Final Report

OPTN Liver and Intestine Committee | Descriptive Data Request

MELD 3.0 and PELD-CR
12 Month Monitoring Report

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Executive Summary

This report provides a review of the first 12 months under the Improving Liver Allocation: MELD, PELD, Status 1A, Status 1B policy. After 12 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 both sexes increased significantly pre- to post-policy, with the post-policy transplant rate being slightly higher for females when compared to males.
- Within each sex, the median allocation MELD score at transplant remained the same pre- to post-policy for males at 27 and dropped from 29 to 28 for females.
- Transplant rates increased for all height and BSA groups from pre- to post-policy (changes were not significant for the smallest height and BSA groups but significant for all other groups).

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. The extent of skewness for the PELD score also decreased, meaning the median PELD score was made closer to the average PELD score in the post-Policy.

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 increased pre- to post-policy.
- 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 definiton 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 and Status 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 waiting list 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 waiting list by reported removal reason, overall and by candidate sex
- Changes in waiting list 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 waiting list 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 waiting list by reported removal reason, overall and by candidate age group
- Changes in waiting list 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 waiting list 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 waiting list 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 turndown 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 December 27, 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 07/12/2022 - 07/12/2023 (pre-policy) and 07/13/2023 - 07/12/2024 (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 07/12/2022 - 07/12/2023 (pre-policy) and 07/13/2023 - 07/12/2024 (post-policy).

Deceased donor, liver-alone transplant cohorts are defined based on transplant date as 07/12/2022 - 07/12/2023 (pre-policy) and 07/13/2023 - 07/12/2024 (post-policy).

Waiting list removal cohorts are defined based on removal date as 07/12/2022 - 07/12/2023 (pre-policy) and 07/13/2023 - 07/12/2024 (post-policy).

Analyses are based on OPTN data as of December 27, 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 waiting list 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 Computer 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 not approved, 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.

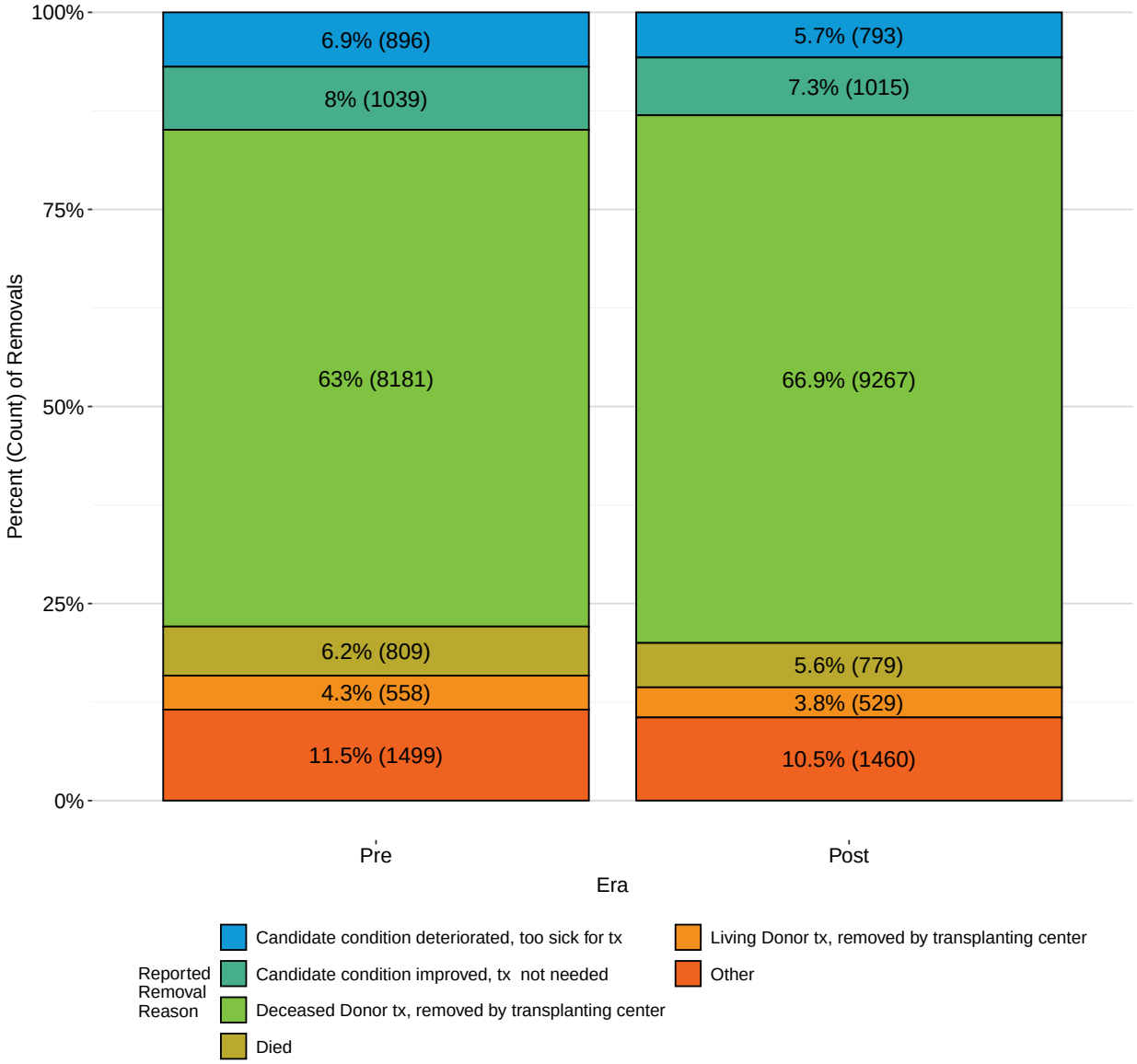
MELD 3.0 Results

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. 12982 candidates were removed in the pre-policy era and 13843 candidates were removed in the post-policy era. Deceased donor transplant made up the largest number and proportion of removal reasons (Pre: 8,181 (63.0%); Post: 9,267 (66.9%)), followed by "Candidate condition improved, transplant not needed" (Pre: 1,039 (8.0%); Post: 1,015 (7.3%)); "Candidate condition deteriorated, too sick for transplant" (Pre: 896 (6.9%); Post: 793 (5.7%)); and waiting list death (Pre: 809 (6.2%); Post: 779 (5.6%)).

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



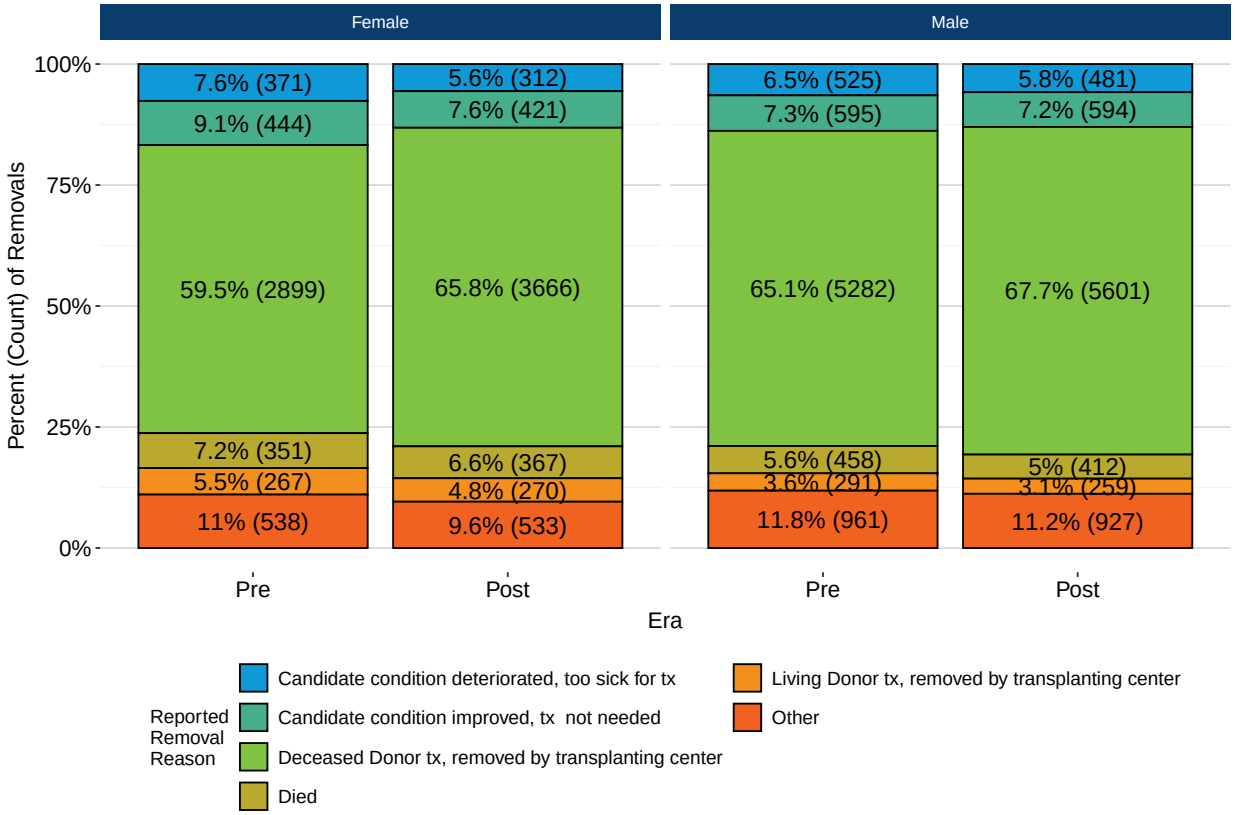
*Removal reasons containing <3% of forms were combined with the Other category for plotting purposes, but appear in the corresponding table.

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	8,181 (63.0%)	9,267 (66.9%)
Candidate condition improved, tx not needed	1,039 (8.0%)	1,015 (7.3%)
Candidate condition deteriorated, too sick for tx	896 (6.9%)	793 (5.7%)
Other	856 (6.6%)	830 (6.0%)
Died	809 (6.2%)	779 (5.6%)
Living Donor tx, removed by transplanting center	558 (4.3%)	529 (3.8%)
Transplant at another center (multi-listed)	285 (2.2%)	260 (1.9%)
Unable to contact candidate	153 (1.2%)	127 (0.9%)
Refused transplant	116 (0.9%)	130 (0.9%)
Transferred to another center	74 (0.6%)	89 (0.6%)
Patient died during TX procedure	8 (0.1%)	16 (0.1%)
Candidate Removed in Error	5 (0.0%)	2 (0.0%)
Transplanted in another country	2 (0.0%)	6 (0.0%)
Total	12,982 (100.0%)	13,843 (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 primary reason for removal was deceased donor transplant. The proportion of females removed for deceased donor transplant increased pre- to post-policy (Pre: 2,899 (59.5%); Post: 3,666 (65.8%)), aligning more closely with the proportion of males removed for deceased donor transplant (Pre: 5,282 (65.1%); Post: 5,601 (67.7%)). These post-policy proportional changes in removals suggest the policy change has made transplants more equitable for females. The secondary reason for removal was waiting list death. The proportion of death removals decreased for both males and females.

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

	Female		Male	
Reported Removal Reason	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	2,899 (59.5%)	3,666 (65.8%)	5,282 (65.1%)	5,601 (67.7%)
Candidate condition improved, tx not needed	444 (9.1%)	421 (7.6%)	595 (7.3%)	594 (7.2%)
Candidate condition deteriorated, too sick for tx	371 (7.6%)	312 (5.6%)	525 (6.5%)	481 (5.8%)
Died	351 (7.2%)	367 (6.6%)	458 (5.6%)	412 (5.0%)
Other	322 (6.6%)	307 (5.5%)	534 (6.6%)	523 (6.3%)
Living Donor tx, removed by transplanting center	267 (5.5%)	270 (4.8%)	291 (3.6%)	259 (3.1%)
Transplant at another center (multi-listed)	94 (1.9%)	92 (1.7%)	191 (2.4%)	168 (2.0%)
Unable to contact candidate	59 (1.2%)	53 (1.0%)	94 (1.2%)	74 (0.9%)
Transferred to another center	31 (0.6%)	37 (0.7%)	43 (0.5%)	52 (0.6%)
Refused transplant	26 (0.5%)	34 (0.6%)	90 (1.1%)	96 (1.2%)
Patient died during TX procedure	5 (0.1%)	6 (0.1%)	3 (0.0%)	10 (0.1%)
Candidate Removed in Error	1 (0.0%)	1 (0.0%)	4 (0.0%)	1 (0.0%)
Transplanted in another country	0 (0.0%)	3 (0.1%)	2 (0.0%)	3 (0.0%)
Total	4,870 (100.0%)	5,569 (100.0%)	8,112 (100.0%)	8,274 (100.0%)

Figure 3 and **Table 3** 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 17.92 (17.07, 18.80) removals per 100 person-years waiting pre-policy to 18.52 (17.61, 19.47) 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

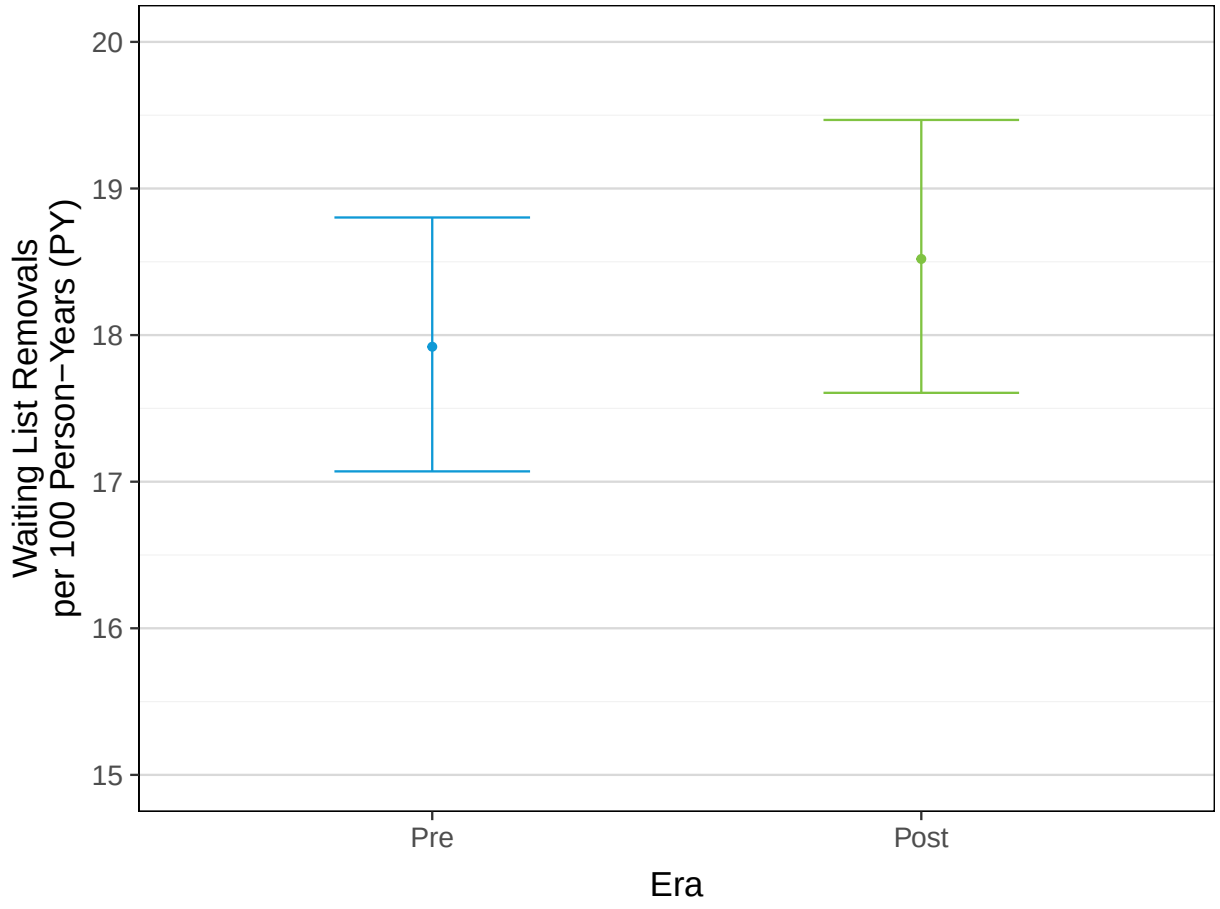


Table 3. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Era

	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	N	N	PY	Estimate	95% CI
Pre	21056	1666	9296.5	17.92	(17.07, 18.80)
Post	21397	1541	8321.0	18.52	(17.61, 19.47)

