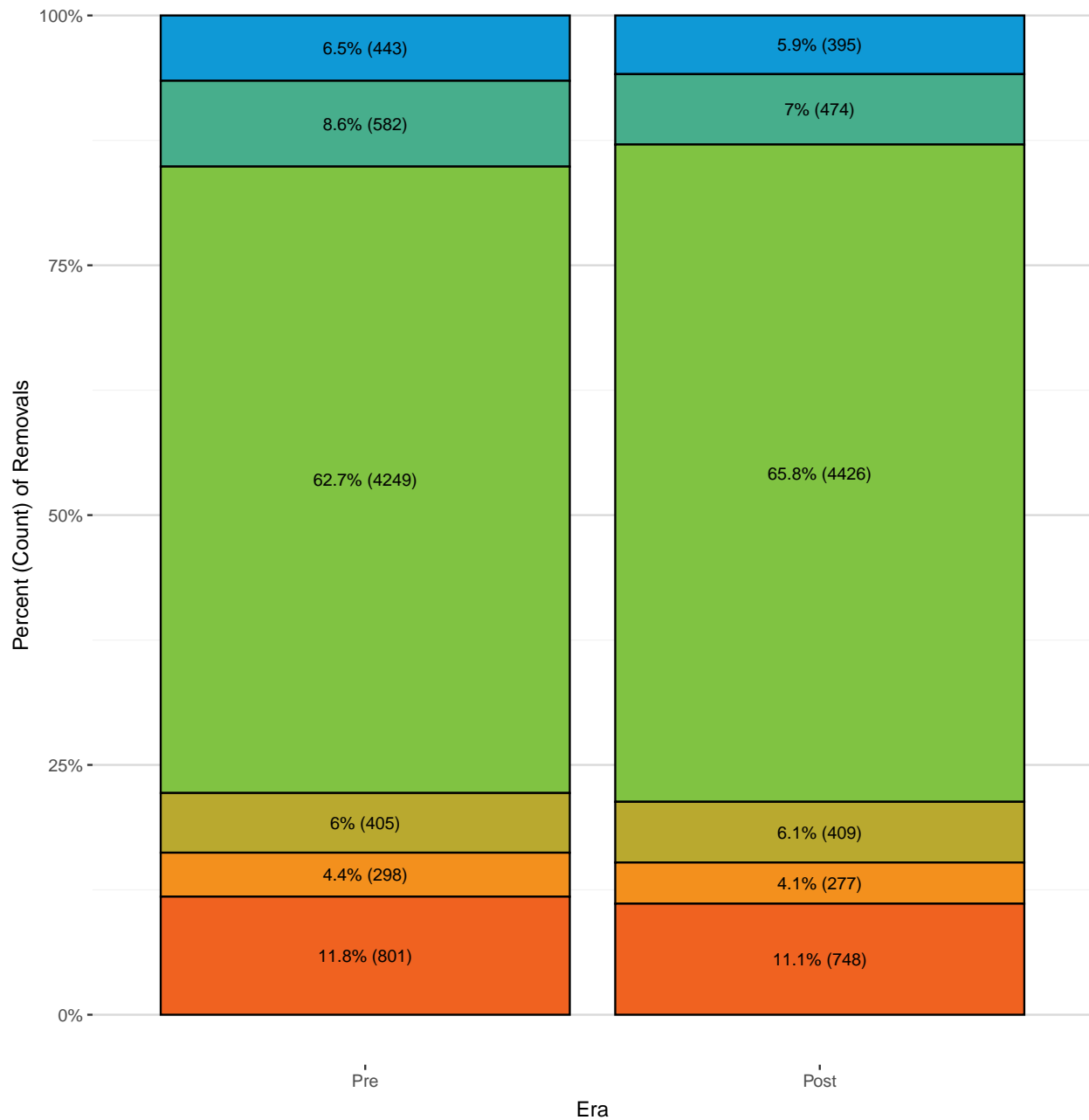
MELD 3.0 Results

This section of the report monitors whether MELD 3.0 reduced the disparity in waiting list removal rates for death or too sick to transplant and liver transplant rates between males and females. All analyses in this section include liver candidates and transplant recipients aged 12 years and older; liver candidates and transplant recipients less than 12 years old appear in the PELD-Cr section below.

Waiting List

Figure 1 and **Table 1** show the number of liver candidates aged 12 years and older who were removed from the waiting list by reported removal reason and policy era. 6778 candidates were removed in the pre-policy era and 6729 candidates were removed in the post-policy era. Deceased donor transplant made up the largest number and proportion of removal reasons (Pre: 4249 (62.7%); Post: 4426 (65.8%)), followed by “Candidate condition improved, transplant not needed” (Pre: 582 (8.6%); Post: 474 (7.0%)); “Other” (Pre: 463 (6.8%); Post: 414 (6.2%)); “Candidate condition deteriorated, too sick for transplant” (Pre: 443 (6.5%); Post: 395 (5.9%)); and waiting list death (Pre: 405 (6.0%); Post: 405 (6.0%)).

Figure 1. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason and Era



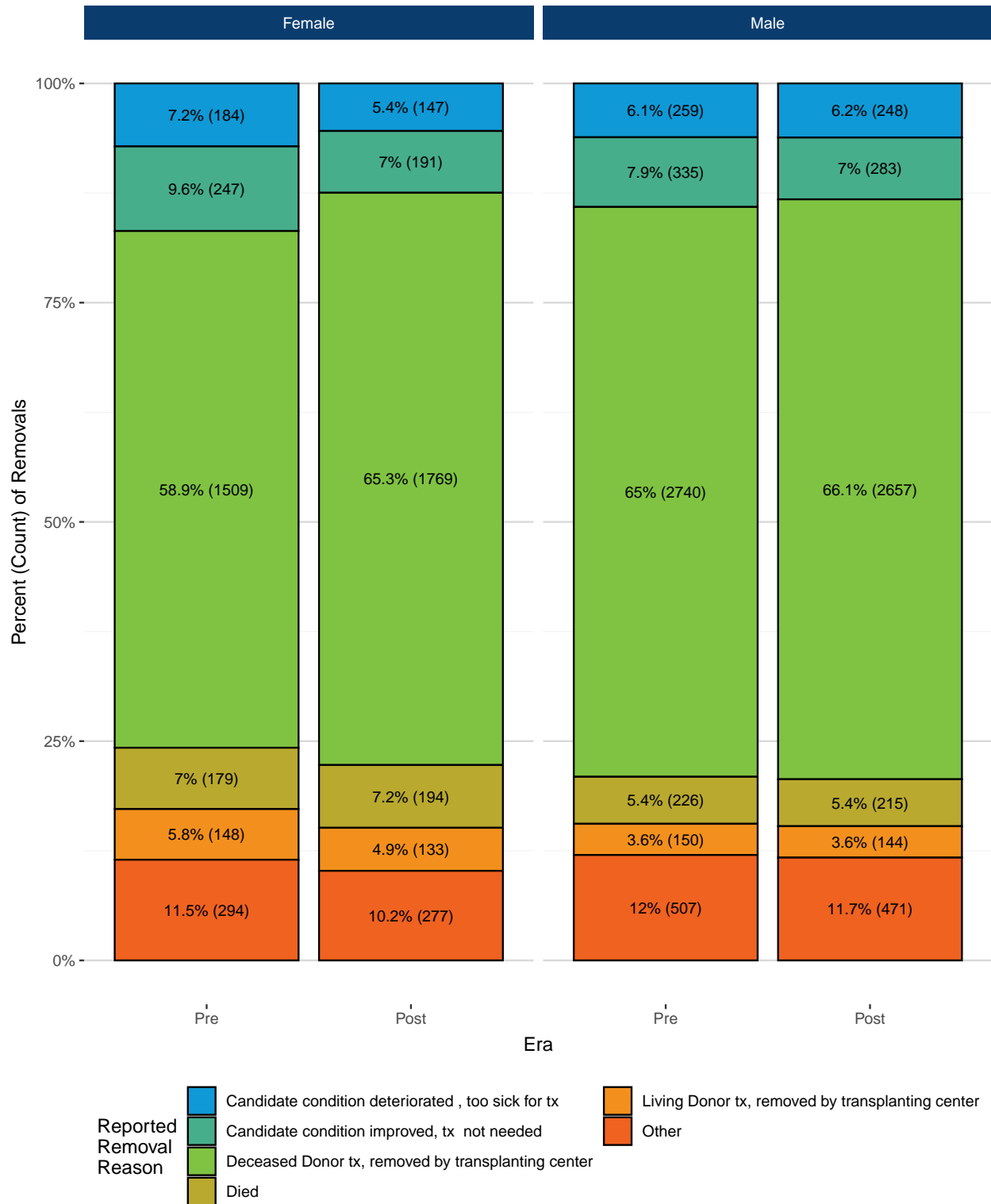
*Removal reasons containing <3% of forms were combined with the Other category for plotting purposes, but appear in the corresponding table.

Table 1. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason and Era

Reported Removal Reason	Pre	Post
Deceased Donor tx, removed by transplanting center	4249 (62.7%)	4426 (65.8%)
Candidate condition improved, tx not needed	582 (8.6%)	474 (7.0%)
Other	463 (6.8%)	414 (6.2%)
Candidate condition deteriorated , too sick for tx	443 (6.5%)	395 (5.9%)
Died	405 (6.0%)	409 (6.1%)
Living Donor tx, removed by transplanting center	298 (4.4%)	277 (4.1%)
Transplant at another center (multi-listed)	138 (2.0%)	146 (2.2%)
Refused transplant	71 (1.0%)	73 (1.1%)
Unable to contact candidate	71 (1.0%)	68 (1.0%)
Transferred to another center	47 (0.7%)	35 (0.5%)
Patient died during TX procedure	6 (0.1%)	8 (0.1%)
Candidate Removed in Error	3 (0.0%)	1 (0.0%)
Transplanted in another country	2 (0.0%)	3 (0.0%)
Total	6778 (100.0%)	6729 (100.0%)

Figure 2 and **Table 2** show the number of liver candidates removed from the waiting list by reported removal reason, candidate sex for the purposes of adult MELD calculation, and policy era. The top reason for removal for both males and females was deceased donor transplant, removed by transplanting center. The proportion of females removed for deceased donor transplant increased pre- to post-policy (Pre: 1509 (58.9%); Post: 1769 (65.3%)), aligning more closely with the proportion of males removed for deceased donor transplant (Pre: 2740 (65.0%); Post: 2657 (66.1%)).

Figure 2. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Candidate Sex for the Purposes of Adult MELD Calculation, and Era



*Removal reasons containing <3% of forms were combined with the Other category for plotting purposes, but appear in the corresponding table.

Table 2. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Candidate Sex for the Purposes of Adult MELD Calculation, and Era

Reported Removal Reason	Female		Male	
	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	1509 (58.9%)	1769 (65.3%)	2740 (65.0%)	2657 (66.1%)
Candidate condition improved, tx not needed	247 (9.6%)	191 (7.0%)	335 (7.9%)	283 (7.0%)
Candidate condition deteriorated , too sick for tx	184 (7.2%)	147 (5.4%)	259 (6.1%)	248 (6.2%)
Other	184 (7.2%)	157 (5.8%)	279 (6.6%)	257 (6.4%)
Died	179 (7.0%)	194 (7.2%)	226 (5.4%)	215 (5.4%)
Living Donor tx, removed by transplanting center	148 (5.8%)	133 (4.9%)	150 (3.6%)	144 (3.6%)
Transplant at another center (multi-listed)	47 (1.8%)	50 (1.8%)	91 (2.2%)	96 (2.4%)
Unable to contact candidate	25 (1.0%)	29 (1.1%)	46 (1.1%)	39 (1.0%)
Transferred to another center	22 (0.9%)	16 (0.6%)	25 (0.6%)	19 (0.5%)
Refused transplant	13 (0.5%)	21 (0.8%)	58 (1.4%)	52 (1.3%)
Patient died during TX procedure	3 (0.1%)	2 (0.1%)	3 (0.1%)	6 (0.1%)
Candidate Removed in Error	0 (0.0%)	0 (0.0%)	3 (0.1%)	1 (0.0%)
Transplanted in another country	0 (0.0%)	2 (0.1%)	2 (0.0%)	1 (0.0%)
Total	2561 (100.0%)	2711 (100.0%)	4217 (100.0%)	4018 (100.0%)

Figure 3 and **Table 4** show the rate of waiting list removal due to death or too sick to transplant per 100 person-years waiting for liver-alone candidates aged 12 years and older by era. The overall waiting list removal rate increased slightly from 18.07 (16.85, 19.35) removals per 100 person-years waiting pre-policy to 19.04 (17.73, 20.42) removals per 100 person-years waiting post-policy. This difference was not statistically significant.

Figure 3. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Era

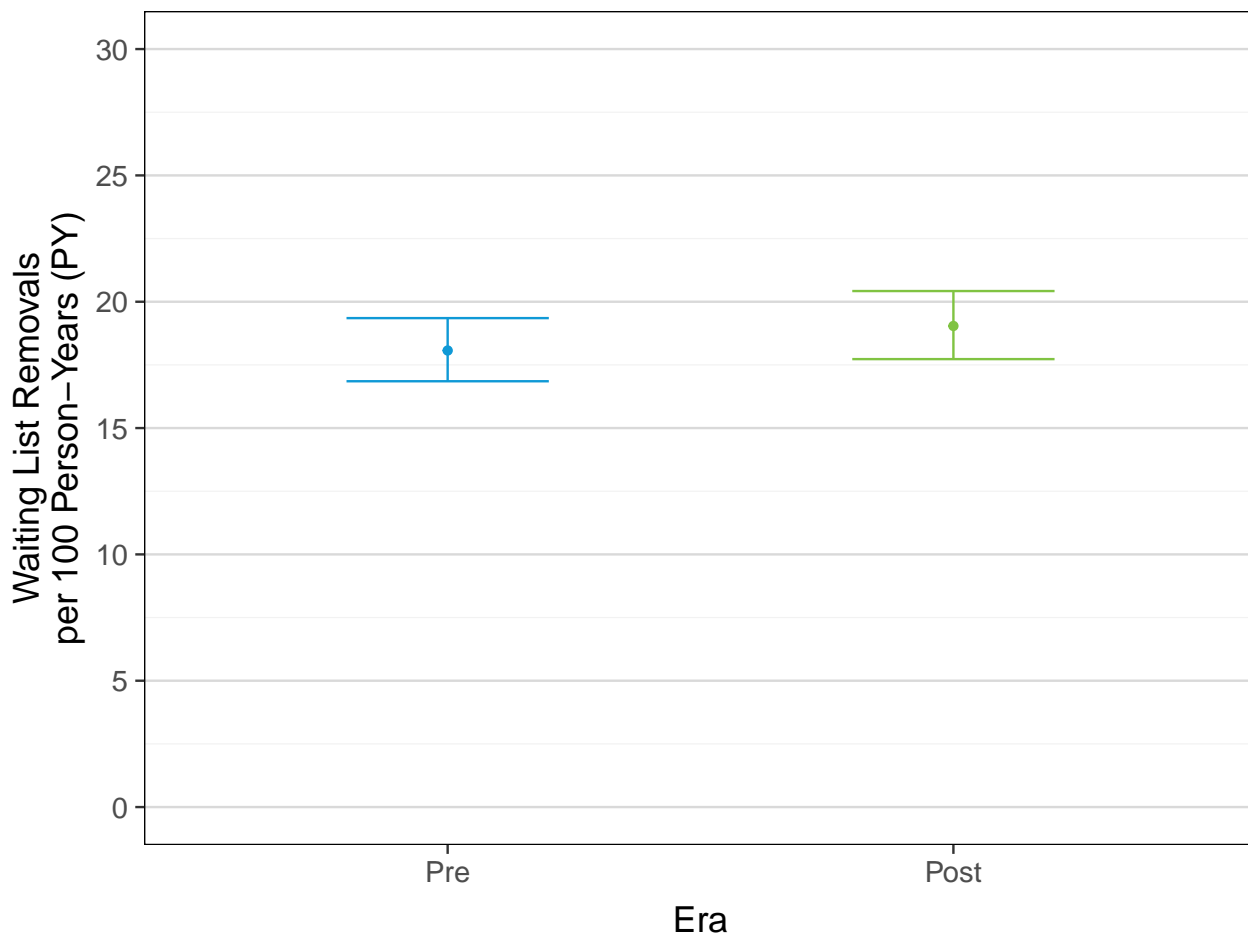


Table 4. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Era

Era	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
	N	N	PY	Estimate	95% CI
Pre	15218	818	4526.9	18.07	(16.85, 19.35)
Post	14957	782	4107.0	19.04	(17.73, 20.42)

Figure 4 and **Table 5** show the rate of waiting list removal due to death or too sick to transplant per 100 person-years waiting for liver-alone candidates aged 12 years and older by candidate sex for the purposes of adult MELD calculation and era. In both policy eras, waiting list removal rates were higher for females compared to males, although these differences were not statistically significant. Within each sex, waiting list removal rates tended to increase pre- to post-policy, although these increases were not statistically significant.

Figure 4. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Candidate Sex for the Purposes of Adult MELD Calculation and Era

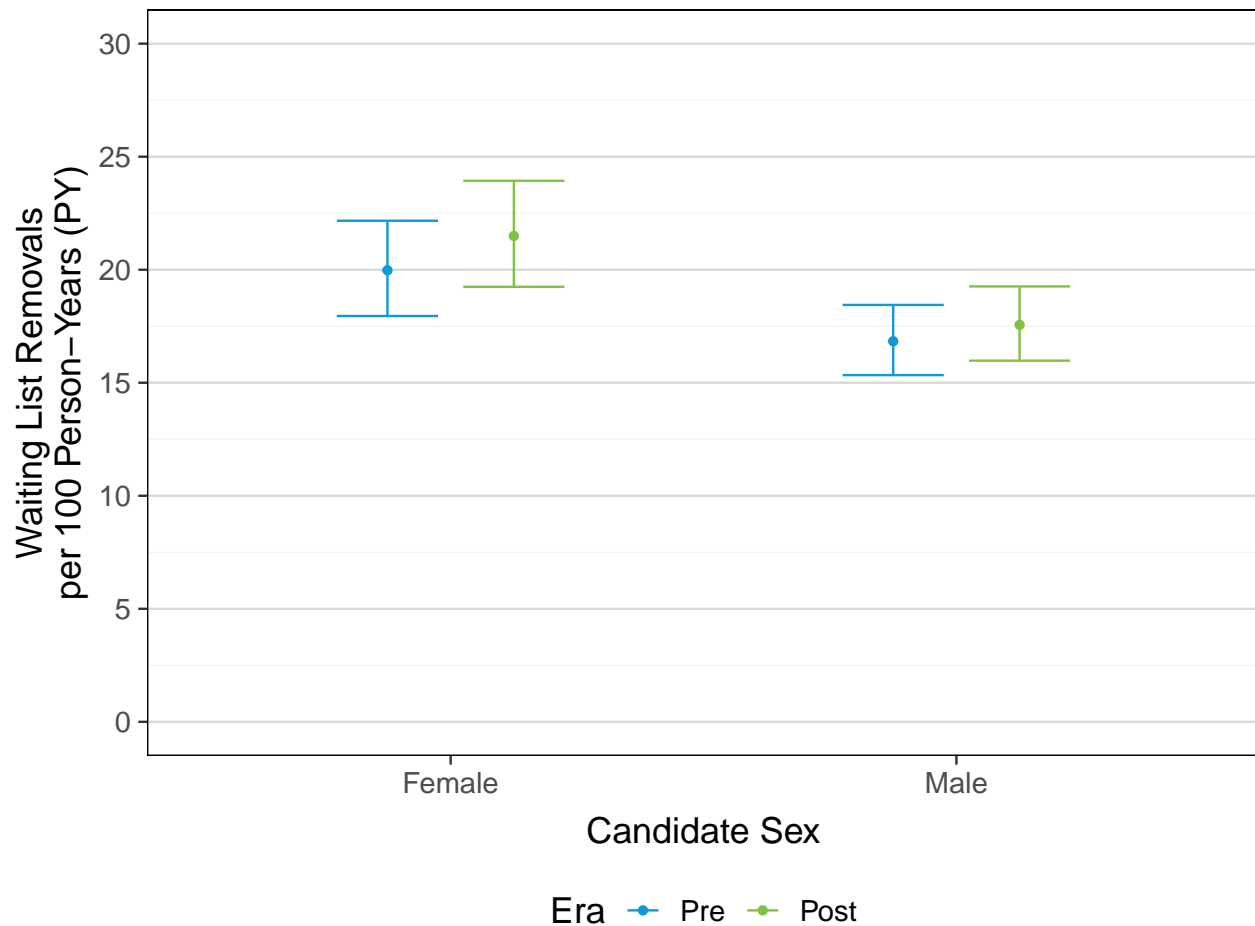


Table 5. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Candidate Sex for the Purposes of Adult MELD Calculation and Era

Era	Candidate Sex	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	Female	5917	355	1777.1	19.98	(17.95, 22.17)
	Male	9301	463	2749.9	16.84	(15.34, 18.44)
Post	Female	5987	332	1544.6	21.49	(19.24, 23.94)
	Male	8971	450	2562.4	17.56	(15.98, 19.26)

Figure 5 and **Table 7** show liver-alone transplant rates per 100 active person-years waiting among candidates aged 12 years and older by era. The overall transplant rate increased from 93.09 (90.30, 95.94) transplants per 100 active person-years waiting pre-policy to 106.74 (103.61, 109.95) transplants per 100 active person-years waiting post-policy. This increase was statistically significant.

Figure 5. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Era

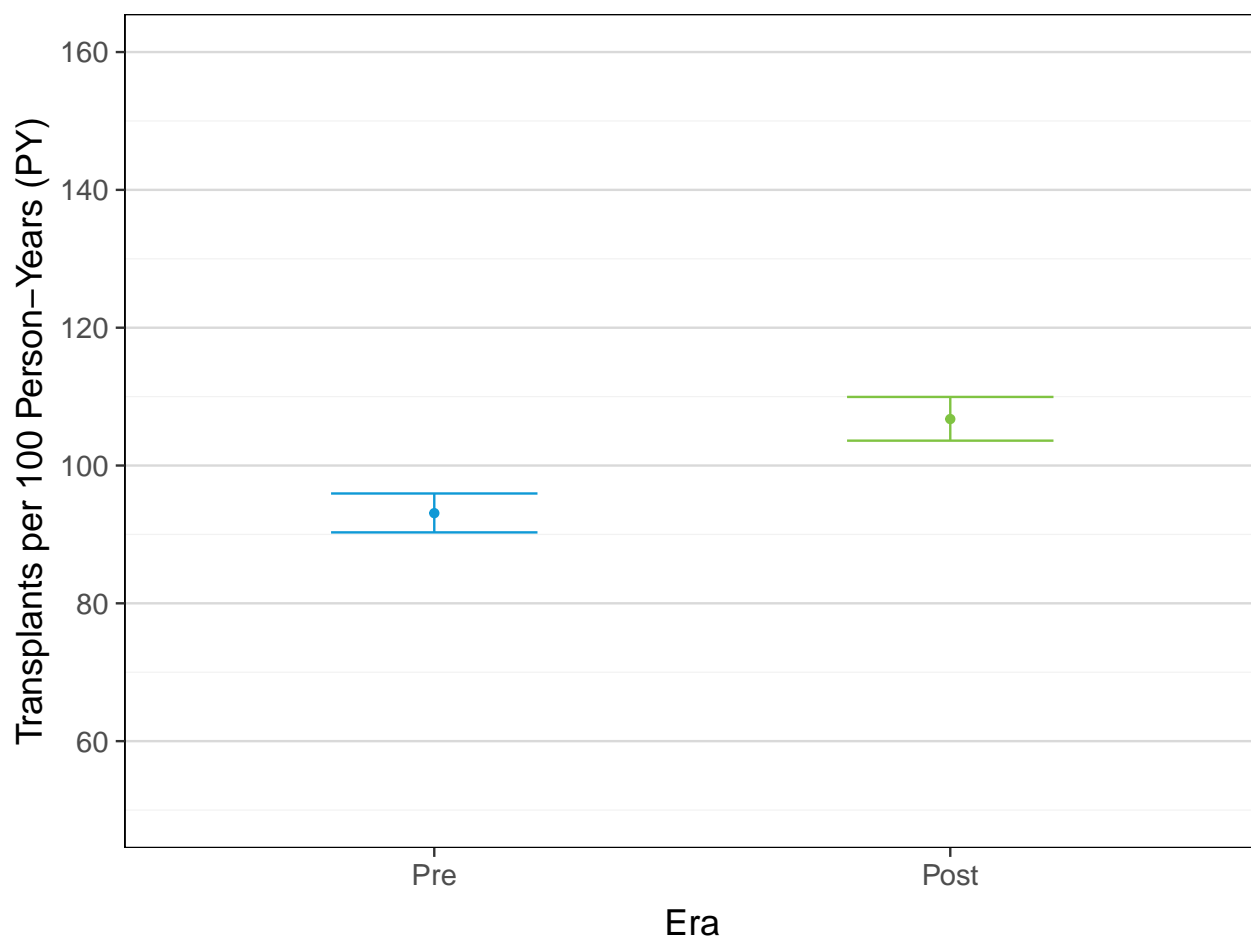


Table 7. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Era

Era	Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
	N	N	PY	Estimate	95% CI
Pre	15218	4214	4526.9	93.09	(90.30, 95.94)
Post	14957	4384	4107.0	106.74	(103.61, 109.95)

Figure 6 and **Table 8** show liver-alone transplant rates per 100 active person-years waiting among candidates aged 12 years and older by candidate sex for the purposes of adult MELD calculation and era. The transplant rate for males remained very similar pre- and post-policy, whereas the transplant rate for females significantly increased in the post-policy era. Note that within each sex, the number of candidates ever waiting remained fairly similar across policy eras.

Figure 6. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Candidate Sex for the Purposes of Adult MELD Calculation and Era

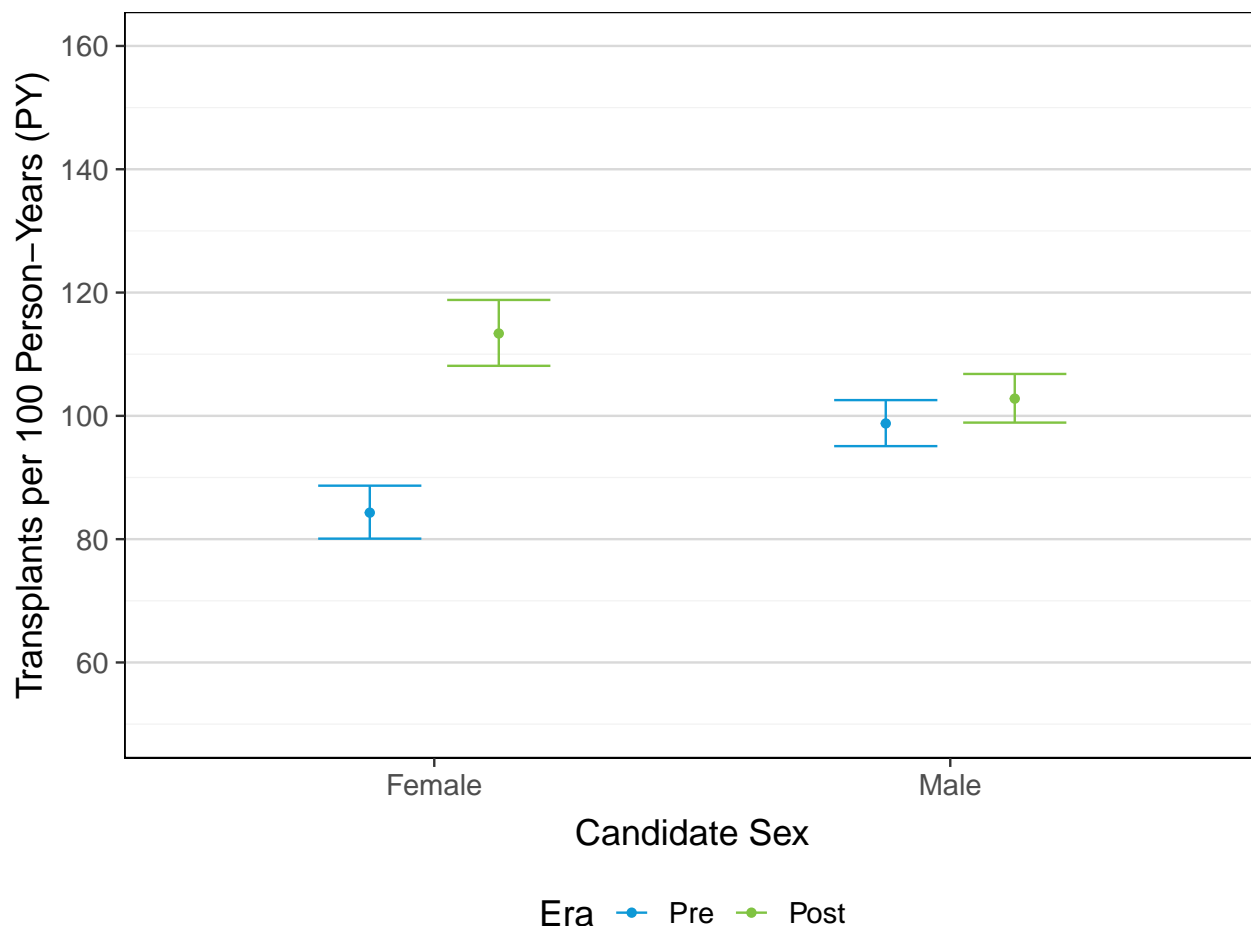
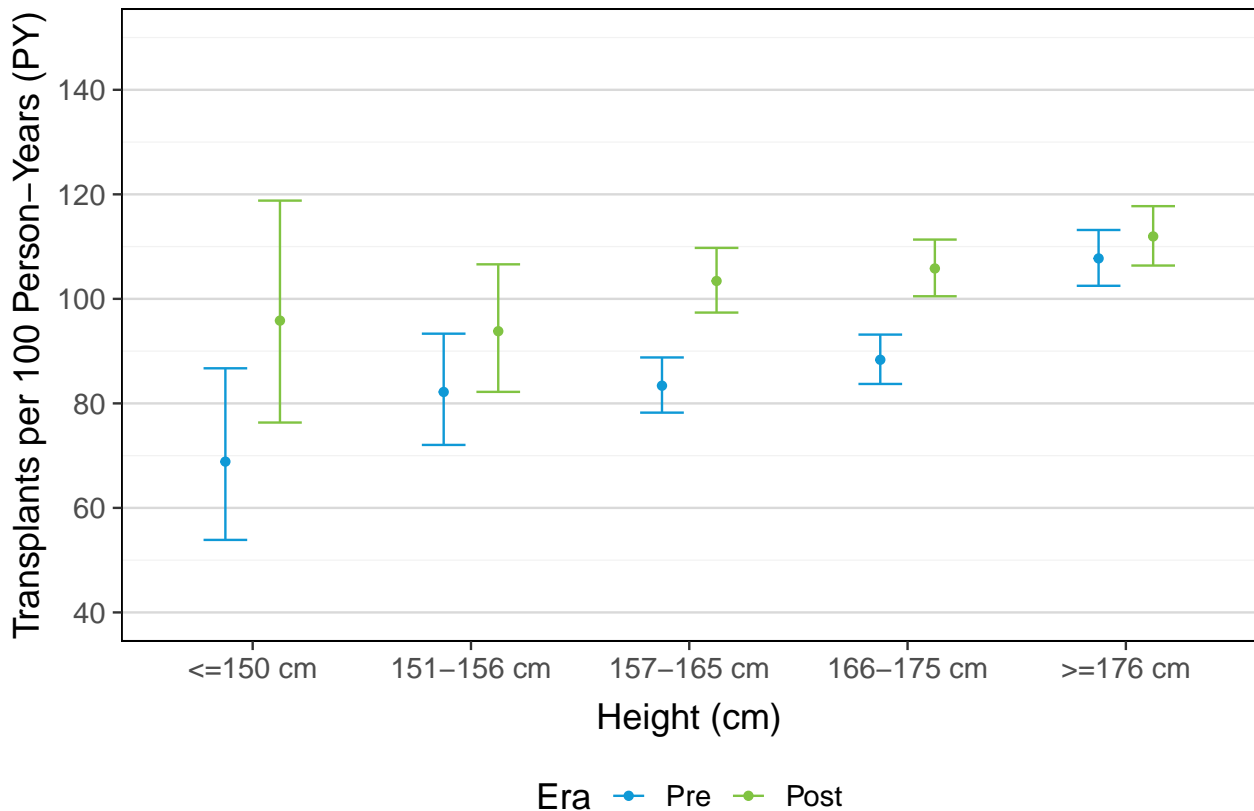


Table 8. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Candidate Sex for the Purposes of Adult MELD Calculation and Era

Era	Candidate Sex	Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	Female	5917	1498	1777.1	84.30	(80.08, 88.68)
	Male	9301	2716	2749.9	98.77	(95.09, 102.55)
Post	Female	5987	1751	1544.6	113.36	(108.11, 118.80)
	Male	8971	2634	2562.4	102.79	(98.90, 106.80)

Figure 7 and **Table 9** show liver-alone transplant rates per 100 active person-years waiting among candidates aged 12 years and older by height and era. Height groupings were defined based on Bernards et al. (Bernards S, Lee E, Leung N, et al. Awarding additional MELD points to the shortest waitlist candidates improves sex disparity in access to liver transplant in the United States. *Am J Transplant.* 2022; 22: 2912-2920. doi: 10.1111/ajt.17159). Transplant rates appear to be more equal across height groups post-policy compared to pre-policy. Similar results were seen when examined among candidates aged 18 years and older (Appendix Figure XXX and Appendix Table XXX). Additional analyses stratified by height are shown in the Appendix.

Figure 7. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Height and Era



Height was grouped into categories as in Bernards et al. (Bernards S, et al. *Am J Transplant.* 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 7 registrations in the pre-policy era and 10 registrations in the post-policy era were excluded.

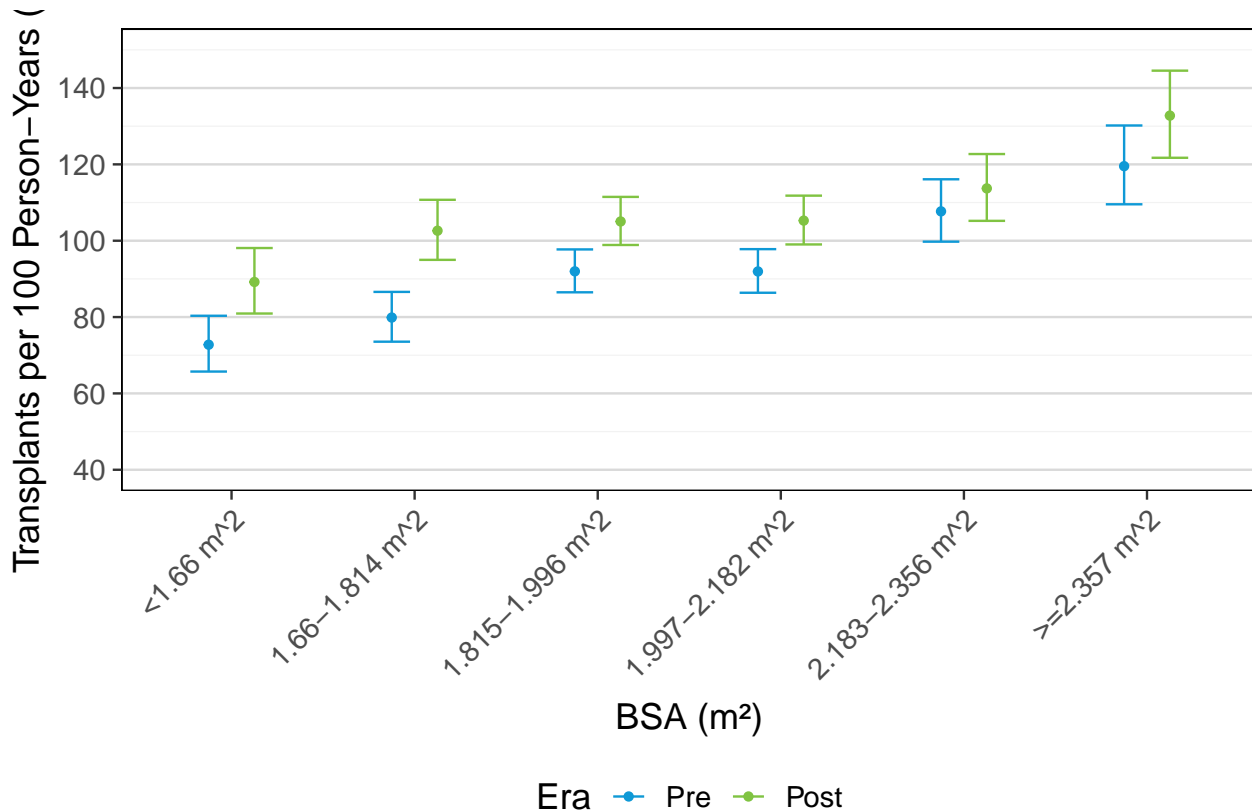
Table 9. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Height and Era

Era	Height (cm)	Ever	Transplant	Active	Transplants	
		Waiting	Events	Person-Years (PY)	per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	<=150 cm	331	72	104.6	68.86	(53.88, 86.71)
	151-156 cm	965	237	288.4	82.18	(72.05, 93.34)
	157-165 cm	3856	974	1168.1	83.38	(78.23, 88.79)
	166-175 cm	5194	1363	1542.8	88.34	(83.72, 93.16)
	>=176 cm	5131	1585	1471.2	107.74	(102.50, 113.18)
Post	<=150 cm	338	83	86.6	95.83	(76.33, 118.80)
	151-156 cm	923	235	250.5	93.81	(82.20, 106.60)
	157-165 cm	3964	1090	1053.9	103.42	(97.37, 109.75)
	166-175 cm	5099	1481	1399.6	105.82	(100.49, 111.35)
	>=176 cm	4885	1512	1350.6	111.95	(106.37, 117.74)

Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 7 registrations in the pre-policy era and 10 registrations in the post-policy era were excluded.

Figure 8 and **Table 9** show liver-alone transplant rates per 100 active person-years waiting among candidates aged 12 years and older by body surface area (BSA) and era. BSA was calculated using Mosteller's equation (Mosteller RD. Simplified calculation of body-surface area. *N Engl J Med.* 1987; 317(17): 1098. doi: 10.1056/NEJM198710223171717) and grouped into categories as defined by Kling et al. (Kling CE, Biggins SW, Bambha KM, et al. Association of Body Surface Area with Access to Deceased Donor Liver Transplant and Novel Allocation Policies. *JAMA Surg.* 2023; 158(6): 610-616. doi: 10.1001/jamasurg.2023.0191). Transplant rates appear to be slightly more equal across BSA groups post-policy compared to pre-policy, although the trend is less pronounced than that seen for height. Additional analyses stratified by BSA appear in the Appendix.

Figure 8. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Body Surface Area (BSA) and Era



BSA was calculated using Mosteller's equation (Mosteller RD, *N Engl J Med.* 1987) and grouped into categories as in Kling et al. (Kling CE, et al. *JAMA Surg.* 2023). BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time.
19 registrations in the pre-policy era and 21 registrations in the post-policy era were excluded.

Table 9. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Body Surface Area (BSA) and Era

Era	BSA (m ²)	Ever	Transplant	Active	Transplants	
		Waiting	Events	Person-Years (PY)	per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	<1.66 m ²	1755	391	537.4	72.76	(65.73, 80.34)
	1.66-1.814 m ²	2421	589	737.4	79.87	(73.55, 86.59)
	1.815-1.996 m ²	3884	1047	1138.4	91.97	(86.49, 97.72)
	1.997-2.182 m ²	3711	1012	1100.6	91.95	(86.37, 97.79)
	2.183-2.356 m ²	2212	681	632.4	107.69	(99.75, 116.09)
	>=2.357 m ²	1606	527	440.9	119.53	(109.54, 130.18)
Post	<1.66 m ²	1775	426	477.6	89.20	(80.93, 98.08)
	1.66-1.814 m ²	2442	667	649.9	102.62	(94.98, 110.72)
	1.815-1.996 m ²	3791	1086	1033.9	105.04	(98.88, 111.48)
	1.997-2.182 m ²	3642	1058	1005.0	105.27	(99.02, 111.81)
	2.183-2.356 m ²	2132	662	582.2	113.70	(105.21, 122.70)
	>=2.357 m ²	1541	532	400.7	132.77	(121.73, 144.55)

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023).

BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time.

19 registrations in the pre-policy era and 21 registrations in the post-policy era were excluded.

Transplant

Figure 9 and **Table 11** show the number of liver transplants among recipients aged 12 years and older by policy era. There were 8775 total transplants among recipients aged 12 years and older in the study period. 4300 of these transplants occurred in the pre-policy era and 4475 occurred in the post-policy era.

Figure 9. Count of Liver Transplants among Recipients Aged 12 Years and Older by Era

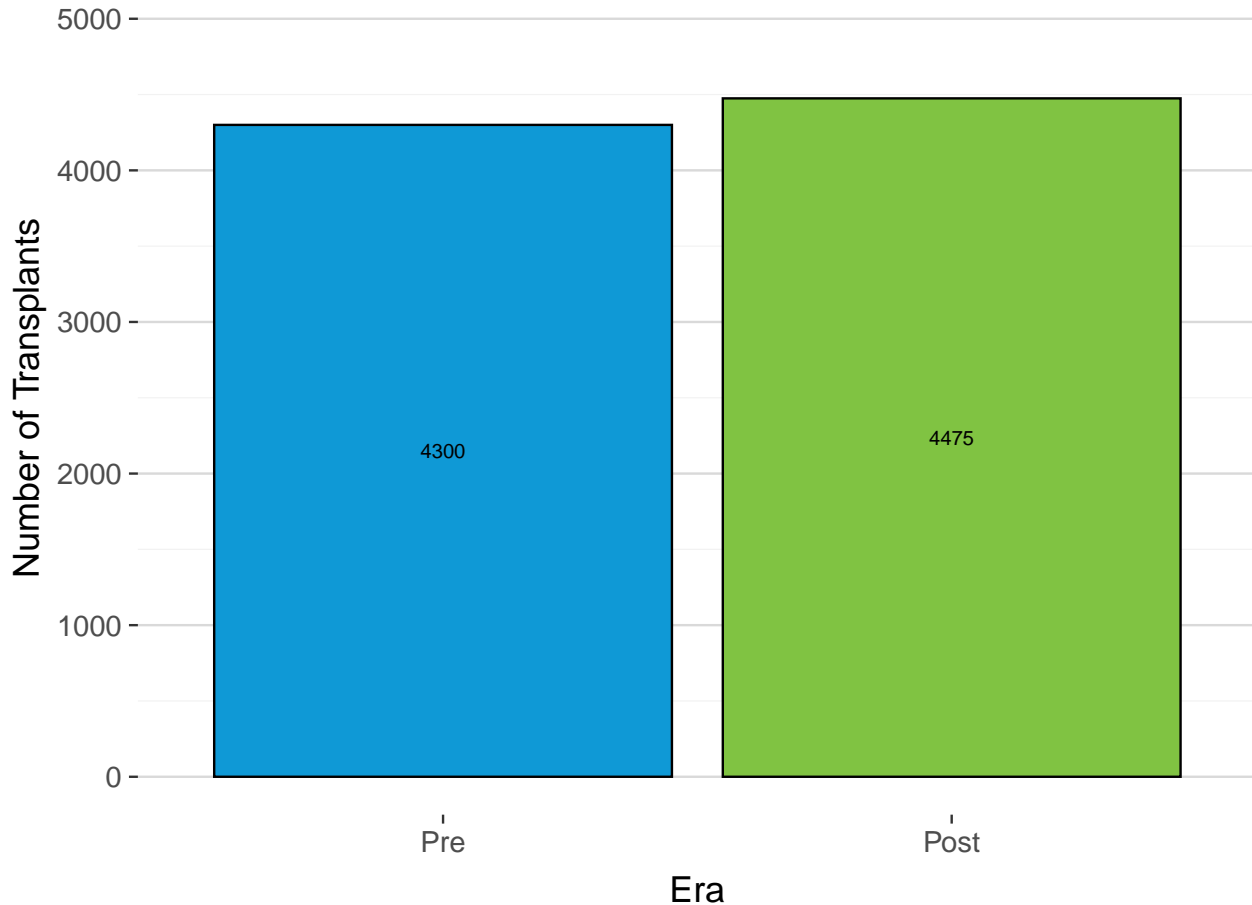


Table 11. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Era

Era	N (%)
Pre	4300 (49.0%)
Post	4475 (51.0%)
Total	8775 (100.0%)

Figure 10 and **Table 13** show the number of liver transplants among recipients aged 12 years and older by recipient sex for the purposes of adult MELD calculation and policy era. The number of female transplant recipients aged 12 years and older increased from 1526 (35.5%) pre-policy to 1793 (40.1%) post-policy.

Figure 10. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Recipient Sex for the Purposes of Adult MELD Calculation and Era

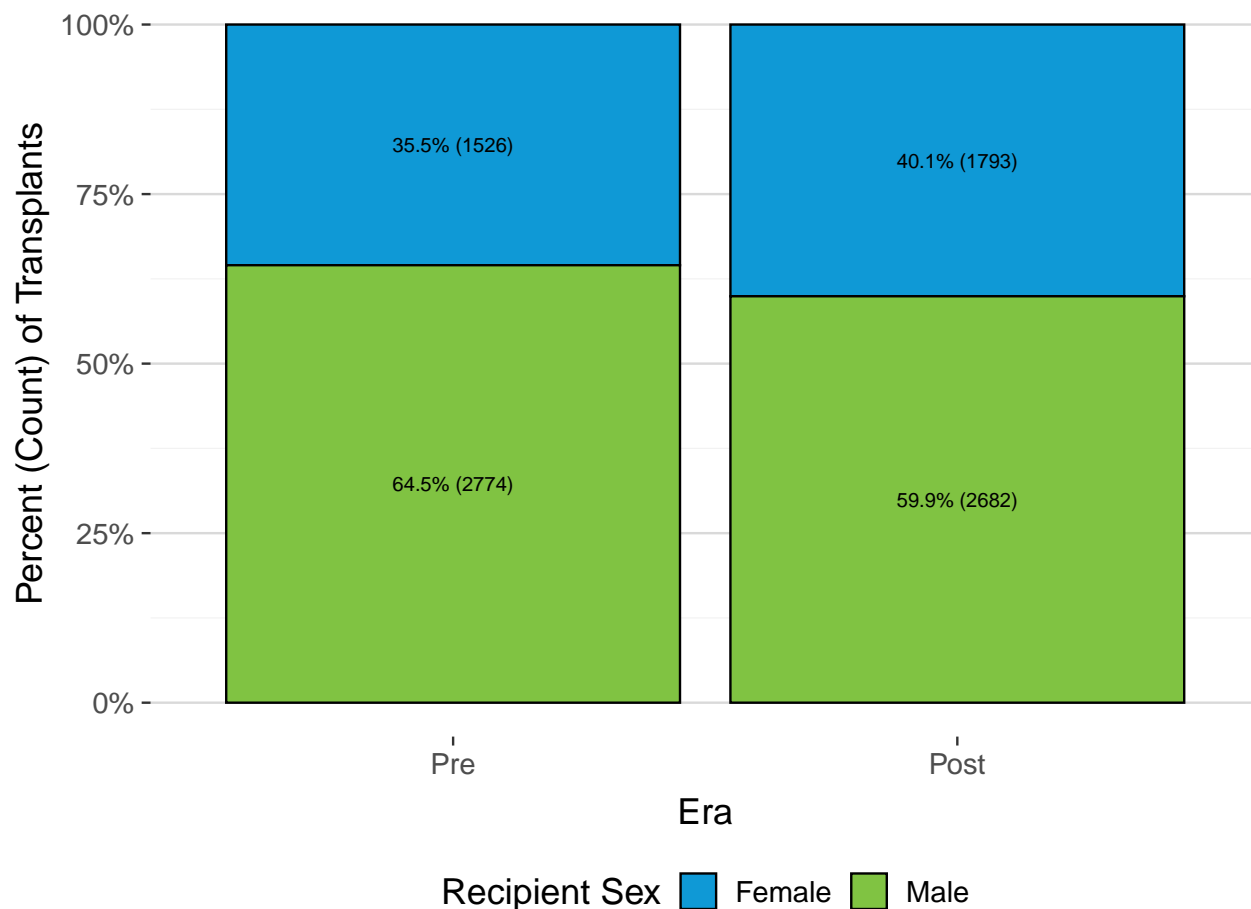


Table 13. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Recipient Sex for the Purposes of Adult MELD Calculation and Era

Recipient Sex	Pre	Post
Female	1526 (35.5%)	1793 (40.1%)
Male	2774 (64.5%)	2682 (59.9%)
Total	4300 (100.0%)	4475 (100.0%)

Figure 11, Figure 12, and Table 15 show the distribution of allocation MELD score at transplant for liver-alone transplant recipients aged 12 years and older by era. The number and proportion of Status 1A/1B transplant recipients decreased slightly from pre- to post-policy. The distribution of allocation MELD scores at transplant remained similar across policy eras, with the median remaining the same (28 pre-policy and 28 post-policy).

Figure 11. Distribution of Allocation MELD Score or Status at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Era

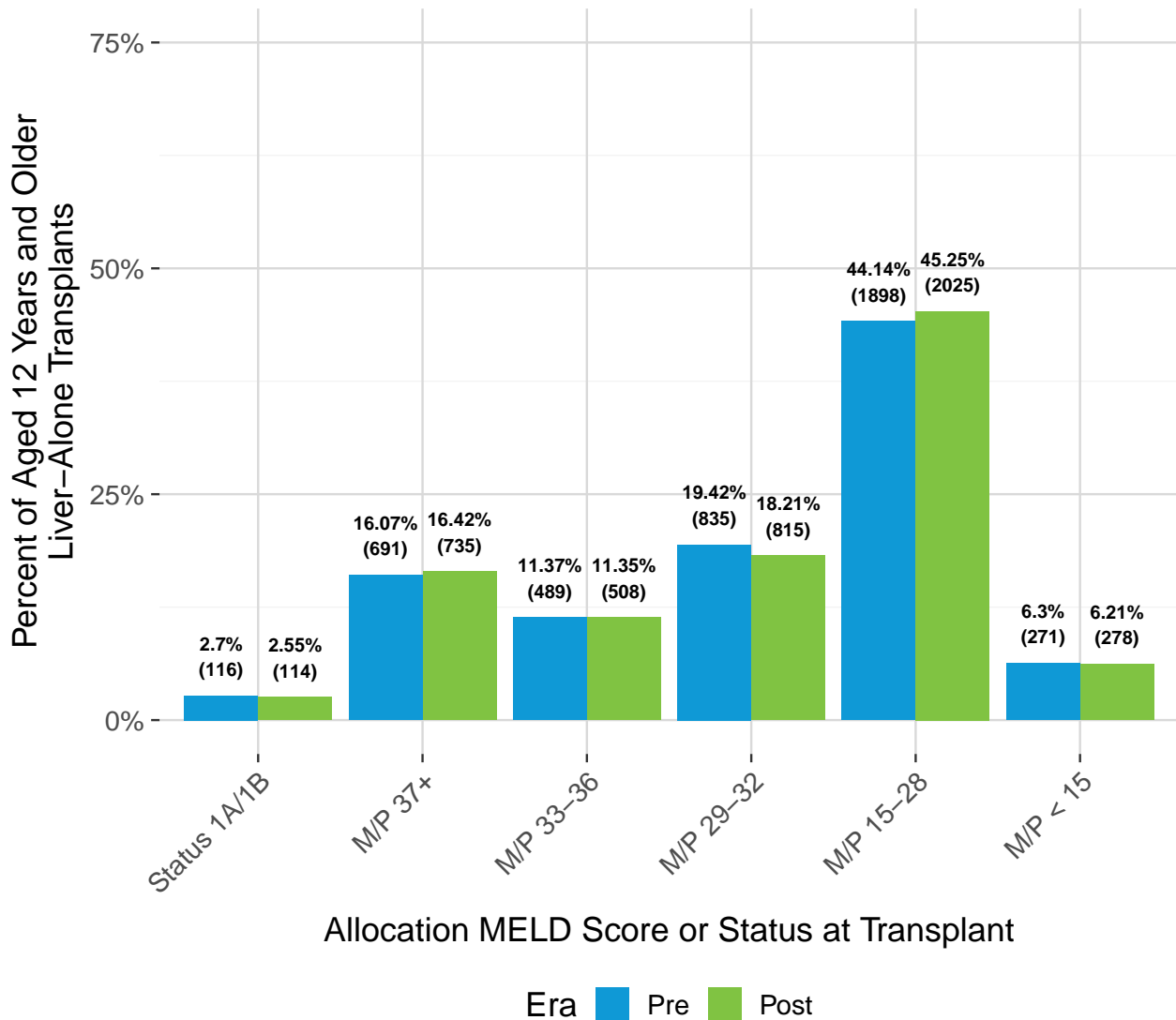
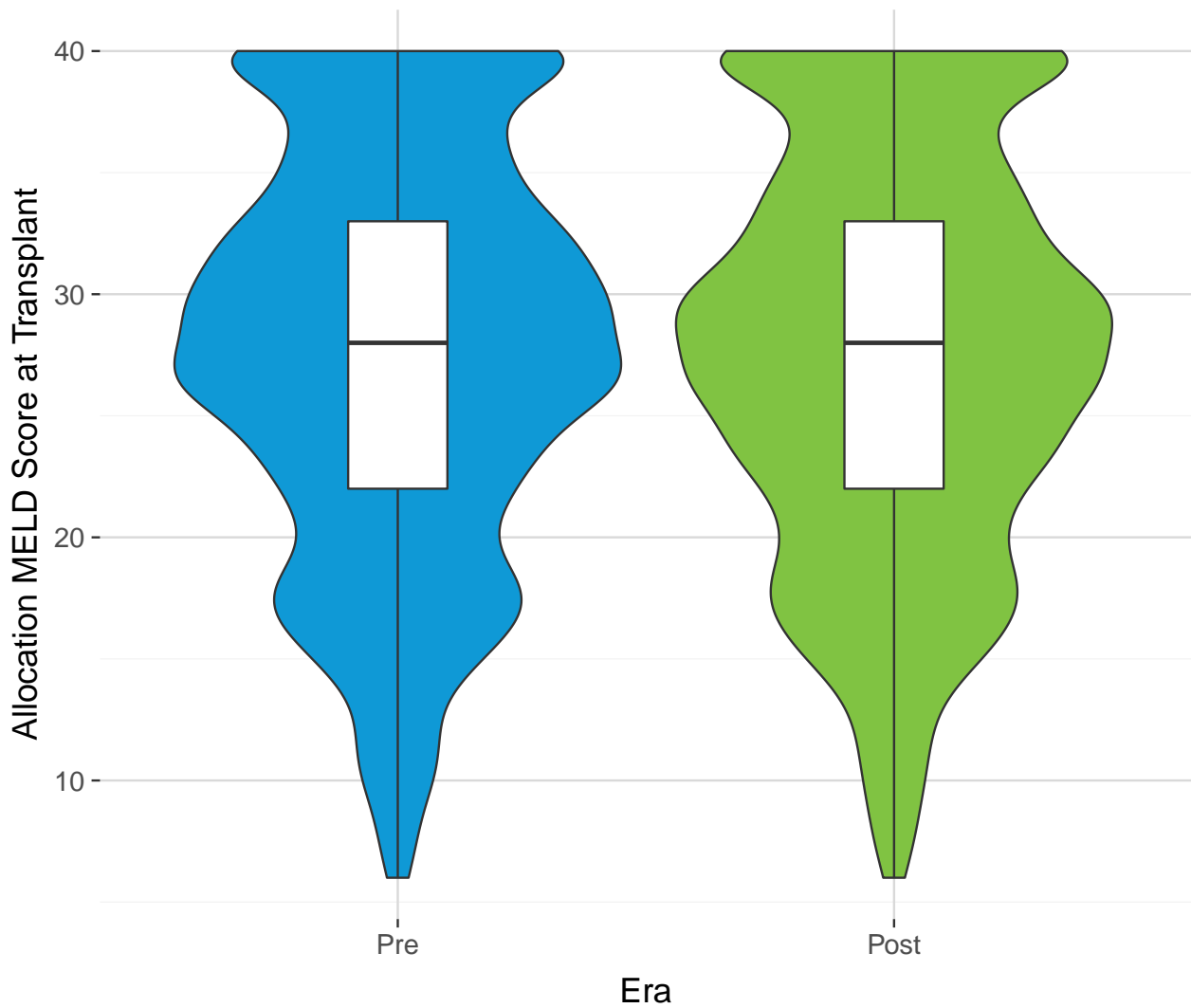


Figure 12. Distribution of Allocation MELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Era



Status 1A/1B candidates do not have allocation MELD scores at transplant. As a result, 116 (2.7%) pre-policy recipients and 114 (2.55%) post-policy recipients were excluded.

Table 15. Summary of Allocation MELD Score at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Era

Era	Transplants	Minimum	25th Per- centile	Median	75th Per- centile	Maximum	Interquartile Range
Pre	4184	6	22	28	33	40	11
Post	4361	6	22	28	33	40	11

Status 1A/1B candidates do not have allocation MELD scores at transplant. As a result, 116 (2.7%) pre-policy recipients and 114 (2.55%) post-policy recipients were excluded.

Figure 13, Figure 14, and Table 17 show the distribution of allocation MELD score at transplant for liver-alone transplant recipients aged 12 years and older by recipient sex and era. The number and proportion of Status 1A/1B transplant recipients remained similar pre- to post-policy for both female and male transplant recipients. Within each sex, the median allocation MELD score at transplant remained the same pre- to post-policy, although it was higher for females (29) compared to males (27). The interquartile range, which captures the middle 50% of allocation MELD scores at transplant, decreased slightly for females pre- to post-policy (Pre: 23-35; Post: 23-34), and remained the same for males pre- to post-policy (Pre: 21-33; Post: 21-33).

Figure 13. Distribution of Allocation MELD Score or Status at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Recipient Sex and Era

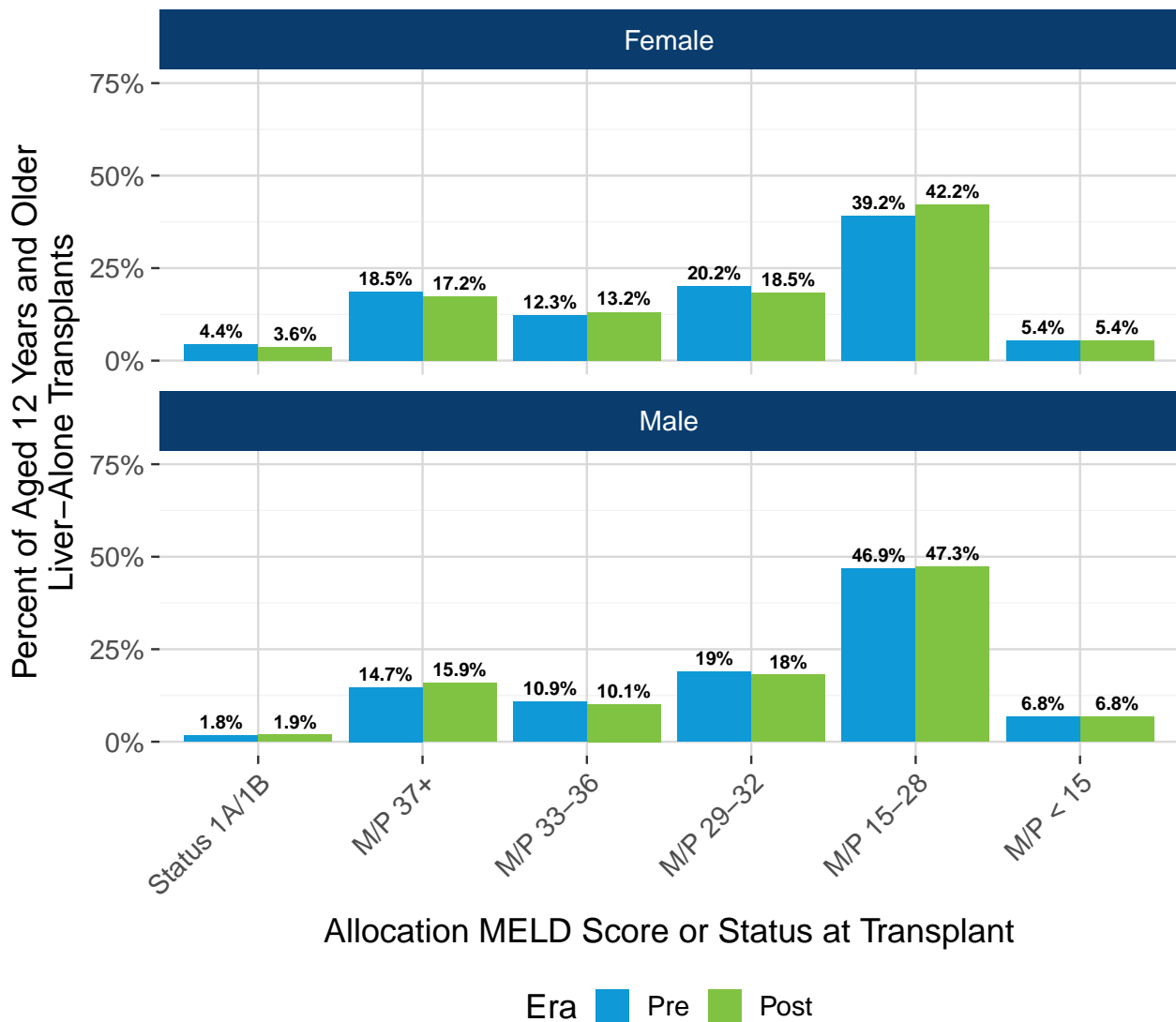
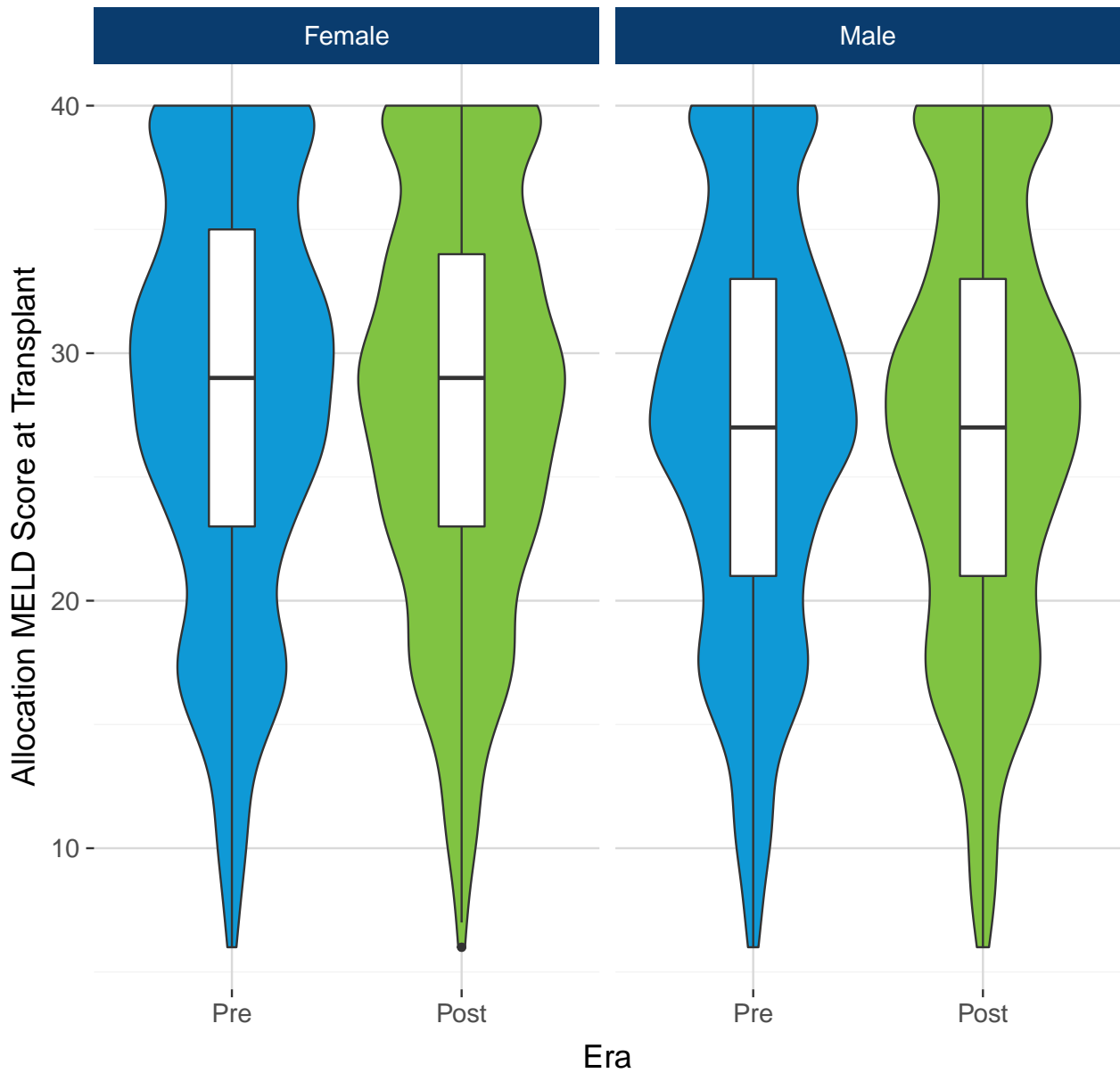


Figure 14. Distribution of Allocation MELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Recipient Sex and Era



Status 1A/1B candidates do not have allocation MELD scores at transplant. As a result, 67 (4.39%) female pre-policy recipients, 64 (3.57%) female post-policy recipients, 49 (1.77%) male pre-policy recipients, and 50 (1.86%) male post-policy recipients were excluded.

Table 17. Summary of Allocation MELD Score at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Recipient Sex and Era

Recipient Sex	Policy Era	Transplants	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
Female	Pre	1459	6	23	29	35	40	12
	Post	1729	6	23	29	34	40	11
Male	Pre	2725	6	21	27	33	40	12
	Post	2632	6	21	27	33	40	12

Status 1A/1B candidates do not have allocation MELD scores at transplant. As a result, 67 (4.39%) female pre-policy recipients, 64 (3.57%) female post-policy recipients, 49 (1.77%) male pre-policy recipients, and 50 (1.86%) male post-policy recipients were excluded.

PELD-Cr Results

This section of the report monitors whether PELD-Cr reduced pediatric waiting list mortality. The analyses in this section include liver candidates and transplant recipients between 0-11 years old; note that throughout this section, age is taken at transplant or removal from the waiting list, as appropriate. Liver candidates and transplant recipients 12 years and older appear in the MELD 3.0 section above.

Waiting List

Figure 15 and **Table 18** show the number of liver candidates aged 0-11 years who were removed from the waiting list by reported removal reason and policy era. 264 candidates were removed in the pre-policy era and 243 candidates were removed in the post-policy era. Deceased donor transplant made up the largest number and proportion of removal reasons (Pre: 167 (63.3%); Post: 148 (60.9%)), followed by living donor transplant (Pre: 37 (14.0%); Post: 41 (16.9%)) and "Candidate condition improved, transplant not needed" (Pre: 35 (13.3%); Post: 23 (9.5%)).

Figure 15. Count and Percent of Liver Candidates Aged 0-11 Years Removed from the Waiting List by Reported Removal Reason and Era

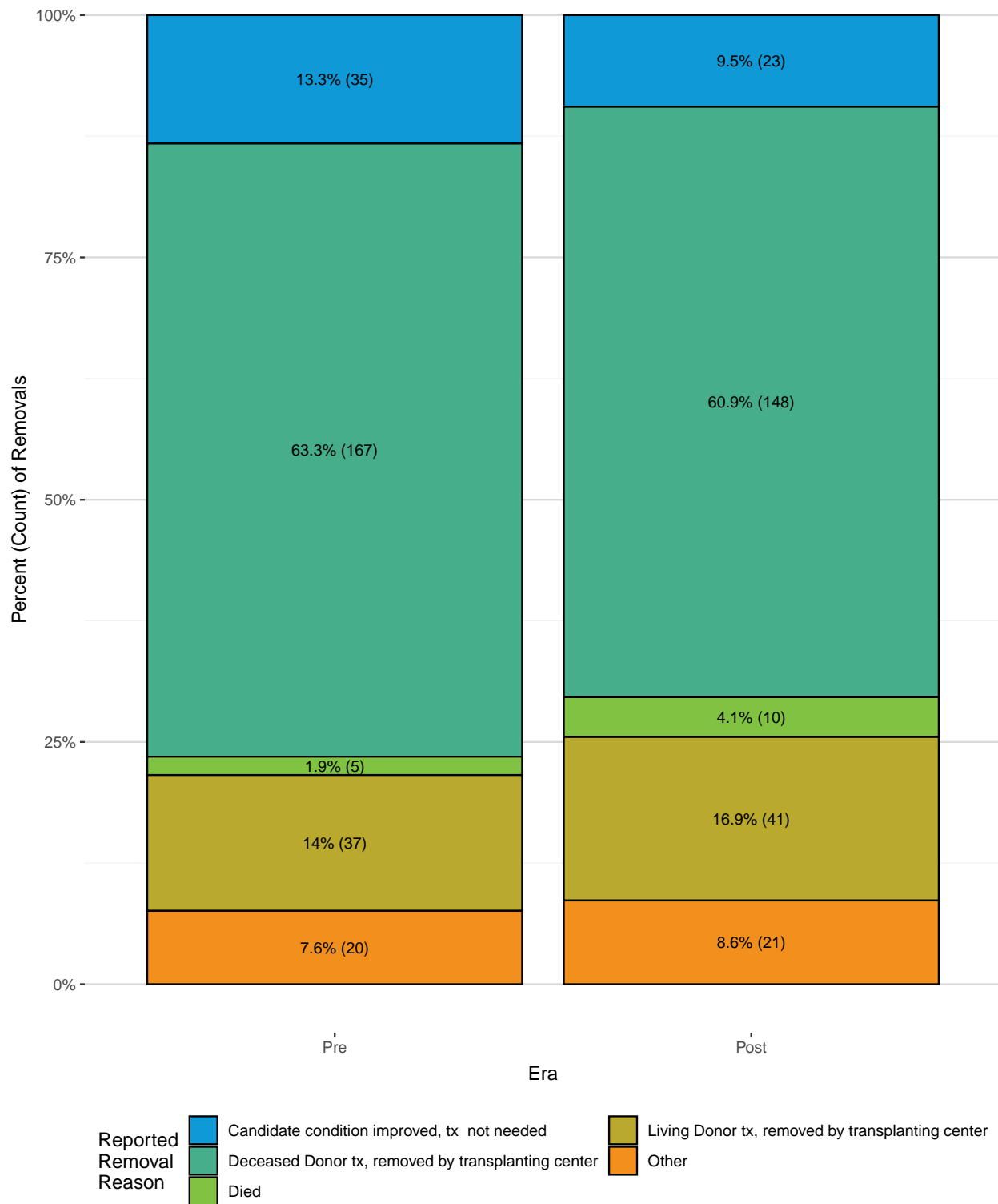
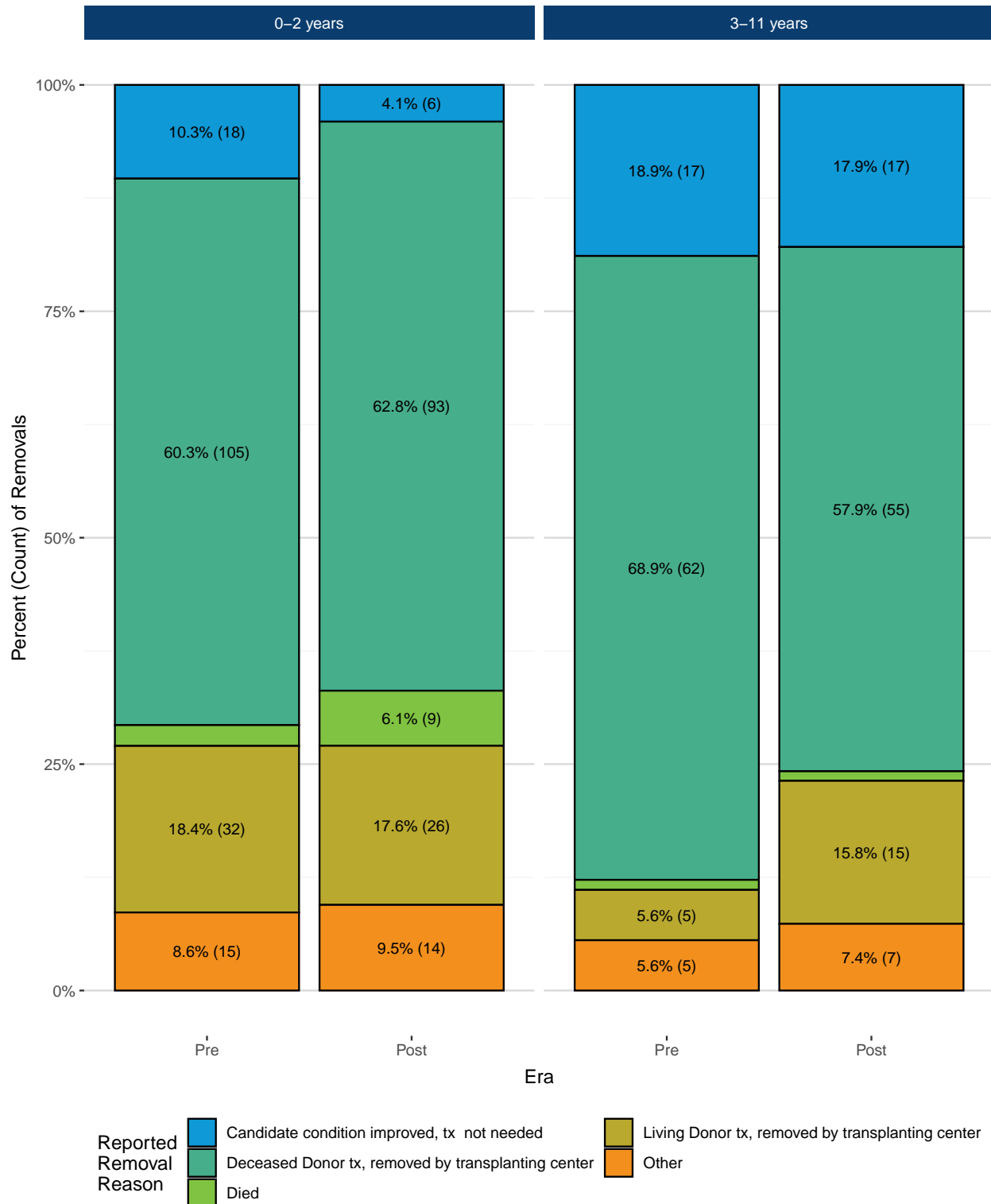


Table 18. Count and Percent of Liver Candidates Aged 0-11 Years Removed from the Waiting List by Reported Removal Reason and Era

Reported Removal Reason	Pre	Post
Deceased Donor tx, removed by transplanting center	167 (63.3%)	148 (60.9%)
Living Donor tx, removed by transplanting center	37 (14.0%)	41 (16.9%)
Candidate condition improved, tx not needed	35 (13.3%)	23 (9.5%)
Transplant at another center (multi-listed)	10 (3.8%)	7 (2.9%)
Died	5 (1.9%)	10 (4.1%)
Transferred to another center	5 (1.9%)	1 (0.4%)
Candidate condition deteriorated , too sick for tx	4 (1.5%)	4 (1.6%)
Other	1 (0.4%)	7 (2.9%)
Patient died during TX procedure	0 (0.0%)	1 (0.4%)
Unable to contact candidate	0 (0.0%)	1 (0.4%)
Total	264 (100.0%)	243 (100.0%)

Figure 16 and **Table 19** show the number of liver candidates aged 0-11 years at removal who were removed from the waiting list by reported removal reason, candidate age group at time of removal (0-2 years vs. 3-11 years) and policy era. Care should be taken when interpreting changes in the other removal categories, as sample sizes are small. Regardless of age group, the top three reasons for removal were deceased donor transplant, removed by transplanting center; living donor transplant, removed by transplanting center; and candidate condition improved, transplant not needed. Although the number of candidates aged 0-2 years old at time of removal who were removed for deceased donor transplant decreased pre- to post-policy, the proportion of candidates aged 0-2 years old at time of removal who were removed for deceased donor transplant increased pre- to post-policy (Pre: 105 (60.3%); Post: 93 (62.8%)). Both the number and proportion of candidates aged 3-11 years old at time of removal who were removed for deceased donor transplant decreased pre- to post-policy (Pre: 62 (68.9%); Post: 55 (57.9%)).

Figure 16. Count and Percent of Liver Candidates Aged 0-11 Years Removed from the Waiting List by Reported Removal Reason, Candidate Age Group at Time of Removal, and Era



*Removal reasons containing <4% of forms in both policy eras were combined with the Other category for plotting purposes, but appear in the corresponding table.

Table 19. Count and Percent of Liver Candidates Aged 0-11 Years Removed from the Waiting List by Reported Removal Reason, Candidate Age Group at Time of Removal, and Era

Reported Removal Reason	0-2 Years		3-11 Years	
	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	105 (60.3%)	93 (62.8%)	62 (68.9%)	55 (57.9%)
Living Donor tx, removed by transplanting center	32 (18.4%)	26 (17.6%)	5 (5.6%)	15 (15.8%)
Candidate condition improved, tx not needed	18 (10.3%)	6 (4.1%)	17 (18.9%)	17 (17.9%)
Transplant at another center (multi-listed)	9 (5.2%)	6 (4.1%)	1 (1.1%)	1 (1.1%)
Died	4 (2.3%)	9 (6.1%)	1 (1.1%)	1 (1.1%)
Candidate condition deteriorated , too sick for tx	3 (1.7%)	3 (2.0%)	1 (1.1%)	1 (1.1%)
Transferred to another center	3 (1.7%)	0 (0.0%)	2 (2.2%)	1 (1.1%)
Other	0 (0.0%)	4 (2.7%)	1 (1.1%)	3 (3.2%)
Patient died during TX procedure	0 (0.0%)	1 (0.7%)	0 (0.0%)	0 (0.0%)
Unable to contact candidate	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.1%)
Total	174 (100.0%)	148 (100.0%)	90 (100.0%)	95 (100.0%)

Figure 17 and **Table 21** show the rate of waiting list removal due to death or too sick to transplant per 100 person-years waiting for liver-alone candidates aged 0-11 years at listing by era. The overall waiting list removal rate increased slightly from 7.49 (3.42, 14.22) removals per 100 person-years waiting pre-policy to 13.09 (7.16, 21.97) removals per 100 person-years waiting post-policy. This difference was not statistically significant.