Figure 4 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 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, with these differences being 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-Alone 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

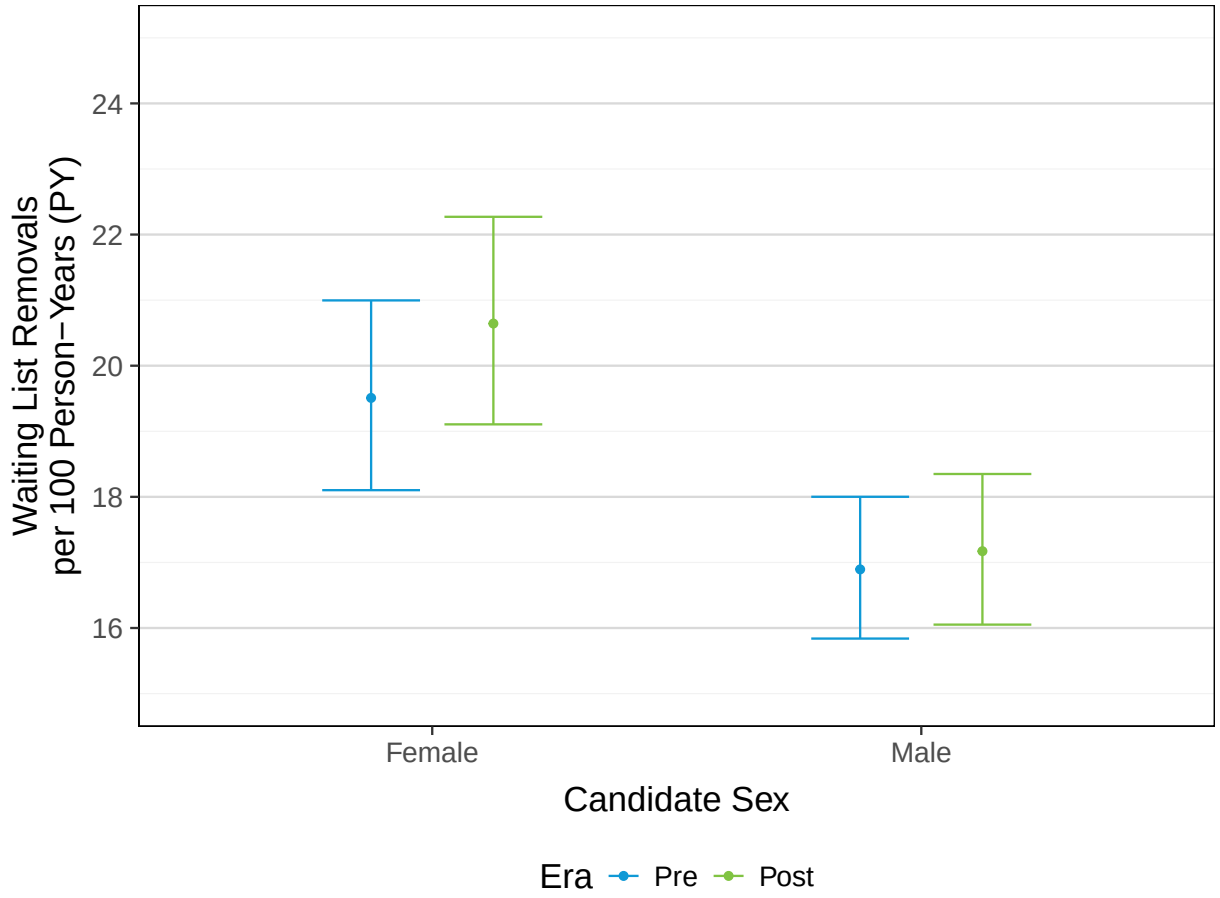


Table 4. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Candidate Sex for the Purposes of Adult MELD Calculation and Era

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	Candidate Sex	N	N	PY	Estimate	95% CI
Pre	Female	8108	712	3649.6	19.51	(18.10, 21.00)
	Male	12950	954	5646.9	16.89	(15.84, 18.00)
Post	Female	8665	667	3231.2	20.64	(19.11, 22.27)
	Male	12734	874	5089.8	17.17	(16.05, 18.35)

Figure 5 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 age for the purposes of adult MELD calculation and era. In both policy eras, waiting list removal rates were higher for adults compared to children 12+ years of age, with these differences being statistically significant for both eras. Within each age group, waiting list removal rates tended to increase pre- to post-policy, although these increases were not statistically significant.

Figure 5. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Age and Era

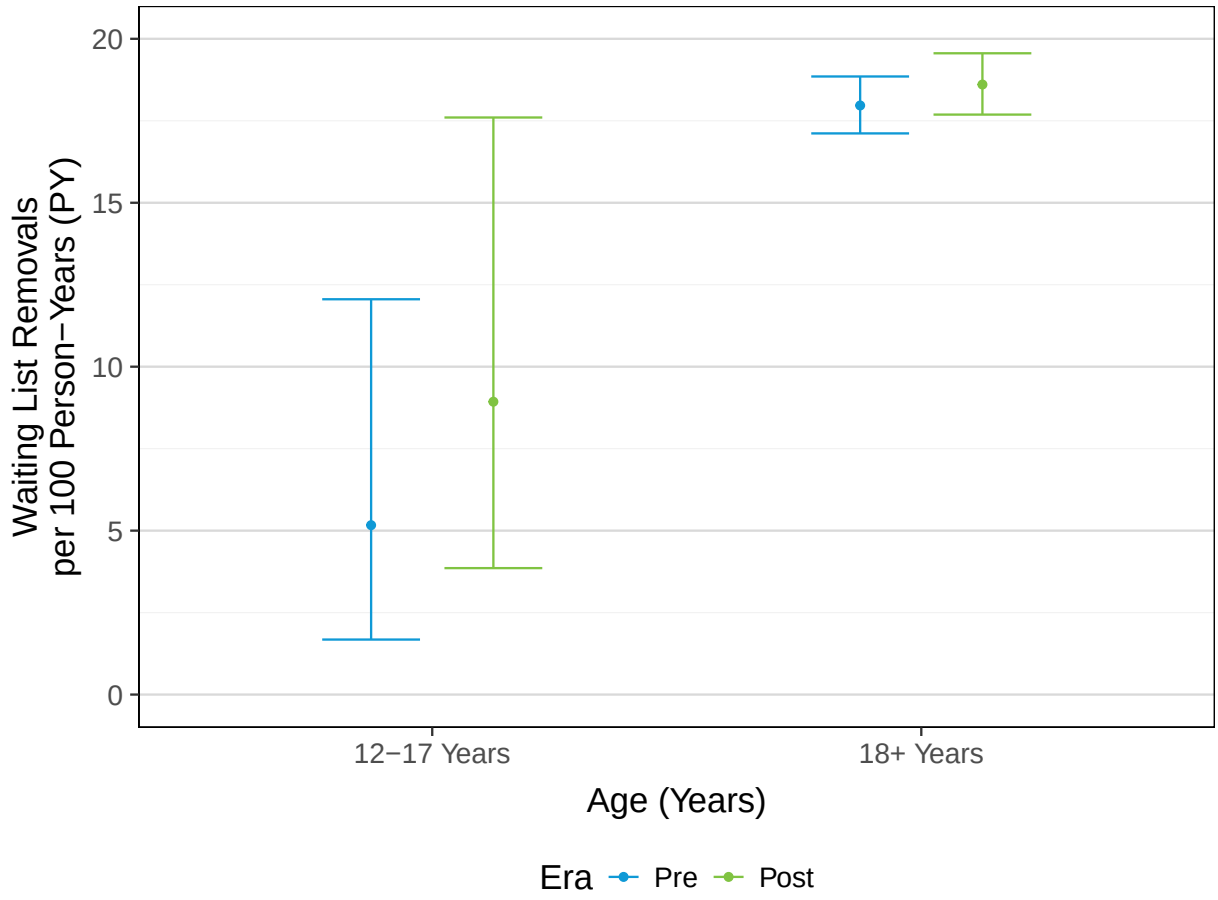


Table 5. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Age and Era

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	Age (Years)	N	N	PY	Estimate	95% CI
Pre	12-17 Years	233	5	96.8	5.17	(1.68, 12.06)
	18+ Years	21206	1667	9278.1	17.97	(17.11, 18.85)
Post	12-17 Years	249	8	89.6	8.93	(3.86, 17.60)
	18+ Years	21510	1541	8282.3	18.61	(17.69, 19.56)

Figure 6 and **Table 6** 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 87.03 (85.15, 88.95) transplants per 100 active person-years waiting pre-policy to 110.13 (107.89, 112.41) transplants per 100 active person-years waiting post-policy. This increase was statistically significant.

Figure 6. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Era

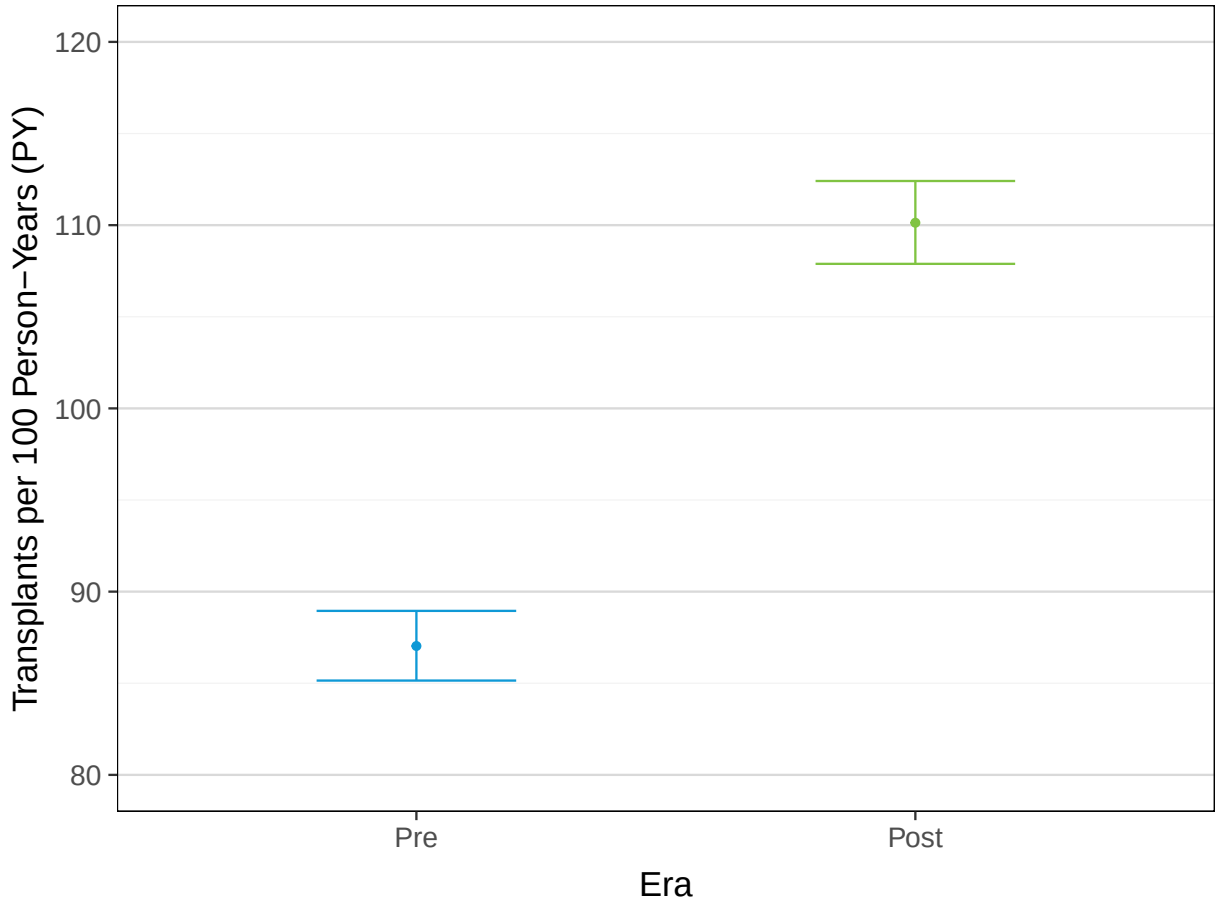


Table 6. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Era

	Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	N	N	PY	Estimate	95% CI
Pre	21056	8091	9296.6	87.03	(85.15, 88.95)
Post	21397	9164	8321.0	110.13	(107.89, 112.41)

Figure 7 and **Table 7** 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 increased for both males and females, with females seeing a larger increase in transplant rate. This larger, post-policy transplant rate for females is statistically insignificant, and resulted in females have slightly higher (but not statistically significant) transplant rates than males in the current era. Note that within each sex, the number of candidates ever waiting remained fairly similar across policy eras.