Figure 17. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Era

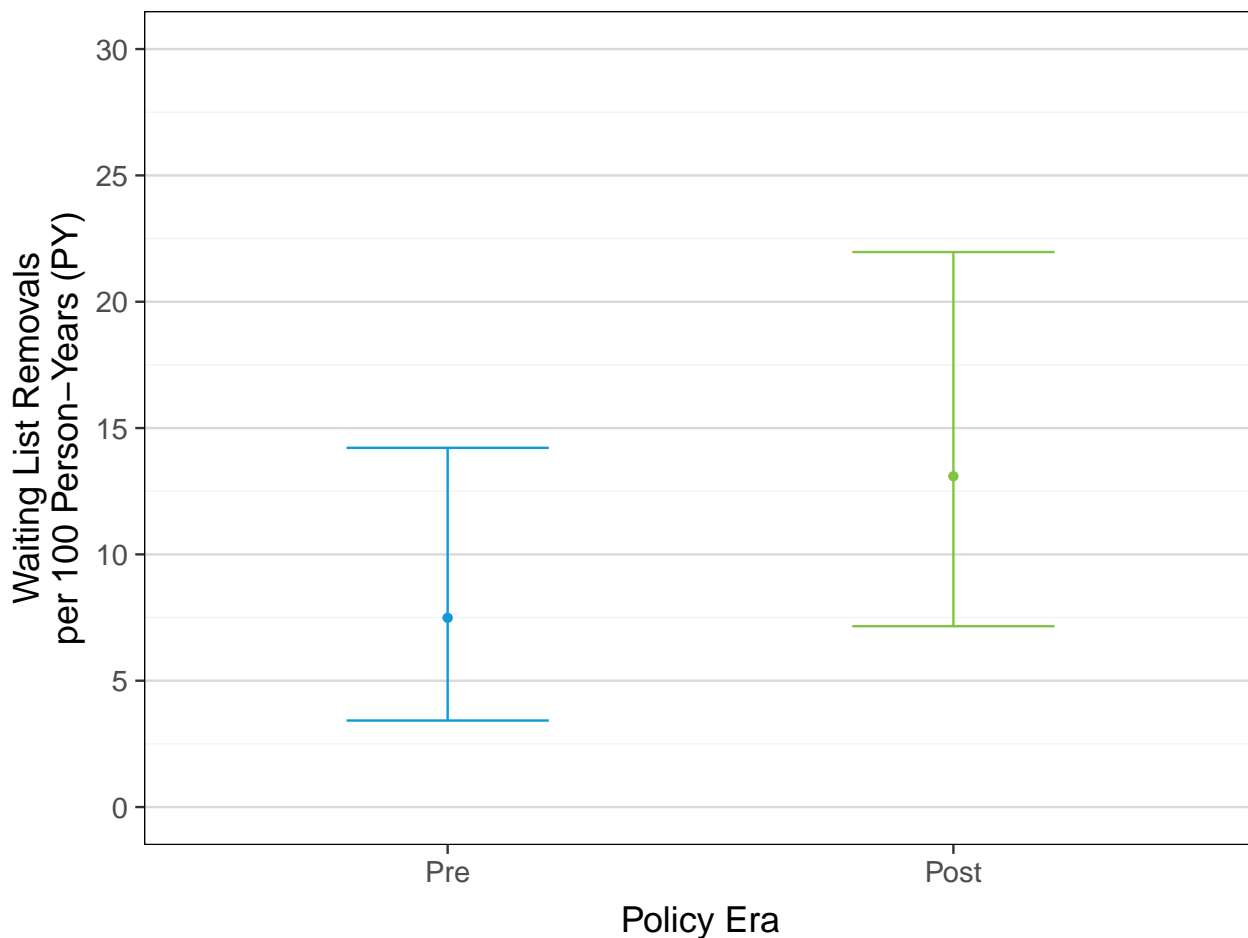


Table 21. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Era

Era	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
	N	N	PY	Estimate	95% CI
Pre	485	9	120.2	7.49	(3.42, 14.22)
Post	464	14	106.9	13.09	(7.16, 21.97)

Figure 18 and **Table 22** show the rate of waiting list removal due to death or too sick to transplant per 100 person-years waiting for liver-alone candidates aged 0-11 years at listing by age group and era. In both policy eras, waiting list removal rates were higher for candidates 0-2 years old compared to candidates between 3-11 years old, although these differences were not statistically significant. Within each age group, waiting list removal rates increased post-policy, although this increase was not statistically significant.

Figure 18. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Age Group and Era

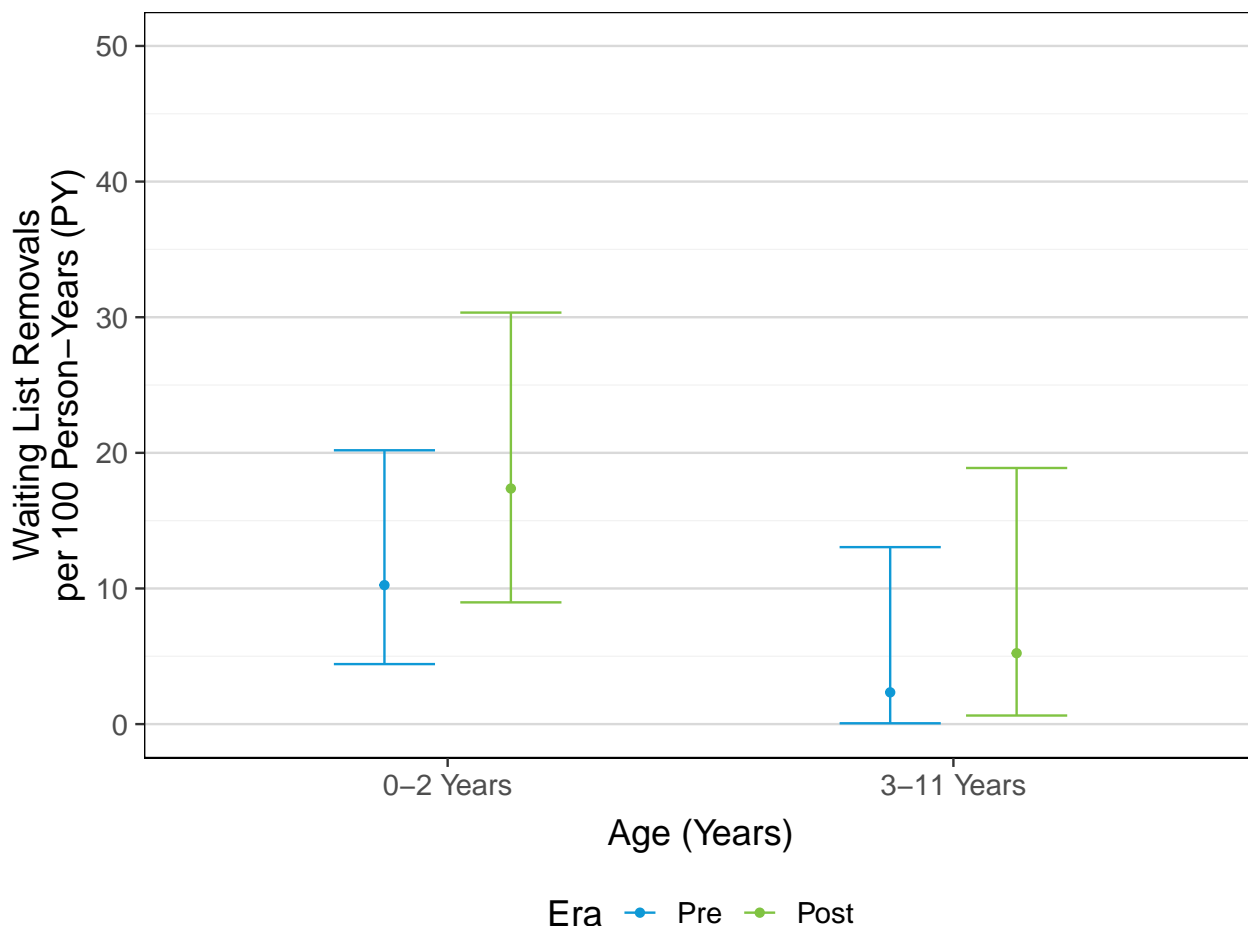


Table 22. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Age Group and Era

Era	Age (Years)	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	0-2 Years	333	8	78.1	10.25	(4.42, 20.19)
	3-11 Years	165	1	42.7	2.34	(0.06, 13.05)
Post	0-2 Years	307	12	69.1	17.37	(8.98, 30.34)
	3-11 Years	163	2	38.3	5.23	(0.63, 18.88)

Figure 19 and **Table 24** show liver-alone transplant rates per 100 person-years waiting among candidates aged 0-11 years at listing by era. The overall transplant rate increased from 137.30 (117.15, 159.92) transplants per 100 active person-years waiting pre-policy to 141.20 (119.58, 165.61) transplants per 100 active person-years waiting post-policy. This increase was not statistically significant.

Figure 19. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Era

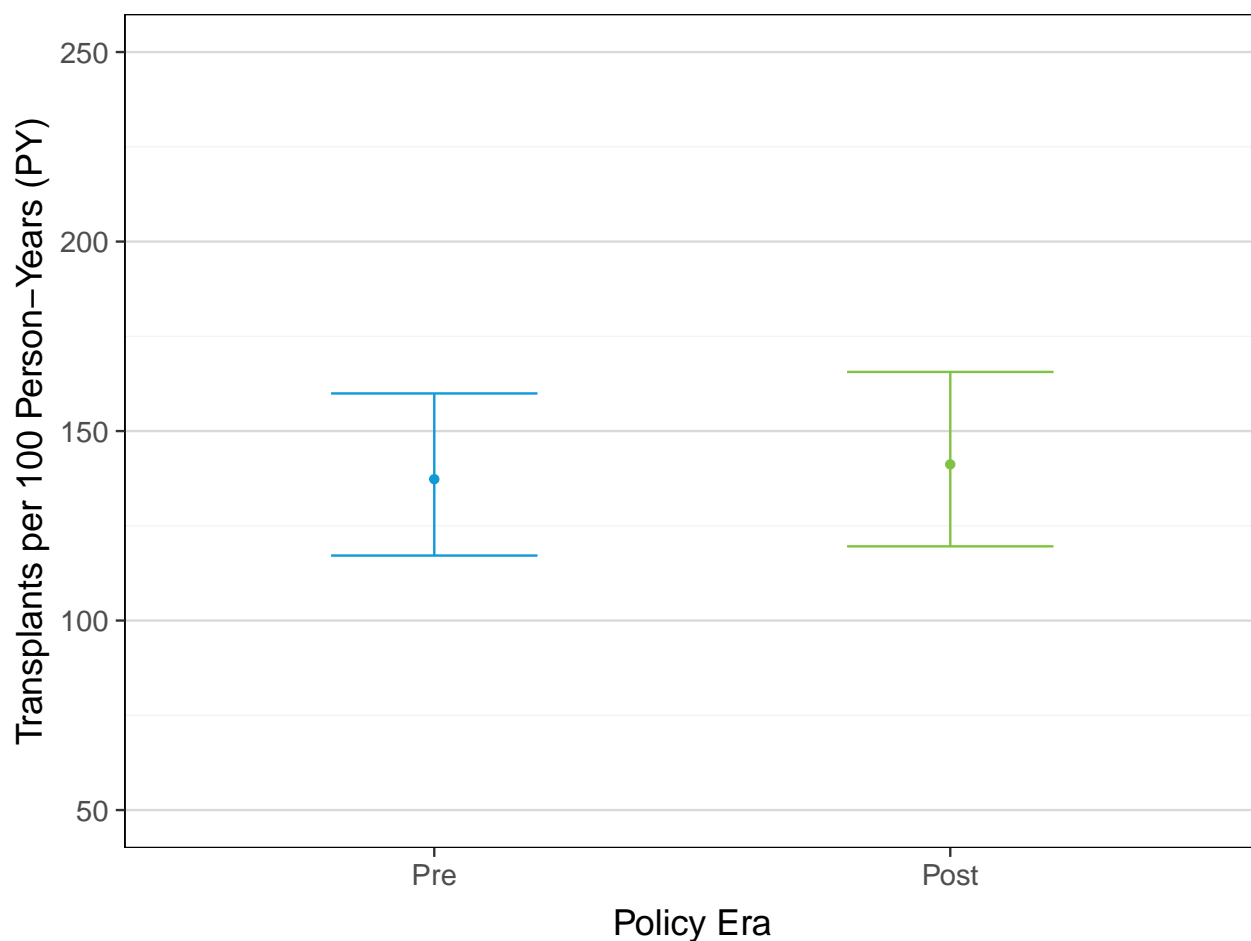


Table 24. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Era

Era	Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
	N	N	PY	Estimate	95% CI
Pre	485	165	120.2	137.30	(117.15, 159.92)
Post	464	151	106.9	141.20	(119.58, 165.61)

Figure 20 and **Table 25** show liver-alone transplant rates per 100 active person-years waiting among candidates aged 0-11 years at listing by age group and era. The transplant rate among candidates 0-2 years old remained slightly (but not significantly) higher than that among candidates 3-11 years old, regardless of policy era. Within each age group, the transplant rate increased pre- to post-policy although these increases were not statistically significant.

Figure 20. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Age Group and Era

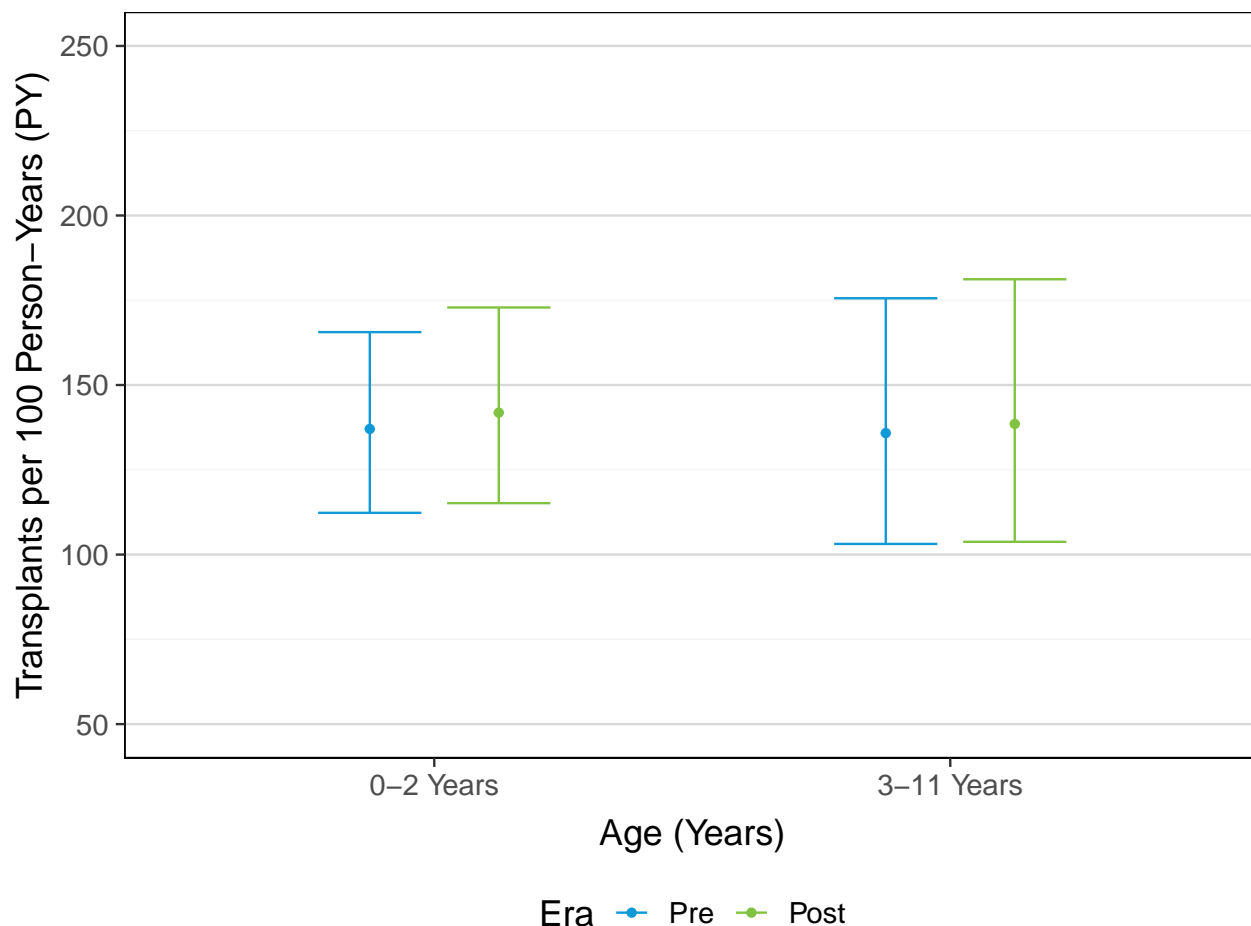


Table 25. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Age Group and Era

Era	Age (Years)	Ever	Transplant	Active	Transplants	
		Waiting	Events		Person-Years (PY)	per 100 Active PY
		N	N	PY	Estimate	95% CI
Pre	0-2 Years	333	107	78.1	137.04	(112.31, 165.60)
	3-11 Years	165	58	42.7	135.83	(103.14, 175.59)
Post	0-2 Years	307	98	69.1	141.85	(115.16, 172.88)
	3-11 Years	163	53	38.3	138.52	(103.76, 181.19)

Transplant

Figure 21 and **Table 27** show the number of liver transplants among recipients aged 0-11 years at time of transplant by policy era. There were 319 total transplants among recipients less than 12 years of age in the study period. 169 of these transplants occurred in the pre-policy era and 150 occurred in the post-policy era.

Figure 21. Number of Liver Transplants among Recipients Aged 0-11 Years at Time of Transplant by Era

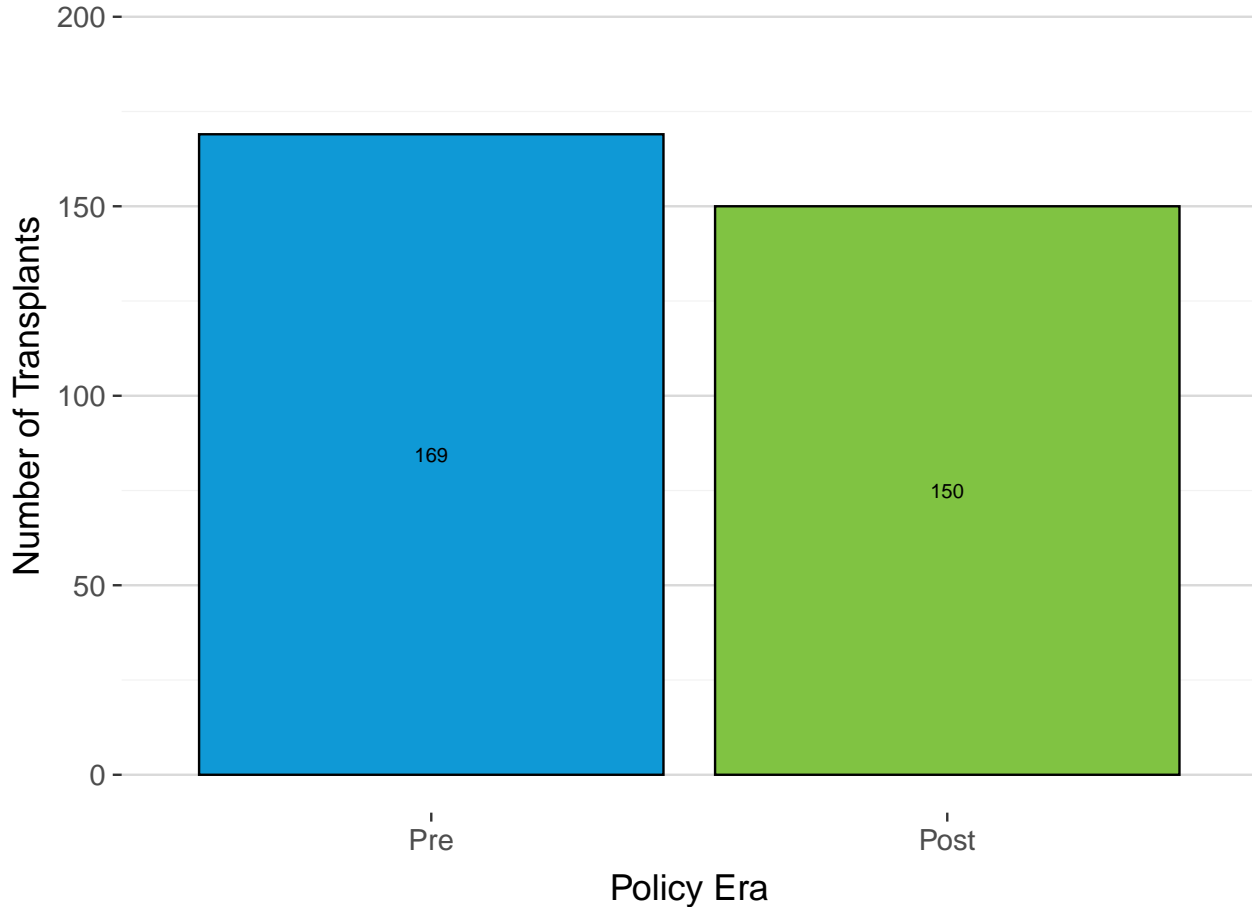


Table 27. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years at Time of Transplant by Era

Era	N (%)
Pre	169 (53.0%)
Post	150 (47.0%)
Total	319 (100.0%)

Figure 22 and **Table 29** show the number of liver transplants among recipients aged 0-11 years by age group at time of transplant (0-2 years vs. 3-11 years) and policy era. The number of transplant recipients 0-2 years old decreased pre- to post-policy, while the proportion increased slightly pre- to post-policy (Pre: 105 (62.1%); Post: 94 (62.7%)).

Figure 22. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era

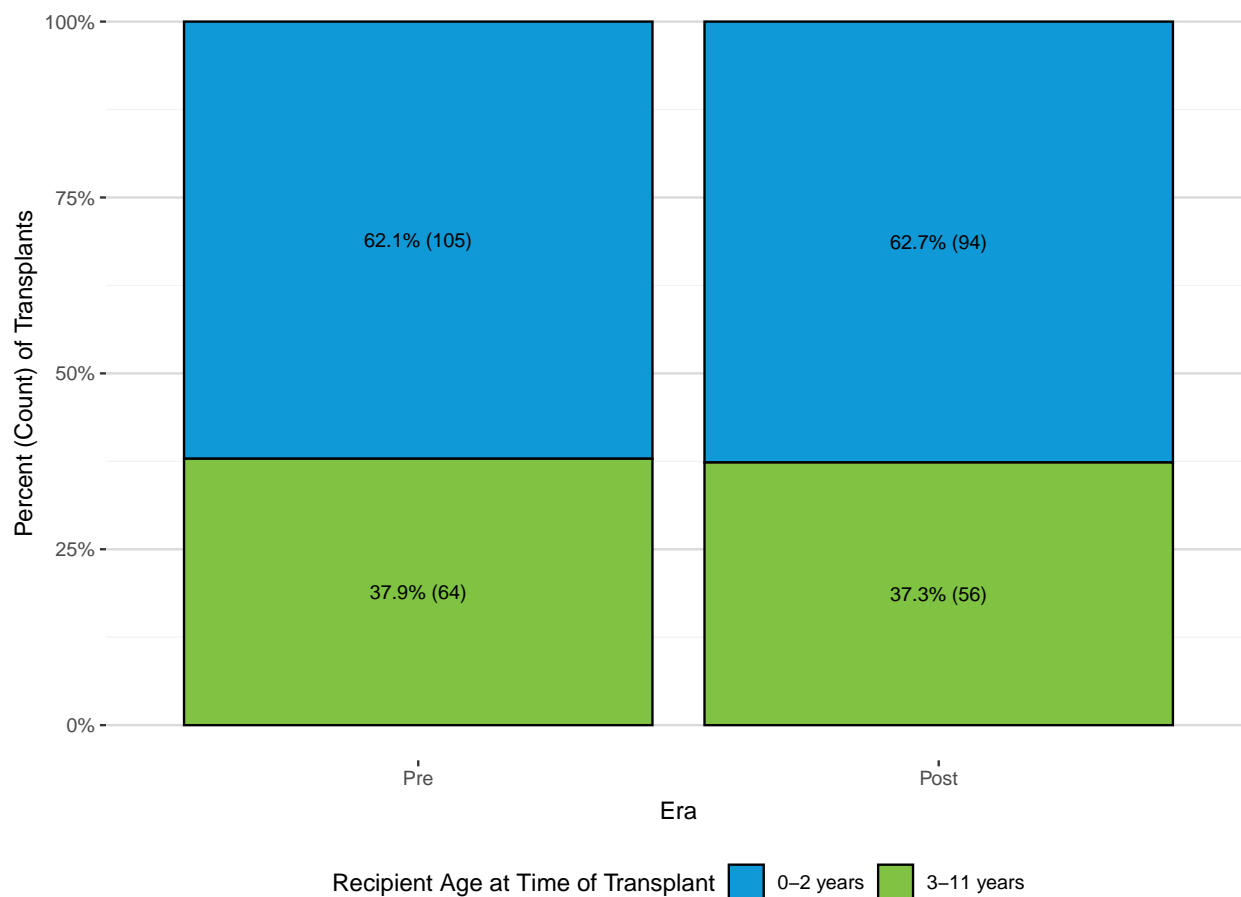


Table 29. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era

Recipient Age at Time of Transplant	Pre	Post
0-2 years	105 (62.1%)	94 (62.7%)
3-11 years	64 (37.9%)	56 (37.3%)
Total	169 (100.0%)	150 (100.0%)

Figure 23, Figure 24, and Table 31 show the distribution of allocation PELD score at transplant for liver-alone transplant recipients aged 0-11 years by era. Note that in the pre-policy era, PELD scores could range between -99 and 99, whereas in the post-policy era, PELD scores were floored at 6; thus, PELD scores in the post-policy era can only range between 6 and 99.

The number and proportion of Status 1A/1B transplant recipients decreased from 72 (42.6%) pre-policy to 61 (40.67%) post-policy. The median PELD score at transplant decreased from 33 pre-policy to 31 post-policy. The interquartile range, which captures the middle 50% of PELD scores at transplant, decreased from 23-35 pre-policy to 23-33 post-policy. Moreover, the overall distribution became less skewed post-policy compared to pre-policy.

Figure 23. Distribution of Allocation PELD Score or Status at Transplant for Liver-Along Transplant Recipients Aged 0-11 Years at Time of Transplant by Era

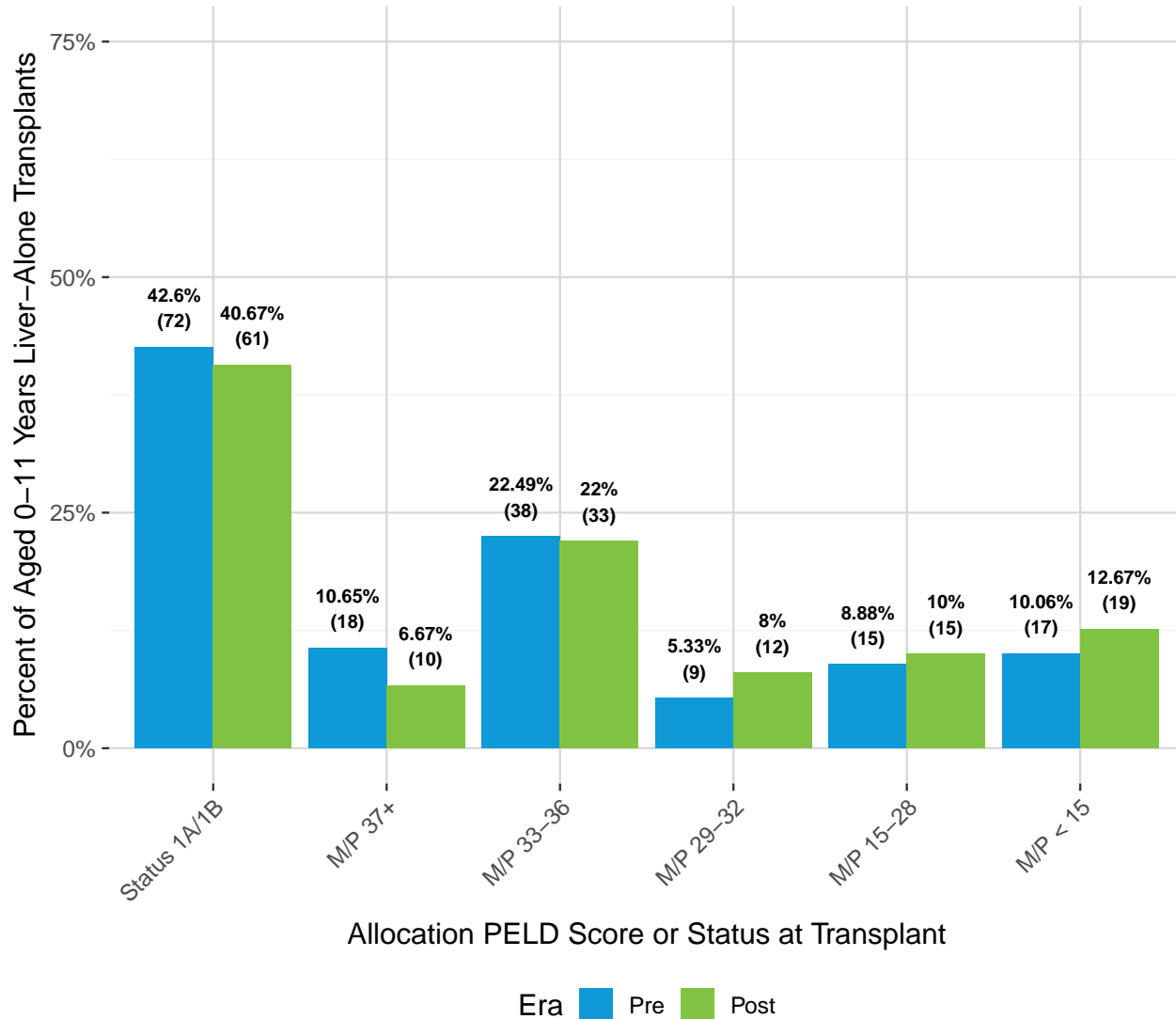
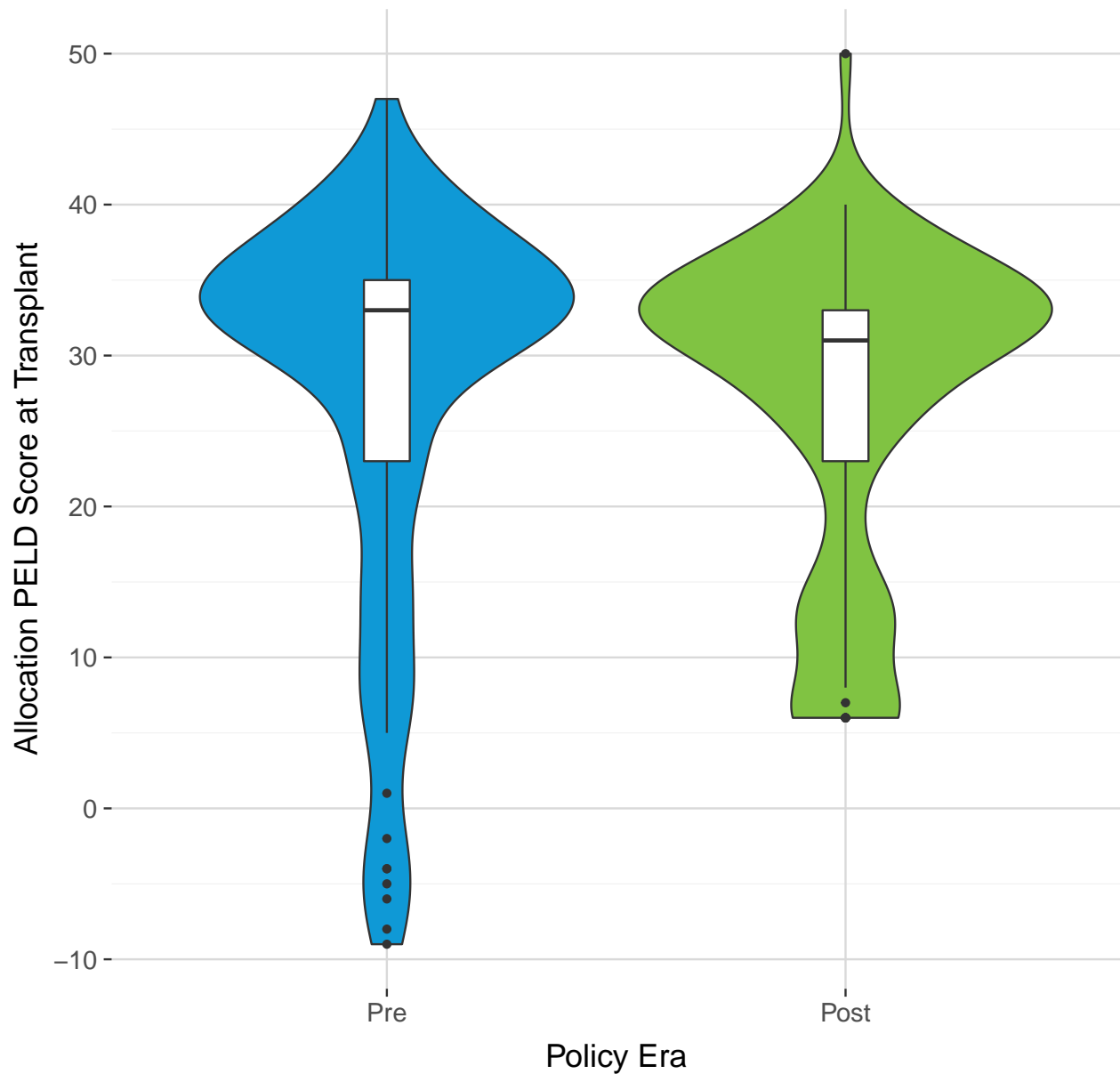


Figure 24. Distribution of Allocation PELD Score at Transplant for Liver-Alone Transplant Recipients Aged 0-11 Years at Time of Transplant by Era



Status 1A/1B candidates do not have allocation PELD scores at transplant. As a result, 72 (42.6%) pre-policy recipients and 61 (40.67%) post-policy recipients were excluded. Pre-policy, PELD could range between -99 and 99; post-policy, PELD ranges between 6 and 99.

Table 31. Summary of Allocation PELD Score at Transplant for Liver-Along Transplant Recipients Aged 0-11 Years at Time of Transplant by Era

Policy Era	N	Minimum	25th Per-centile	Median	75th Per-centile	Maximum	Interquartile Range
Pre	97	-9	23	33	35	47	12
Post	89	6	23	31	33	50	10

Status 1A/1B candidates do not have allocation PELD scores at transplant. As a result, 72 (42.6%) pre-policy recipients and 61 (40.67%) post-policy recipients were excluded.

Pre-policy, PELD could range between -99 and 99; post-policy, PELD ranges between 6 and 99.

Figure 25, Figure 26, and Table 33 show the distribution of allocation PELD score at transplant for liver-alone transplant recipients aged 0-11 years at time of transplant by age group and era. Among transplant recipients 0-2 years old at the time of transplant, the number and proportion of Status 1A/1B transplant recipients decreased from 43 (40.95%) pre- to 33 (35.11%) post-policy. The median PELD score at transplant among recipients 0-2 years old remained the same pre- to post-policy (33), but the interquartile range, which captures the middle 50% of allocation PELD scores at transplant, increased slightly (Pre: 30-35.8; Post: 28-35).

Among transplant recipients 3-11 years old at the time of transplant, the number of Status 1A/1B transplant recipients decreased, but the proportion of Status 1A/1B transplant recipients increased from 29 (45.31%) pre-policy to 28 (50%) post-policy. The median PELD score at transplant among recipients 3-11 years old at the time of transplant decreased from 28 pre-policy to 27 post-policy. The interquartile range of allocation PELD scores at transplant for recipients 3-11 years old decreased as well (Pre: 6-35; Post: 7.8-33).

Regardless of policy era, the median allocation PELD score at transplant was higher for recipients 0-2 years old than for recipients 3-11 years old; the interquartile range of allocation PELD scores at transplant was narrower for recipients 0-2 years old than for recipients 3-11 years old. Overall, the distribution of allocation PELD scores at transplant was less skewed post-policy compared to pre-policy.

Figure 25. Distribution of Allocation PELD Score or Status at Transplant for Liver-Along Transplant Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era

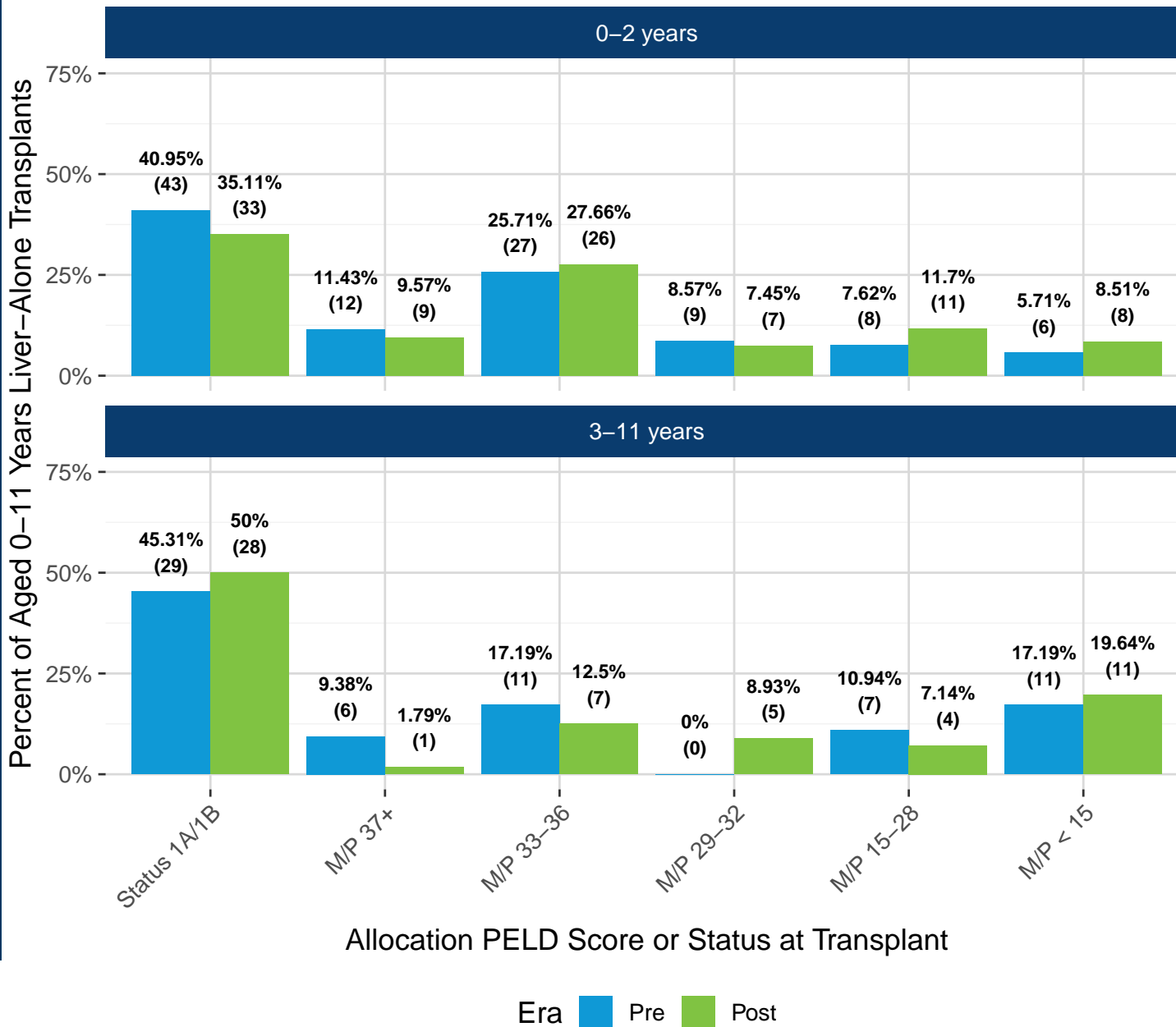


Figure 26. Distribution of Allocation PELD Score at Transplant for Liver-Along Transplant Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era



Status 1A/1B candidates do not have allocation PELD scores at transplant. As a result, 43 (40.95%) pre-policy recipients aged 0-2 years, 33 (35.11%) post-policy recipients aged 0-2 years, 29 (45.31%) pre-policy recipients aged 3-11 years, and 28 (50%) post-policy recipients aged 3-11 years were excluded. Pre-policy, PELD could range between -99 and 99; post-policy, PELD ranges between 6 and 99.