Figure 7. 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

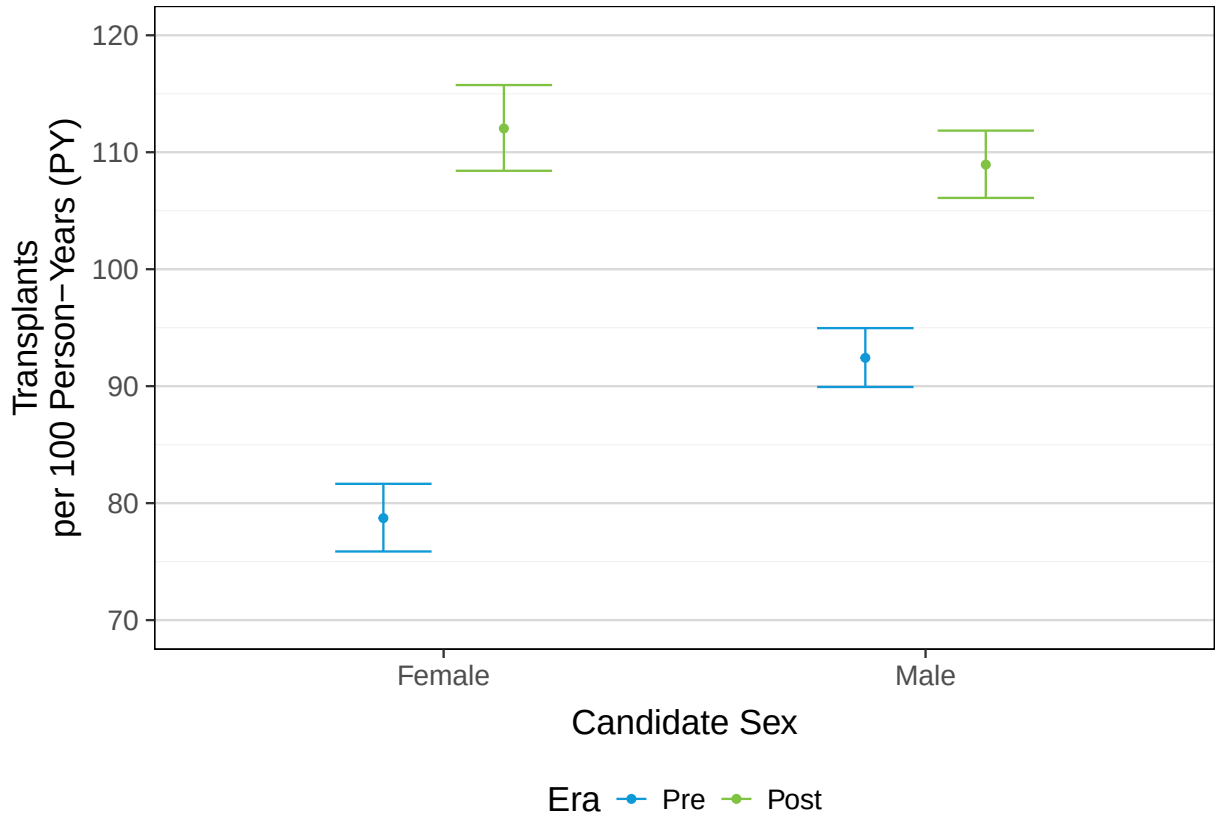
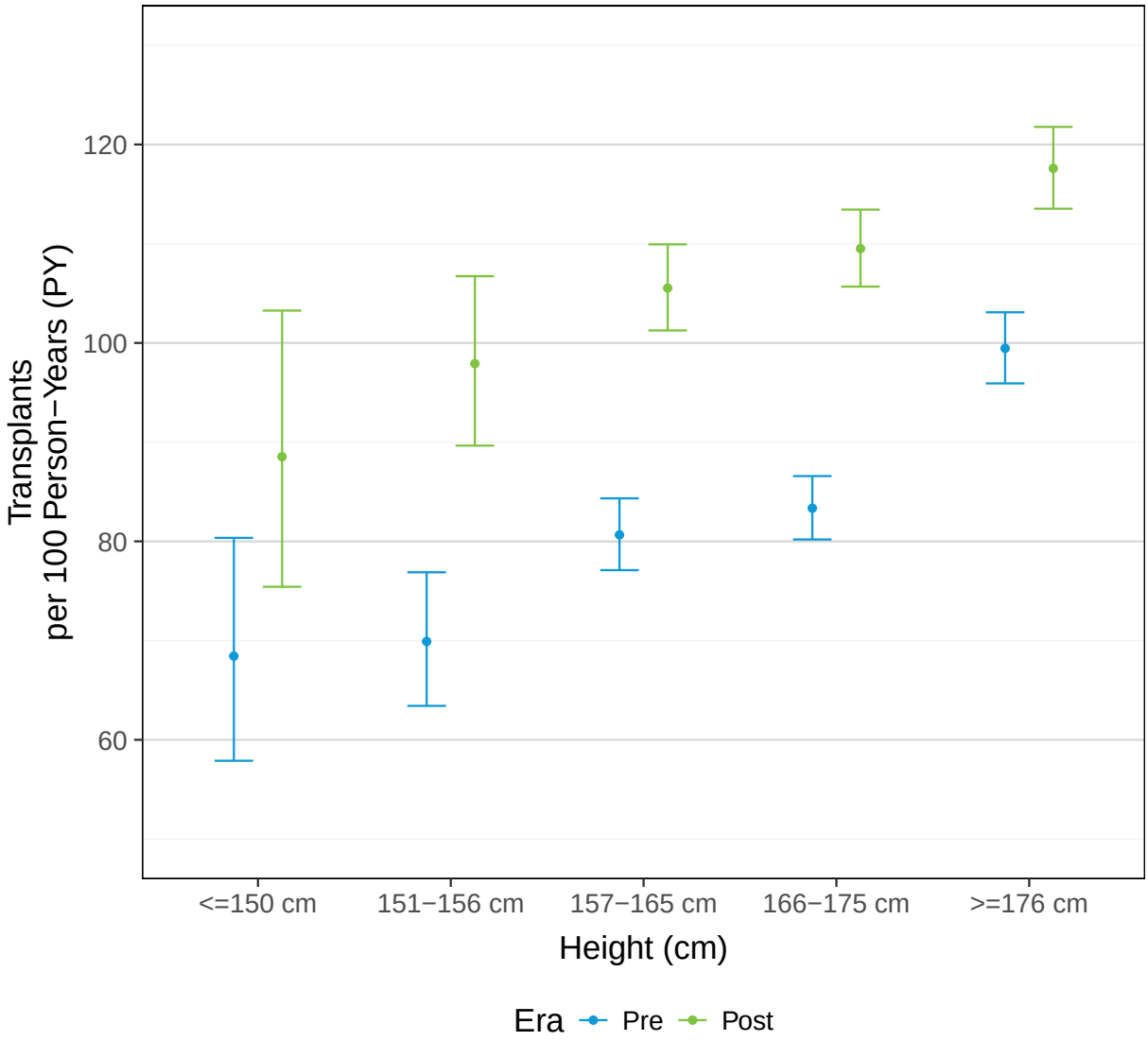


Table 7. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Candidate Sex for the Purposes of Adult MELD Calculation and Era

		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	Candidate Sex	N	N	PY	Estimate	95% CI
Pre	Female	8108	2873	3649.6	78.72	(75.87, 81.65)
	Male	12950	5219	5646.9	92.42	(89.93, 94.96)
Post	Female	8665	3620	3231.2	112.03	(108.41, 115.74)
	Male	12734	5545	5089.8	108.94	(106.09, 111.85)

Figure 8 and **Table 8** 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 waiting list 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 increased across all height groups post-policy with all, but for the height group of <= 150 cm, being statistically significant. Similar results were seen when examined among candidates aged 18 years and older (Appendix Figure 17 and Appendix Table 14).

Figure 8. 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. 9 registrations in the pre−policy era and 10 registrations in the post−policy era were excluded.

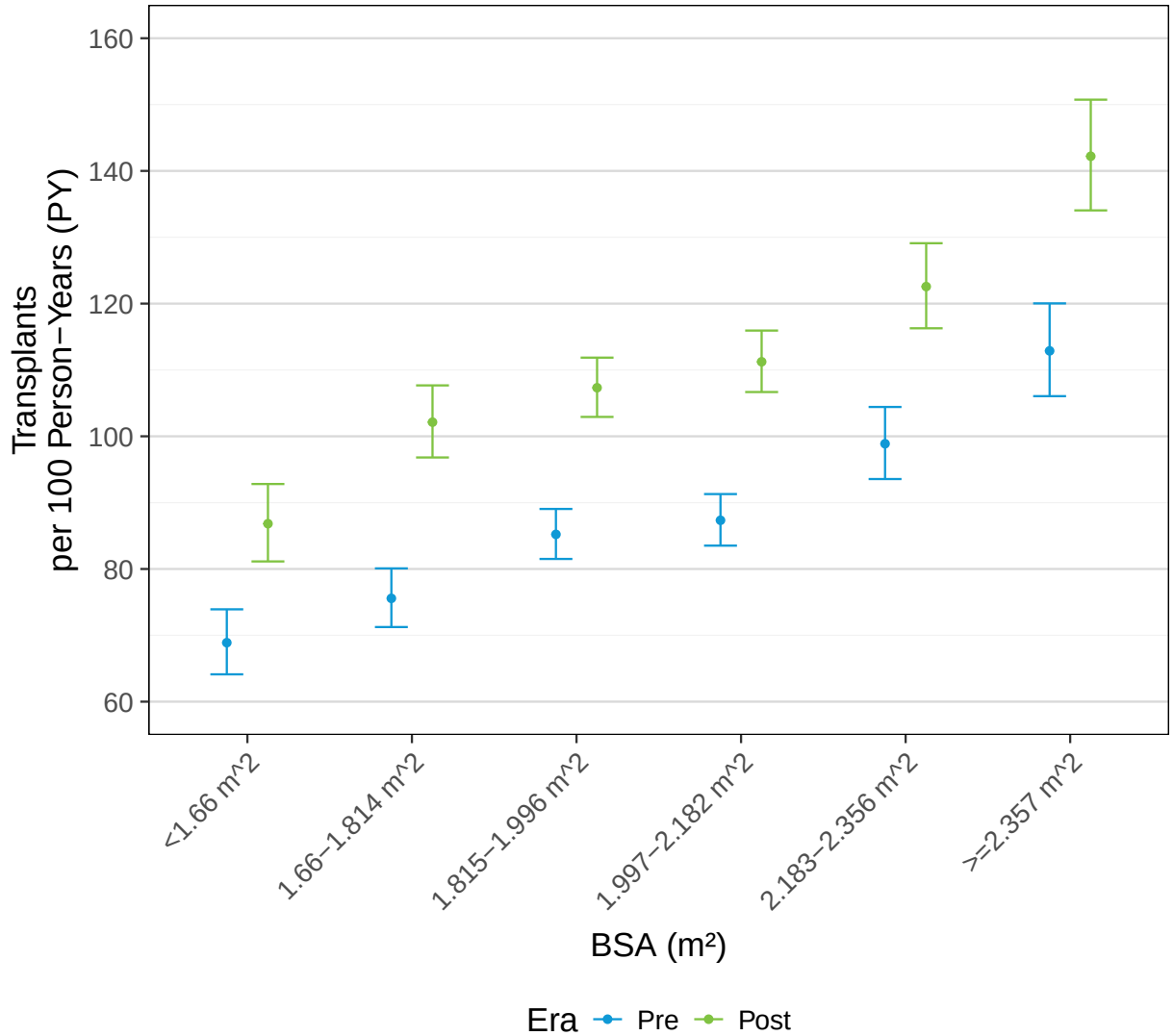
Table 8. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Height and Era

		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	Height (cm)	N	N	PY	Estimate	95% CI
Pre	<=150 cm	466	149	217.7	68.44	(57.89, 80.35)
	151-156 cm	1309	425	607.9	69.91	(63.42, 76.89)
	157-165 cm	5375	1932	2395.3	80.66	(77.10, 84.34)
	166-175 cm	7181	2640	3167.7	83.34	(80.19, 86.58)
	>=176 cm	7168	2988	3004.4	99.46	(95.92, 103.09)
Post	<=150 cm	481	162	183.0	88.53	(75.42, 103.26)
	151-156 cm	1330	517	528.0	97.91	(89.65, 106.73)
	157-165 cm	5705	2297	2176.7	105.53	(101.26, 109.93)
	166-175 cm	7280	3085	2817.2	109.50	(105.67, 113.44)
	>=176 cm	7036	3153	2681.2	117.60	(113.53, 121.77)

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

Figure 9 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 increased significantly across all BSA groups post-policy. Similar results were seen when examined among candidates aged 18 years and older (Appendix Figure 19 and Appendix Table 16).

Figure 9. 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. 26 registrations in the pre−policy era and 24 registrations in the post−policy era were excluded.

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

		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	BSA (m^2)	N	N	PY	Estimate	95% CI
Pre	<1.66 m^2	2433	774	1123.5	68.89	(64.12, 73.92)
	1.66-1.814 m^2	3312	1140	1508.5	75.57	(71.25, 80.09)
	1.815-1.996 m^2	5408	1987	2331.7	85.22	(81.51, 89.05)
	1.997-2.182 m^2	5154	1963	2247.6	87.34	(83.52, 91.29)
	2.183-2.356 m^2	3108	1291	1305.7	98.88	(93.55, 104.42)
	>=2.357 m^2	2288	1018	901.9	112.88	(106.05, 120.03)
Post	<1.66 m^2	2521	866	997.4	86.83	(81.14, 92.81)
	1.66-1.814 m^2	3479	1377	1348.3	102.13	(96.81, 107.67)
	1.815-1.996 m^2	5400	2242	2089.1	107.32	(102.92, 111.85)
	1.997-2.182 m^2	5245	2239	2012.9	111.23	(106.67, 115.94)
	2.183-2.356 m^2	3120	1423	1161.0	122.57	(116.28, 129.10)
	>=2.357 m^2	2296	1133	796.7	142.21	(134.05, 150.74)

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.
26 registrations in the pre-policy era and 24 registrations in the post-policy era were excluded.

Transplant

Figure 10 and **Table 10** show the number of liver-alone transplants among recipients aged 12 years and older by policy era. There were 17633 total transplants among recipients aged 12 years and older in the study period. 8267 of these transplants occurred in the pre-policy era and 9366 occurred in the post-policy era.

Figure 10. Count of Liver Transplants among Recipients Aged 12 Years and Older by Era

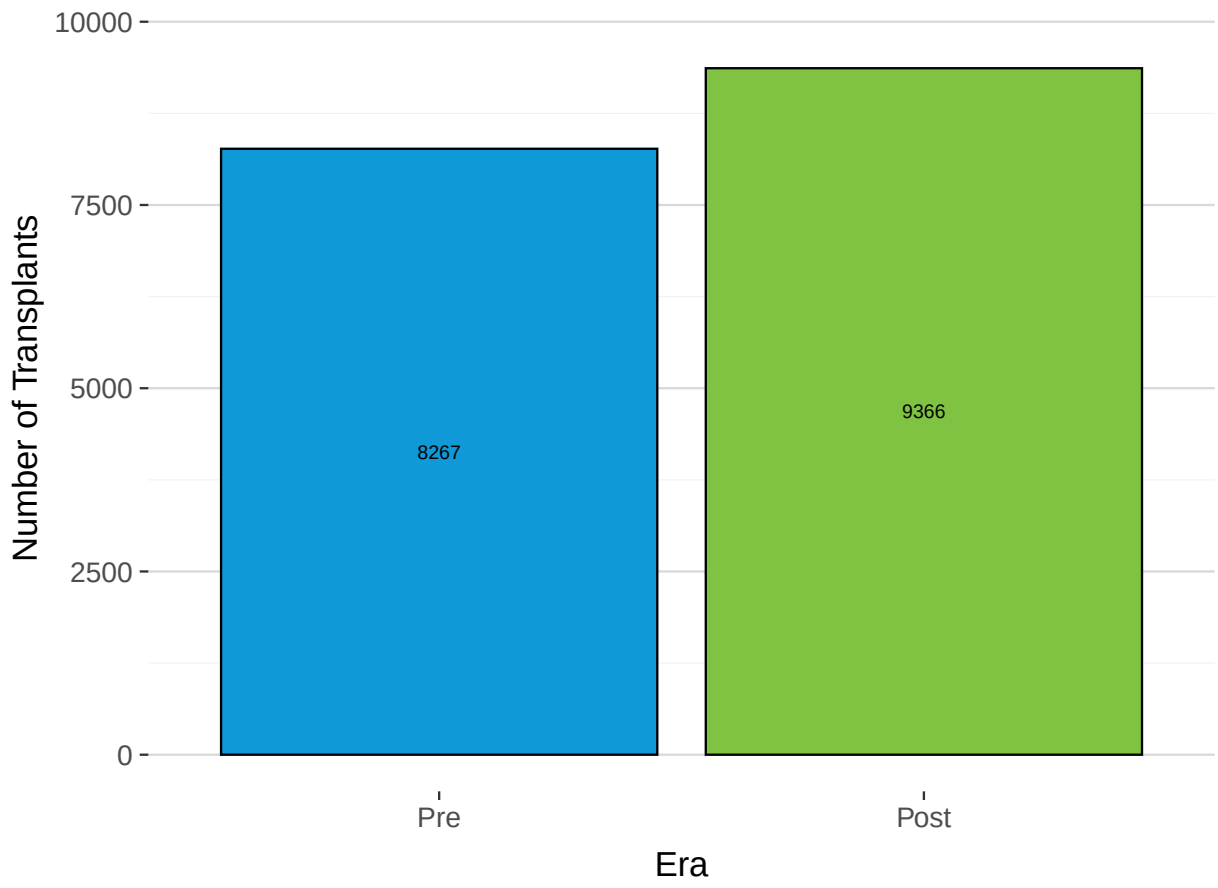


Table 10. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Era

Era	N (%)
Pre	8,267 (46.9%)
Post	9,366 (53.1%)
Total	17,633 (100.0%)

Figure 11 and **Table 11** 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 2,933 (35.5%) pre-policy to 3,715 (39.7%) post-policy.