Table 33. Summary of Allocation PELD Score at Transplant for Liver-Along Transplant Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era

Recipient Age at Time of Transplant	Policy Era	Transplants	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
0-2 years	Pre	62	5	30.0	33	35.8	47	5.8
	Post	61	6	28.0	33	35.0	50	7.0
3-11 years	Pre	35	-9	6.0	28	35.0	40	29.0
	Post	28	6	7.8	27	33.0	37	25.2

Status 1A/1B candidates do not have allocation PELD scores at transplant. As a result, 43 (40.95%) pre-policy recipients aged 0-2 years, 33 (35.11%) post-policy recipients aged 0-2 years, 29 (45.31%) pre-policy recipients aged 3-11 years, and 28 (50%) post-policy recipients aged 3-11 years were excluded. Pre-policy, PELD could range between -99 and 99; post-policy, PELD ranges between 6 and 99.

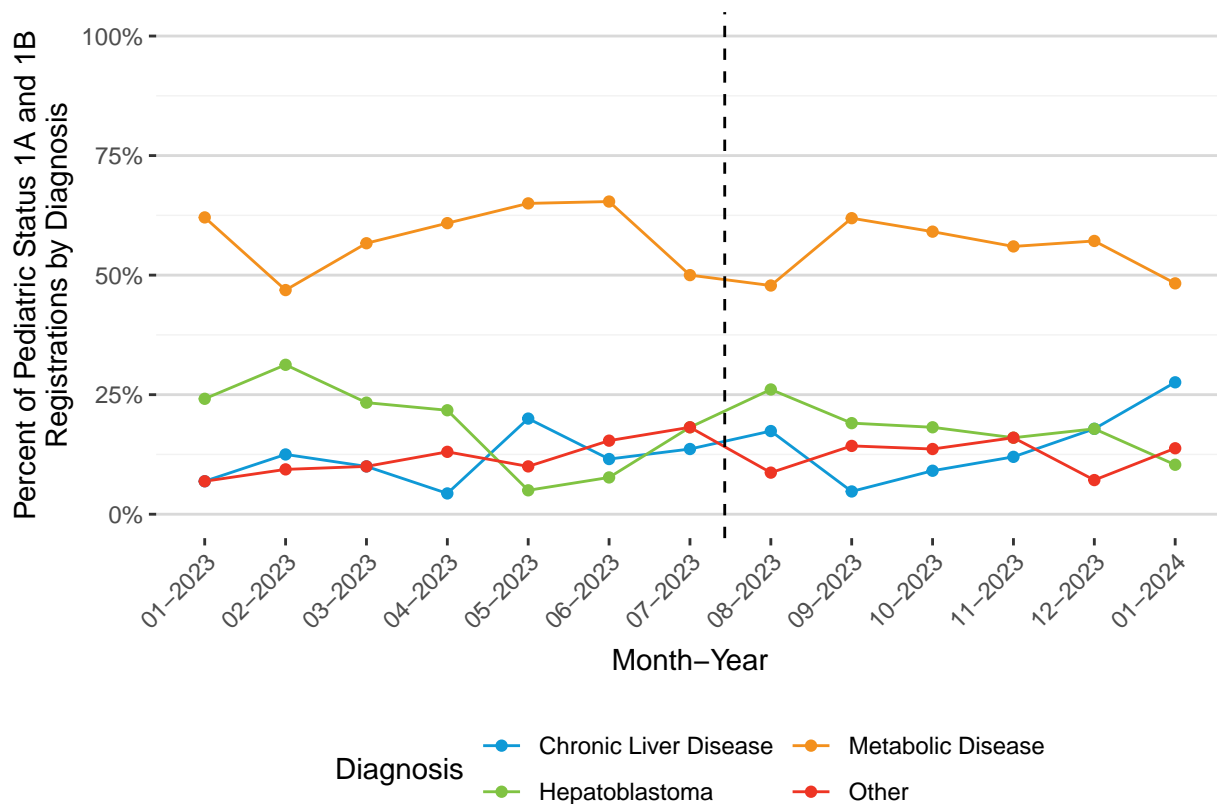
Status 1A and 1B Results

This section of the report monitors whether the Status 1A and 1B policy changes reduced pediatric waiting list mortality. The analyses in this section include liver candidates and transplant recipients with Status 1A or 1B who were less than 18 years old at listing.

Waiting List

Figure 27 and Table 34 show the percent of pediatric (<18 years old) Status 1A/1B liver-alone waiting list registrations with Status 1B at the end of each month by diagnosis (chronic liver disease, hepatoblastoma, metabolic disease, other). At the end of each month, the majority of pediatric Status 1A and 1B registrations had metabolic disease. Counts and percents remained fairly consistent pre- and post-policy, although results should be interpreted cautiously due to small sample size.

Figure 27. Percent of Pediatric (Age <18) Status 1A and 1B Liver Waiting List Registrations at the End of Each Month by Diagnosis



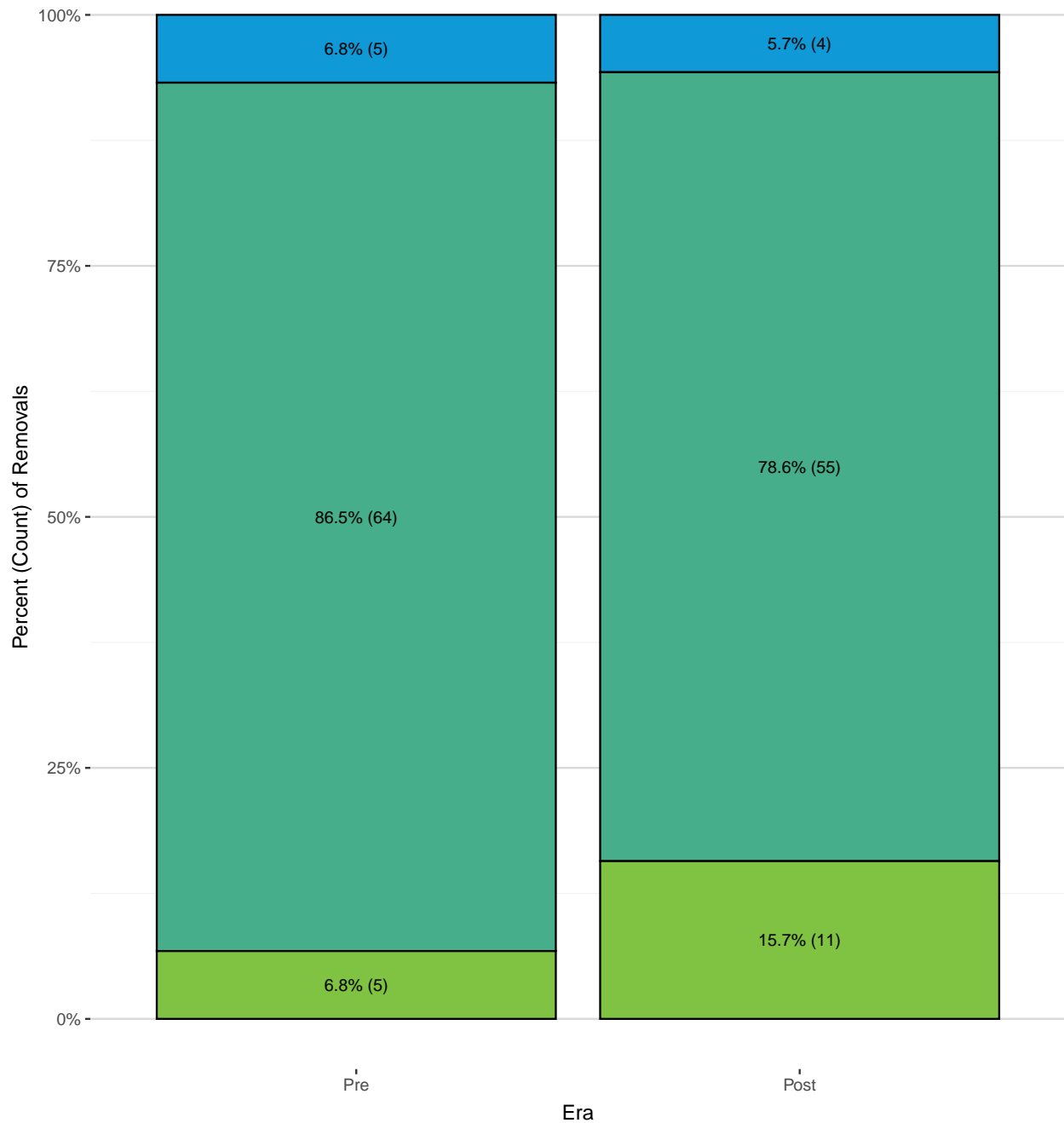
Dotted line represents implementation of MELD 3.0, PELD-Cr, Status 1A and 1B policy on July 13, 2023.

Table 34. Count and Percent of Pediatric (Age <18) Status 1A and 1B Liver Waiting List Registrations at the End of Each Month by Diagnosis

Month-Year	Chronic Liver Disease		Hepatoblastoma		Metabolic Disease		Other	
	N	%	N	%	N	%	N	%
01-2023	2	6.9	7	24.1	18	62.1	2	6.9
02-2023	4	12.5	10	31.2	15	46.9	3	9.4
03-2023	3	10.0	7	23.3	17	56.7	3	10.0
04-2023	1	4.3	5	21.7	14	60.9	3	13.0
05-2023	4	20.0	1	5.0	13	65.0	2	10.0
06-2023	3	11.5	2	7.7	17	65.4	4	15.4
07-2023	3	13.6	4	18.2	11	50.0	4	18.2
08-2023	4	17.4	6	26.1	11	47.8	2	8.7
09-2023	1	4.8	4	19.0	13	61.9	3	14.3
10-2023	2	9.1	4	18.2	13	59.1	3	13.6
11-2023	3	12.0	4	16.0	14	56.0	4	16.0
12-2023	5	17.9	5	17.9	16	57.1	2	7.1
01-2024	8	27.6	3	10.3	14	48.3	4	13.8

Figure 28 and **Table 35** show the number of pediatric liver candidates with Status 1A and 1B who were removed from the waiting list by reported removal reason and policy era. 74 candidates were removed in the pre-policy era and 70 candidates were removed in the post-policy era. Deceased donor transplant made up the largest number and proportion of removal reasons (Pre: 64 (86.5%); Post: 55 (78.6%)).

Figure 28. Count and Percent of Pediatric (Age <18) Liver Candidates with Status 1A and 1B who were Removed from the Waiting List by Reported Removal Reason and Era



Reported Removal Reason

- Candidate condition improved, tx not needed
- Deceased Donor tx, removed by transplanting center
- Other

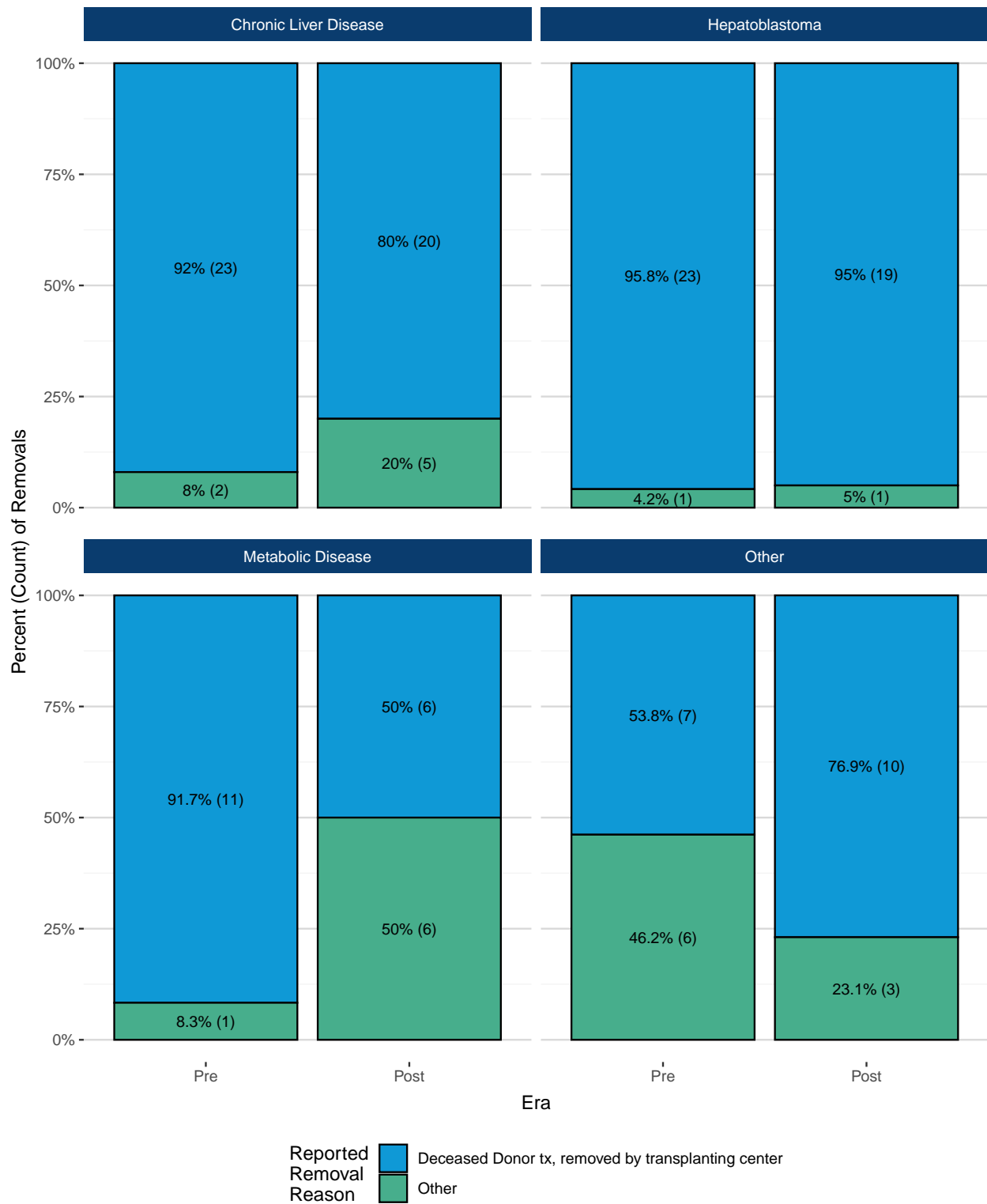
*Removal reasons containing <5% of forms were combined with the Other category for plotting purposes, but appear in the corresponding table.

Table 35. Count and Percent of Pediatric (Age <18) Liver Candidates with Status 1A and 1B who were Removed from the Waiting List by Reported Removal Reason and Era

Reported Removal Reason	Pre	Post
Deceased Donor tx, removed by transplanting center	64 (86.5%)	55 (78.6%)
Candidate condition improved, tx not needed	5 (6.8%)	4 (5.7%)
Candidate condition deteriorated , too sick for tx	2 (2.7%)	1 (1.4%)
Died	2 (2.7%)	2 (2.9%)
Transplant at another center (multi-listed)	1 (1.4%)	2 (2.9%)
Living Donor tx, removed by transplanting center	0 (0.0%)	3 (4.3%)
Other	0 (0.0%)	3 (4.3%)
Total	74 (100.0%)	70 (100.0%)

Figure 29 and **Table 36** show the number of pediatric liver candidates with Status 1A and 1B who were removed from the waiting list by reported removal reason, diagnosis (chronic liver disease, hepatoblastoma, metabolic disease, other), and policy era. Care should be taken when interpreting changes in the other removal categories, as sample sizes are small. Regardless of diagnosis, the top reason for removal was deceased donor transplant. The number of removals for deceased donor transplant decreased pre- to post-policy for Status 1A and 1B candidates in the “Chronic Liver Disease” (Pre: 23 (92.0%); Post: 20 (80.0%)), “Hepatoblastoma” (Pre: 23 (95.8%); Post: 19 (95.0%)), and “Metabolic Disease” diagnosis categories (Pre: 11 (91.7%); Post: 6 (50.0%)).

Figure 29. Count and Percent of Pediatric (Age <18) Liver Candidates with Status 1A and 1B who were Removed from the Waiting List by Reported Removal Reason, Diagnosis, and Era



*Due to small sample size, only removal due to deceased donor transplant is shown;

Table 36. Count and Percent of Pediatric (Age <18) Liver Candidates with Status 1A and 1B who were Removed from the Waiting List by Reported Removal Reason, Diagnosis, and Era

Reported Removal Reason	Chronic Liver Disease		Hepatoblastoma		Metabolic Disease		Other	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	23 (92.0%)	20 (80.0%)	23 (95.8%)	19 (95.0%)	11 (91.7%)	6 (50.0%)	7 (53.8%)	10 (76.9%)
Other	2 (8.0%)	5 (20.0%)	1 (4.2%)	1 (5.0%)	1 (8.3%)	6 (50.0%)	6 (46.2%)	3 (23.1%)
Total	25 (100.0%)	25 (100.0%)	24 (100.0%)	20 (100.0%)	12 (100.0%)	12 (100.0%)	13 (100.0%)	13 (100.0%)

Due to small sample size, only removal due to deceased donor transplant is shown; all other removal reasons are grouped into the Other category.

Transplant

Figure 30 and **Table 38** show the number of pediatric (age <18 at time of transplant) Status 1A and 1B liver transplants by policy era. There were 158 total transplants among pediatric Status 1A and 1B recipients in the study period. 86 (54.4%) of these transplants occurred in the pre-policy era and 72 (45.6%) occurred in the post-policy era.

Figure 30. Number of Pediatric (Age <18 at Transplant) Status 1A and 1B Liver Transplants by Era

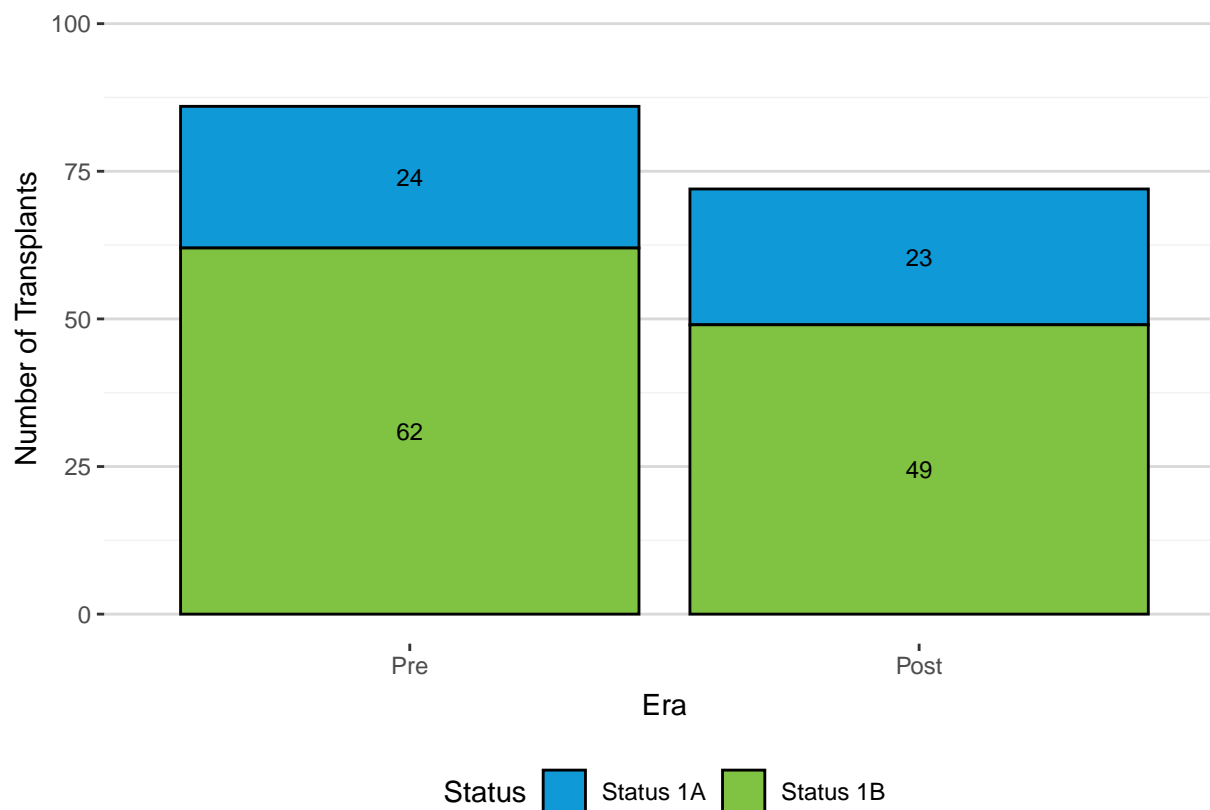


Table 38. Count and Percent of Pediatric (Age <18 at Transplant) Status 1A and 1B Liver Transplants by Era

Status	Pre	Post
Status 1A	24 (27.9%)	23 (31.9%)
Status 1B	62 (72.1%)	49 (68.1%)
Total	86 (100.0%)	72 (100.0%)

Figure 31 and **Table 40** show the number and proportion of liver transplants among pediatric (age <18 at time of transplant) Status 1B recipients by diagnosis (chronic liver disease, hepatoblastoma, metabolic disease, other) and policy era. In the pre-policy era, Status 1B recipients with metabolic disease made up the largest proportion of transplants (Pre: 24 (38.7%)), whereas in the post-policy era, Status 1B recipients with hepatoblastoma made up the largest proportion of transplants (Post: 20 (40.8%)). In both policy eras, Status 1B recipients with “Other” diagnosis made up the smallest proportion of transplants (Pre: 2 (3.2%); Post: 3 (6.1%)). The proportion of Status 1B recipients with chronic liver disease, hepatoblastoma, or other diagnosis increased pre- to post-policy, whereas the proportion of recipients with metabolic disease decreased pre- to post-policy (Pre: 24 (38.7%); Post: 12 (24.5%)).

Figure 31. Count and Percent of Pediatric (Age <18 at Transplant) Status 1B Liver Transplants by Diagnosis and Era

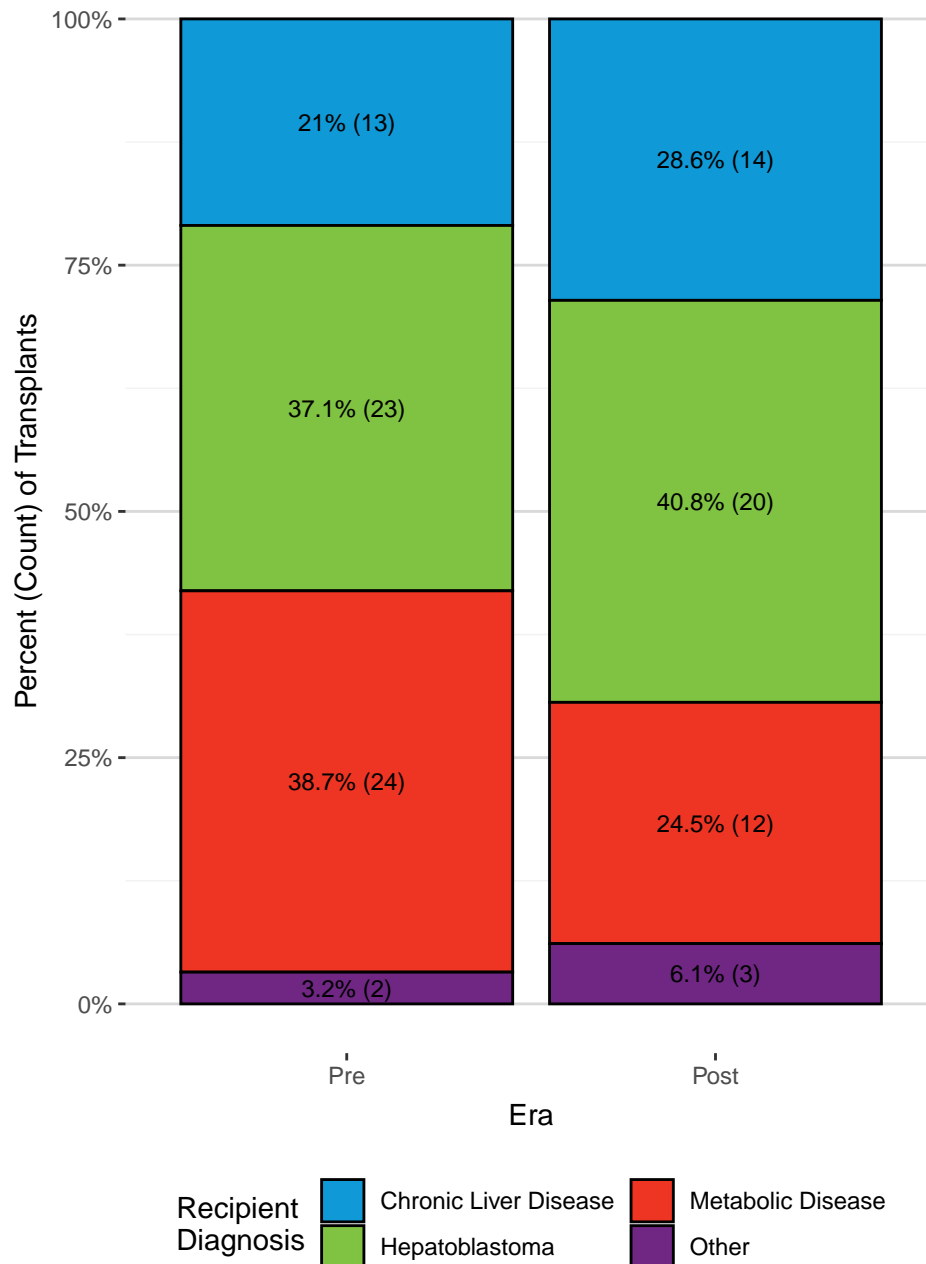


Table 40. Count and Percent of Pediatric (Age <18 at Transplant) Status 1B Liver Transplants by Diagnosis and Era

Recipient Diagnosis	Pre	Post
Chronic Liver Disease	13 (21.0%)	14 (28.6%)
Hepatoblastoma	23 (37.1%)	20 (40.8%)
Metabolic Disease	24 (38.7%)	12 (24.5%)
Other	2 (3.2%)	3 (6.1%)
Total	62 (100.0%)	49 (100.0%)

Case Outcomes for Forms Submitted in the Pre- and Post-Policy Eras

This section summarizes outcomes for pediatric Status 1B cases submitted in the pre- and post-policy era. Due to the small number of pediatric Status 1B cases sent to the Pediatric Review Board that closed without a majority or that were disapproved, turnaround reasons for these cases are not summarized in this report. A summary of the reasons for criteria not met for cases that were ultimately approved is shown instead.

Figure 32 and **Table 42** show the number and percent of pediatric Status 1B forms that were auto-approved versus sent to the Pediatric Review Board (i.e., forms that met standard criteria versus forms that did not) in the pre- and post-policy eras. 131 pediatric Status 1B cases were submitted pre-policy, compared to 108 pediatric Status 1B cases submitted post-policy. A greater number and proportion of cases were auto-approved in the post-policy era compared to the pre-policy era (Pre: 87 (66.4%); Post: 97 (89.8%)).

Figure 32. Count and Percent of Pediatric Status 1B Forms by Auto-Approved vs. Not and Era

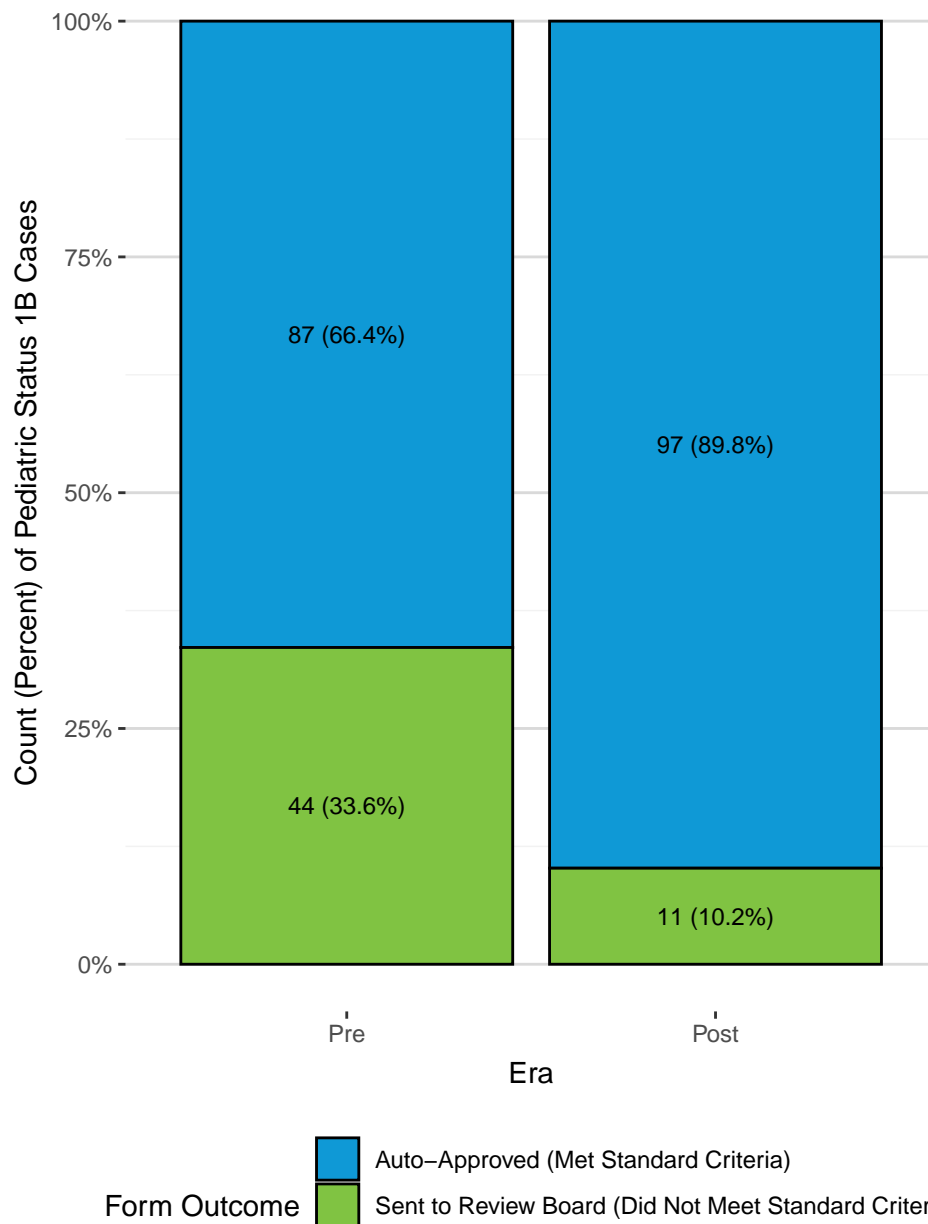
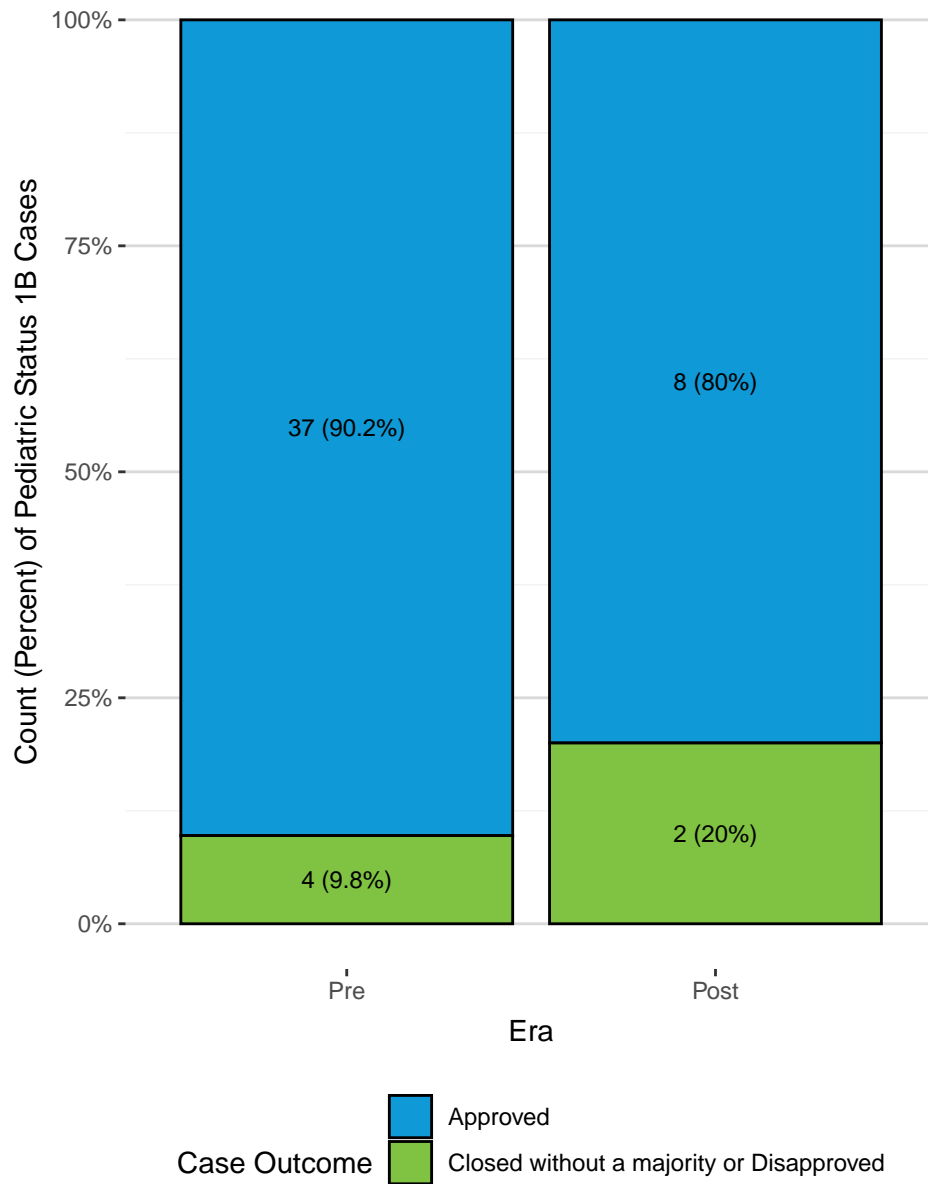


Table 42. Count and Percent of Pediatric Status 1B Forms by Auto-Approved vs. Not and Era

Form Outcome	Pre	Post
Auto-Approved (Met Standard Criteria)	87 (66.4%)	97 (89.8%)
Sent to Review Board (Did Not Meet Standard Criteria)	44 (33.6%)	11 (10.2%)
Sent to Review Board (Did Not Meet Standard Criteria)	131 (100.0%)	108 (100.0%)

Figure 33 and **Table 44** show the number and percent of pediatric Status 1B cases that did not meet standard criteria by case outcome for forms submitted in the pre- and post-policy eras. Duplicate forms are excluded from this analysis. 41 pediatric Status 1B cases did not meet standard criteria pre-policy, whereas only 10 pediatric Status 1B cases did not meet standard criteria post-policy. In both policy eras, the majority of pediatric Status 1B cases that did not meet standard criteria were approved (Pre: 37 (90.2%); Post: 8 (80.0%)).

Figure 33. Count and Percent of Pediatric Status 1B Cases Sent To Review Board by Case Outcome and Era



*Due to small sample sizes, cases that closed without a majority or that were disapproved are combined into one category.

Table 44. Count and Percent of Pediatric Status 1B Cases Sent to Review Board by Case Outcome and Era

Case Outcome	Pre	Post
Approved	37 (90.2%)	8 (80.0%)
Closed without a majority or Disapproved	4 (9.8%)	2 (20.0%)
Total	41 (100.0%)	10 (100.0%)

Due to small sample sizes, cases that closed without a majority or that were disapproved are combined into one category.

Due to the small number of pediatric Status 1B cases sent to the Pediatric Review Board that closed without a majority or that were disapproved (i.e., Pre: 4 (9.8%); Post: 2 (20.0%)), turnaround reasons for these cases are not summarized in this report. However, **Table 45** shows the criteria not met for Status 1B requests that did not meet standard criteria but were subsequently approved by era. The most common reason why these Status 1B requests did not meet standard criteria in the pre-policy era was that the candidate had chronic liver disease but the calculated MELD or PELD score was less than or equal to 25. The most common reason why these Status 1B requests did not meet standard criteria in the post-policy era was that the candidate had metabolic disease but did not have an approved MELD or PELD exception meeting standard criteria for metabolic disease for at least 30 days.

Table 45. Number and Percent of Criteria Not Met for Pediatric Status 1B Requests that Do Not Meet Standard Criteria by Case Outcome and Era

Criteria Not Met for Status 1B Requests that Do Not Meet Standard Criteria	Approved	
	Pre	Post
Chronic liver disease BUT calculated MELD/PELD score is less than or equal to 25	26 (70.3%)	0 (0.0%)
Candidate does not have chronic liver disease, non-metastatic hepatoblastoma, or metabolic disease	7 (18.9%)	2 (25.0%)
Chronic Liver Disease with MELD/PELD greater than 25 BUT Candidate is not on a mechanical ventilator, dialysis, CVVH, or CVVHD, does not have a GI Bleed requiring at least 30 mL/kg of red blood cell replacement, and does not have a Glasgow coma score less than 10 (for Liver Only candidate)	2 (5.4%)	0 (0.0%)
Chronic Liver Disease with MELD/PELD greater than 25 and GI bleeding requiring red blood cell replacement BUT amount indicated is less than 30 mL/kg for initial forms or less than 1 mL/kg for extensions (for Liver Only candidate)	1 (2.7%)	0 (0.0%)
Metabolic disease BUT candidate does not have an approved MELD/PELD Exception meeting standard criteria for metabolic disease for at least 30 days	1 (2.7%)	5 (62.5%)
Non-metastatic Hepatoblastoma BUT no biopsy	0 (0.0%)	1 (12.5%)
Total	37 (100.0%)	8 (100.0%)

Due to small sample sizes, cases that closed without a majority or that were disapproved are not shown.

Conclusion

During the 6-months after implementation of the Improving Liver Allocation: MELD, PELD, Status 1A, Status 1B policy, deceased donor transplant was the most common reason for removal from the waiting list for MELD, PELD, and Status 1A/1B candidates. Under MELD 3.0, transplant rates increased significantly post-policy both overall and for females, whereas the transplant rate for males remained roughly the same across policy eras; transplant rates became more equal across height groups (and, to a lesser extent, body surface area groups) post-policy compared to pre-policy; waiting list removal rates due to death or too sick increased slightly (but not significantly) both overall and by sex, with removal rates being higher for females compared to males; and the median allocation MELD score at transplant remained the same across policy eras.