Figure 11. 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

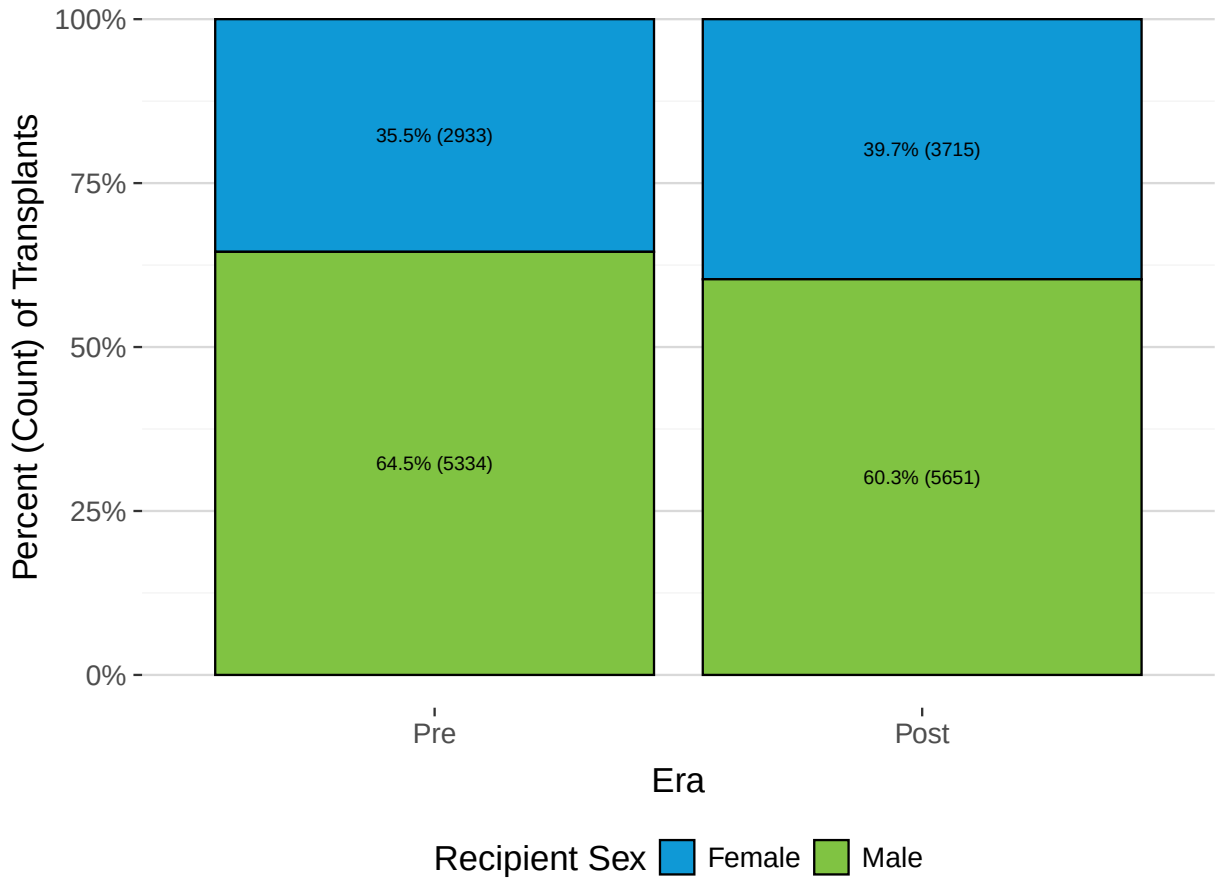


Table 11. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Recipient Sex for the Purposes of Adult MELD Calculation and Era

Recipient Sex	Pre	Post
Female	2,933 (35.5%)	3,715 (39.7%)
Male	5,334 (64.5%)	5,651 (60.3%)
Total	8,267 (100.0%)	9,366 (100.0%)

Figure 12, **Figure 13**, and **Table 12** show the distribution of allocation MELD score at transplant for liver-alone transplant recipients aged 12 years and older by era. The 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 decreasing slightly (28 pre-policy and 27 post-policy).

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

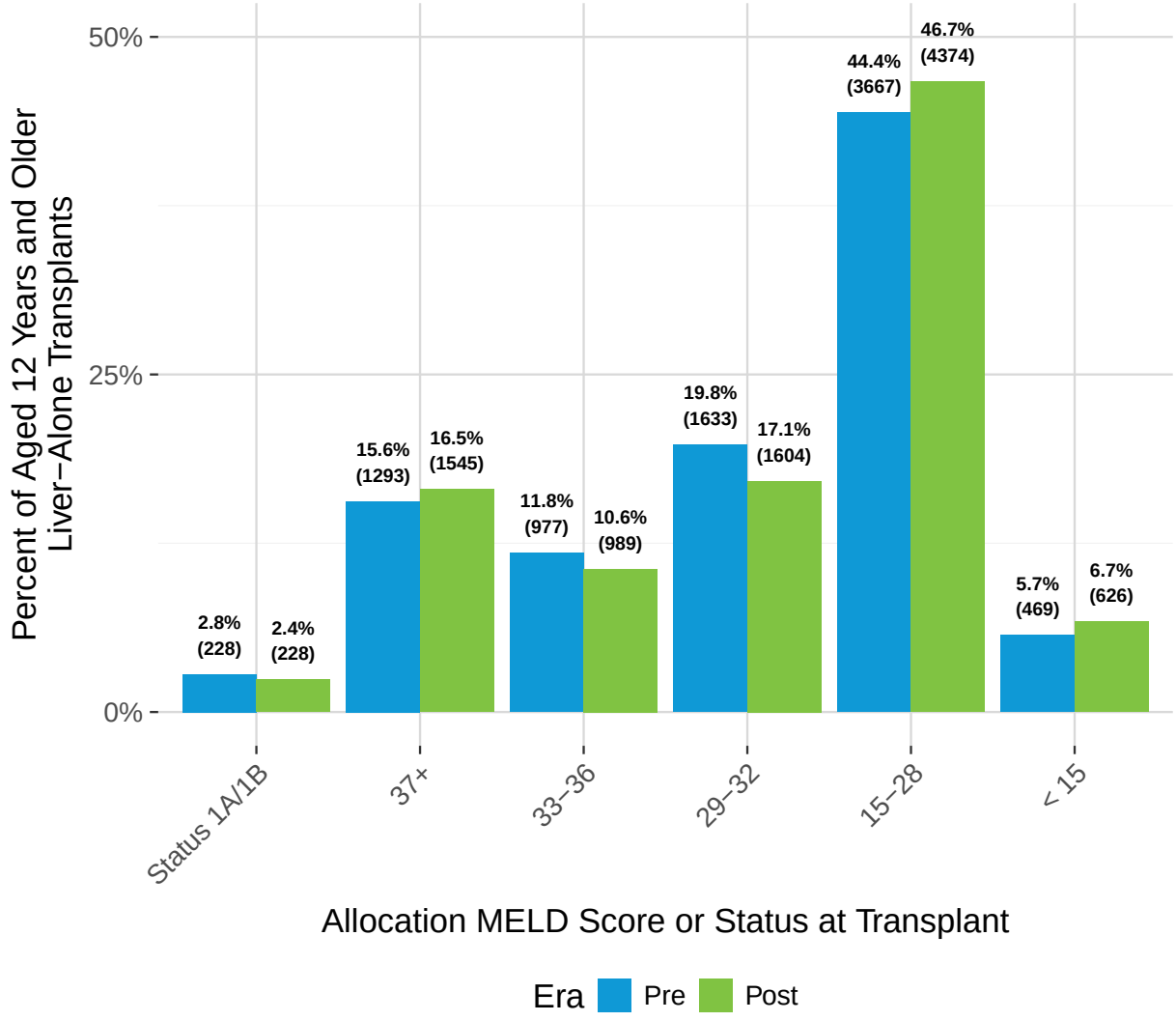
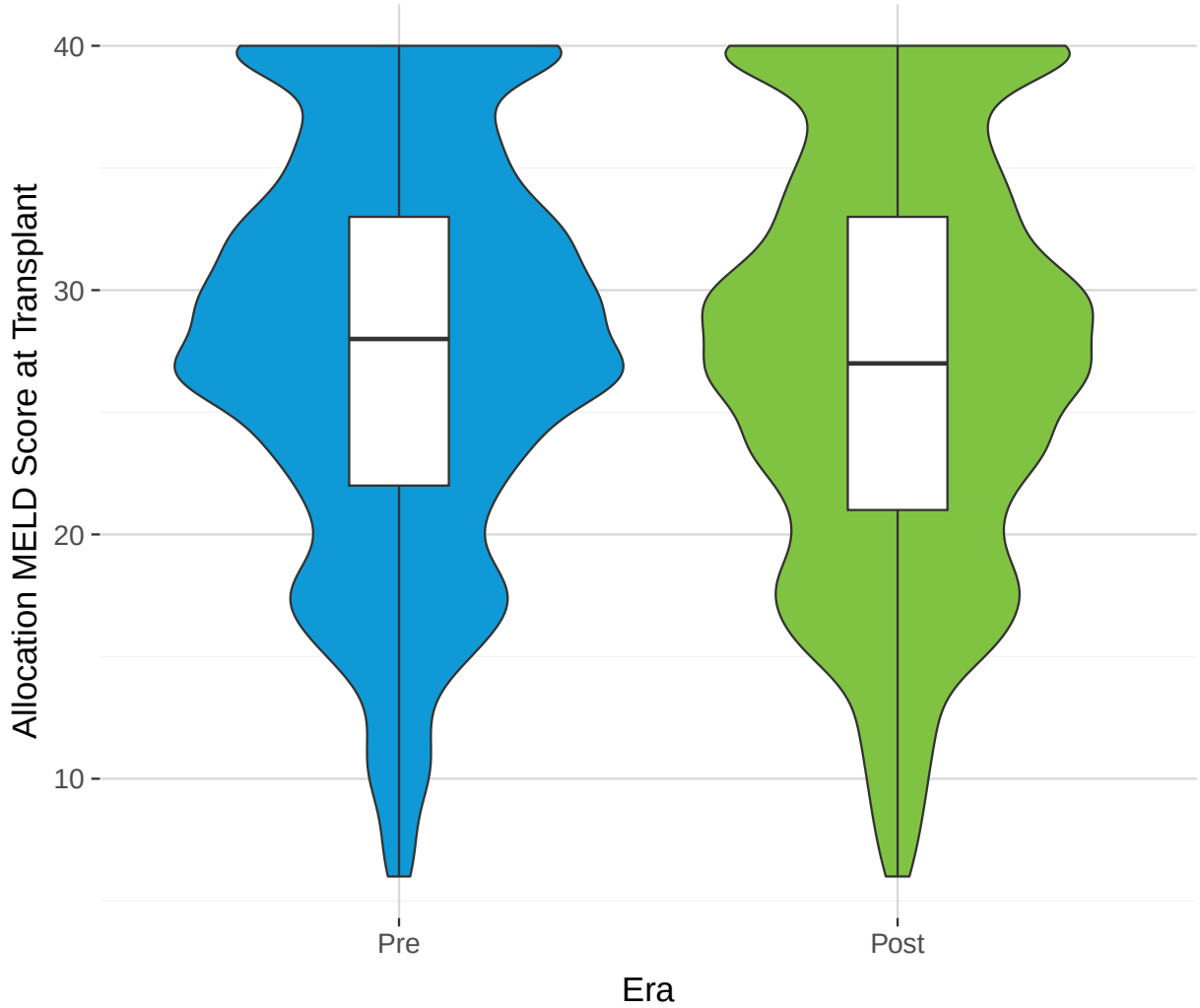


Figure 13. Distribution of Allocation MELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Era



Status 1A/1B candidates do not have allocation MELD scores at transplant. As a result, 228 (2.8%) pre−policy recipients and 228 (2.4%) post−policy recipients were excluded.

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

Era	Transplants	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
Pre	8039	6	22	28	33	40	11
Post	9138	6	21	27	33	40	12

Status 1A/1B candidates do not have allocation MELD scores at transplant. As a result, 228 (2.8%) pre-policy recipients and 228 (2.4%) post-policy recipients were excluded.

Figure 14, **Figure 15**, and **Table 13** 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 for males and decreased for females, with the score being higher in both policy eras for females (Pre: 29; Post: 28) when compared to males (Pre: 27; Post: 27). The interquartile range, which captures the middle 50% of allocation MELD scores at transplant, increased slightly for females pre- to post-policy (Pre: 23-34; Post: 22-34), and increased slightly for males pre- to post-policy (Pre: 22-33; Post: 20-33).

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

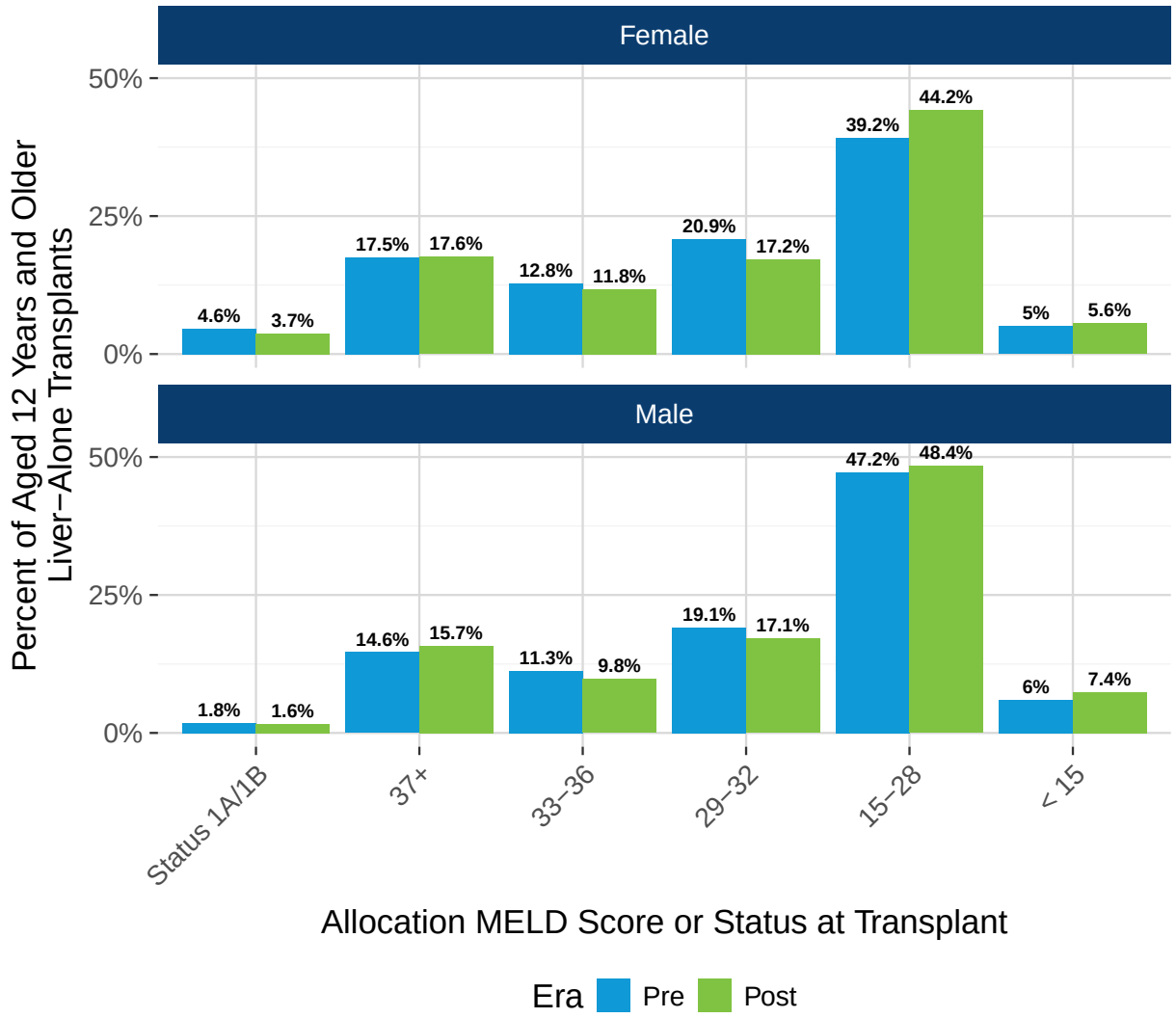
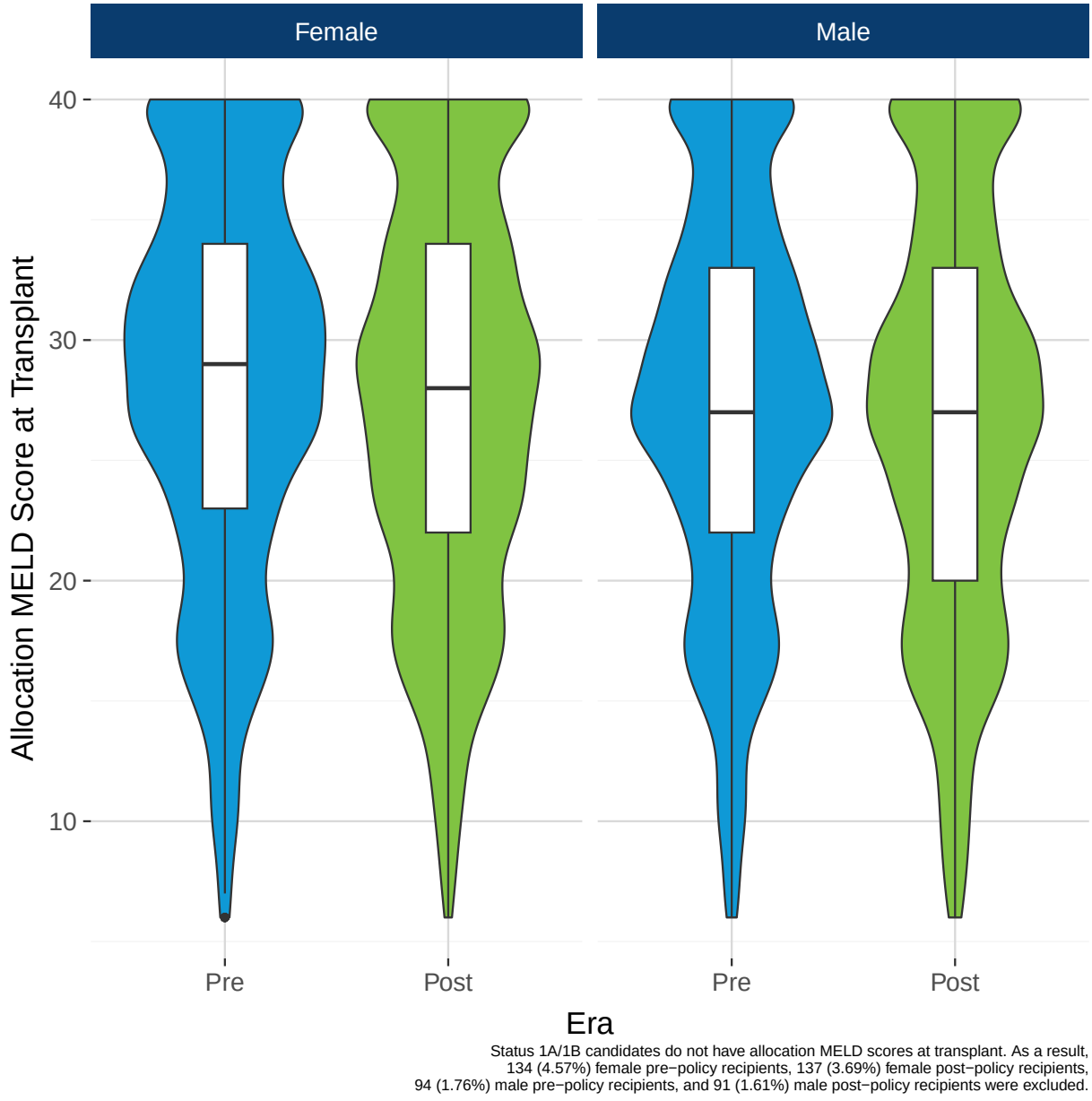