Under PELD-Cr, there were no significant changes in transplant rates and waiting list removal rates. The median PELD score at transplant decreased across policy eras, as did the interquartile range and extent of skewness.

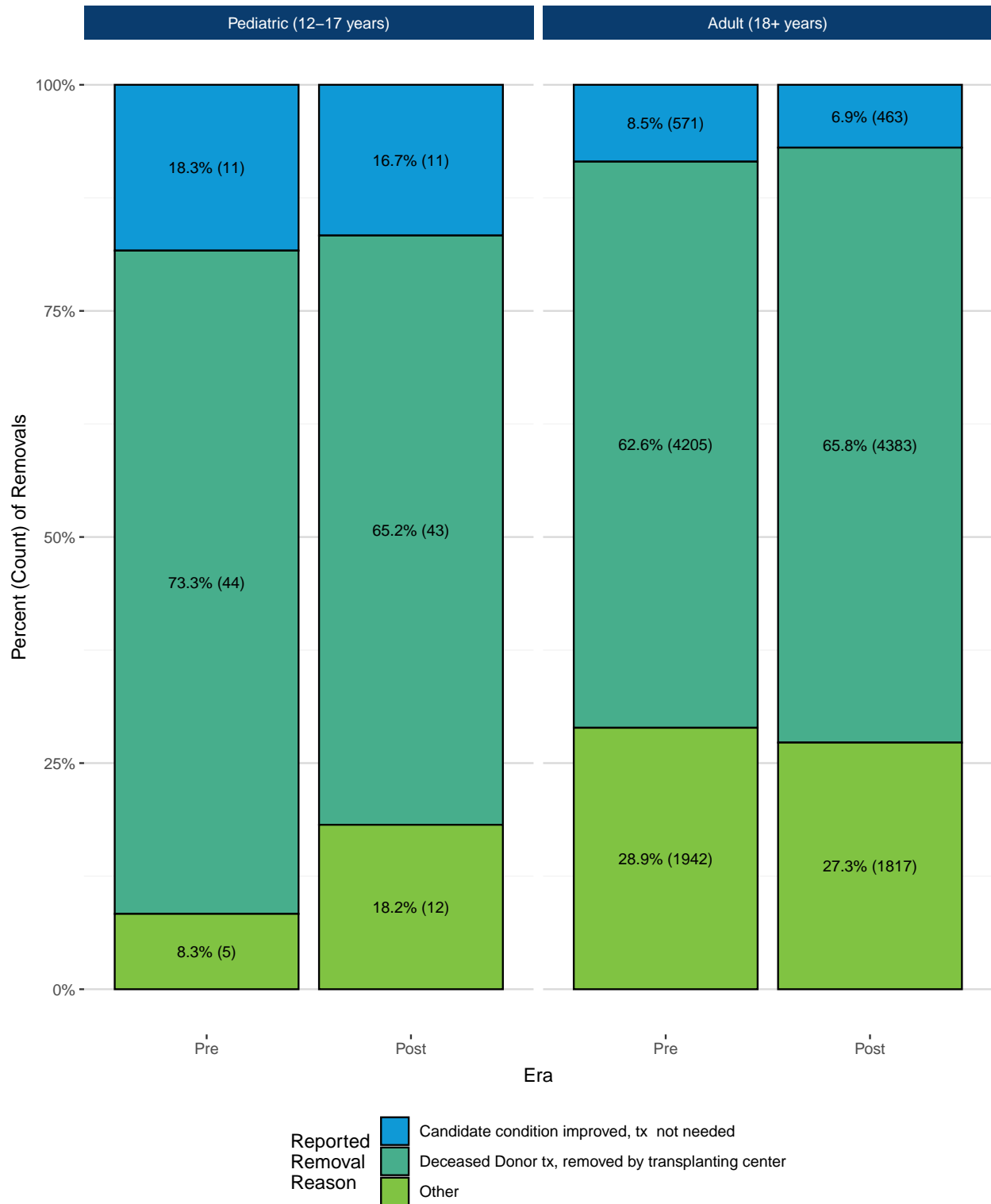
Under the Status 1A and 1B modifications, the number of pediatric Status 1A and 1B liver transplants decreased pre- to post-policy; pediatric Status 1B recipients with chronic liver disease and hepatoblastoma made up the largest proportion of transplants, while recipients with other diagnosis made up the smallest proportion of transplants; the number of pediatric Status 1B cases that did not meet standard criteria decreased, and the number of those cases that were not approved decreased as well.

Appendix

Additional MELD 3.0 Results

This section stratifies the analyses shown in the main “MELD 3.0 Results” section by age group (12-17 years vs. 18+ years), height, and exception type (no exception, HCC exception, non-HCC exception), as appropriate. Note that these results should be interpreted cautiously, as some subgroups have small sample sizes.

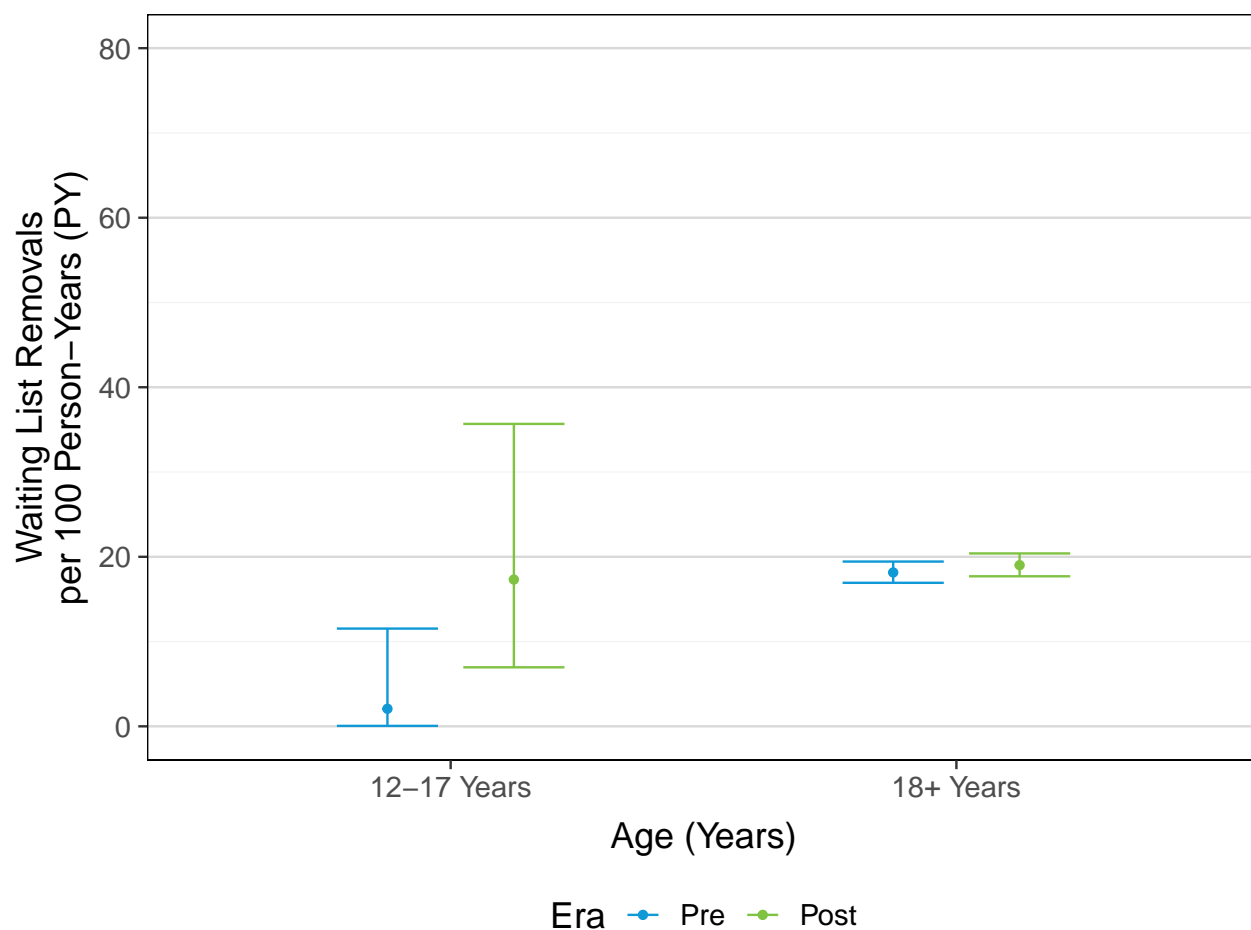
Appendix Figure 1. Count and Percent of Liver Candidates 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Age at Removal, and Era



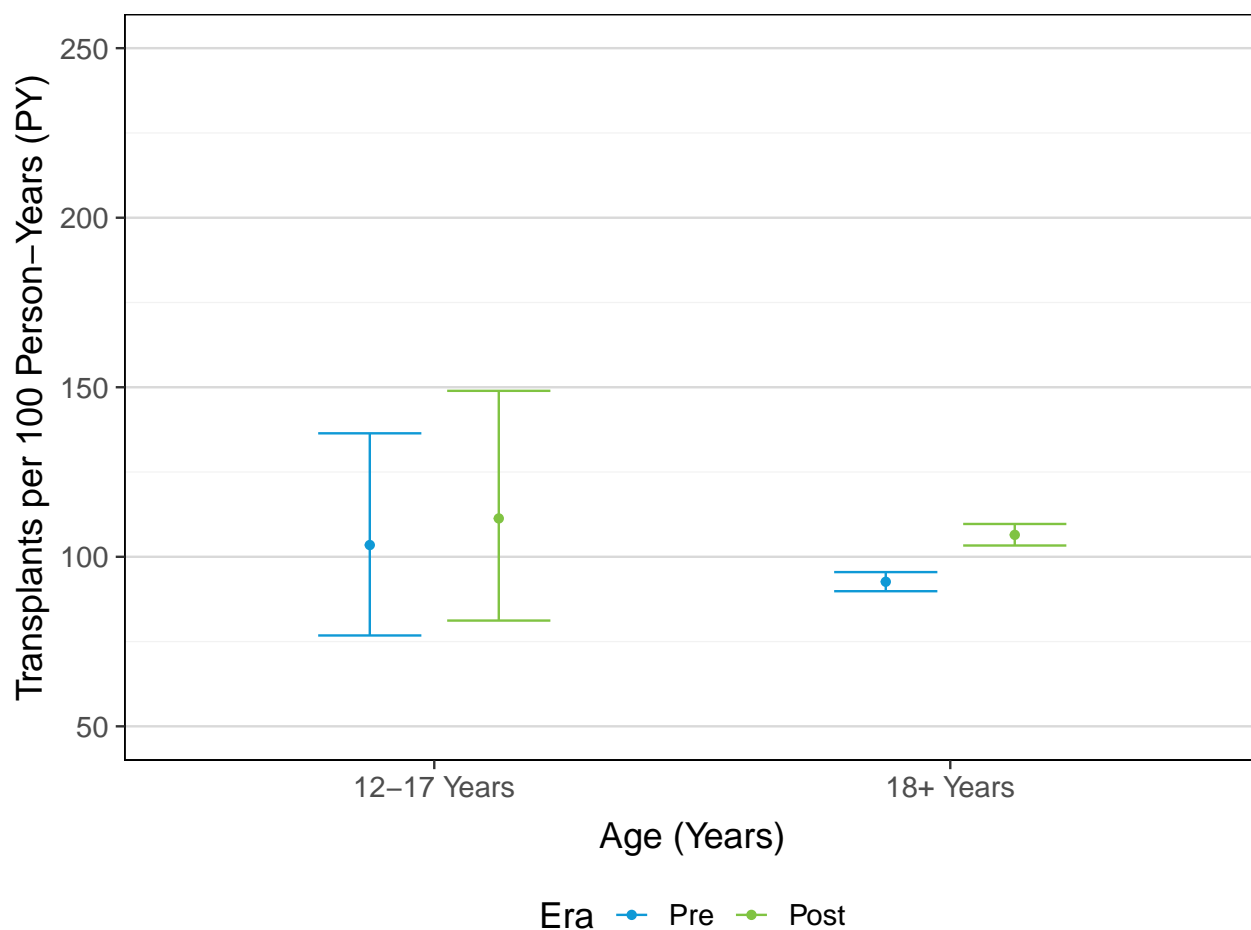
*Removal reasons containing <7% of forms in each policy era were combined with the Other category for plotting purposes, but appear in the corresponding table.

Appendix Table 2. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Age at Removal, and Era

Reported Removal Reason	Pediatric (12-17 years)		Adult (18+ years)	
	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	44 (73.3%)	43 (65.2%)	4205 (62.6%)	4383 (65.8%)
Candidate condition improved, tx not needed	11 (18.3%)	11 (16.7%)	571 (8.5%)	463 (6.9%)
Other	2 (3.3%)	1 (1.5%)	461 (6.9%)	413 (6.2%)
Candidate condition deteriorated , too sick for tx	1 (1.7%)	4 (6.1%)	442 (6.6%)	391 (5.9%)
Died	0 (0.0%)	3 (4.5%)	405 (6.0%)	406 (6.1%)
Living Donor tx, removed by transplanting center	1 (1.7%)	2 (3.0%)	297 (4.4%)	275 (4.1%)
Transplant at another center (multi-listed)	1 (1.7%)	1 (1.5%)	137 (2.0%)	145 (2.2%)
Refused transplant	0 (0.0%)	0 (0.0%)	71 (1.1%)	73 (1.1%)
Unable to contact candidate	0 (0.0%)	0 (0.0%)	71 (1.1%)	68 (1.0%)
Transferred to another center	0 (0.0%)	0 (0.0%)	47 (0.7%)	35 (0.5%)
Patient died during TX procedure	0 (0.0%)	0 (0.0%)	6 (0.1%)	8 (0.1%)
Candidate Removed in Error	0 (0.0%)	1 (1.5%)	3 (0.0%)	0 (0.0%)
Transplanted in another country	0 (0.0%)	0 (0.0%)	2 (0.0%)	3 (0.0%)
Total	60 (100.0%)	66 (100.0%)	6718 (100.0%)	6663 (100.0%)

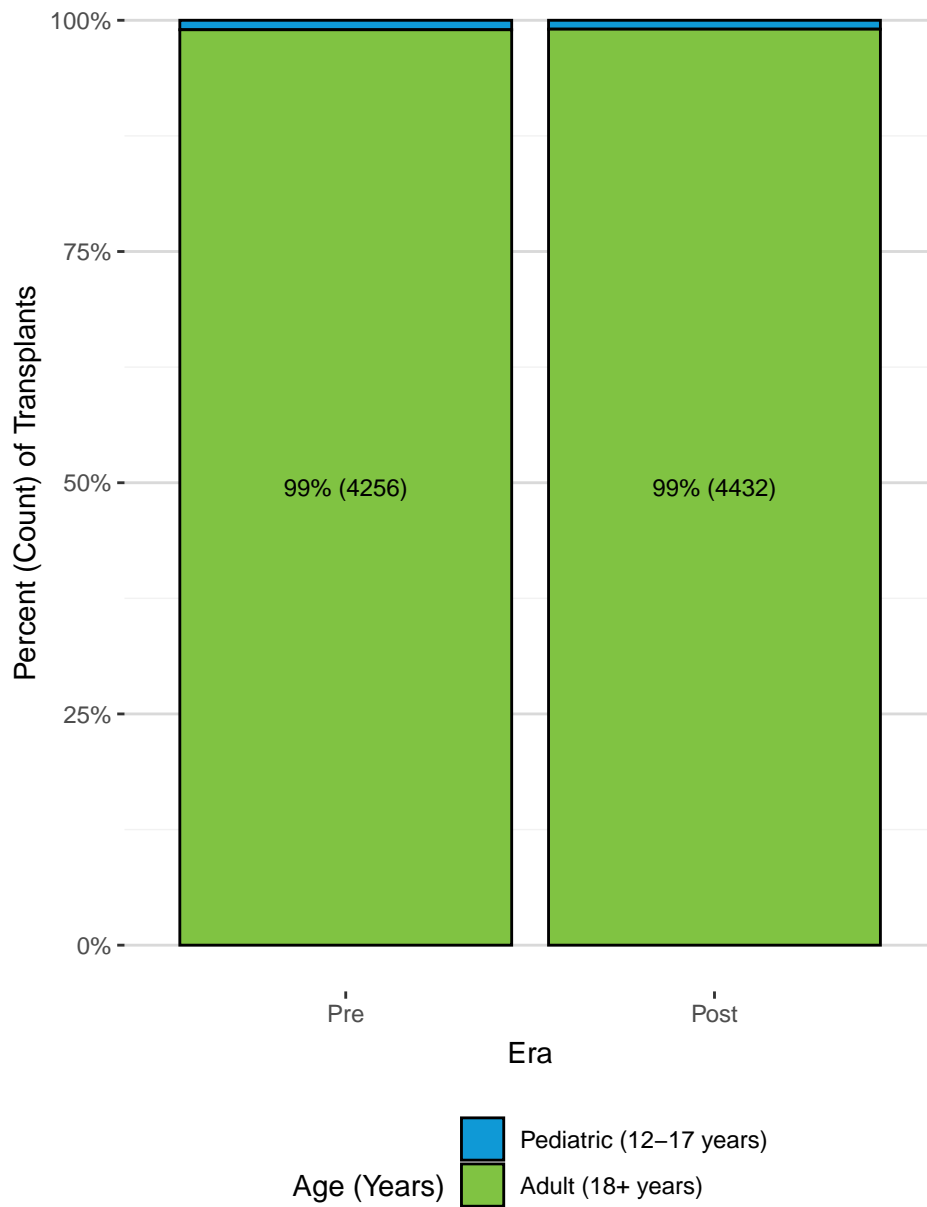
Appendix Figure 2. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Age and Era**Appendix Table 3. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Age and Era**

Era	Age (Years)	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	12-17 Years	163	1	48.3	2.07	(0.05, 11.53)
	18+ Years	15273	820	4517.9	18.15	(16.93, 19.44)
Post	12-17 Years	159	7	40.4	17.31	(6.96, 35.68)
	18+ Years	14996	778	4092.3	19.01	(17.70, 20.40)

Appendix Figure 3. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Age and Era**Appendix Table 4. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Age and Era**

Era	Age (Years)	Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	12-17 Years	163	50	48.3	103.47	(76.80, 136.41)
	18+ Years	15273	4185	4517.9	92.63	(89.85, 95.48)
Post	12-17 Years	159	45	40.4	111.31	(81.19, 148.94)
	18+ Years	14996	4357	4092.3	106.47	(103.33, 109.68)

Appendix Figure 4. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Age at Transplant and Era

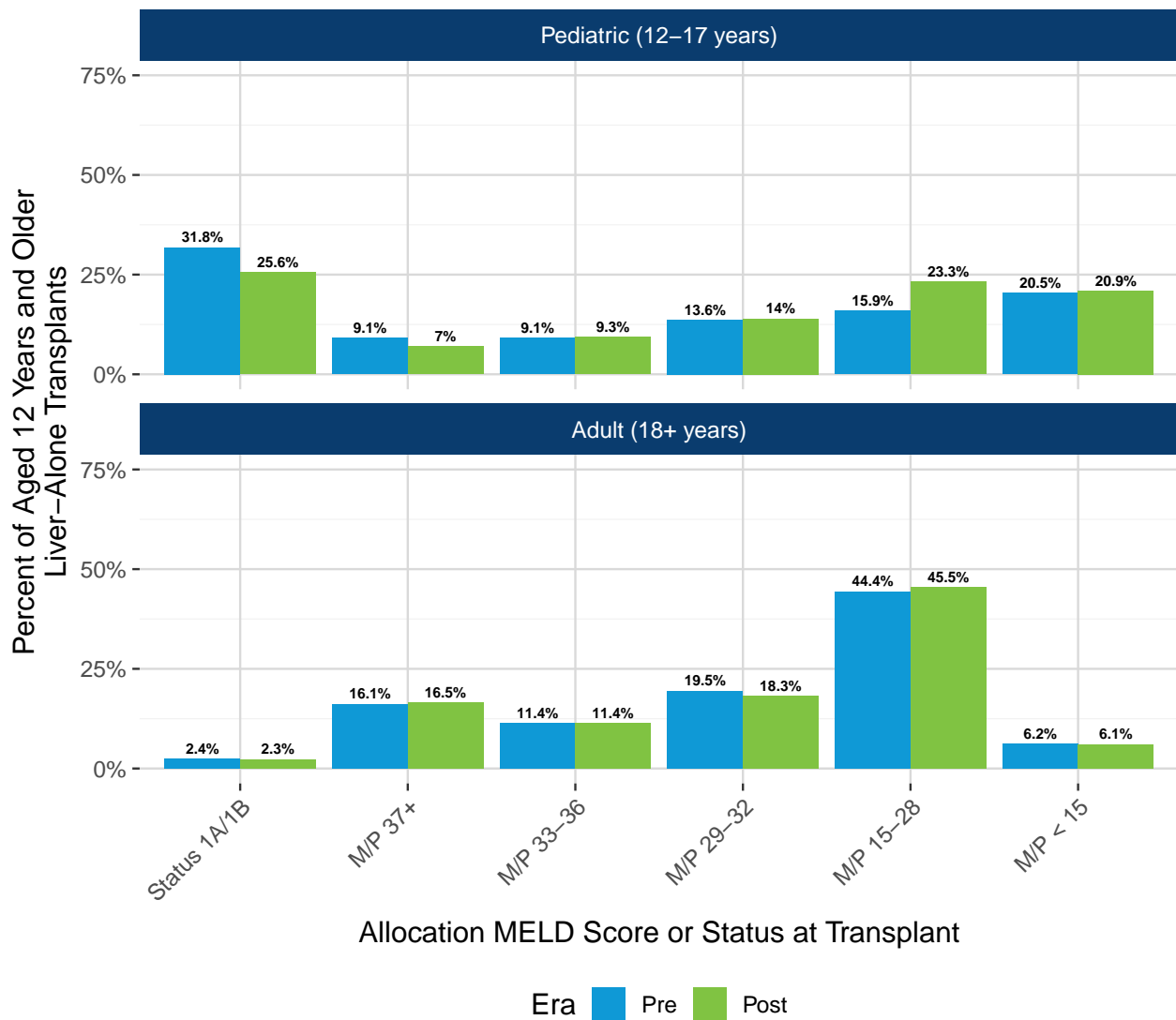


*Label is omitted for age groups that contain <2% of transplants.

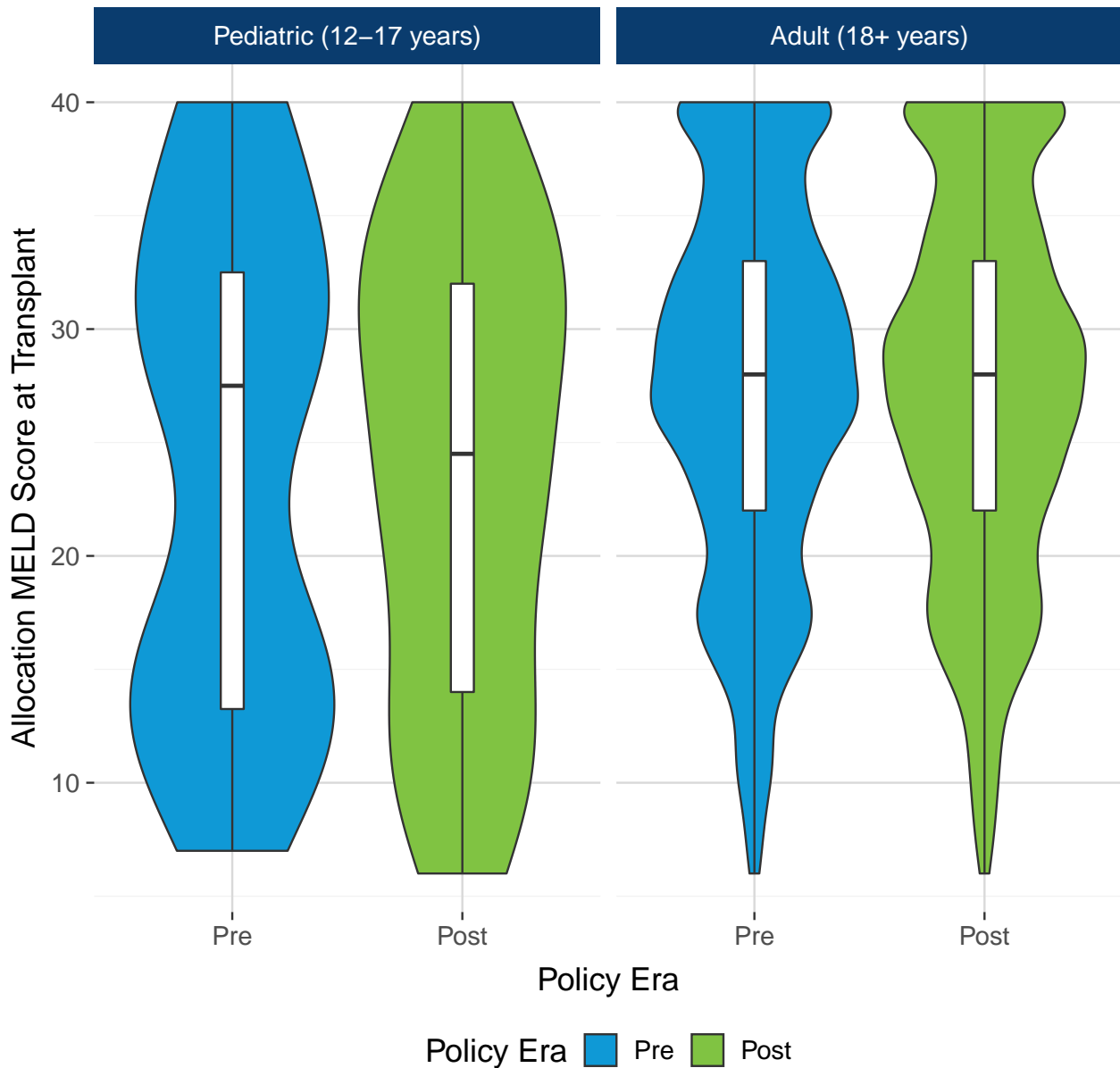
Appendix Table 5. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Age at Transplant and Era

Age (Years)	Pre	Post
Pediatric (12-17 years)	44 (1.0%)	43 (1.0%)
Adult (18+ years)	4256 (99.0%)	4432 (99.0%)
Total	4300 (100.0%)	4475 (100.0%)

Appendix Figure 5. Distribution of Allocation MELD Score or Status at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Age at Transplant and Era



Appendix Figure 6. Distribution of Allocation MELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Age at Transplant and Era



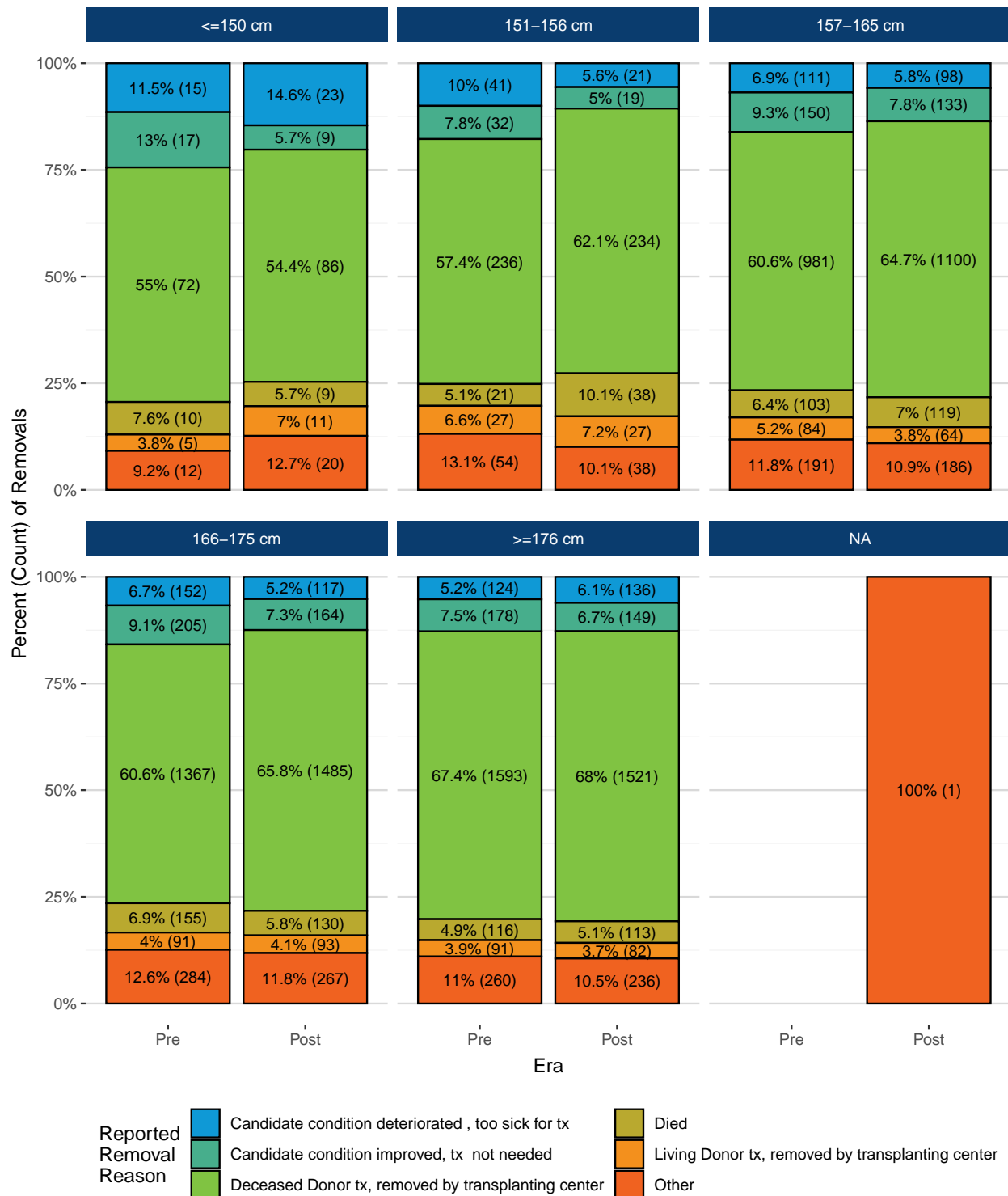
Status 1A/1B recipients were excluded because they do not have allocation MELD scores at transplant. Pre-policy, 14 (31.82%) and 102 (2.4%) Status 1A/1B recipients were in the Pediatric (12-17 years) and Adult (18+ years) age groups, respectively. Post-policy, 11 (25.58%) and 103 (2.32%) Status 1A/1B recipients were in the Pediatric (12-17 years) and Adult (18+ years) age groups, respectively.

Appendix Table 6. Summary of Allocation PELD Score at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Age at Transplant and Era

Age (Years)	Policy Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
Pediatric (12-17 years)	Pre	30	7	13.2	27.5	32.5	40	19.2
	Post	32	6	14.0	24.5	32.0	40	18.0
Adult (18+ years)	Pre	4154	6	22.0	28.0	33.0	40	11.0
	Post	4329	6	22.0	28.0	33.0	40	11.0

Status 1A/1B recipients were excluded because they do not have allocation MELD scores at transplant. Pre-policy, 14 (31.82%) and 102 (2.4%) Status 1A/1B recipients were in the Pediatric (12-17 years) and Adult (18+ years) age groups, respectively. Post-policy, 11 (25.58%) and 103 (2.32%) Status 1A/1B recipients were in the Pediatric (12-17 years) and Adult (18+ years) age groups, respectively.

Appendix Figure 7. Count and Percent of Liver Candidates 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Height at Removal, and Era



*Removal reasons containing <3% of forms in both policy eras were combined with the Other category for plotting purposes, but appear in the corresponding table. Height was grouped into categories as in Bernards et al. Am J Transplant. 2022. 3 registrations missing height at time of removal were excluded.



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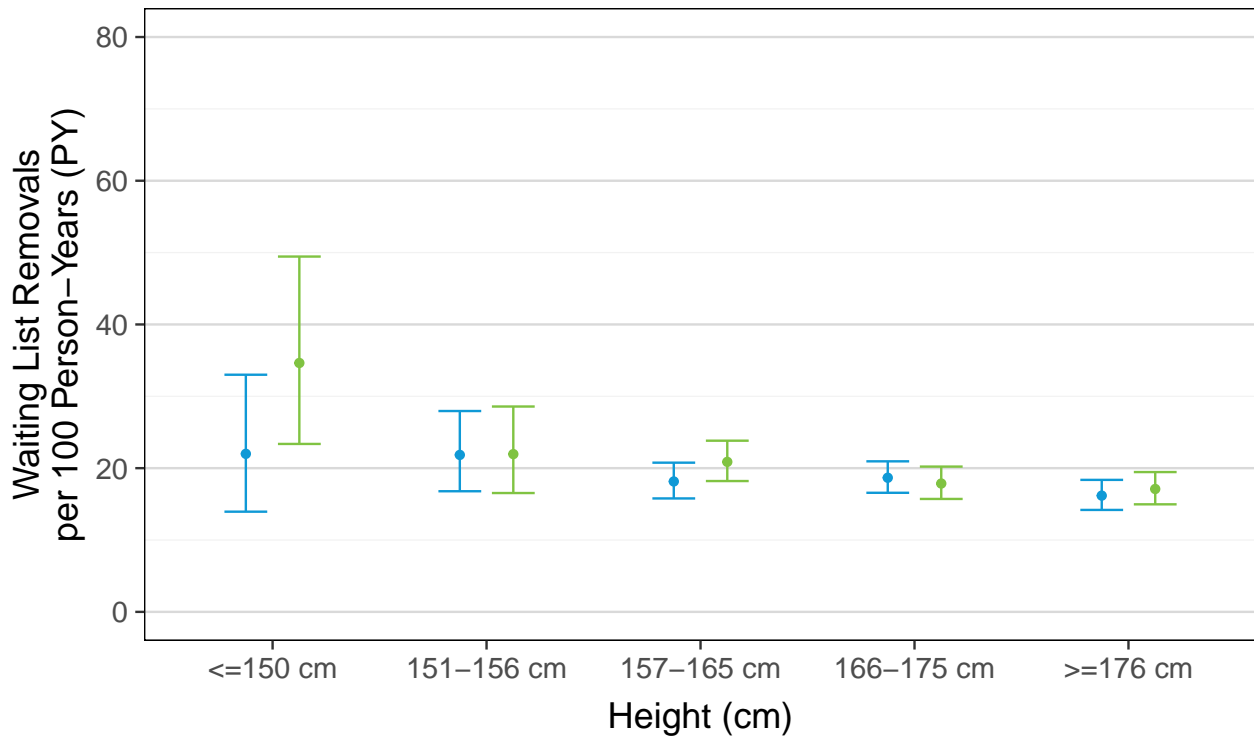
Appendix Table 7. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Height at Removal, and Era

Reported Removal Reason	<=150 cm		151-156 cm		157-165 cm		166-175 cm		≥176 cm	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Candidate condition deteriorated , too sick for tx	15 (11.5%)	23 (14.6%)	41 (10.0%)	21 (5.6%)	111 (6.9%)	98 (5.8%)	152 (6.7%)	117 (5.2%)	124 (5.2%)	136 (6.1%)
Candidate condition improved, tx not needed	17 (13.0%)	9 (5.7%)	32 (7.8%)	19 (5.0%)	150 (9.3%)	133 (7.8%)	205 (9.1%)	164 (7.3%)	178 (7.5%)	149 (6.7%)
Candidate Removed in Error	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.1%)	1 (0.0%)	1 (0.0%)	0 (0.0%)
Deceased Donor tx, removed by transplanting center	72 (55.0%)	86 (54.4%)	236 (57.4%)	234 (62.1%)	981 (60.6%)	1100 (64.7%)	1367 (60.6%)	1485 (65.8%)	1593 (67.4%)	1521 (68.0%)
Died	10 (7.6%)	9 (5.7%)	21 (5.1%)	38 (10.1%)	103 (6.4%)	119 (7.0%)	155 (6.9%)	130 (5.8%)	116 (4.9%)	113 (5.1%)
Living Donor tx, removed by transplanting center	5 (3.8%)	11 (7.0%)	27 (6.6%)	27 (7.2%)	84 (5.2%)	64 (3.8%)	91 (4.0%)	93 (4.1%)	91 (3.9%)	82 (3.7%)
Other	7 (5.3%)	8 (5.1%)	40 (9.7%)	23 (6.1%)	115 (7.1%)	101 (5.9%)	164 (7.3%)	156 (6.9%)	137 (5.8%)	125 (5.6%)
Patient died during TX procedure	0 (0.0%)	0 (0.0%)	2 (0.5%)	0 (0.0%)	1 (0.1%)	2 (0.1%)	2 (0.1%)	4 (0.2%)	1 (0.0%)	2 (0.1%)
Refused transplant	1 (0.8%)	1 (0.6%)	1 (0.2%)	5 (1.3%)	16 (1.0%)	18 (1.1%)	35 (1.6%)	26 (1.2%)	18 (0.8%)	23 (1.0%)
Transferred to another center	0 (0.0%)	2 (1.3%)	1 (0.2%)	2 (0.5%)	16 (1.0%)	12 (0.7%)	15 (0.7%)	11 (0.5%)	15 (0.6%)	8 (0.4%)
Transplant at another center (multi-listed)	2 (1.5%)	7 (4.4%)	7 (1.7%)	5 (1.3%)	27 (1.7%)	34 (2.0%)	47 (2.1%)	42 (1.9%)	55 (2.3%)	58 (2.6%)
Transplanted in another country	0 (0.0%)	1 (0.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.1%)	1 (0.0%)	1 (0.0%)	1 (0.0%)	0 (0.0%)
Unable to contact candidate	2 (1.5%)	1 (0.6%)	3 (0.7%)	3 (0.8%)	16 (1.0%)	18 (1.1%)	18 (0.8%)	26 (1.2%)	32 (1.4%)	20 (0.9%)
Total	131 (100.0%)	158 (100.0%)	411 (100.0%)	377 (100.0%)	1620 (100.0%)	1700 (100.0%)	2254 (100.0%)	2256 (100.0%)	2362 (100.0%)	2237 (100.0%)

Height was grouped into categories as in Bernards et al. Am J Transplant. 2022.

3 registrations missing height at time of removal were excluded.

Appendix Figure 8. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Height and Era



Era ● Pre ● Post

Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 7 registrations in the pre-policy era and 10 registrations in the post-policy era were excluded.