Figure 15. Distribution of Allocation MELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Recipient Sex and Era



Status 1A/1B candidates do not have allocation MELD scores at transplant. As a result, 134 (4.57%) female pre−policy recipients, 137 (3.69%) female post−policy recipients, 94 (1.76%) male pre−policy recipients, and 91 (1.61%) male post−policy recipients were excluded.

Table 13. Summary of Allocation MELD Score at Transplant for Liver-Alone 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	2799	6	23	29	34	40	11
	Post	3578	6	22	28	34	40	12
Male	Pre	5240	6	22	27	33	40	11
	Post	5560	6	20	27	33	40	13

Status 1A/1B candidates do not have allocation MELD scores at transplant. As a result, 134 (4.57%) female pre-policy recipients, 137 (3.69%) female post-policy recipients, 94 (1.76%) male pre-policy recipients, and 91 (1.61%) male post-policy recipients were excluded.

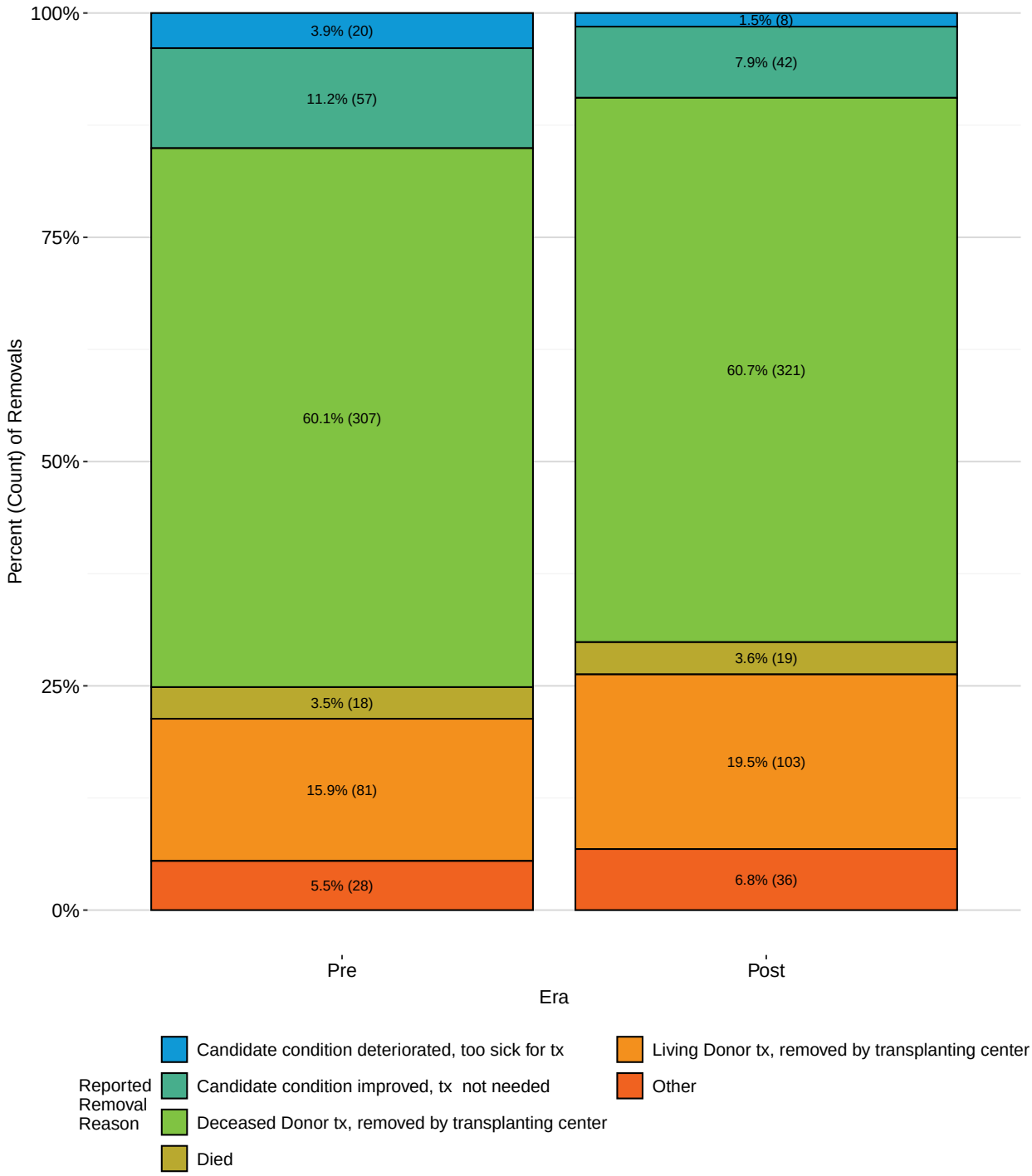
PELD-Cr Results

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 16 and **Table 14** show the number of liver candidates aged 0-11 years who were removed from the waiting list by reported removal reason and policy era. 511 candidates were removed in the pre-policy era and 529 candidates were removed in the post-policy era. Deceased donor transplant made up the largest number and proportion of removal reasons (Pre: 307 (60.1%); Post: 321 (60.7%)), followed by living donor transplant (Pre: 81 (15.9%); Post: 103 (19.5%)) and "Candidate condition improved, transplant not needed" (Pre: 57 (11.2%); Post: 42 (7.9%)).

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



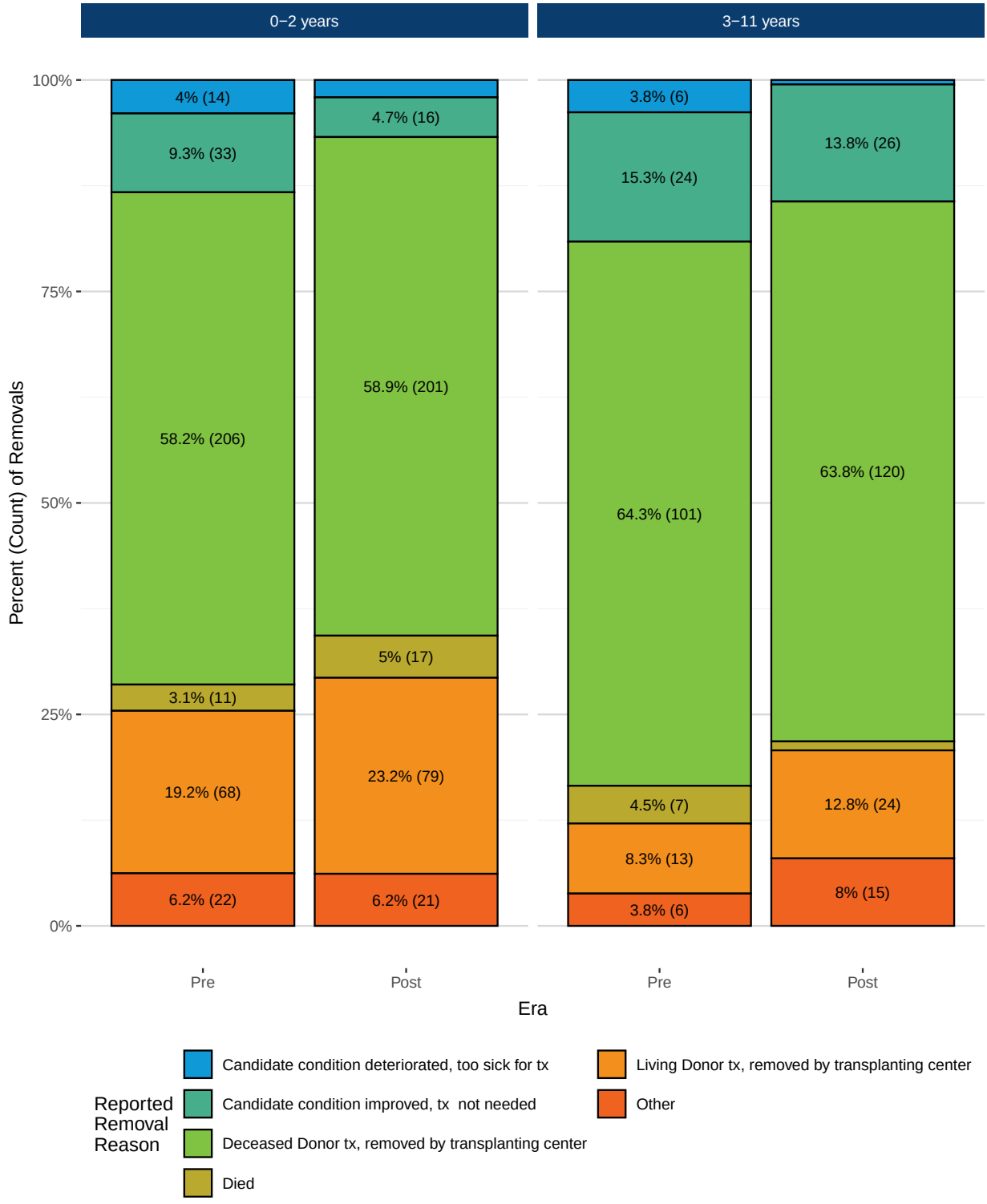
*Removal reasons containing <3% of forms were combined with the Other category for plotting purposes, but appear in the corresponding table.

Table 14. 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	307 (60.1%)	321 (60.7%)
Living Donor tx, removed by transplanting center	81 (15.9%)	103 (19.5%)
Candidate condition improved, tx not needed	57 (11.2%)	42 (7.9%)
Candidate condition deteriorated, too sick for tx	20 (3.9%)	8 (1.5%)
Died	18 (3.5%)	19 (3.6%)
Transplant at another center (multi-listed)	17 (3.3%)	16 (3.0%)
Transferred to another center	8 (1.6%)	8 (1.5%)
Other	2 (0.4%)	10 (1.9%)
Refused transplant	1 (0.2%)	0 (0.0%)
Patient died during TX procedure	0 (0.0%)	1 (0.2%)
Unable to contact candidate	0 (0.0%)	1 (0.2%)
Total	511 (100.0%)	529 (100.0%)

Figure 17 and **Table 15** 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; living donor transplant; 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 slightly increased pre- to post-policy (Pre: 206 (58.2%); Post: 201 (58.9%)). The proportion of candidates aged 3-11 years old at time of removal who were removed for deceased donor transplant slightly decreased pre- to post-policy while the number of transplants increased (Pre: 101 (64.3%); Post: 120 (63.8%)).

Figure 17. 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 15. 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

	0-2 Years		3-11 Years	
Reported Removal Reason	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	206 (58.2%)	201 (58.9%)	101 (64.3%)	120 (63.8%)
Living Donor tx, removed by transplanting center	68 (19.2%)	79 (23.2%)	13 (8.3%)	24 (12.8%)
Candidate condition improved, tx not needed	33 (9.3%)	16 (4.7%)	24 (15.3%)	26 (13.8%)
Candidate condition deteriorated, too sick for tx	14 (4.0%)	7 (2.1%)	6 (3.8%)	1 (0.5%)
Transplant at another center (multi-listed)	14 (4.0%)	13 (3.8%)	3 (1.9%)	3 (1.6%)
Died	11 (3.1%)	17 (5.0%)	7 (4.5%)	2 (1.1%)
Transferred to another center	6 (1.7%)	2 (0.6%)	2 (1.3%)	6 (3.2%)
Other	1 (0.3%)	5 (1.5%)	1 (0.6%)	5 (2.7%)
Refused transplant	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Patient died during TX procedure	0 (0.0%)	1 (0.3%)	0 (0.0%)	0 (0.0%)
Unable to contact candidate	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.5%)
Total	354 (100.0%)	341 (100.0%)	157 (100.0%)	188 (100.0%)

Figure 18 and **Table 16** 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 decreased slightly from 15.65 (11.07, 21.48) removals per 100 person-years waiting pre-policy to 12.09 (7.96, 17.58) removals per 100 person-years waiting post-policy. This difference was not statistically significant.