Appendix Table 8. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Height and Era

Era	Height (cm)	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	≤150 cm	331	23	104.6	22.00	(13.94, 33.00)
	151-156 cm	965	63	288.4	21.85	(16.79, 27.95)
	157-165 cm	3856	212	1168.1	18.15	(15.79, 20.76)
	166-175 cm	5194	288	1542.8	18.67	(16.57, 20.95)
	≥176 cm	5131	238	1471.2	16.18	(14.19, 18.37)
Post	≤150 cm	338	30	86.6	34.64	(23.37, 49.45)
	151-156 cm	923	55	250.5	21.96	(16.54, 28.58)
	157-165 cm	3964	220	1053.9	20.87	(18.21, 23.82)
	166-175 cm	5099	250	1399.6	17.86	(15.72, 20.22)
	≥176 cm	4885	231	1350.6	17.10	(14.97, 19.46)

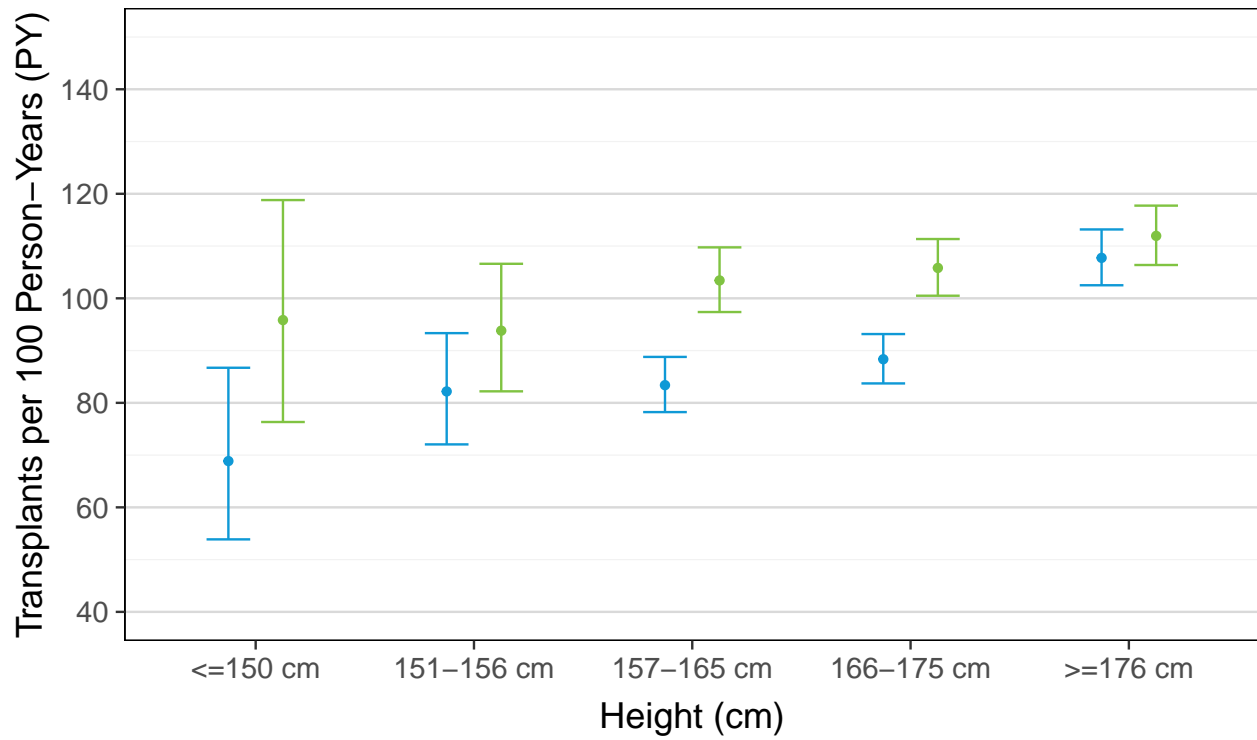
Height was grouped into categories as in Bernards et al. (Bernards S, et al.

Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period.

Registrations missing height at a particular time were excluded at that time.

7 registrations in the pre-policy era and 10 registrations in the post-policy era were excluded.

Appendix Figure 9. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Height and Era



Era — Pre — Post

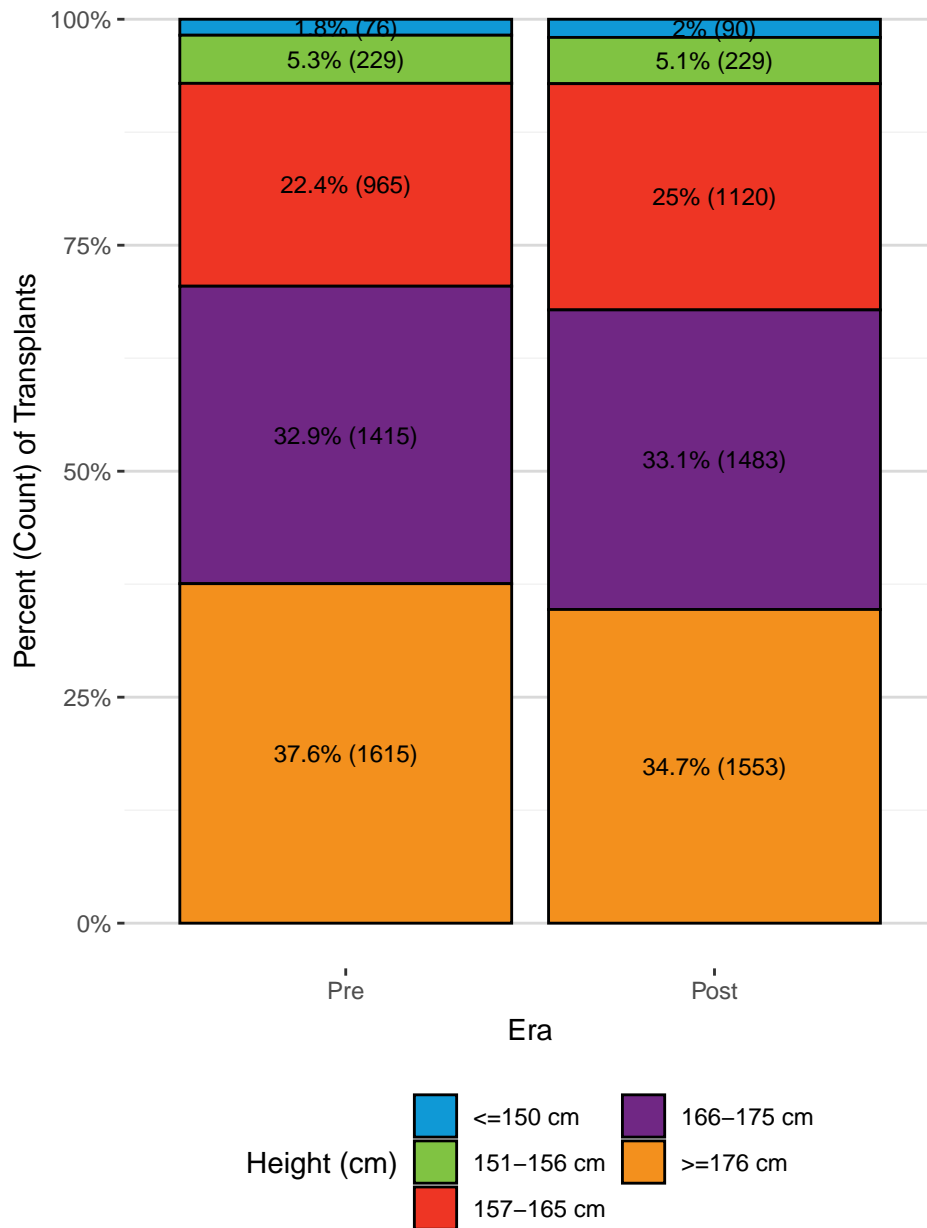
Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 7 registrations in the pre-policy era and 10 registrations in the post-policy era were excluded.

Appendix Table 9. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Height and Era

Era	Height (cm)	Ever	Transplant	Active	Transplants	
		Waiting	Events	Person-Years (PY)	per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	<=150 cm	331	72	104.6	68.86	(53.88, 86.71)
	151-156 cm	965	237	288.4	82.18	(72.05, 93.34)
	157-165 cm	3856	974	1168.1	83.38	(78.23, 88.79)
	166-175 cm	5194	1363	1542.8	88.34	(83.72, 93.16)
	>=176 cm	5131	1585	1471.2	107.74	(102.50, 113.18)
Post	<=150 cm	338	83	86.6	95.83	(76.33, 118.80)
	151-156 cm	923	235	250.5	93.81	(82.20, 106.60)
	157-165 cm	3964	1090	1053.9	103.42	(97.37, 109.75)
	166-175 cm	5099	1481	1399.6	105.82	(100.49, 111.35)
	>=176 cm	4885	1512	1350.6	111.95	(106.37, 117.74)

Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 7 registrations in the pre-policy era and 10 registrations in the post-policy era were excluded.

Appendix Figure 10. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Height at Transplant and Era



Height was grouped into categories as in Bernards et al. Am J Transplant. 2022.
 No registrations were missing height at time of transplant.

Appendix Table 10. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Height at Transplant and Era

Height (cm)	Pre	Post
<=150 cm	76 (1.8%)	90 (2.0%)
151-156 cm	229 (5.3%)	229 (5.1%)
157-165 cm	965 (22.4%)	1120 (25.0%)
166-175 cm	1415 (32.9%)	1483 (33.1%)
>=176 cm	1615 (37.6%)	1553 (34.7%)
Total	4300 (100.0%)	4475 (100.0%)

Height was grouped into categories as in Bernards et al. Am J Transplant. 2022.

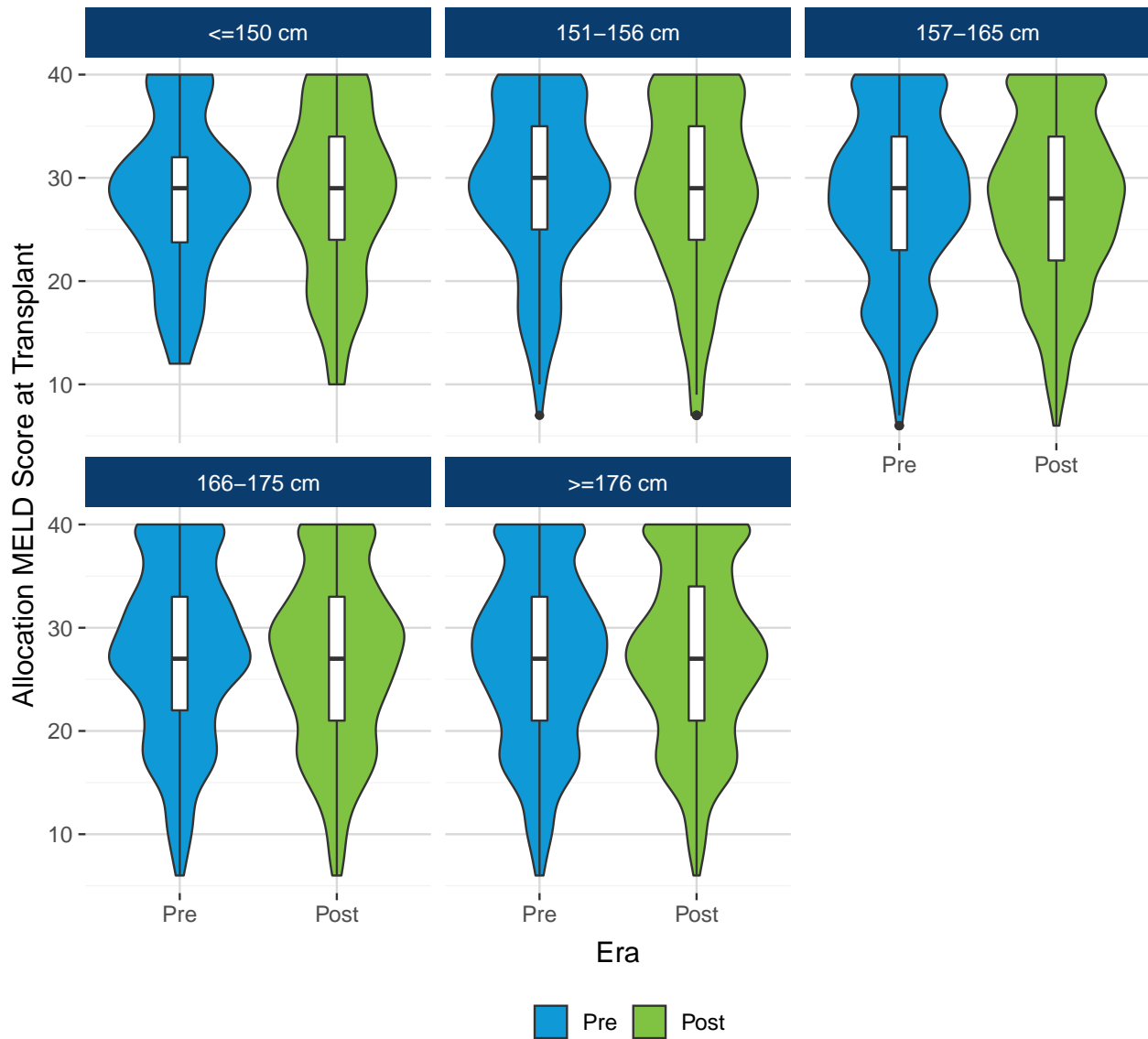
No registrations with missing height at time of transplant.

Appendix Figure 11. Distribution of Allocation MELD Score or Status at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Height at Transplant and Era



Height was grouped into categories as in Bernards et al. Am J Transplant. 2022.
No registrations missing height at time of transplant.

Appendix Figure 12. Distribution of Allocation MELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Height at Transplant and Era



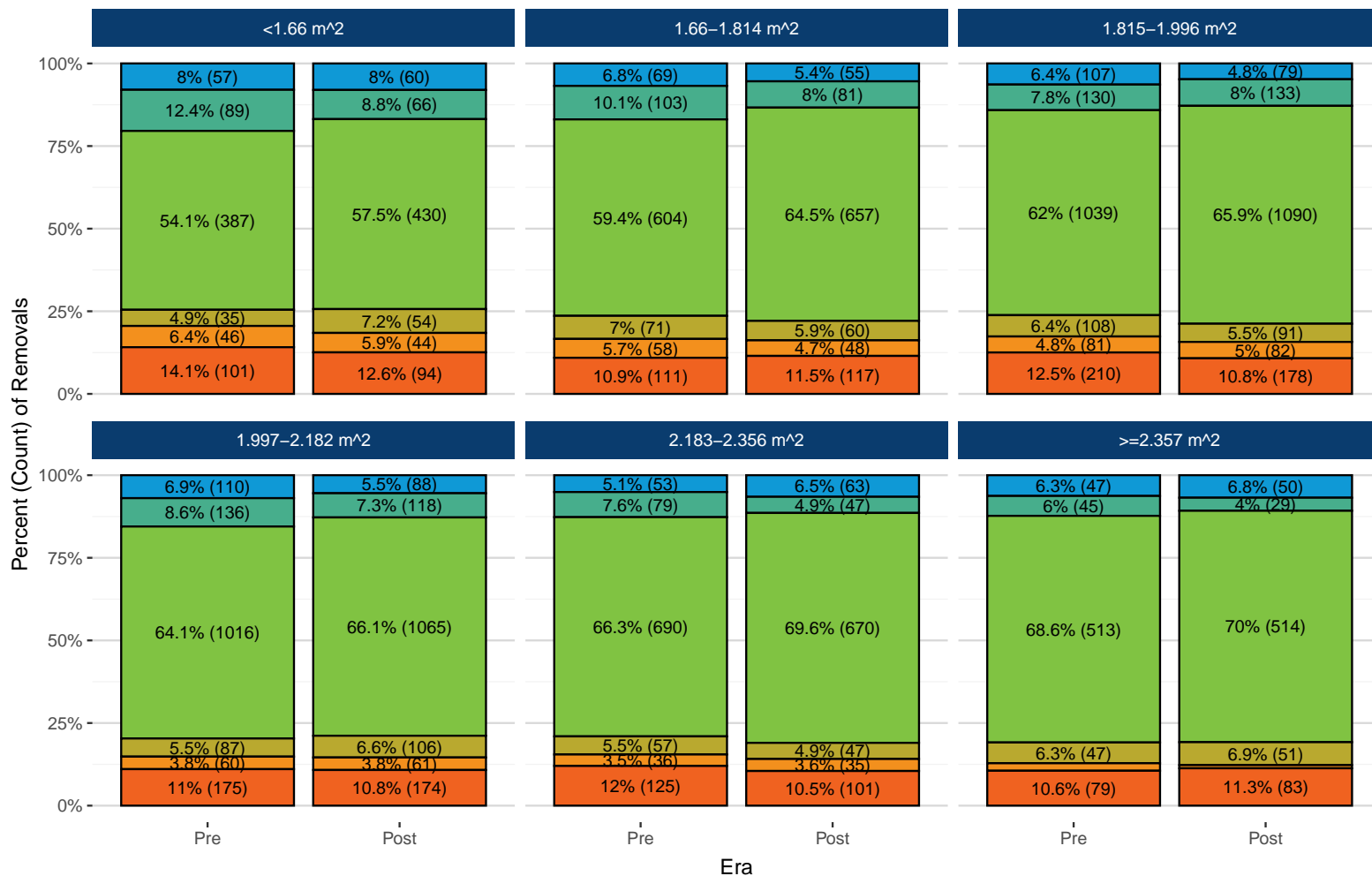
Recipients who received transplant while in Status 1A/1B were excluded because they do not have allocation MELD scores at transplant.
 Pre-policy, 8 (10.53%), 16 (6.99%), 36 (3.73%), 29 (2.05%), 27 (1.67%), and 0 (0%) Status 1A/1B recipients were in the <150 cm, 151-156 cm, 157-165 cm, 166-175 cm, >176 cm, and missing height groups, respectively.
 Post-policy, 5 (5.56%), 6 (2.62%), 41 (3.66%), 31 (2.09%), 31 (2%), and 0 (0%) Status 1A/1B recipients were in the <150 cm, 151-156 cm, 157-165 cm, 166-175 cm, >176 cm, and missing height groups, respectively.

Appendix Table 11. Summary of Allocation PELD Score at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Height at Transplant and Era

Height (cm)	Policy Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
<=150 cm	Pre	68	12	23.8	29	32	40	8.2
	Post	85	10	24.0	29	34	40	10.0
151-156 cm	Pre	213	7	25.0	30	35	40	10.0
	Post	223	7	24.0	29	35	40	11.0
157-165 cm	Pre	929	6	23.0	29	34	40	11.0
	Post	1079	6	22.0	28	34	40	12.0
166-175 cm	Pre	1386	6	22.0	27	33	40	11.0
	Post	1452	6	21.0	27	33	40	12.0
>=176 cm	Pre	1588	6	21.0	27	33	40	12.0
	Post	1522	6	21.0	27	34	40	13.0

Recipients who received transplant while in Status 1A/1B were excluded because they do not have allocation MELD scores at transplant. Pre-policy, 8 (10.53%) , 16 (6.99%) , 36 (3.73%) , 29 (2.05%) , 27 (1.67%) , and 0 (0%) Status 1A/1B recipients were in the <150 cm, 151-156 cm, 157-165 cm, 166-175 cm, >176 cm, and missing height groups, respectively. Post-policy, 5 (5.56%) , 6 (2.62%) , 41 (3.66%) , 31 (2.09%) , 31 (2%) , and 0 (0%) Status 1A/1B recipients were in the <150 cm, 151-156 cm, 157-165 cm, 166-175 cm, >176 cm, and missing height groups, respectively.

Appendix Figure 13. Count and Percent of Liver Candidates 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Body Surface Area (BSA) at Removal, and Era



Reported Removal Reason

- Candidate condition deteriorated, too sick for tx
- Candidate condition improved, tx not needed
- Deceased Donor tx, removed by transplanting center
- Died
- Living Donor tx, removed by transplanting center
- Other

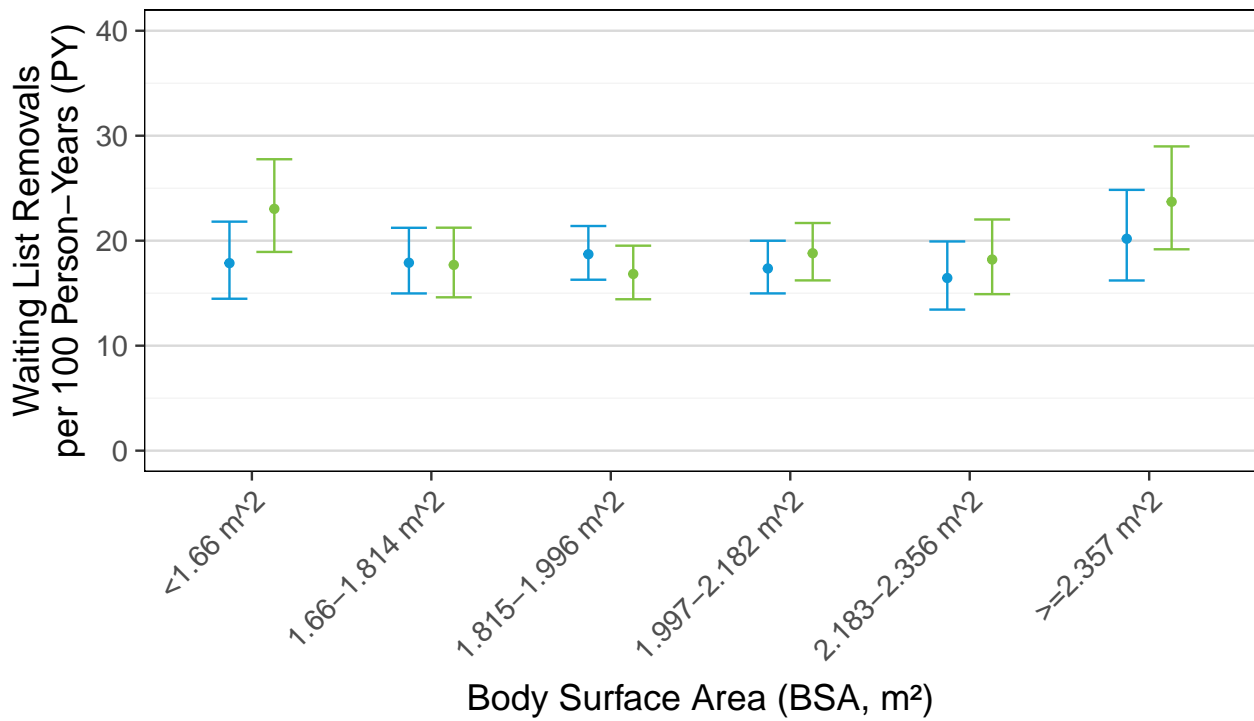
*Removal reasons containing <3% of forms in both policy eras were combined with the Other category for plotting purposes, but appear in the corresponding table. BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). 4 registrations with missing BSA at removal were excluded.

Appendix Table 12. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Body Surface Area (BSA) at Removal, and Era

Reported Removal Reason	<1.66 m ²		1.66-1.814 m ²		1.815-1.996 m ²		1.997-2.182 m ²		2.183-2.356 m ²		≥2.357 m ²	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Candidate condition deteriorated , too sick for tx	57 (8.0%)	60 (8.0%)	69 (6.8%)	55 (5.4%)	107 (6.4%)	79 (4.8%)	110 (6.9%)	88 (5.5%)	53 (5.1%)	63 (6.5%)	47 (6.3%)	50 (6.8%)
Candidate condition improved, tx not needed	89 (12.4%)	66 (8.8%)	103 (10.1%)	81 (8.0%)	130 (7.8%)	133 (8.0%)	136 (8.6%)	118 (7.3%)	79 (7.6%)	47 (4.9%)	45 (6.0%)	29 (4.0%)
Candidate Removed in Error	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.1%)	1 (0.1%)	0 (0.0%)	1 (0.1%)	0 (0.0%)	1 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Deceased Donor tx, removed by transplanting center	387 (54.1%)	430 (57.5%)	604 (59.4%)	657 (64.5%)	1039 (62.0%)	1090 (65.9%)	1016 (64.1%)	1065 (66.1%)	690 (66.3%)	670 (69.6%)	513 (68.6%)	514 (70.0%)
Died	35 (4.9%)	54 (7.2%)	71 (7.0%)	60 (5.9%)	108 (6.4%)	91 (5.5%)	87 (5.5%)	106 (6.6%)	57 (5.5%)	47 (4.9%)	47 (6.3%)	51 (6.9%)
Living Donor tx, removed by transplanting center	46 (6.4%)	44 (5.9%)	58 (5.7%)	48 (4.7%)	81 (4.8%)	82 (5.0%)	60 (3.8%)	61 (3.8%)	36 (3.5%)	35 (3.6%)	17 (2.3%)	7 (1.0%)
Other	70 (9.8%)	47 (6.3%)	67 (6.6%)	69 (6.8%)	117 (7.0%)	100 (6.0%)	99 (6.2%)	101 (6.3%)	61 (5.9%)	56 (5.8%)	49 (6.6%)	40 (5.4%)
Patient died during TX procedure	1 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.1%)	4 (0.2%)	3 (0.2%)	2 (0.1%)	1 (0.1%)	2 (0.2%)	0 (0.0%)	0 (0.0%)
Refused transplant	5 (0.7%)	8 (1.1%)	7 (0.7%)	16 (1.6%)	21 (1.3%)	16 (1.0%)	18 (1.1%)	13 (0.8%)	11 (1.1%)	11 (1.1%)	9 (1.2%)	9 (1.2%)
Transferred to another center	7 (1.0%)	7 (0.9%)	7 (0.7%)	5 (0.5%)	9 (0.5%)	9 (0.5%)	10 (0.6%)	8 (0.5%)	10 (1.0%)	4 (0.4%)	4 (0.5%)	2 (0.3%)
Transplant at another center (multi-listed)	12 (1.7%)	18 (2.4%)	20 (2.0%)	17 (1.7%)	33 (2.0%)	29 (1.8%)	30 (1.9%)	37 (2.3%)	30 (2.9%)	24 (2.5%)	13 (1.7%)	21 (2.9%)
Transplanted in another country	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.1%)	2 (0.1%)	1 (0.1%)	0 (0.0%)	1 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Unable to contact candidate	6 (0.8%)	14 (1.9%)	10 (1.0%)	8 (0.8%)	26 (1.6%)	19 (1.1%)	14 (0.9%)	12 (0.7%)	11 (1.1%)	4 (0.4%)	4 (0.5%)	11 (1.5%)
Total	715 (100.0%)	748 (100.0%)	1016 (100.0%)	1018 (100.0%)	1675 (100.0%)	1653 (100.0%)	1584 (100.0%)	1612 (100.0%)	1040 (100.0%)	963 (100.0%)	748 (100.0%)	734 (100.0%)

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). 4 registrations with missing BSA at removal were excluded.

Appendix Figure 14. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Body Surface Area (BSA) and Era



Era — Pre — Post

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time. 19 registrations in the pre-policy era and 21 registrations in the post-policy era were excluded.

Appendix Table 13. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Body Surface Area (BSA) and Era

Era	BSA (m ²)	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	<1.66 m ²	1755	96	537.4	17.86	(14.47, 21.82)
	1.66-1.814 m ²	2421	132	737.4	17.90	(14.98, 21.23)
	1.815-1.996 m ²	3884	213	1138.4	18.71	(16.28, 21.40)
	1.997-2.182 m ²	3711	191	1100.6	17.35	(14.98, 20.00)
	2.183-2.356 m ²	2212	104	632.4	16.45	(13.44, 19.93)
	>=2.357 m ²	1606	89	440.9	20.19	(16.21, 24.84)
Post	<1.66 m ²	1775	110	477.6	23.03	(18.93, 27.76)
	1.66-1.814 m ²	2442	115	650.0	17.69	(14.61, 21.24)
	1.815-1.996 m ²	3791	174	1033.9	16.83	(14.42, 19.52)
	1.997-2.182 m ²	3642	189	1005.0	18.81	(16.22, 21.69)
	2.183-2.356 m ²	2132	106	582.2	18.21	(14.91, 22.02)
	>=2.357 m ²	1541	95	400.7	23.71	(19.18, 28.98)

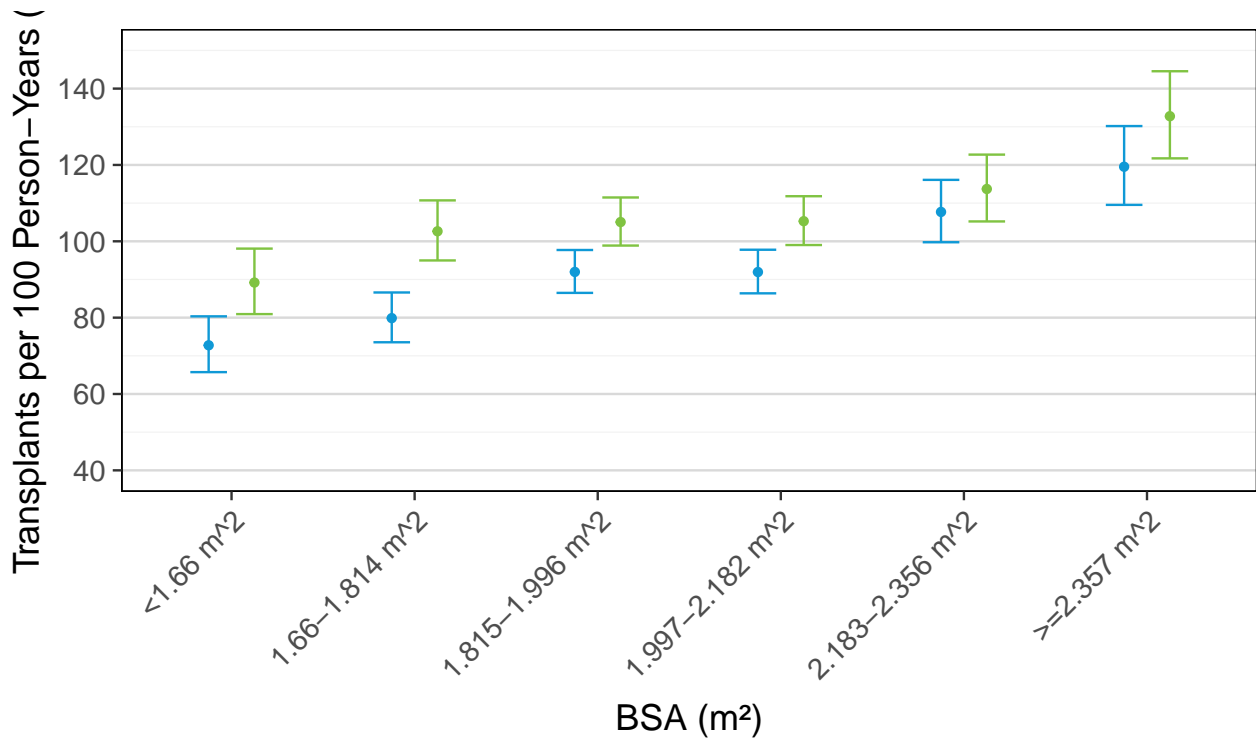
BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023).

BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period.

Registrations with missing BSA at a particular time were excluded at that time.

19 registrations in the pre-policy era and 21 registrations in the post-policy era were excluded.

Appendix Figure 15. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Body Surface Area (BSA) and Era



Era — Pre — Post

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time.
 19 registrations in the pre-policy era and 21 registrations in the post-policy era were excluded.

Appendix Table 14. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Body Surface Area (BSA) and Era

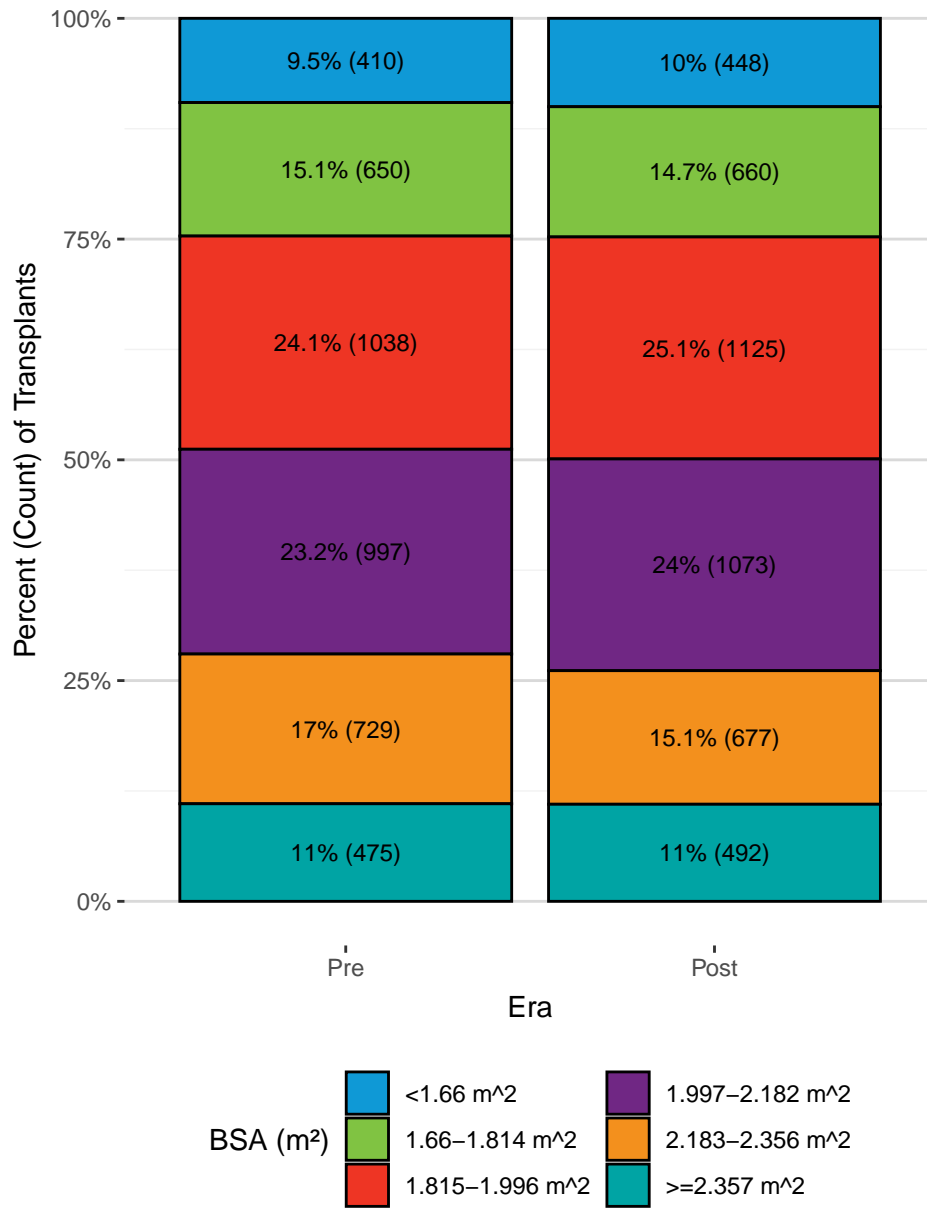
Era	BSA (m ²)	Ever	Transplant	Active	Transplants	
		Waiting	Events	Person-Years (PY)	per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	<1.66 m ²	1755	391	537.4	72.76	(65.73, 80.34)
	1.66-1.814 m ²	2421	589	737.4	79.87	(73.55, 86.59)
	1.815-1.996 m ²	3884	1047	1138.4	91.97	(86.49, 97.72)
	1.997-2.182 m ²	3711	1012	1100.6	91.95	(86.37, 97.79)
	2.183-2.356 m ²	2212	681	632.4	107.69	(99.75, 116.09)
	>=2.357 m ²	1606	527	440.9	119.53	(109.54, 130.18)
Post	<1.66 m ²	1775	426	477.6	89.20	(80.93, 98.08)
	1.66-1.814 m ²	2442	667	649.9	102.62	(94.98, 110.72)
	1.815-1.996 m ²	3791	1086	1033.9	105.04	(98.88, 111.48)
	1.997-2.182 m ²	3642	1058	1005.0	105.27	(99.02, 111.81)
	2.183-2.356 m ²	2132	662	582.2	113.70	(105.21, 122.70)
	>=2.357 m ²	1541	532	400.7	132.77	(121.73, 144.55)

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023).

BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time.

19 registrations in the pre-policy era and 21 registrations in the post-policy era were excluded.

Appendix Figure 16. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Body Surface Area (BSA) at Transplant and Era



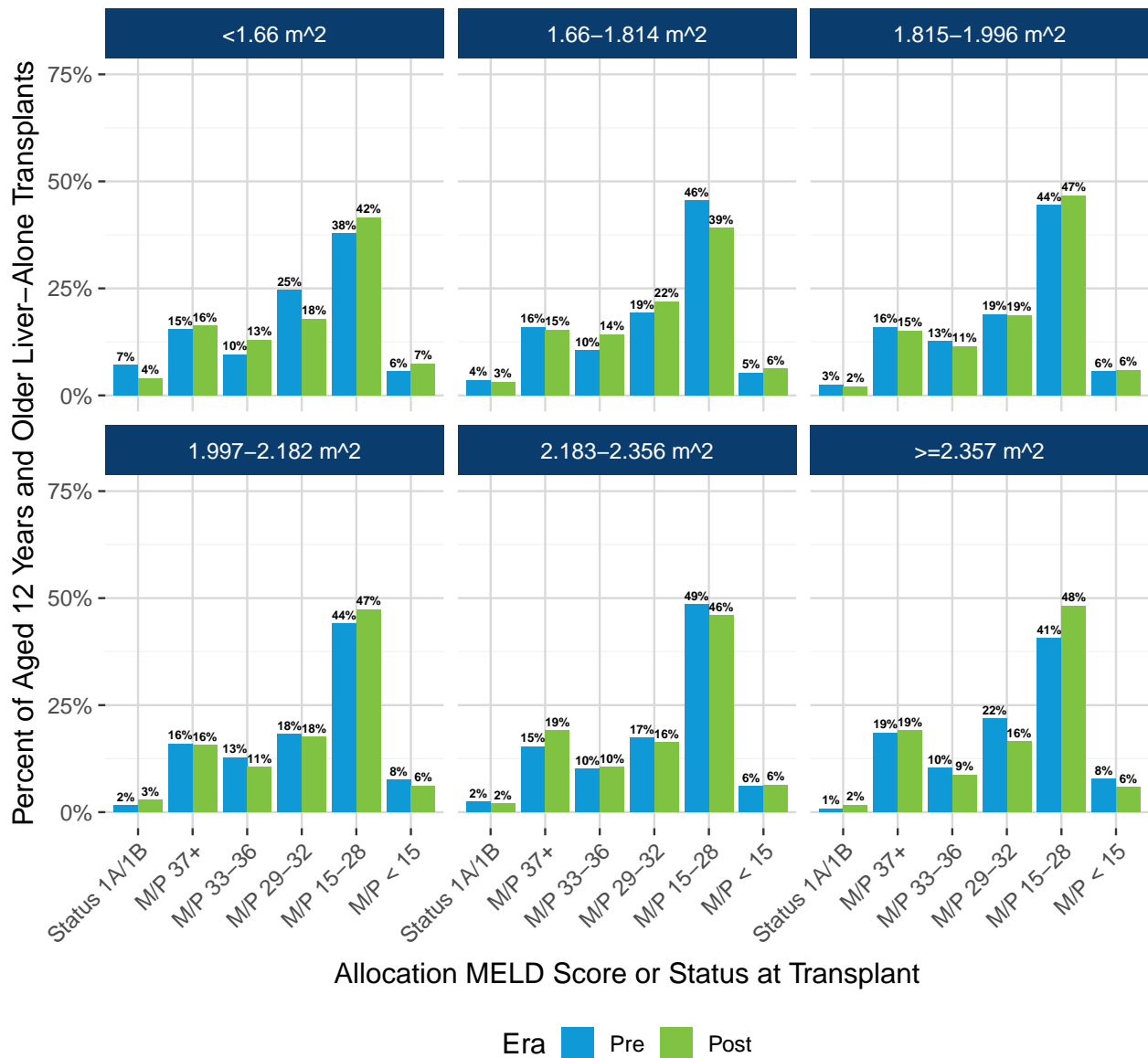
BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). 2 registrations with missing BSA at transplant were excluded.