Figure 18. 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

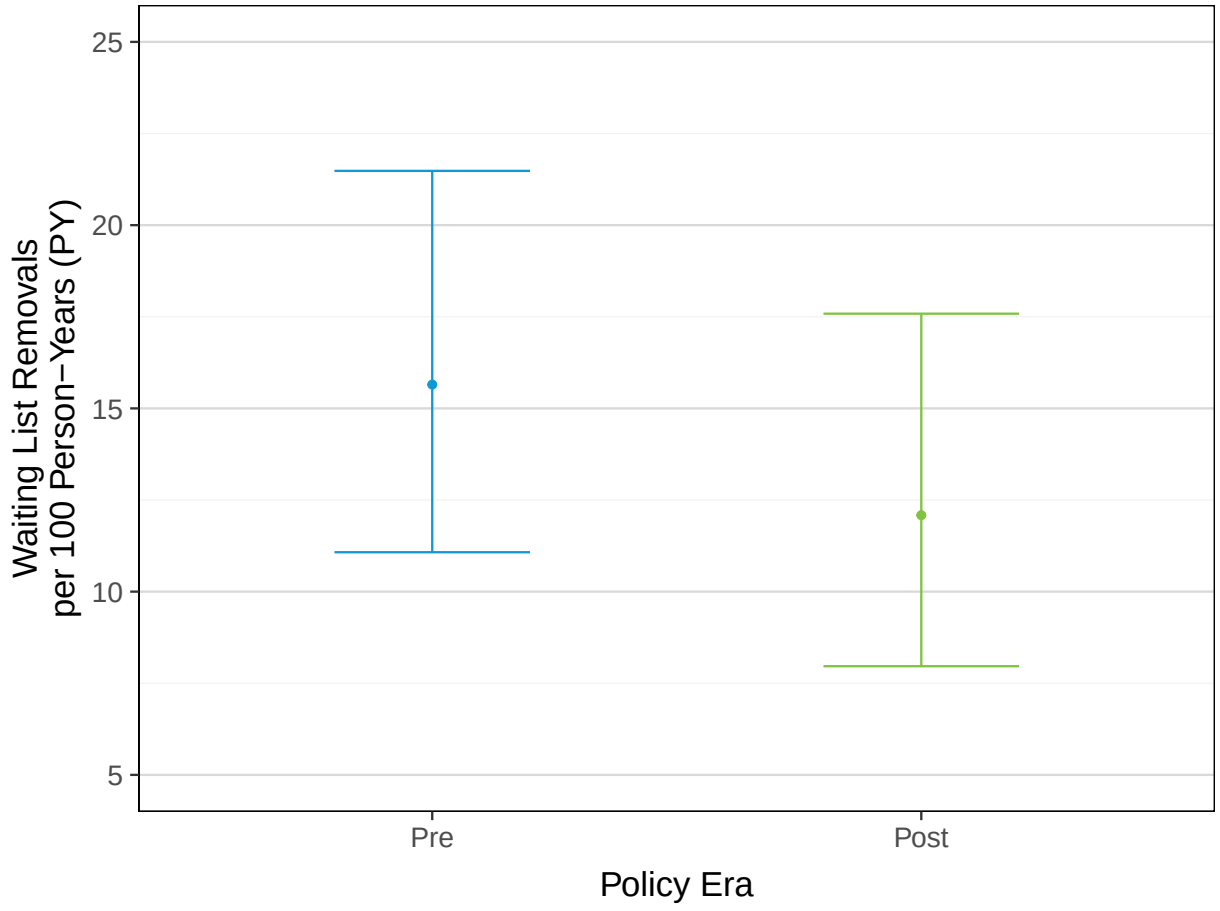


Table 16. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Era

	Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	N	N	PY	Estimate	95% CI
Pre	719	38	242.8	15.65	(11.07, 21.48)
Post	708	27	223.4	12.09	(7.96, 17.58)

Figure 19 and **Table 17** 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 for ages 0-2 and decreased post-policy for ages 3-11, although neither of these changes were statistically significant.

Figure 19. Liver-Alone 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

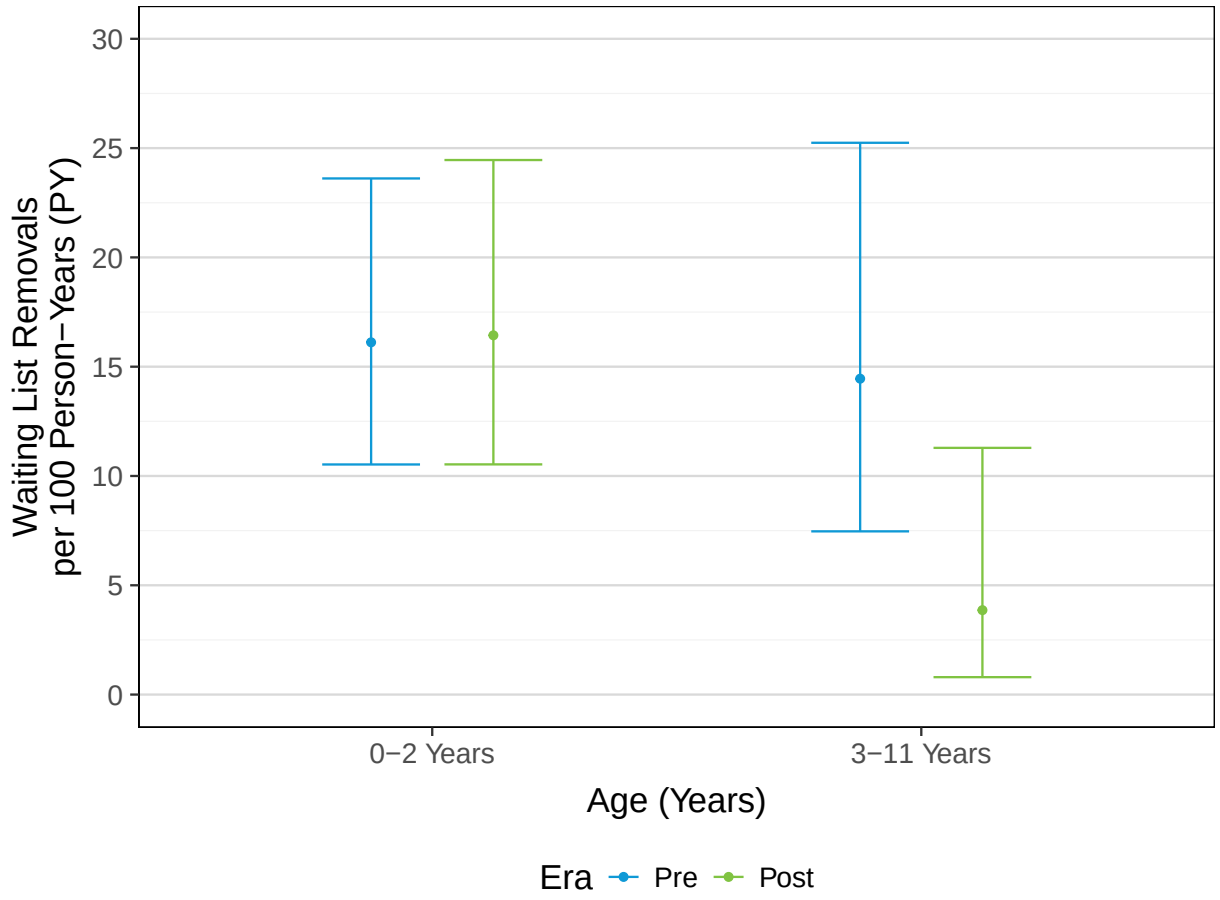


Table 17. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Age Group and Era

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	Age (Years)	N	N	PY	Estimate	95% CI
Pre	0-2 Years	518	26	161.3	16.11	(10.53, 23.61)
	3-11 Years	224	12	83.0	14.45	(7.47, 25.24)
Post	0-2 Years	484	24	146.0	16.44	(10.53, 24.45)
	3-11 Years	240	3	77.7	3.86	(0.80, 11.29)

Figure 20 and **Table 18** 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 124.79 (111.13, 139.66) transplants per 100 active person-years waiting pre-policy to 144.58 (129.24, 161.24) transplants per 100 active person-years waiting post-policy. This increase was not statistically significant.

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

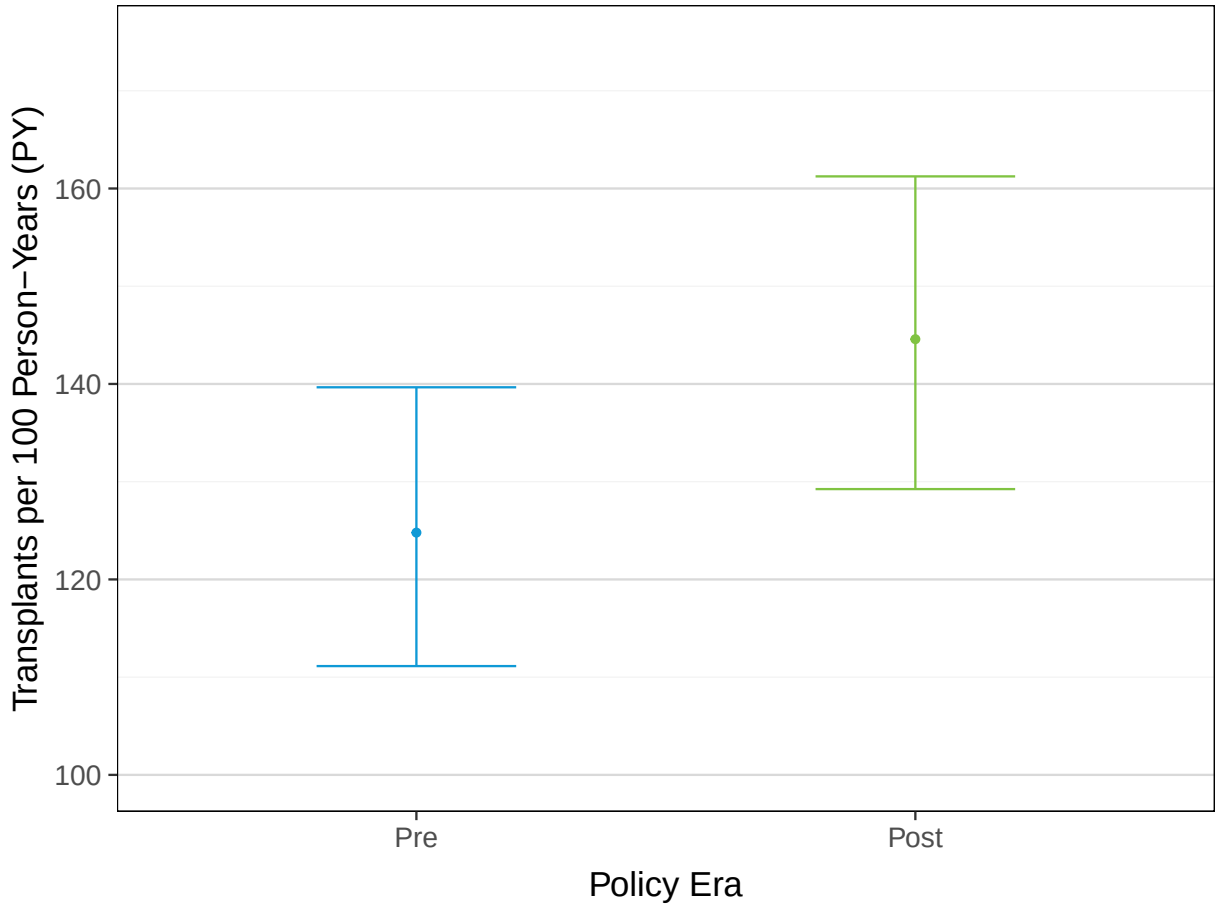


Table 18. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Era

	Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	N	N	PY	Estimate	95% CI
Pre	719	303	242.8	124.79	(111.13, 139.66)
Post	708	323	223.4	144.58	(129.24, 161.24)

Figure 21 and **Table 19** show liver-alone transplant rates per 100 active person-years waiting among candidates aged 0-11 years at listing by age group and era. Transplant rates increased pre- to post-policy for all age groups, and rates were more similar post-policy for the 0-2 and 3-11 years age groups compared to pre-policy. Differences in transplant rate across eras were not statistically significant.

Figure 21. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Age Group and Era

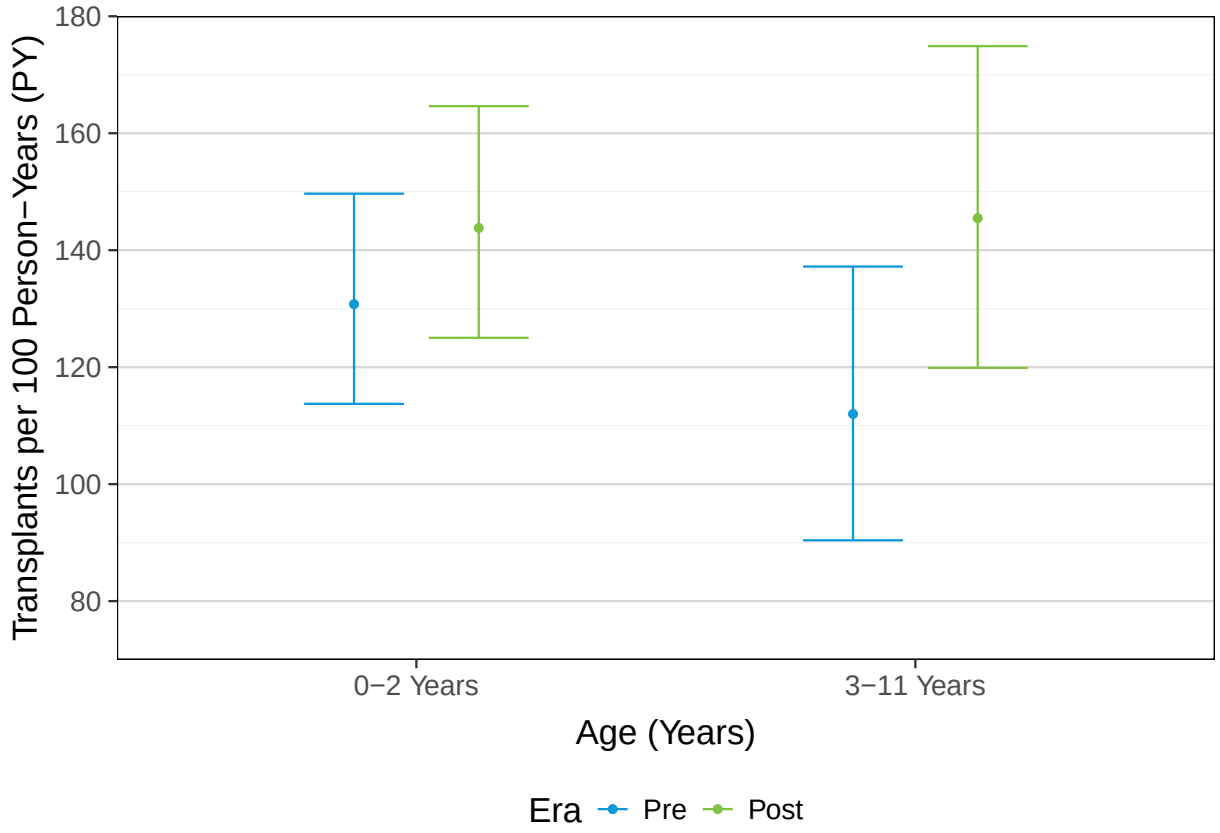


Table 19. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years at Listing by Age Group and Era

		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	Age (Years)	N	N	PY	Estimate	95% CI
Pre	0-2 Years	518	211	161.3	130.78	(113.73, 149.66)
	3-11 Years	224	93	83.0	112.00	(90.40, 137.20)
Post	0-2 Years	484	210	146.0	143.81	(125.02, 164.63)
	3-11 Years	240	113	77.7	145.47	(119.89, 174.89)

Transplant

Figure 22 and **Table 20** show the number of liver-alone transplants among recipients aged 0-11 years at time of transplant by policy era. There were 634 total transplants among recipients less than 12 years of age in the study period. 310 of these transplants occurred in the pre-policy era and 324 occurred in the post-policy era.