Appendix Table 15. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Body Surface Area (BSA) at Transplant and Era

BSA (m ²)	Pre	Post
<1.66 m ²	410 (9.5%)	448 (10.0%)
1.66-1.814 m ²	650 (15.1%)	660 (14.7%)
1.815-1.996 m ²	1038 (24.1%)	1125 (25.1%)
1.997-2.182 m ²	997 (23.2%)	1073 (24.0%)
2.183-2.356 m ²	729 (17.0%)	677 (15.1%)
>=2.357 m ²	475 (11.0%)	492 (11.0%)
NA	1 (0.0%)	NA (-)
Total	4300 (100.0%)	4475 (100.0%)

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). 2 registrations with missing BSA at transplant were excluded.

Appendix Figure 17. Distribution of Allocation MELD Score or Status at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Body Surface Area (BSA) at Transplant and Era

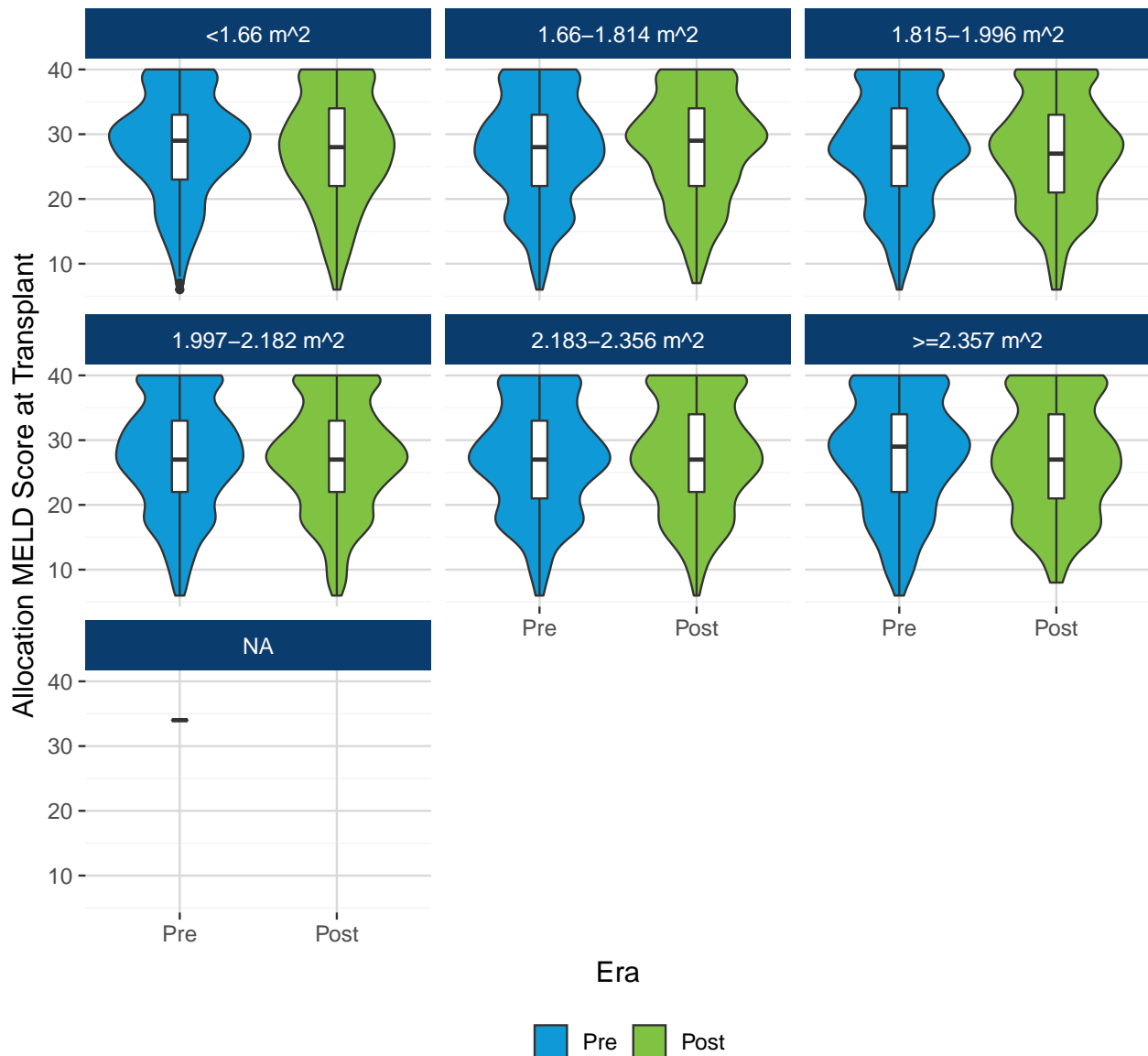


Allocation MELD Score or Status at Transplant

Era ■ Pre ■ Post

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). 2 registrations with missing BSA at transplant were excluded.

Appendix Figure 18. Distribution of Allocation MELD Score at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Body Surface Area (BSA) at Transplant and Era



Recipients who received transplant while in Status 1A/1B were excluded because they do not have allocation MELD scores at transplant. Pre-policy, 29 (7.07%), 23 (3.54%), 26 (2.5%), 16 (1.6%), 18 (2.47%), 4 (0.84%), and 0 (0%) Status 1A/1B recipients were in the <1.66 m², 1.66–1.814 m², 1.815–1.996 m², 1.997–2.182 m², 2.183–2.356 m², >=2.357 m², and missing BSA groups, respectively. Post-policy, 18 (4.02%), 21 (3.18%), 24 (2.13%), 30 (2.8%), 13 (1.92%), 8 (1.63%), and 0 (0%) Status 1A/1B recipients were in the <1.66 m², 1.66–1.814 m², 1.815–1.996 m², 1.997–2.182 m², 2.183–2.356 m², >=2.357 m², and missing BSA groups, respectively.

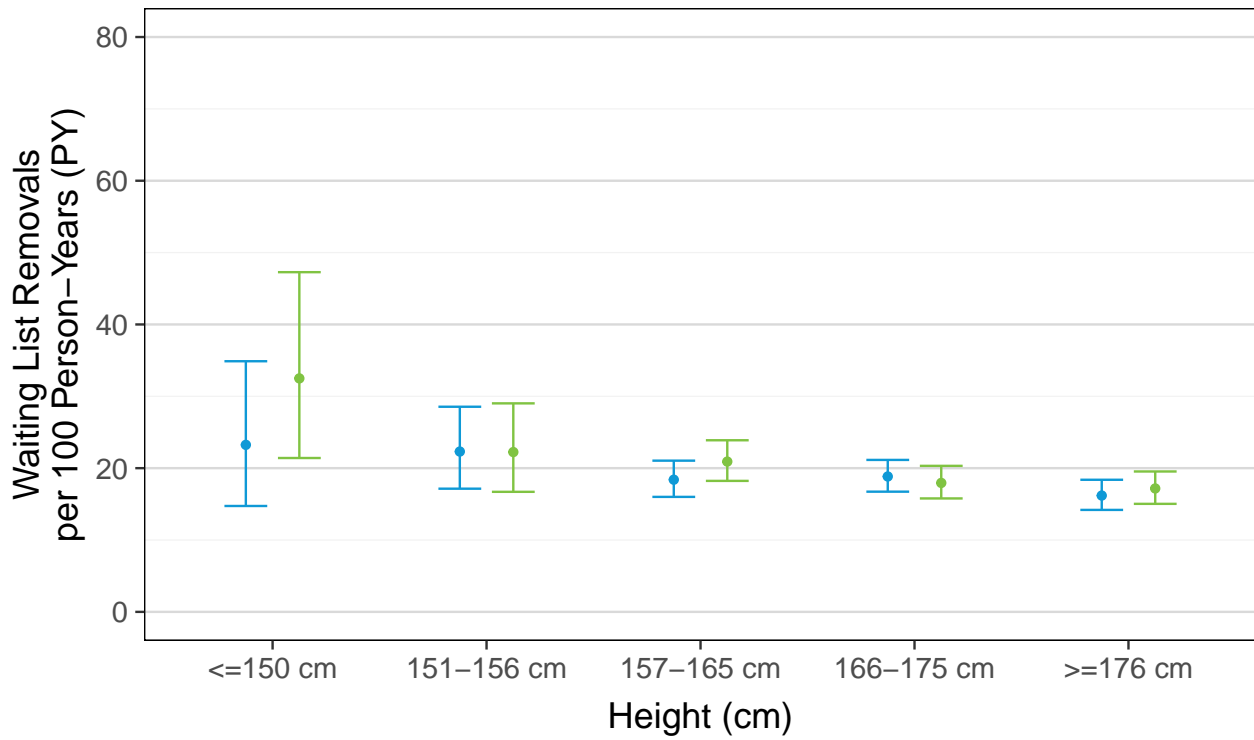
Appendix Table 16. Summary of Allocation PELD Score at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Body Surface Area (BSA) at Transplant and Era

BSA (m ²)	Policy Era	N	Minimum	25th Per-centile	Median	75th Per-centile	Maximum	Interquartile Range
<1.66 m ²	Pre	381	6	23	29	33	40	10
	Post	430	6	22	28	34	40	12
1.66-1.814 m ²	Pre	627	6	22	28	33	40	11
	Post	639	7	22	29	34	40	12
1.815-1.996 m ²	Pre	1012	6	22	28	34	40	12
	Post	1101	6	21	27	33	40	12
1.997-2.182 m ²	Pre	981	6	22	27	33	40	11
	Post	1043	6	22	27	33	40	11
2.183-2.356 m ²	Pre	711	6	21	27	33	40	12
	Post	664	6	22	27	34	40	12
≥2.357 m ²	Pre	471	6	22	29	34	40	12
	Post	484	8	21	27	34	40	13
NA	Pre	1	34	34	34	34	34	0

Recipients who received transplant while in Status 1A/1B were excluded because they do not have allocation MELD scores at transplant. Pre-policy, 29 (7.07%) , 23 (3.54%) , 26 (2.5%) , 16 (1.6%) , 18 (2.47%) , 4 (0.84%) , and 0 (0%) Status 1A/1B recipients were in the <1.66 m², 1.66-1.814 m², 1.815-1.996 m², 1.997-2.182 m², 2.183-2.356 m², ≥2.357 m², and missing BSA groups, respectively.

Post-policy, 18 (4.02%) , 21 (3.18%) , 24 (2.13%) , 30 (2.8%) , 13 (1.92%) , 8 (1.63%) , and 0 (0%) Status 1A/1B recipients were in the <1.66 m², 1.66-1.814 m², 1.815-1.996 m², 1.997-2.182 m², 2.183-2.356 m², ≥2.357 m² and missing BSA groups, respectively.

Appendix Figure 19. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Height and Era



Era ● Pre ● Post

Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 6 registrations in the pre-policy era and 9 registrations in the post-policy era were excluded.

Appendix Table 17. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 18 Years and Older by Height and Era

Era	Height (cm)	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	≤150 cm	308	23	98.9	23.25	(14.74, 34.88)
	151-156 cm	935	63	282.4	22.31	(17.14, 28.55)
	157-165 cm	3811	212	1152.5	18.40	(16.00, 21.05)
	166-175 cm	5153	288	1528.5	18.84	(16.73, 21.15)
	≥176 cm	5105	237	1464.2	16.19	(14.19, 18.38)
Post	≤150 cm	321	27	83.1	32.49	(21.41, 47.28)
	151-156 cm	898	54	242.8	22.24	(16.71, 29.02)
	157-165 cm	3913	218	1042.4	20.91	(18.23, 23.88)
	166-175 cm	5049	249	1387.4	17.95	(15.79, 20.32)
	≥176 cm	4867	231	1345.0	17.18	(15.03, 19.54)

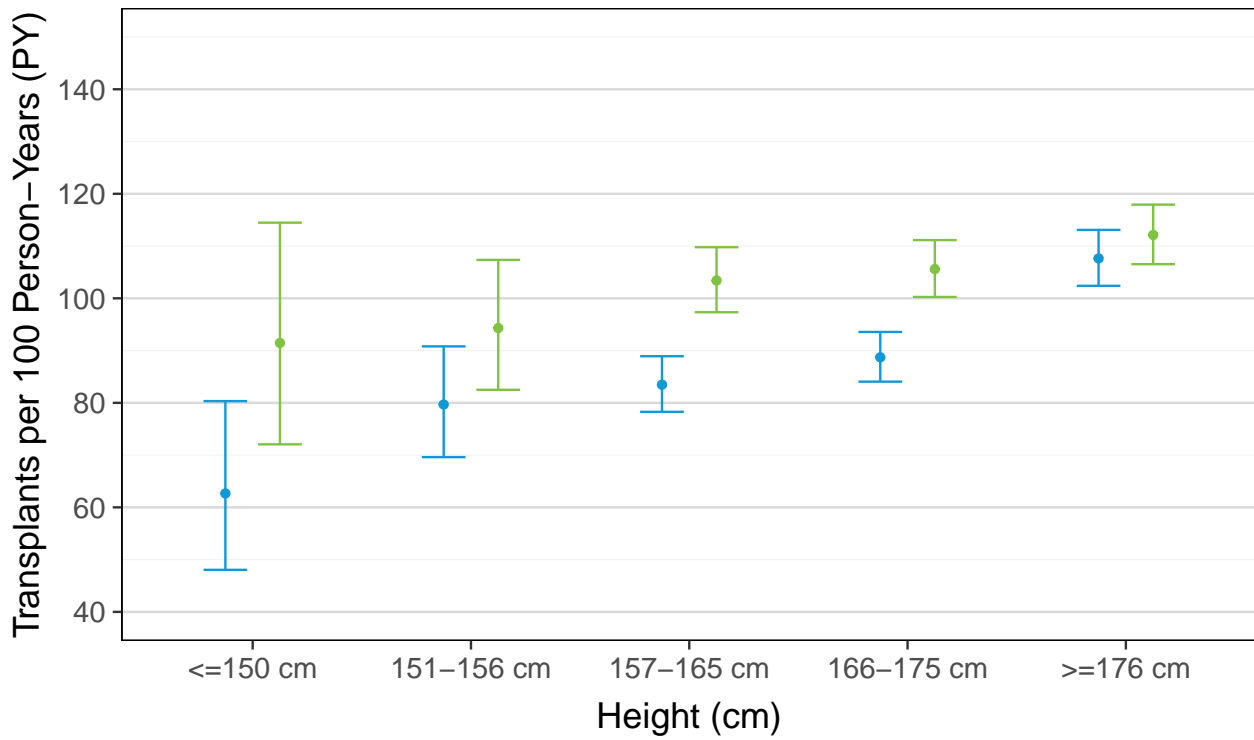
Height was grouped into categories as in Bernards et al. (Bernards S, et al.

Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period.

Registrations missing height at a particular time were excluded at that time.

6 registrations in the pre-policy era and 9 registrations in the post-policy era were excluded.

Appendix Figure 20. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 18 Years and Older by Height and Era



Era — Pre — Post

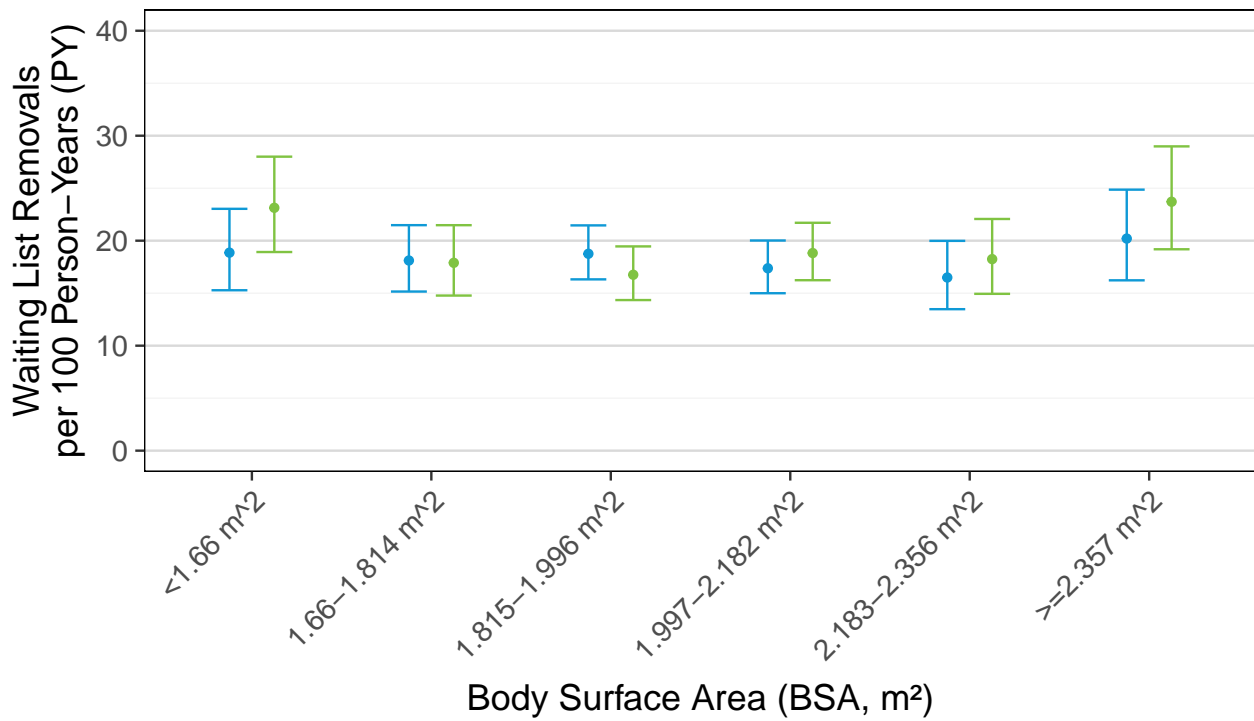
Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 6 registrations in the pre-policy era and 9 registrations in the post-policy era were excluded.

Appendix Table 18. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 18 Years and Older by Height and Era

Era	Height (cm)	Ever	Transplant	Active	Transplants	
		Waiting	Events	Person-Years (PY)	per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	<=150 cm	308	62	98.9	62.66	(48.04, 80.33)
	151-156 cm	935	225	282.4	79.68	(69.61, 90.80)
	157-165 cm	3811	962	1152.5	83.47	(78.28, 88.92)
	166-175 cm	5153	1356	1528.5	88.71	(84.05, 93.56)
	>=176 cm	5105	1576	1464.2	107.64	(102.39, 113.09)
Post	<=150 cm	321	76	83.1	91.46	(72.06, 114.48)
	151-156 cm	898	229	242.8	94.31	(82.49, 107.35)
	157-165 cm	3913	1078	1042.4	103.42	(97.34, 109.78)
	166-175 cm	5049	1465	1387.4	105.59	(100.26, 111.14)
	>=176 cm	4867	1508	1345.0	112.12	(106.53, 117.93)

Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 6 registrations in the pre-policy era and 9 registrations in the post-policy era were excluded.

Appendix Figure 21. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 18 Years and Older by Body Surface Area (BSA) and Era



Era ● Pre ● Post

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time. 18 registrations in the pre-policy era and 20 registrations in the post-policy era were excluded.

Appendix Table 19. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 18 Years and Older by Body Surface Area (BSA) and Era

Era	BSA (m ²)	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	<1.66 m ²	1654	96	508.9	18.86	(15.28, 23.04)
	1.66-1.814 m ²	2397	132	728.7	18.11	(15.16, 21.48)
	1.815-1.996 m ²	3858	212	1130.3	18.76	(16.32, 21.46)
	1.997-2.182 m ²	3706	191	1099.5	17.37	(15.00, 20.02)
	2.183-2.356 m ²	2206	104	630.6	16.49	(13.48, 19.98)
	>=2.357 m ²	1603	89	440.5	20.20	(16.23, 24.86)
Post	<1.66 m ²	1683	105	453.9	23.13	(18.92, 28.01)
	1.66-1.814 m ²	2414	115	642.7	17.89	(14.77, 21.48)
	1.815-1.996 m ²	3762	172	1026.5	16.76	(14.35, 19.46)
	1.997-2.182 m ²	3636	189	1004.1	18.82	(16.24, 21.71)
	2.183-2.356 m ²	2127	106	580.9	18.25	(14.94, 22.07)
	>=2.357 m ²	1540	95	400.7	23.71	(19.18, 28.98)

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987)

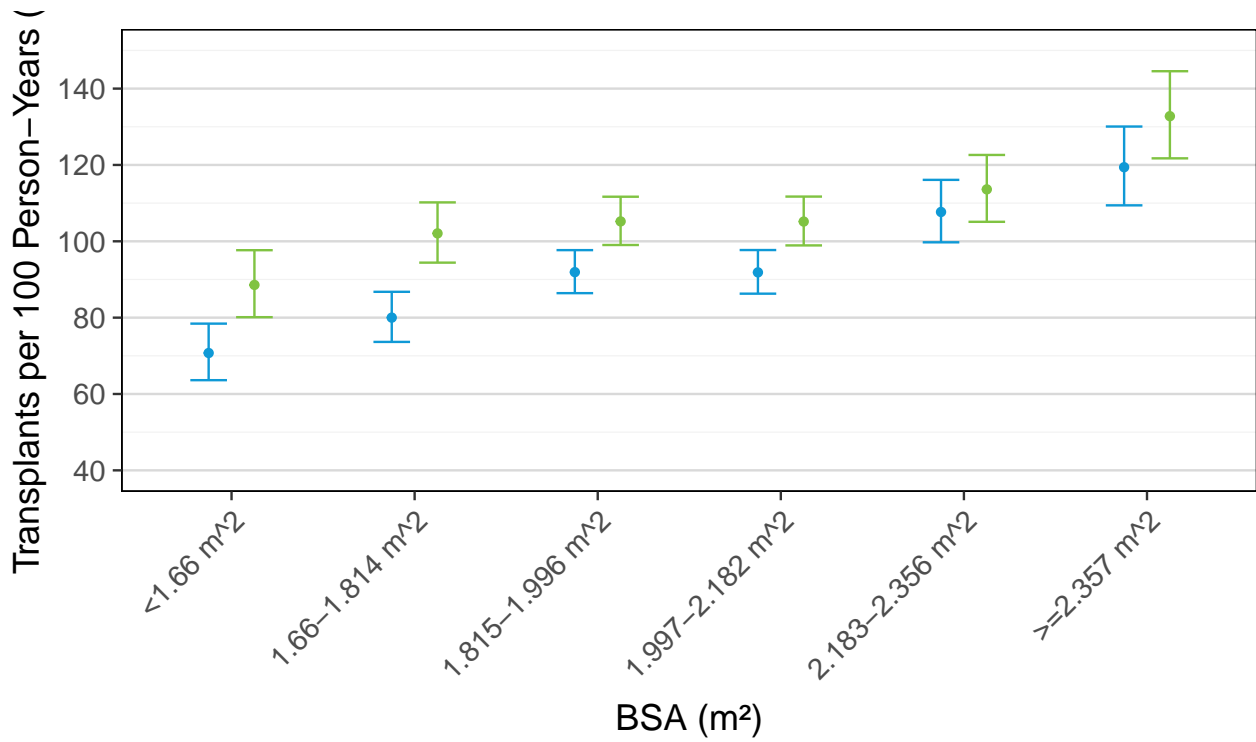
and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023).

BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period.

Registrations with missing BSA at a particular time were excluded at that time.

18 registrations in the pre-policy era and 20 registrations in the post-policy era were excluded.

Appendix Figure 22. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 18 Years and Older by Body Surface Area (BSA) and Era



Era — Pre — Post

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time. 18 registrations in the pre-policy era and 20 registrations in the post-policy era were excluded.

Appendix Table 20. Liver-Along Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 18 Years and Older by Body Surface Area (BSA) and Era

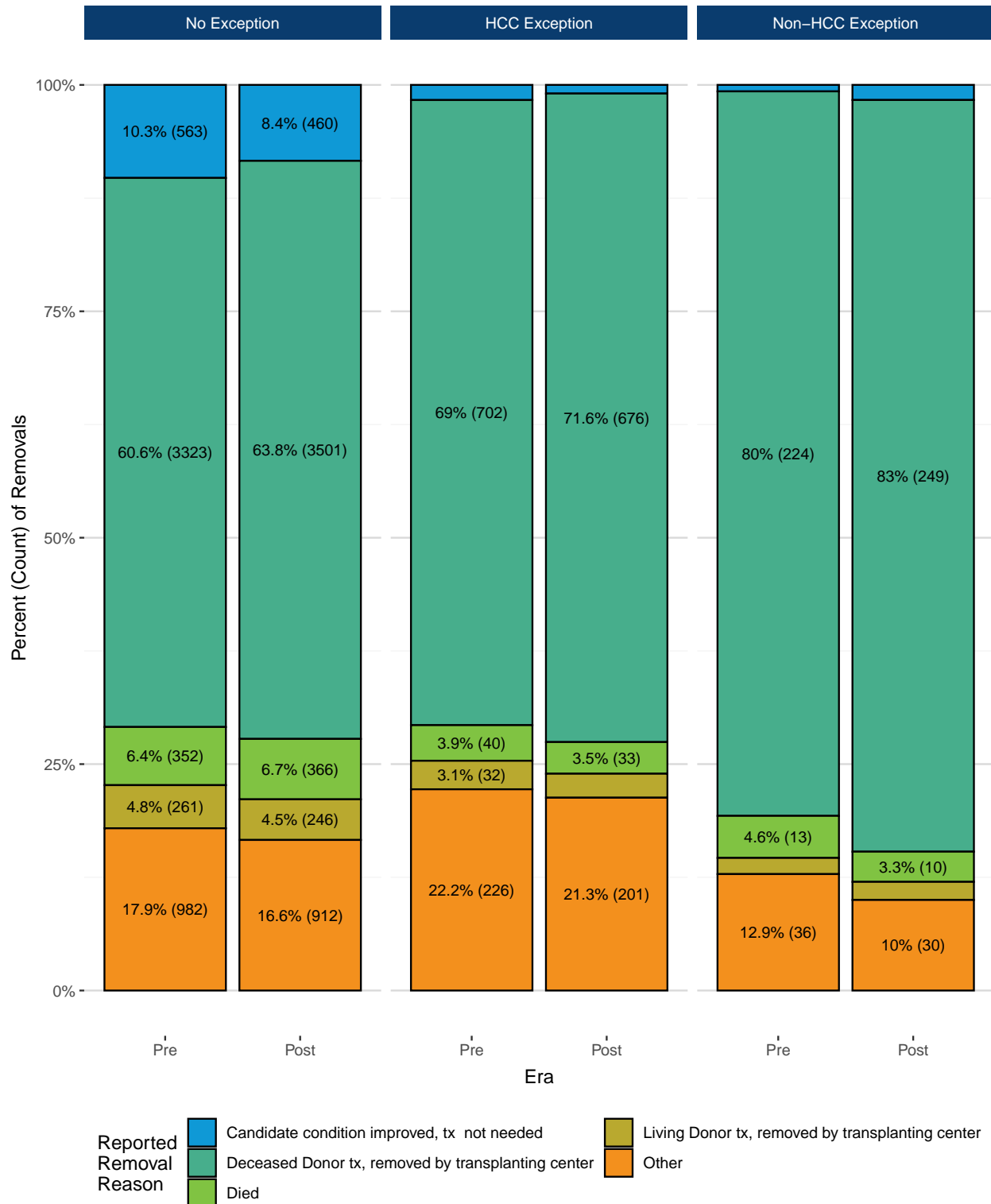
Era	BSA (m ²)	Ever	Transplant	Active	Transplants	
		Waiting	Events	Person-Years (PY)	per 100 Active PY	95% CI
		N	N	PY	Estimate	
Pre	<1.66 m ²	1654	360	508.9	70.74	(63.62, 78.43)
	1.66-1.814 m ²	2397	583	728.7	80.00	(73.64, 86.77)
	1.815-1.996 m ²	3858	1039	1130.3	91.92	(86.42, 97.69)
	1.997-2.182 m ²	3706	1010	1099.5	91.86	(86.28, 97.71)
	2.183-2.356 m ²	2206	679	630.6	107.68	(99.73, 116.09)
	≥2.357 m ²	1603	526	440.5	119.40	(109.42, 130.06)
Post	<1.66 m ²	1683	402	453.9	88.57	(80.12, 97.67)
	1.66-1.814 m ²	2414	656	642.7	102.07	(94.41, 110.19)
	1.815-1.996 m ²	3762	1080	1026.5	105.21	(99.03, 111.68)
	1.997-2.182 m ²	3636	1056	1004.1	105.17	(98.92, 111.71)
	2.183-2.356 m ²	2127	660	580.9	113.61	(105.11, 122.62)
	≥2.357 m ²	1540	532	400.7	132.78	(121.73, 144.55)

BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023).

BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time.

18 registrations in the pre-policy era and 20 registrations in the post-policy era were excluded.

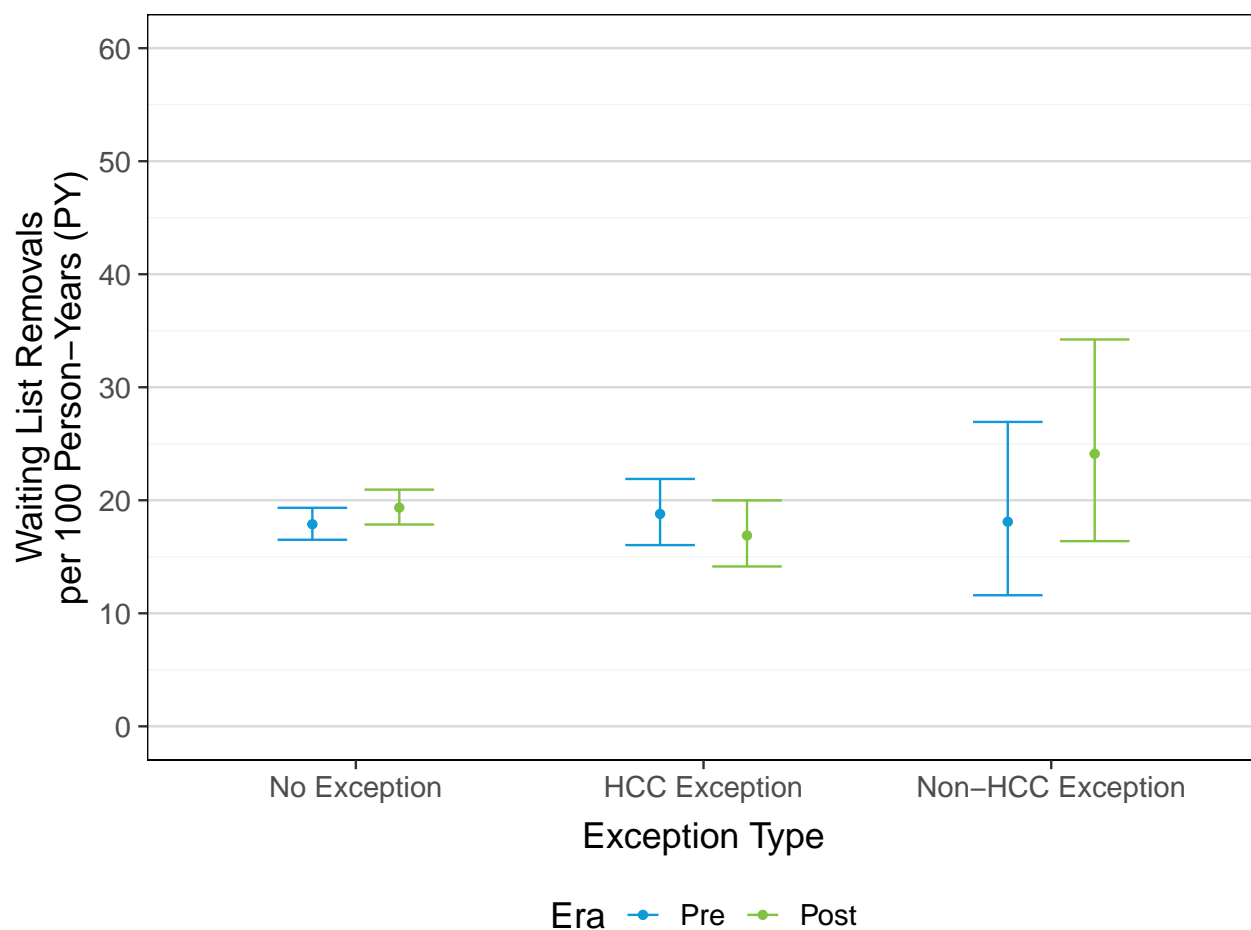
Appendix Figure 23. Count and Percent of Liver Candidates 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Exception Type, and Era



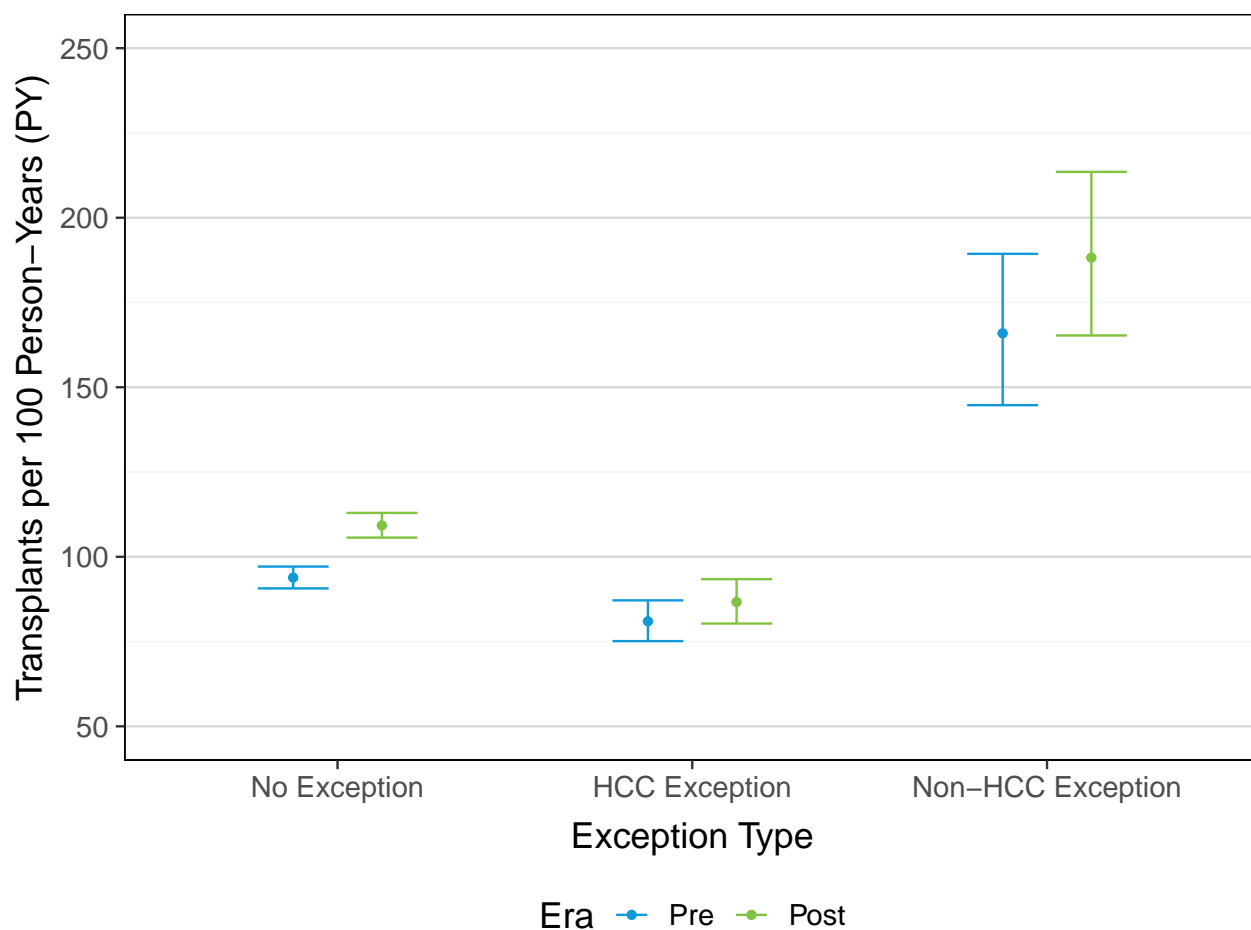
*Removal reasons containing <3% of forms in both policy eras were combined with the Other category for plotting purposes, but appear in the corresponding table.