Figure 22. Number of Liver Transplants among Recipients Aged 0-11 Years at Time of Transplant by Era

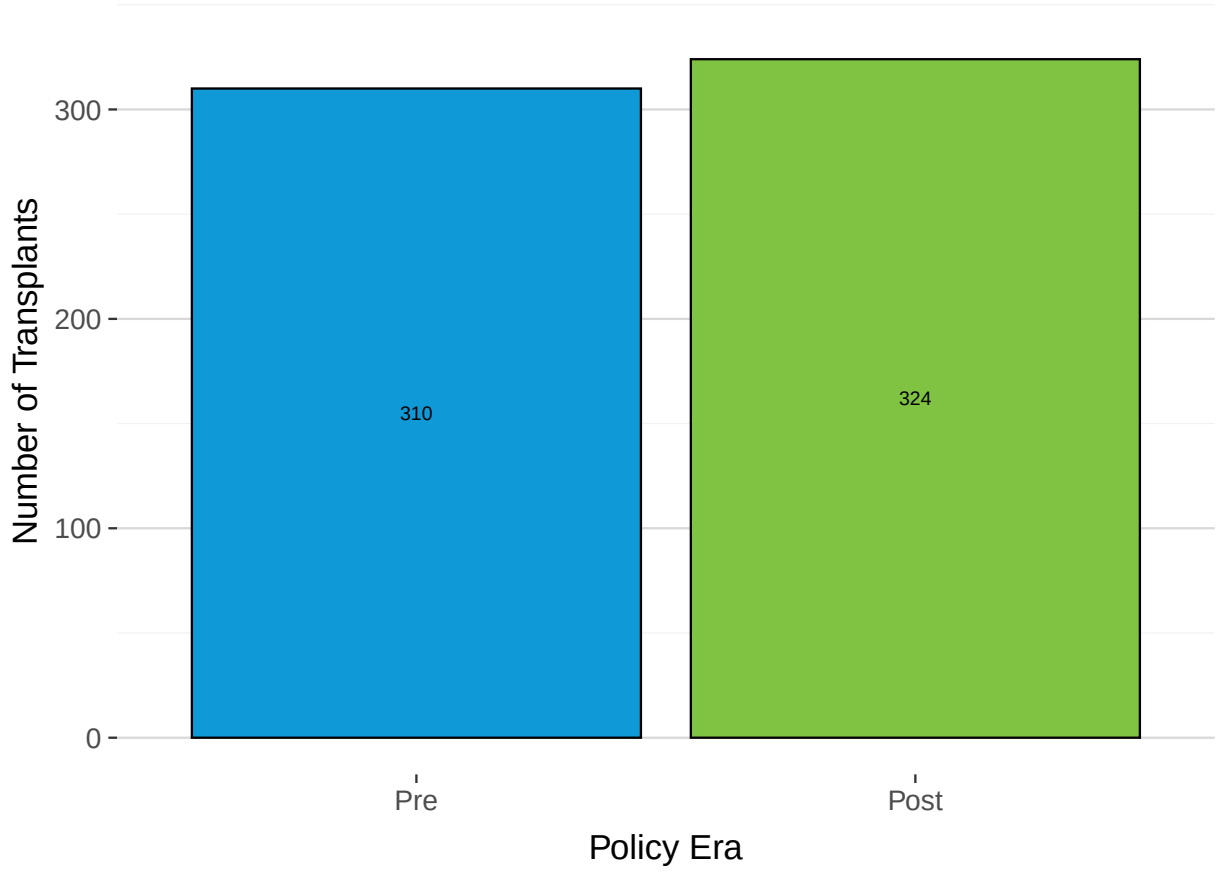


Table 20. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years at Time of Transplant by Era

Era	N (%)
Pre	310 (48.9%)
Post	324 (51.1%)
Total	634 (100.0%)

Figure 23 and **Table 21** 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 and proportion of transplant recipients 0-2 years old decreased pre- to post-policy (Pre: 206 (66.5%); Post: 203 (62.7%)).

Figure 23. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era

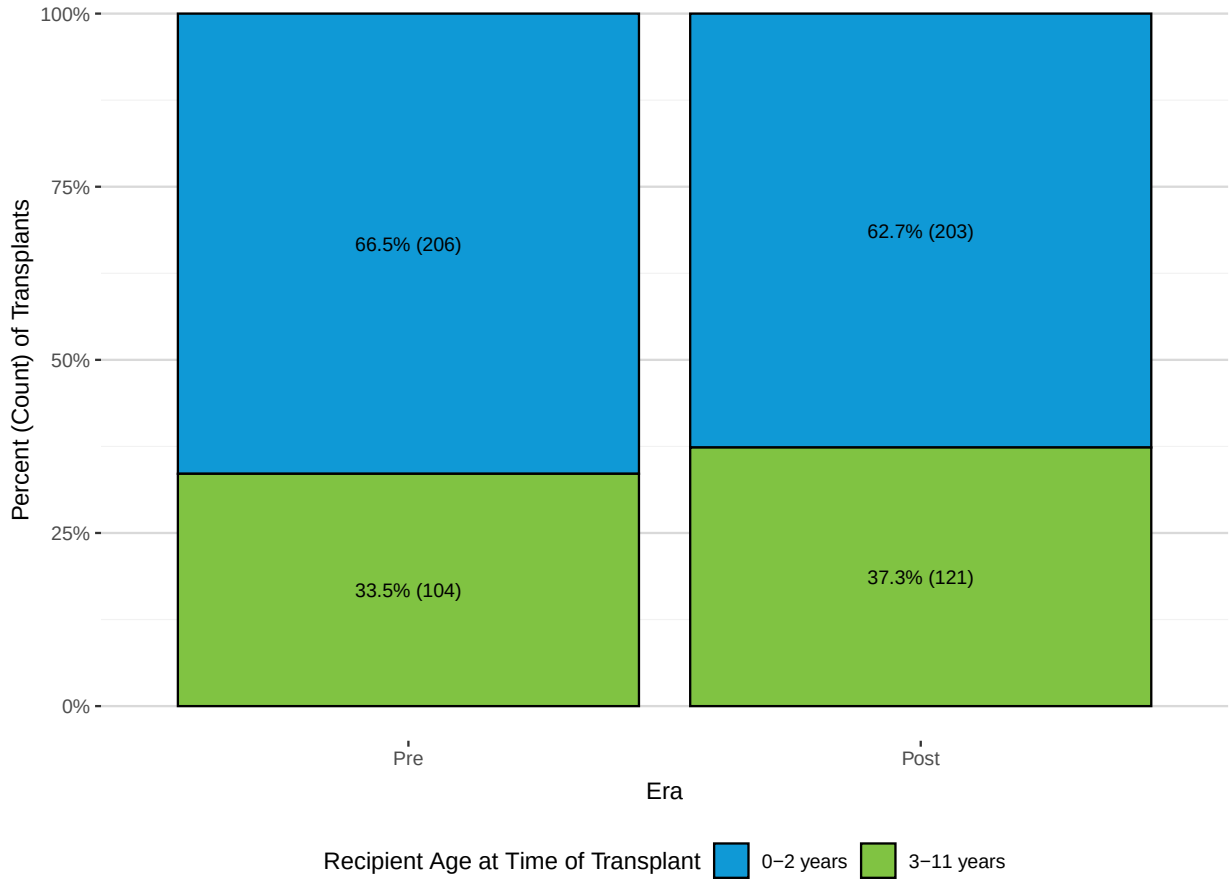


Table 21. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era

Recipient Age at Time of Transplant	Pre	Post
0-2 years	206 (66.5%)	203 (62.7%)
3-11 years	104 (33.5%)	121 (37.3%)
Total	310 (100.0%)	324 (100.0%)

Figure 24, **Figure 25**, and **Table 22** 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 sum total number and proportion of both Status 1A and Status 1B transplant recipients increased from 130 (41.94%) pre-policy to 143 (44.14%) 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 22-36 pre-policy to 21-34 post-policy.

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

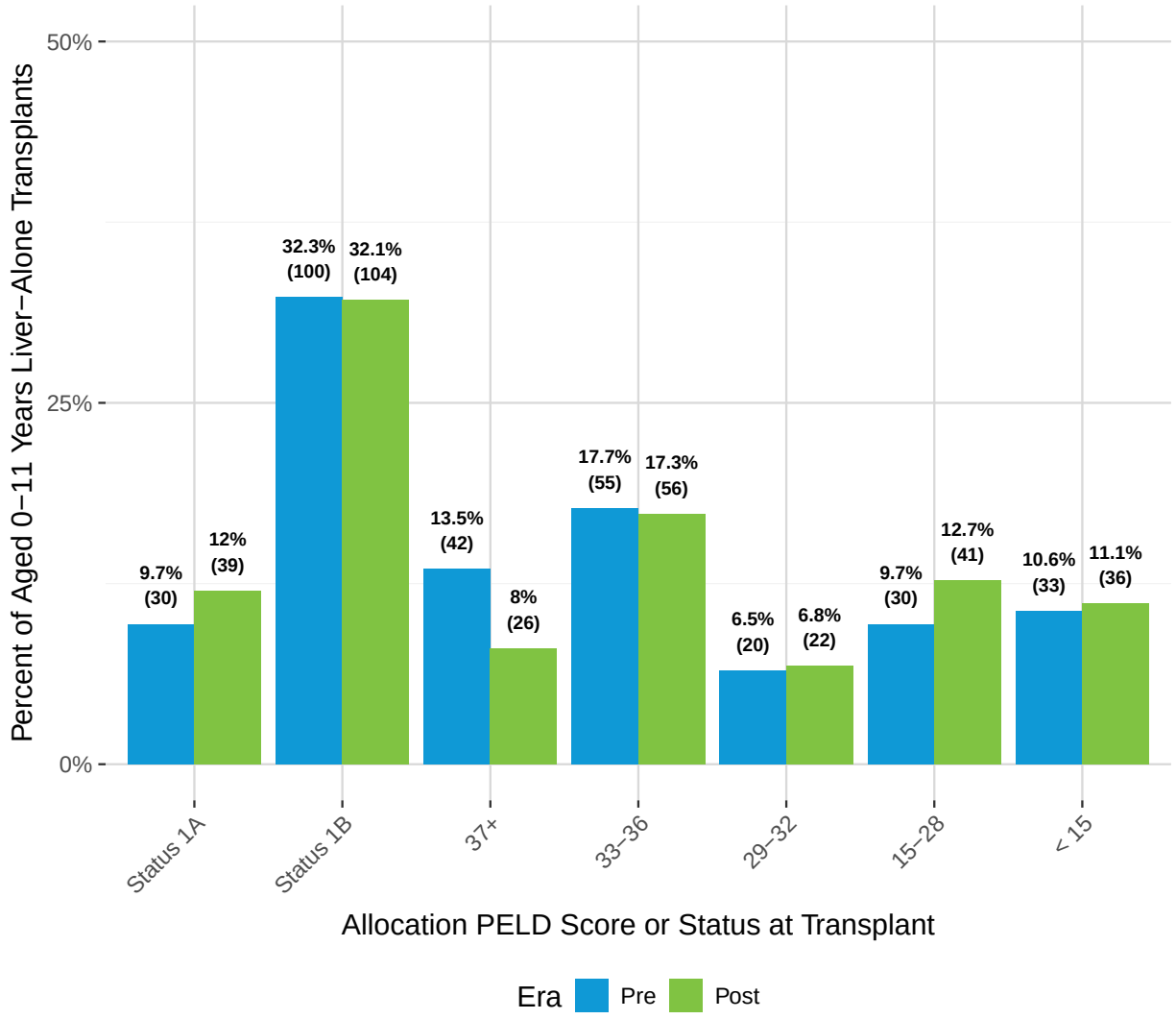
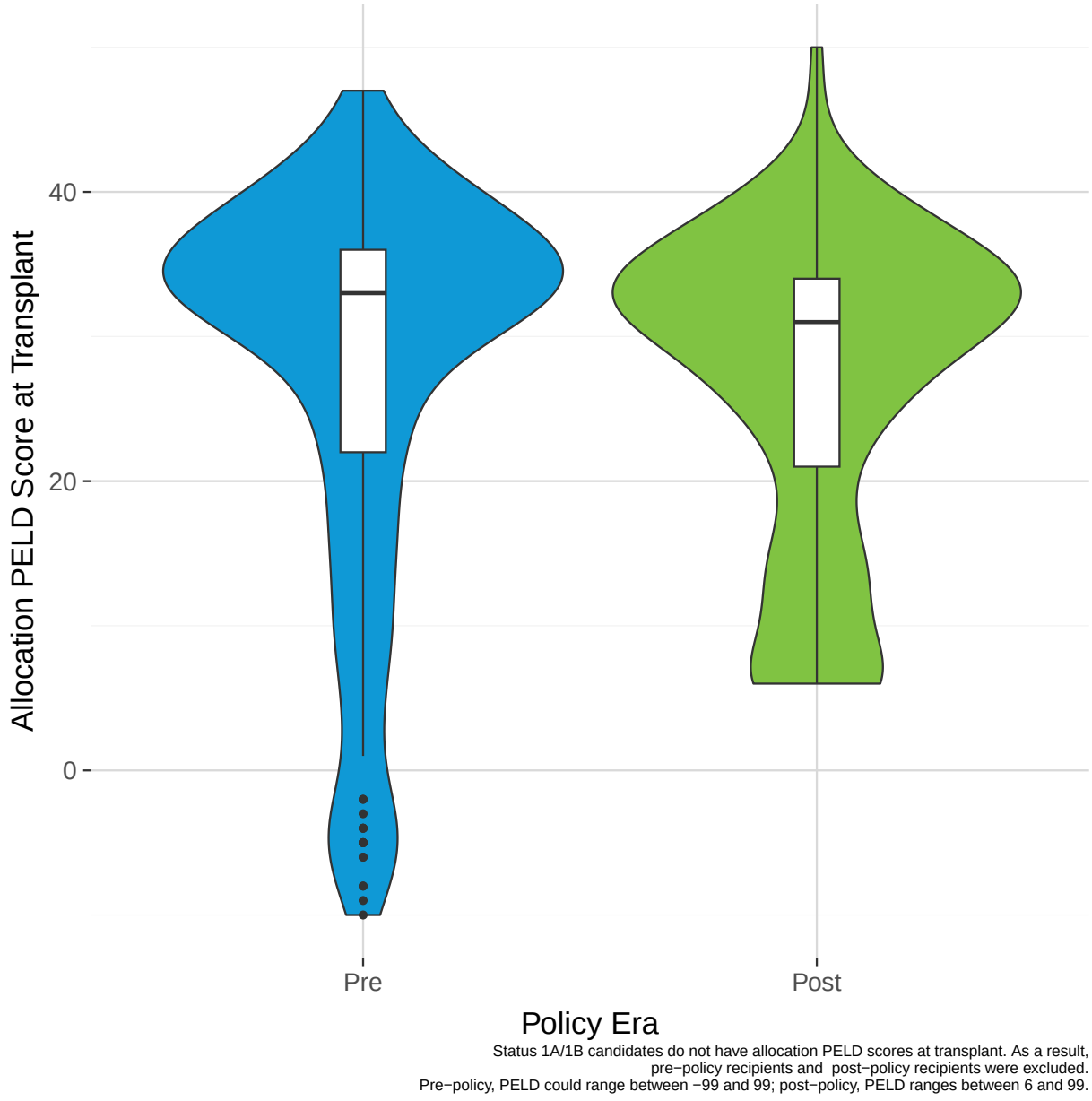


Figure 25. Distribution of Allocation PELD Score at Transplant for Liver-Alone Transplant Recipients Aged 0-11 Years at Time of Transplant by Era



Status 1A/1B candidates do not have allocation PELD scores at transplant. As a result, pre−policy recipients and post−policy recipients were excluded.
Pre−policy, PELD could range between −99 and 99; post−policy, PELD ranges between 6 and 99.

Table 22. Summary of Allocation PELD Score at Transplant for Liver-Alone Transplant Recipients Aged 0-11 Years at Time of Transplant by Era

Policy Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
Pre	180	-10	22	33	36	47	14
Post	181	6	21	31	34	50	13

Status 1A/1B candidates do not have allocation PELD scores at transplant. As a result, pre-policy recipients and post-policy recipients were excluded.