Appendix Table 21. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Exception Type, and Era

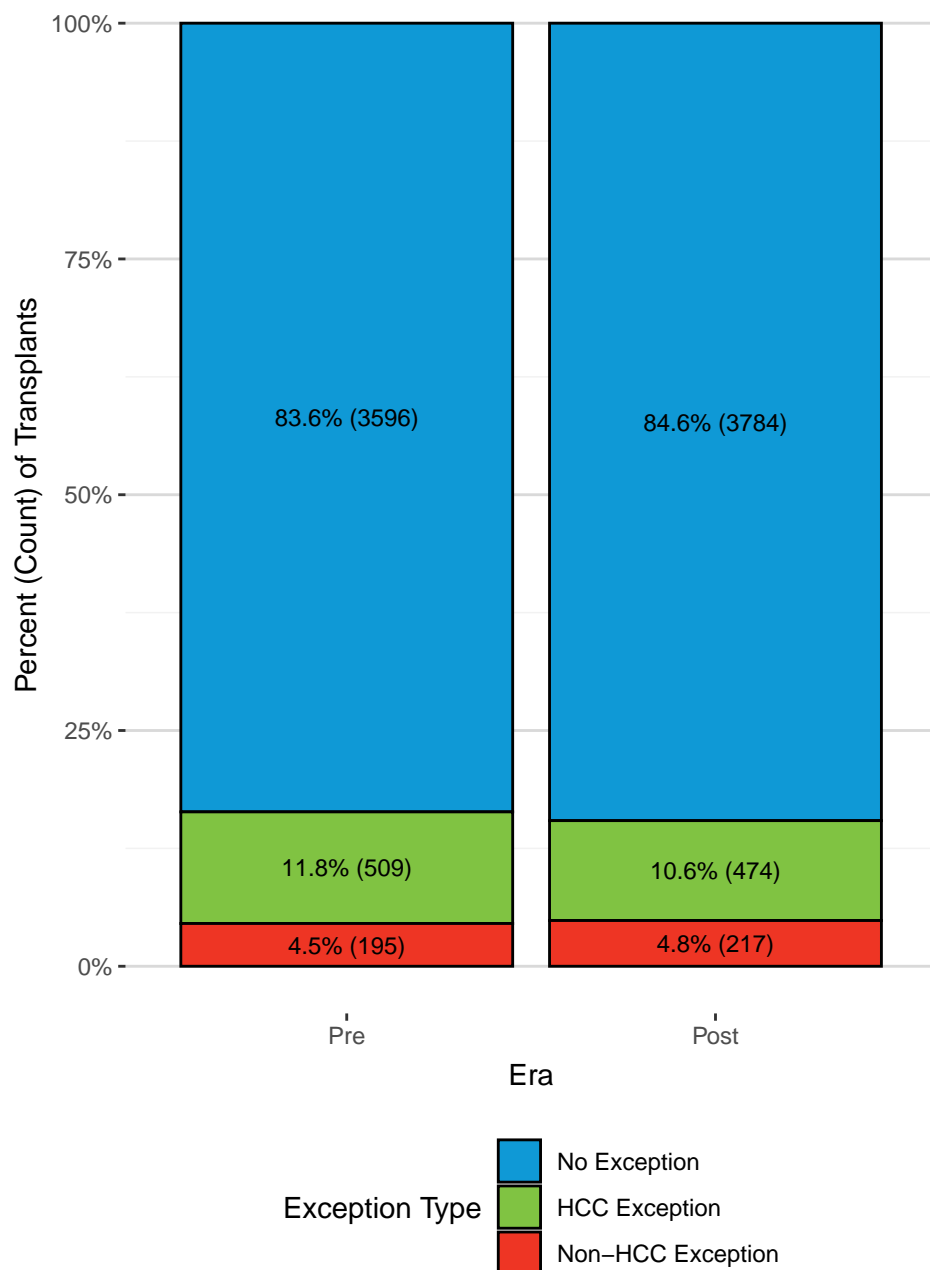
Reported Removal Reason	No Exception		HCC Exception		Non-HCC Exception	
	Pre	Post	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	3323 (60.6%)	3501 (63.8%)	702 (69.0%)	676 (71.6%)	224 (80.0%)	249 (83.0%)
Candidate condition improved, tx not needed	563 (10.3%)	460 (8.4%)	17 (1.7%)	9 (1.0%)	2 (0.7%)	5 (1.7%)
Other	401 (7.3%)	344 (6.3%)	54 (5.3%)	67 (7.1%)	8 (2.9%)	3 (1.0%)
Died	352 (6.4%)	366 (6.7%)	40 (3.9%)	33 (3.5%)	13 (4.6%)	10 (3.3%)
Candidate condition deteriorated , too sick for tx	339 (6.2%)	306 (5.6%)	91 (8.9%)	70 (7.4%)	13 (4.6%)	19 (6.3%)
Living Donor tx, removed by transplanting center	261 (4.8%)	246 (4.5%)	32 (3.1%)	25 (2.6%)	5 (1.8%)	6 (2.0%)
Transplant at another center (multi-listed)	94 (1.7%)	109 (2.0%)	37 (3.6%)	31 (3.3%)	7 (2.5%)	6 (2.0%)
Unable to contact candidate	69 (1.3%)	68 (1.2%)	1 (0.1%)	0 (0.0%)	1 (0.4%)	0 (0.0%)
Refused transplant	41 (0.7%)	50 (0.9%)	30 (2.9%)	23 (2.4%)	0 (0.0%)	0 (0.0%)
Transferred to another center	28 (0.5%)	28 (0.5%)	13 (1.3%)	6 (0.6%)	6 (2.1%)	1 (0.3%)
Patient died during TX procedure	6 (0.1%)	4 (0.1%)	0 (0.0%)	3 (0.3%)	0 (0.0%)	1 (0.3%)
Candidate Removed in Error	2 (0.0%)	1 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.4%)	0 (0.0%)
Transplanted in another country	2 (0.0%)	2 (0.0%)	0 (0.0%)	1 (0.1%)	0 (0.0%)	0 (0.0%)
Total	5481 (100.0%)	5485 (100.0%)	1017 (100.0%)	944 (100.0%)	280 (100.0%)	300 (100.0%)

Appendix Figure 24. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Exception Type and Era**Appendix Table 22. Liver-Along Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Exception Type and Era**

Era	Exception Type	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	No Exception	12142	629	3518.2	17.88	(16.51, 19.33)
	HCC Exception	2631	165	878.1	18.79	(16.03, 21.89)
	Non-HCC Exception	500	24	132.6	18.10	(11.60, 26.93)
Post	No Exception	11941	617	3188.1	19.35	(17.86, 20.94)
	HCC Exception	2564	134	793.8	16.88	(14.14, 19.99)
	Non-HCC Exception	527	31	128.6	24.11	(16.38, 34.23)

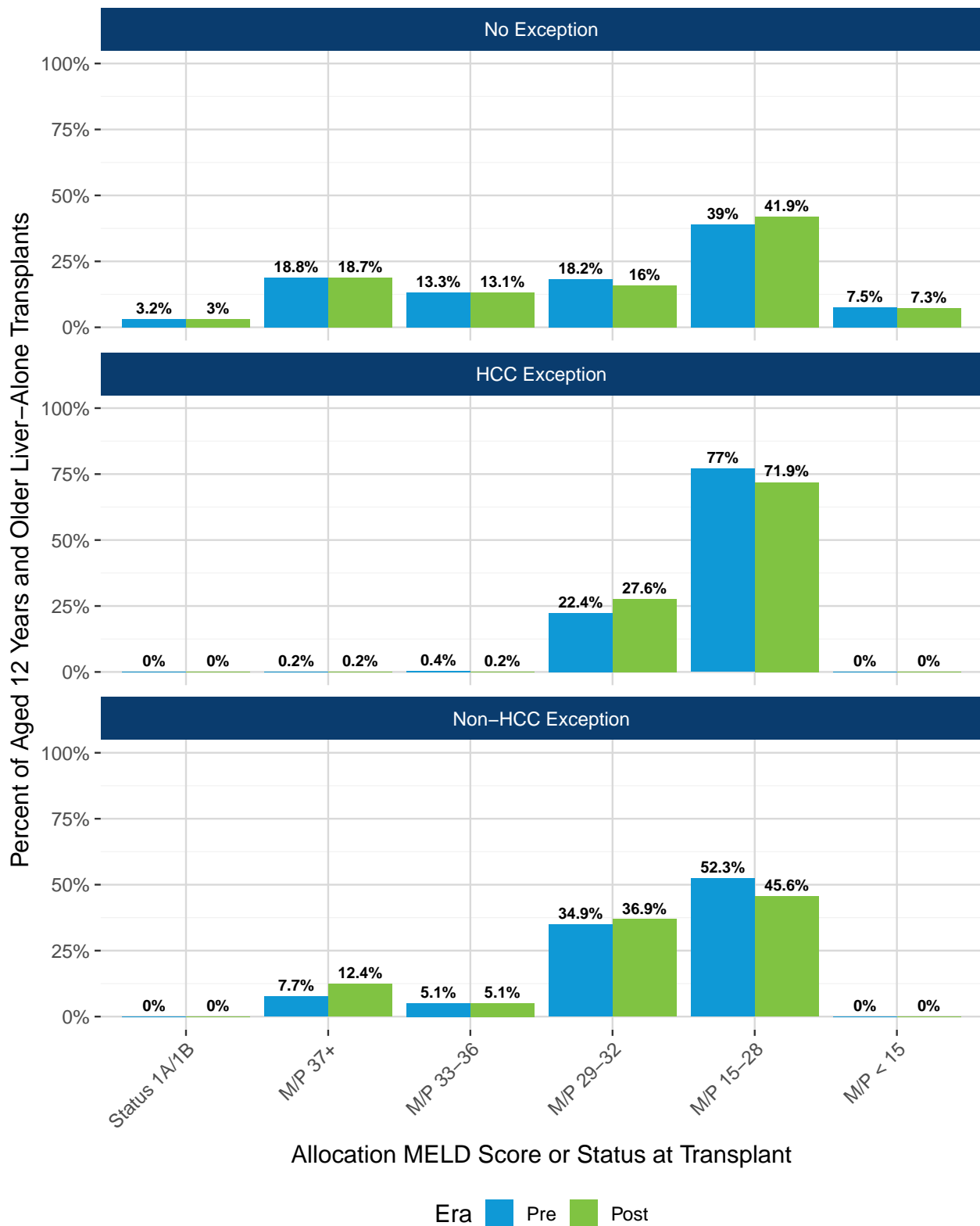
Appendix Figure 25. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Exception Type and Era**Appendix Table 23. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Exception Type and Era**

Era	Exception Type	Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	No Exception	12142	3302	3518.2	93.86	(90.68, 97.11)
	HCC Exception	2631	711	878.1	80.97	(75.13, 87.15)
	Non-HCC Exception	500	220	132.6	165.91	(144.71, 189.35)
Post	No Exception	11941	3483	3188.1	109.25	(105.65, 112.94)
	HCC Exception	2564	688	793.8	86.67	(80.32, 93.40)
	Non-HCC Exception	527	242	128.6	188.25	(165.28, 213.52)

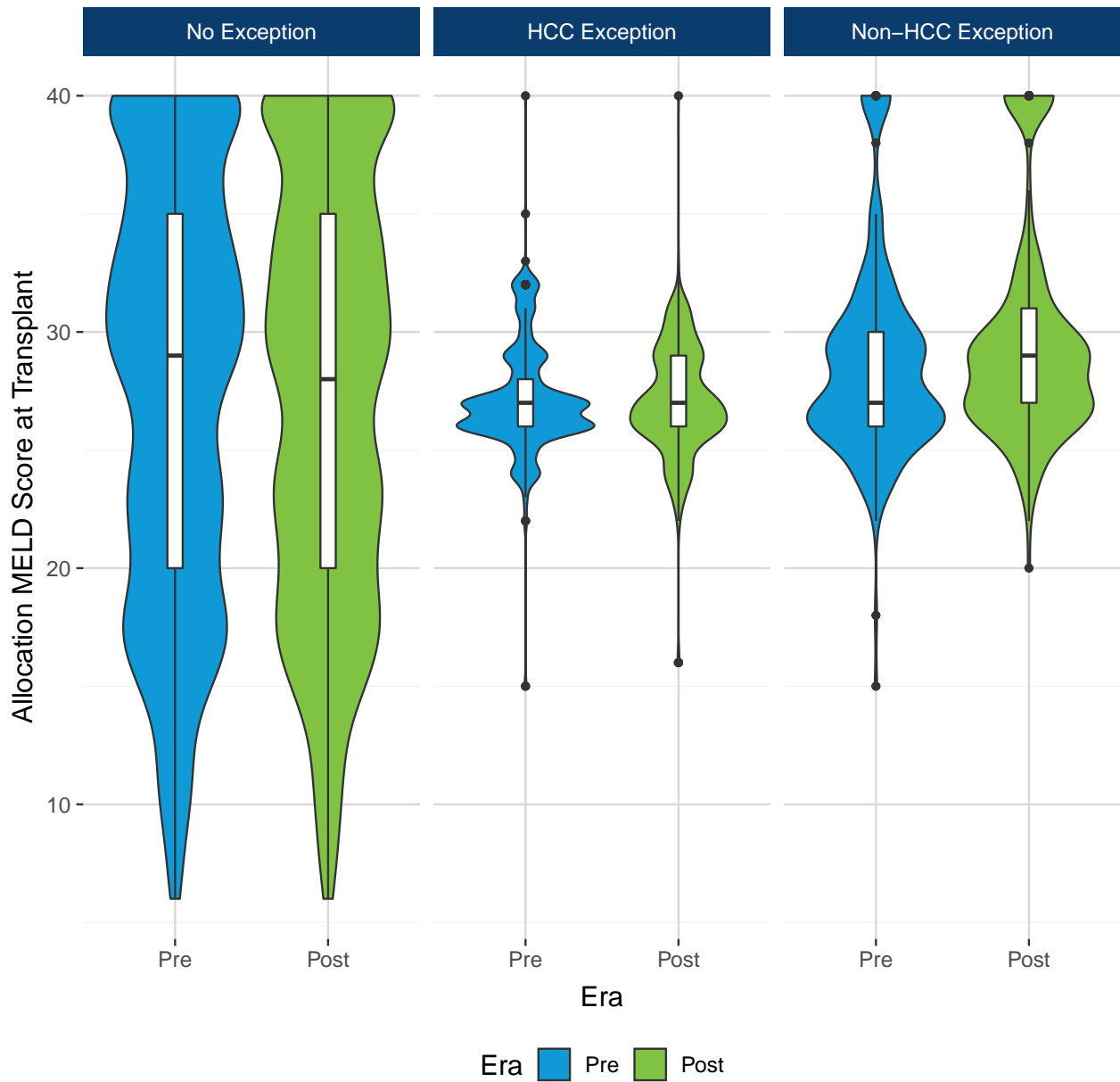
Appendix Figure 26. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Exception Type and Era**Appendix Table 24. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Exception Type and Era**

Exception Type	Pre	Post
No Exception	3596 (83.6%)	3784 (84.6%)
HCC Exception	509 (11.8%)	474 (10.6%)
Non-HCC Exception	195 (4.5%)	217 (4.8%)
Total	4300 (100.0%)	4475 (100.0%)

Appendix Figure 27. Distribution of Allocation MELD Score or Status at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Exception Type and Era



Appendix Figure 28. Distribution of Allocation MELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Exception Type and Era



Status 1A/1B recipients do not have allocation MELD scores at transplant. As a result, 116 (3.23%) pre-policy recipients and 114 (3.01%) post-policy recipients were excluded.

Appendix Table 25. Summary of Allocation MELD Score at Transplant for Liver-Along Transplant Recipients Aged 12 Years and Older by Exception Type and Era

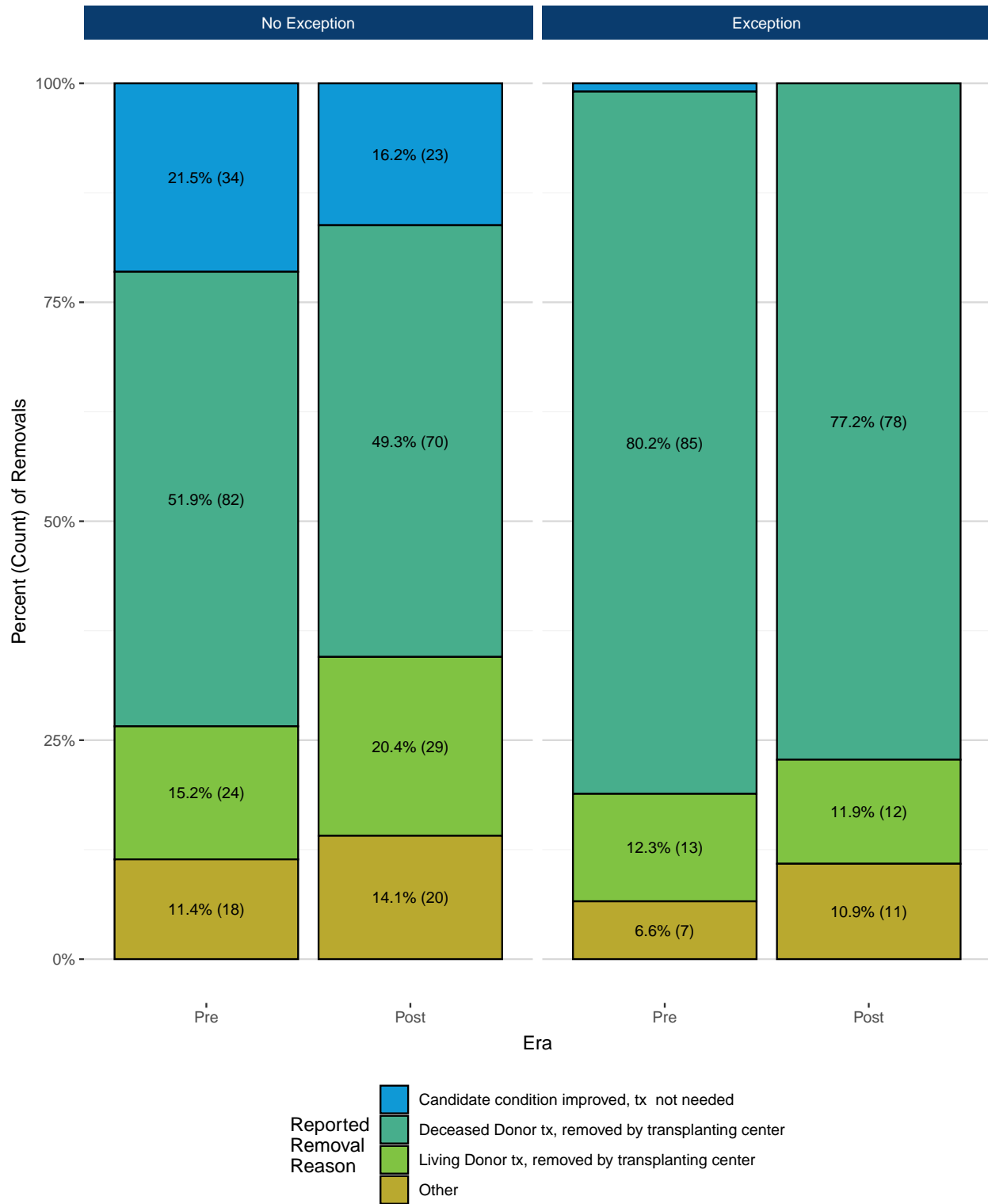
Exception Type	Policy Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
No Exception	Pre	3480	6	20	29	35	40	15
	Post	3670	6	20	28	35	40	15
HCC Exception	Pre	509	15	26	27	28	40	2
	Post	474	16	26	27	29	40	3
Non-HCC Exception	Pre	195	15	26	27	30	40	4
	Post	217	20	27	29	31	40	4

Status 1A/1B recipients do not have allocation MELD scores. As a result, 116 (3.23%) pre-policy recipients and 114 (3.01%) post-policy recipients were excluded.

Additional PELD-Cr Results

This section stratifies the analyses shown in the main “PELD-Cr Results” section by exception type (no exception vs. exception). Note that exceptions are not further stratified into HCC exceptions vs. non-HCC exceptions here due to the fact that there are very few pediatric candidates with HCC exceptions. Results should still be interpreted cautiously as some subgroups have small sample sizes.

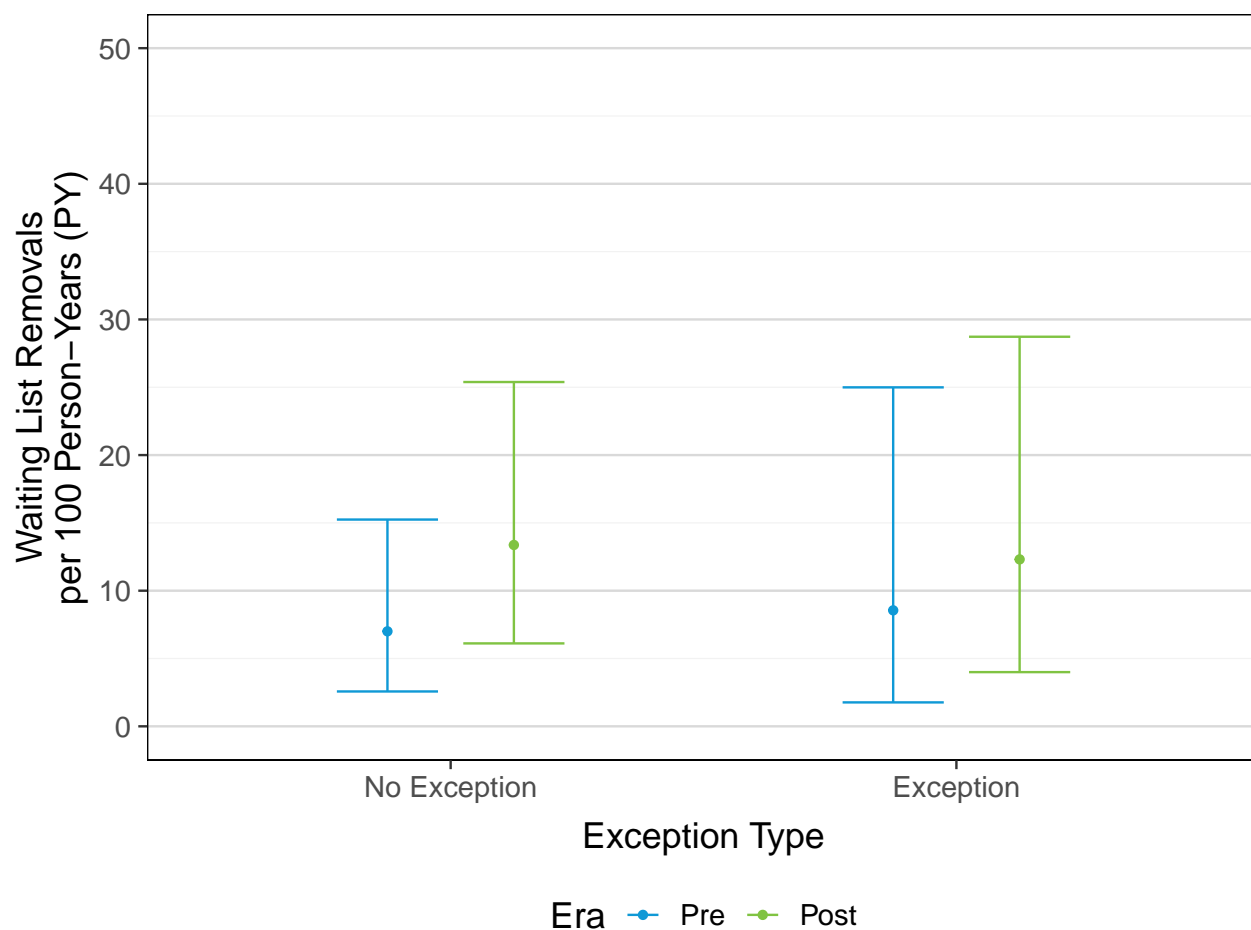
Appendix Figure 29. Count and Percent of Liver Candidates Aged 0-11 Years Removed from the Waiting List by Reported Removal Reason, Exception Type, and Era



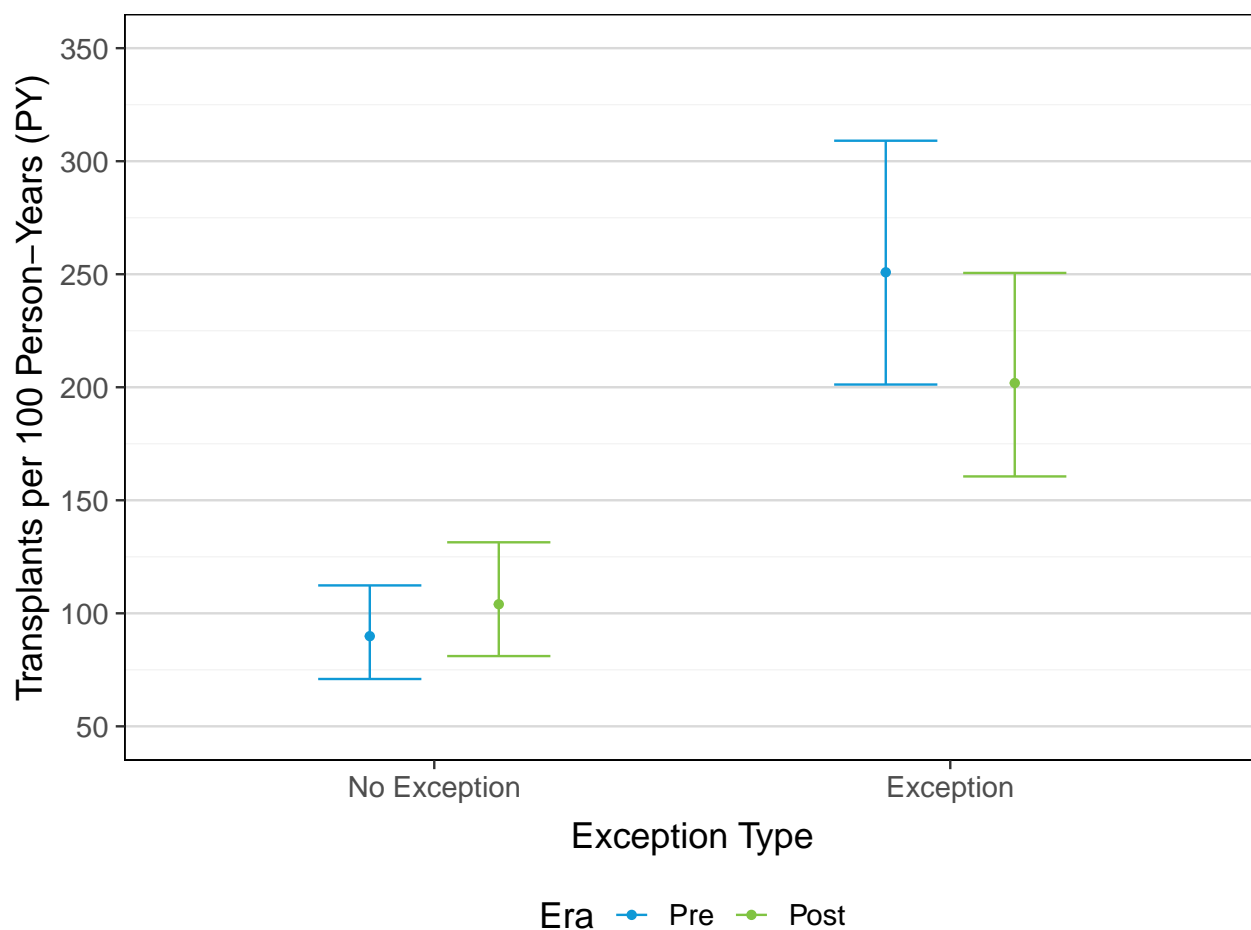
*Removal reasons containing <4 forms in both policy eras were combined with the Other category for plotting purposes, but appear in the corresponding table.

Appendix Table 26. Count and Percent of Liver Candidates Aged 0-11 Years Removed from the Waiting List by Reported Removal Reason, Exception Type, and Era

Reported Removal Reason	No Exception		Exception	
	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	82 (51.9%)	70 (49.3%)	85 (80.2%)	78 (77.2%)
Candidate condition improved, tx not needed	34 (21.5%)	23 (16.2%)	1 (0.9%)	0 (0.0%)
Living Donor tx, removed by transplanting center	24 (15.2%)	29 (20.4%)	13 (12.3%)	12 (11.9%)
Transplant at another center (multi-listed)	6 (3.8%)	3 (2.1%)	4 (3.8%)	4 (4.0%)
Died	4 (2.5%)	5 (3.5%)	1 (0.9%)	5 (5.0%)
Transferred to another center	4 (2.5%)	1 (0.7%)	1 (0.9%)	0 (0.0%)
Candidate condition deteriorated , too sick for tx	3 (1.9%)	4 (2.8%)	1 (0.9%)	0 (0.0%)
Other	1 (0.6%)	6 (4.2%)	0 (0.0%)	1 (1.0%)
Patient died during TX procedure	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.0%)
Unable to contact candidate	0 (0.0%)	1 (0.7%)	0 (0.0%)	0 (0.0%)
Total	158 (100.0%)	142 (100.0%)	106 (100.0%)	101 (100.0%)

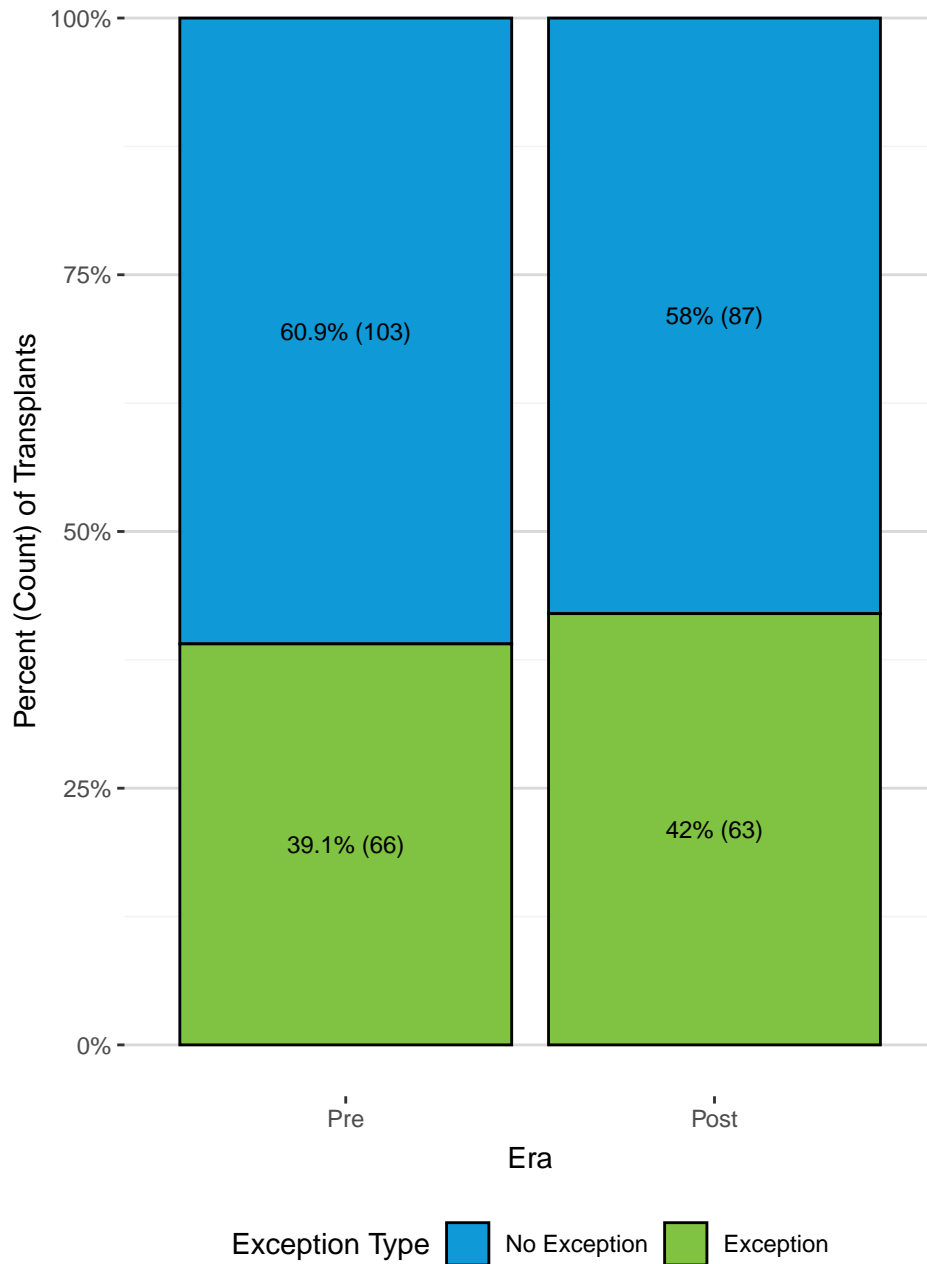
Appendix Figure 30. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years by Exception Type and Era**Appendix Table 27. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years by Exception Type and Era**

Era	Exception Type	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
		N	N	PY	Estimate	95% CI
Pre	No Exception	331	6	85.7	7.00	(2.57, 15.24)
	Exception	167	3	35.1	8.55	(1.76, 24.99)
Post	No Exception	296	9	67.3	13.37	(6.11, 25.38)
	Exception	176	5	40.6	12.31	(4.00, 28.72)

Appendix Figure 31. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years by Exception Type and Era**Appendix Table 28. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years by Exception Type and Era**

Era	Exception Type	Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
		N	N	PY	Estimate	95% CI
Pre	No Exception	331	77	85.7	89.88	(70.94, 112.34)
	Exception	167	88	35.1	250.86	(201.20, 309.07)
Post	No Exception	296	70	67.3	104.01	(81.08, 131.40)
	Exception	176	82	40.6	201.86	(160.55, 250.56)

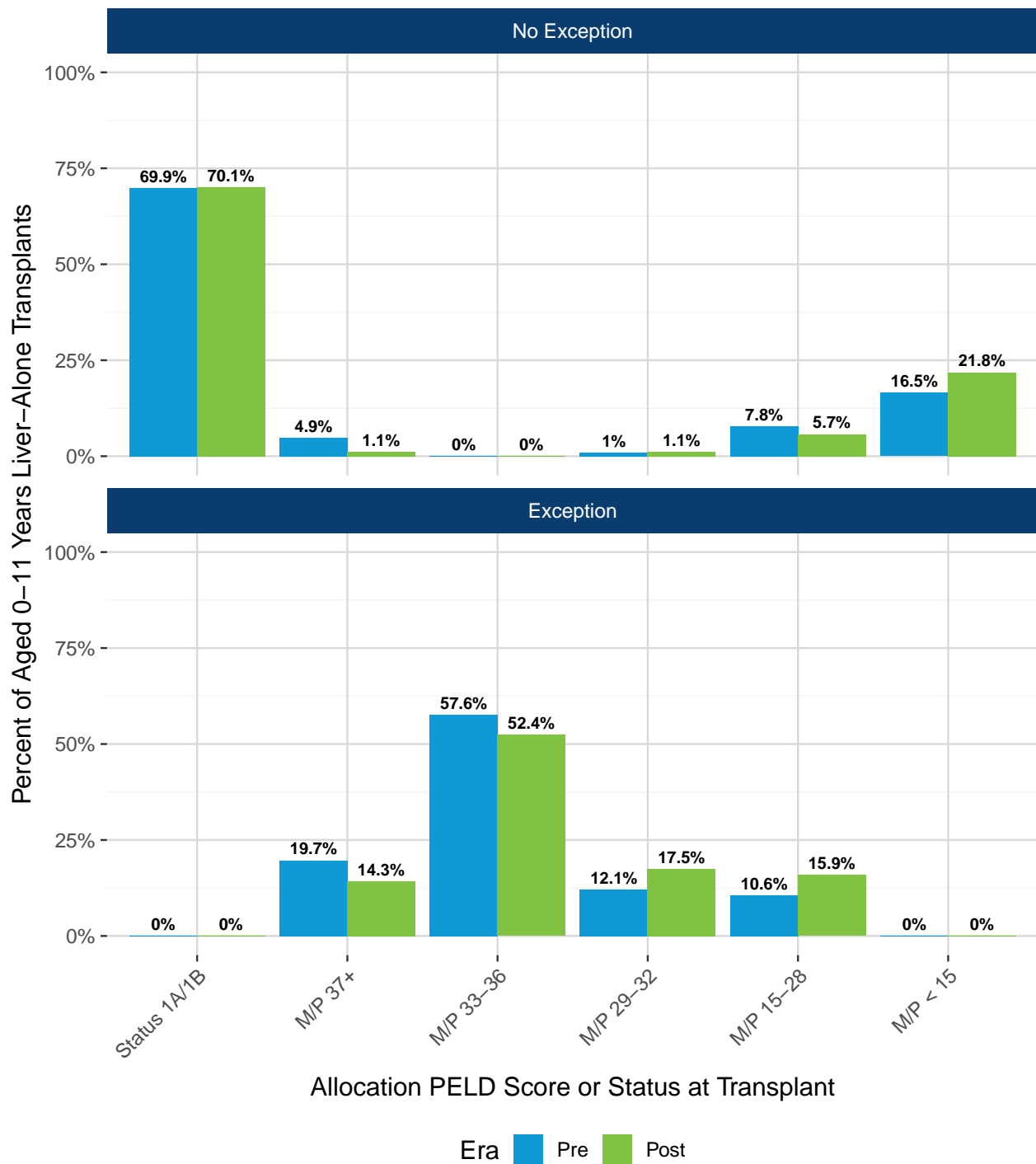
Appendix Figure 32. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years by Exception Type and Era



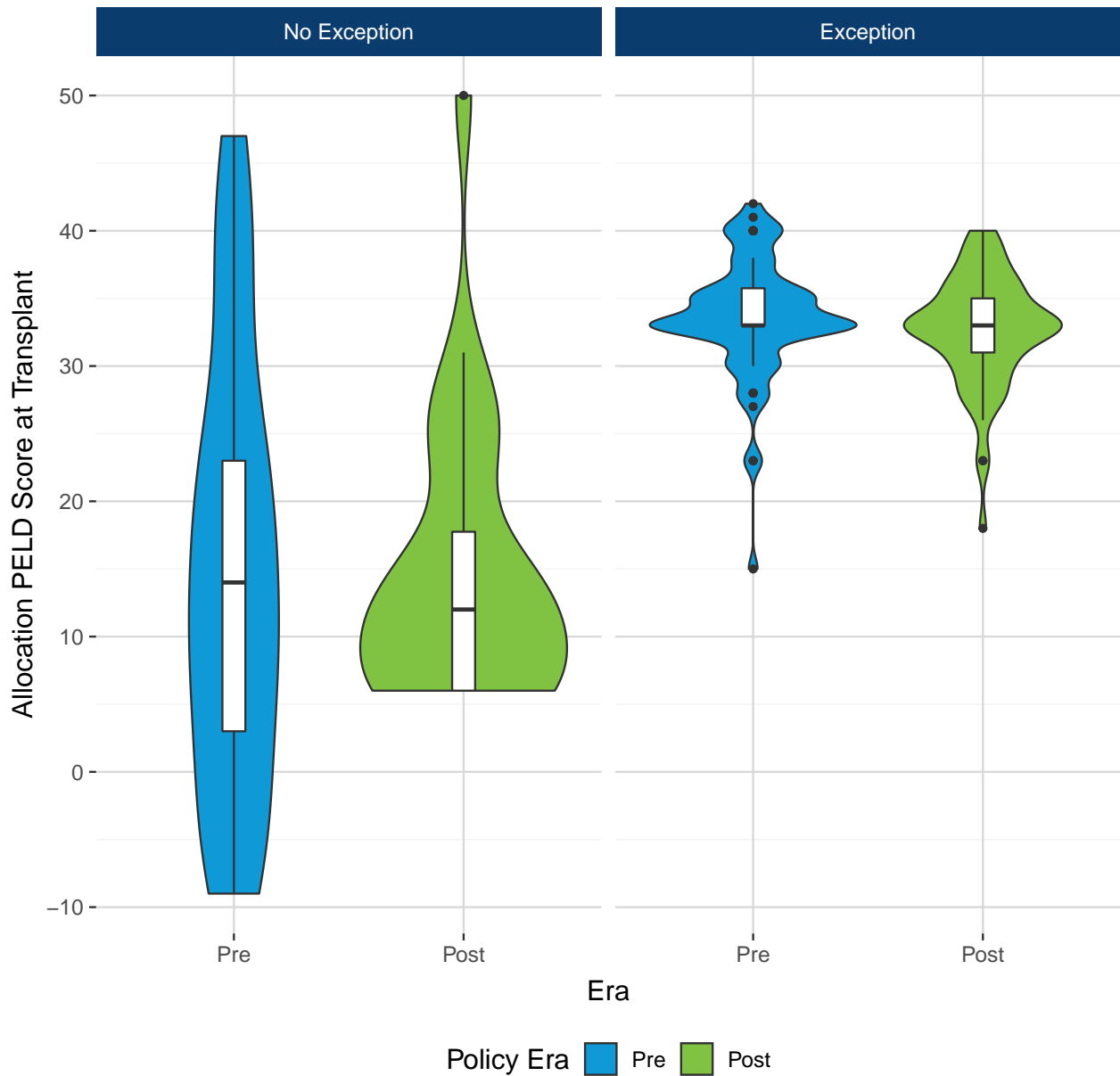
Appendix Table 29. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years by Exception Type and Era

Exception Type	Pre	Post
No Exception	103 (60.9%)	87 (58.0%)
Exception	66 (39.1%)	63 (42.0%)
Total	169 (100.0%)	150 (100.0%)

Appendix Figure 33. Distribution of Allocation PELD Score or Status at Transplant for Liver-Alone Transplant Recipients Aged 0-11 Years by Exception Type and Era



Appendix Figure 34. Distribution of Allocation PELD Score at Transplant for Liver-Alone Transplant Recipients Aged 0-11 Years by Exception Type and Era



Status 1A/1B recipients do not have allocation PELD scores at transplant. As a result, 72 (69.9%) pre-policy recipients and 61 (70.11%) post-policy recipients were excluded. Pre-policy, PELD could range between -99 and 99; post-policy, PELD ranges between 6-99.

Appendix Table 30. Summary of Allocation PELD Score at Transplant for Liver-Along Transplant Recipients Aged 0-11 Years by Exception Type and Era

Exception Type	Policy Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
No Exception	Pre	31	-9	3	14	23.0	47	20.0
	Post	26	6	6	12	17.8	50	11.8
Exception	Pre	66	15	33	33	35.8	42	2.8
	Post	63	18	31	33	35.0	40	4.0

Status 1A/1B recipients do not have allocation PELD scores at transplant. As a result, 72 (69.9%) pre-policy recipients and 61 (70.11%) post-policy recipients were excluded. Pre-policy, PELD could range between -99 and 99; post-policy, PELD ranges between 6 and 99.