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

Figure 26, **Figure 27**, and **Table 23** 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 sum total number and proportion of both Status 1A and Status 1B transplant recipients decreased from 90 (43.69%) pre- to 86 (42.36%) post-policy. The proportion of PELD 37+ decreased for both age groups while the PELD 15-28 increased for the 0-2 age group. The median PELD score at transplant among recipients 0-2 years old remained the same pre- to post-policy (33), and the interquartile range, which captures the middle 50% of allocation PELD scores at transplant, increased slightly (Pre: 27.5-36; Post: 25-36).

Among transplant recipients 3-11 years old at the time of transplant, the number and proportion of Status 1A/1B transplant recipients increased from 40 (38.46%) pre-policy to 57 (47.11%) post-policy. The median PELD score at transplant among recipients 3-11 years old at the time of transplant decreased from 29 pre-policy to 28 post-policy. The interquartile range of allocation PELD scores at transplant for recipients 3-11 years old decreased as well (Pre: 4.8-35; Post: 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 26. Distribution of Allocation PELD Score or Status at Transplant for Liver-Alone Transplant Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era

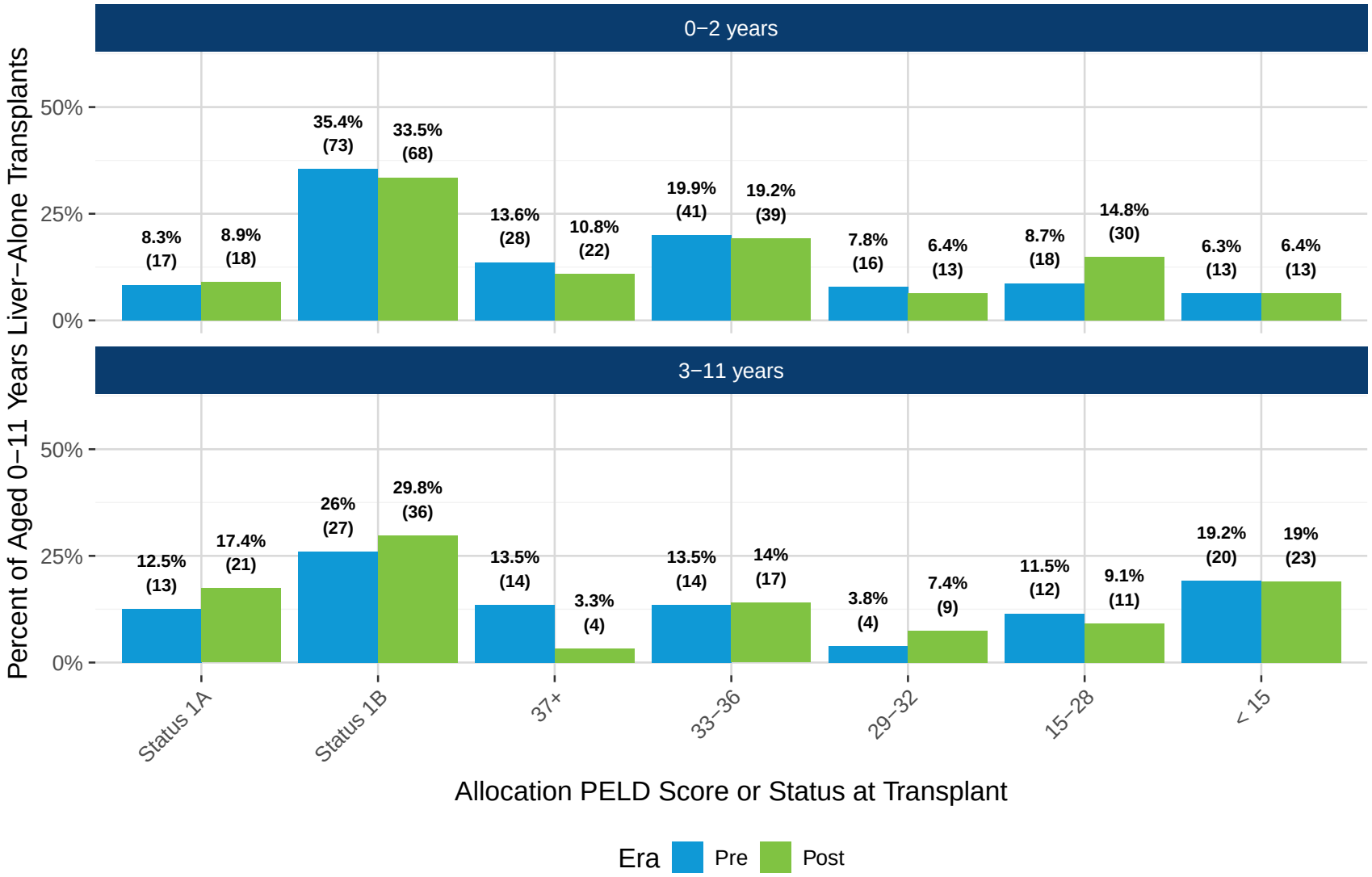


Figure 27. Distribution of Allocation PELD Score at Transplant for Liver-Alone Transplant Recipients Aged 0-11 Years by Recipient Age Group at Time of Transplant and Era

Status 1A/1B candidates do not have allocation PELD scores at transplant. As a result, pre–policy recipients aged 0–2 years, post–policy recipients aged 0–2 years, pre–policy recipients aged 3–11 years, and 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 23. Summary of Allocation PELD Score at Transplant for Liver-Alone 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	116	-8	28	33	36	47	8
	Post	117	6	25	33	36	50	11
3-11 years	Pre	64	-10	5	29	35	45	30
	Post	64	6	8	28	33	41	25

Status 1A/1B candidates do not have allocation PELD scores at transplant. As a result,
pre-policy recipients aged 0-2 years, post-policy recipients aged 0-2 years,
pre-policy recipients aged 3-11 years, and 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.

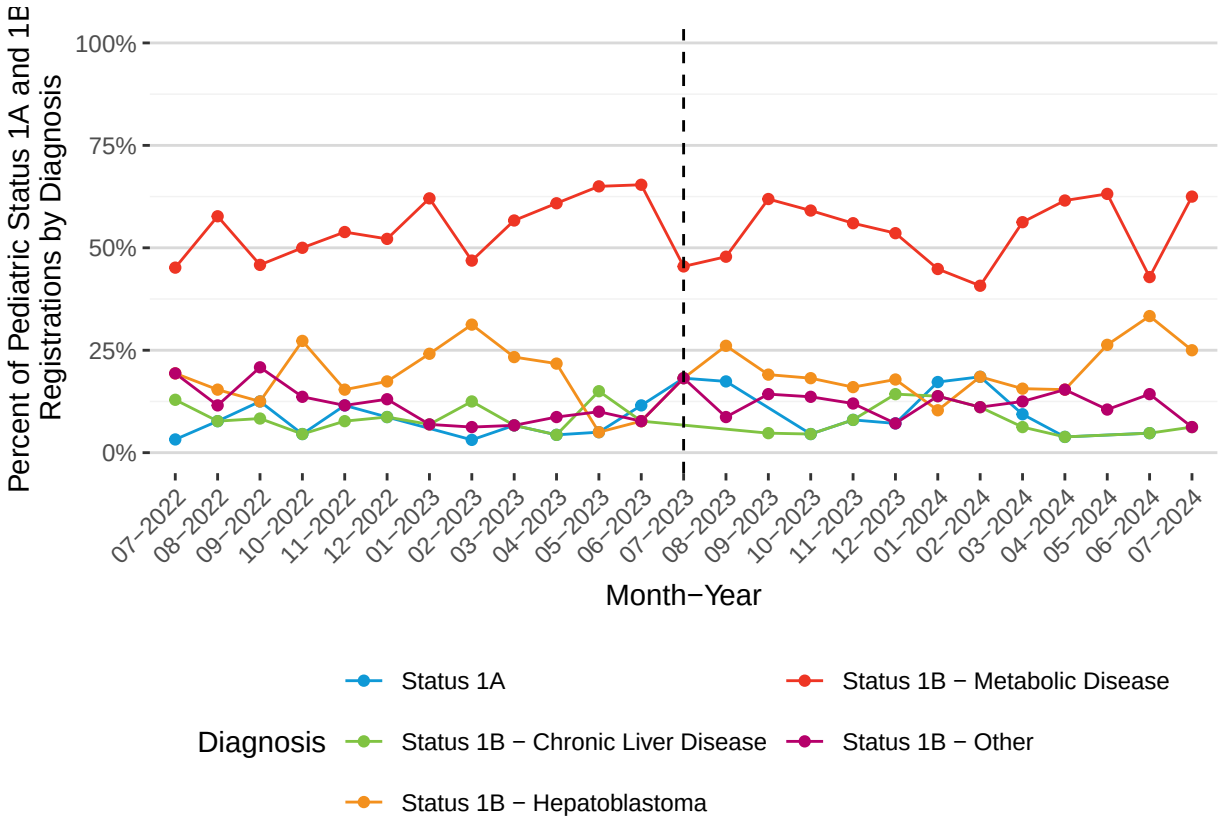
Status 1A and 1B Results

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 28 and **Table 24** show the percent of pediatric (<18 years old) Status 1A and Status 1B liver-alone waiting list registrations with Status 1A and 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 28. Percent of Pediatric (Age <18) Status 1A and 1B Liver Waiting List Registrations at the End of Each Month by Diagnosis



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

Table 24. Count and Percent of Pediatric (Age <18) Status 1A and 1B Liver Waiting List Registrations at the End of Each Month by Diagnosis

	Status 1A		Status 1B Chronic Liver Disease		Status 1B Hepatoblastoma		Status 1B Metabolic Disease		Status 1B Other	
Month-Year	N	%	N	%	N	%	N	%	N	%
07-2022	1	3.2	4	12.9	6	19.4	14	45.2	6	19.4
08-2022	2	7.7	2	7.7	4	15.4	15	57.7	3	11.5
09-2022	3	12.5	2	8.3	3	12.5	11	45.8	5	20.8
10-2022	1	4.5	1	4.5	6	27.3	11	50.0	3	13.6
11-2022	3	11.5	2	7.7	4	15.4	14	53.8	3	11.5
12-2022	2	8.7	2	8.7	4	17.4	12	52.2	3	13.0
01-2023	0	0.0	2	6.9	7	24.1	18	62.1	2	6.9
02-2023	1	3.1	4	12.5	10	31.2	15	46.9	2	6.2
03-2023	2	6.7	2	6.7	7	23.3	17	56.7	2	6.7
04-2023	1	4.3	1	4.3	5	21.7	14	60.9	2	8.7
05-2023	1	5.0	3	15.0	1	5.0	13	65.0	2	10.0
06-2023	3	11.5	2	7.7	2	7.7	17	65.4	2	7.7
07-2023	4	18.2	0	0.0	4	18.2	10	45.5	4	18.2
08-2023	4	17.4	0	0.0	6	26.1	11	47.8	2	8.7
09-2023	0	0.0	1	4.8	4	19.0	13	61.9	3	14.3
10-2023	1	4.5	1	4.5	4	18.2	13	59.1	3	13.6
11-2023	2	8.0	2	8.0	4	16.0	14	56.0	3	12.0
12-2023	2	7.1	4	14.3	5	17.9	15	53.6	2	7.1
01-2024	5	17.2	4	13.8	3	10.3	13	44.8	4	13.8
02-2024	5	18.5	3	11.1	5	18.5	11	40.7	3	11.1
03-2024	3	9.4	2	6.2	5	15.6	18	56.2	4	12.5
04-2024	1	3.8	1	3.8	4	15.4	16	61.5	4	15.4
05-2024	0	0.0	0	0.0	5	26.3	12	63.2	2	10.5
06-2024	1	4.8	1	4.8	7	33.3	9	42.9	3	14.3
07-2024	0	0.0	1	6.2	4	25.0	10	62.5	1	6.2

Figure 29 and **Table 25** 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. 165 candidates were removed in the pre-policy era and 164 candidates were removed in the post-policy era. Deceased donor transplant made up the largest number and proportion of removal reasons (Pre: 120 (72.7%); Post: 129 (78.7%)).

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 and Era

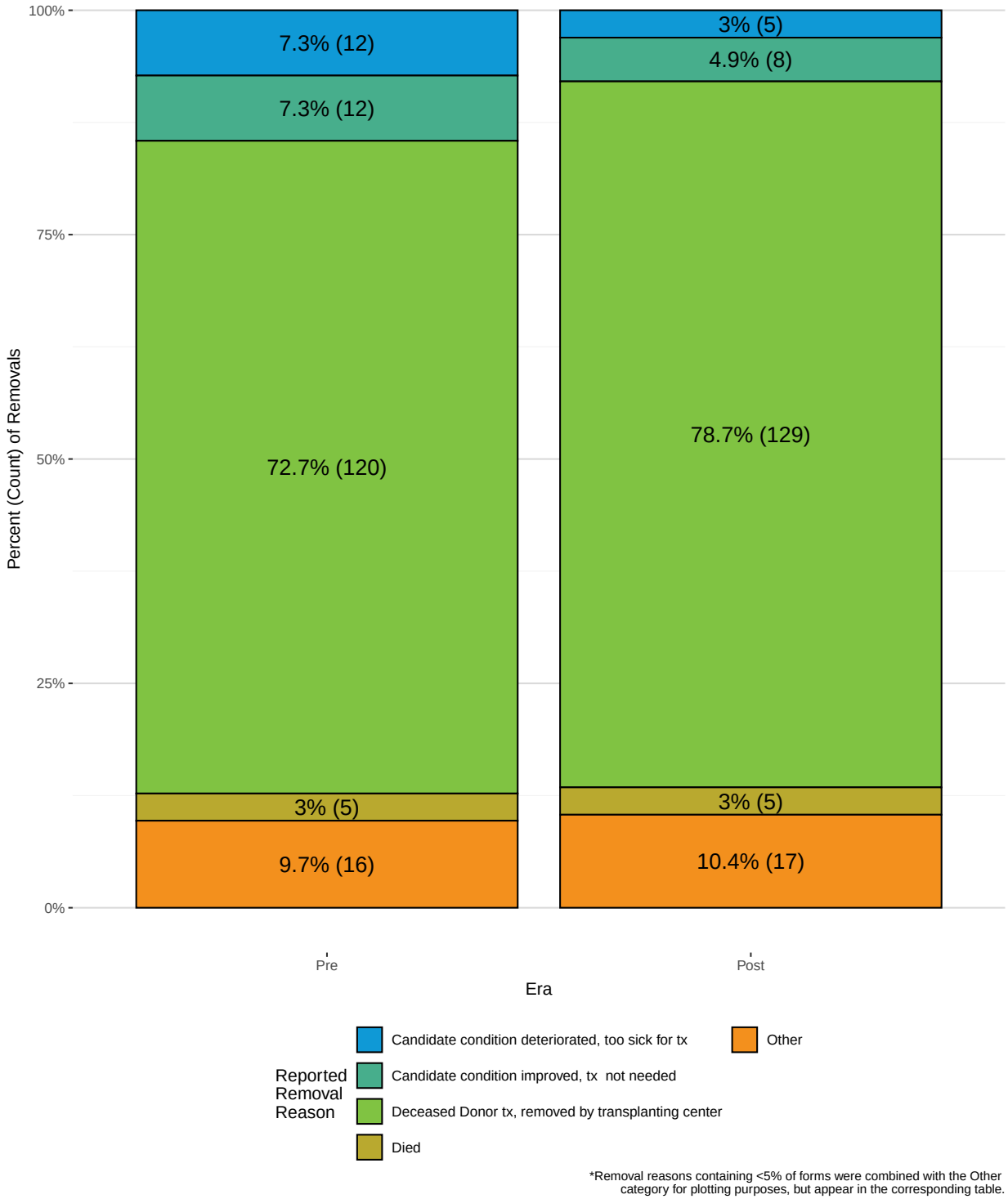
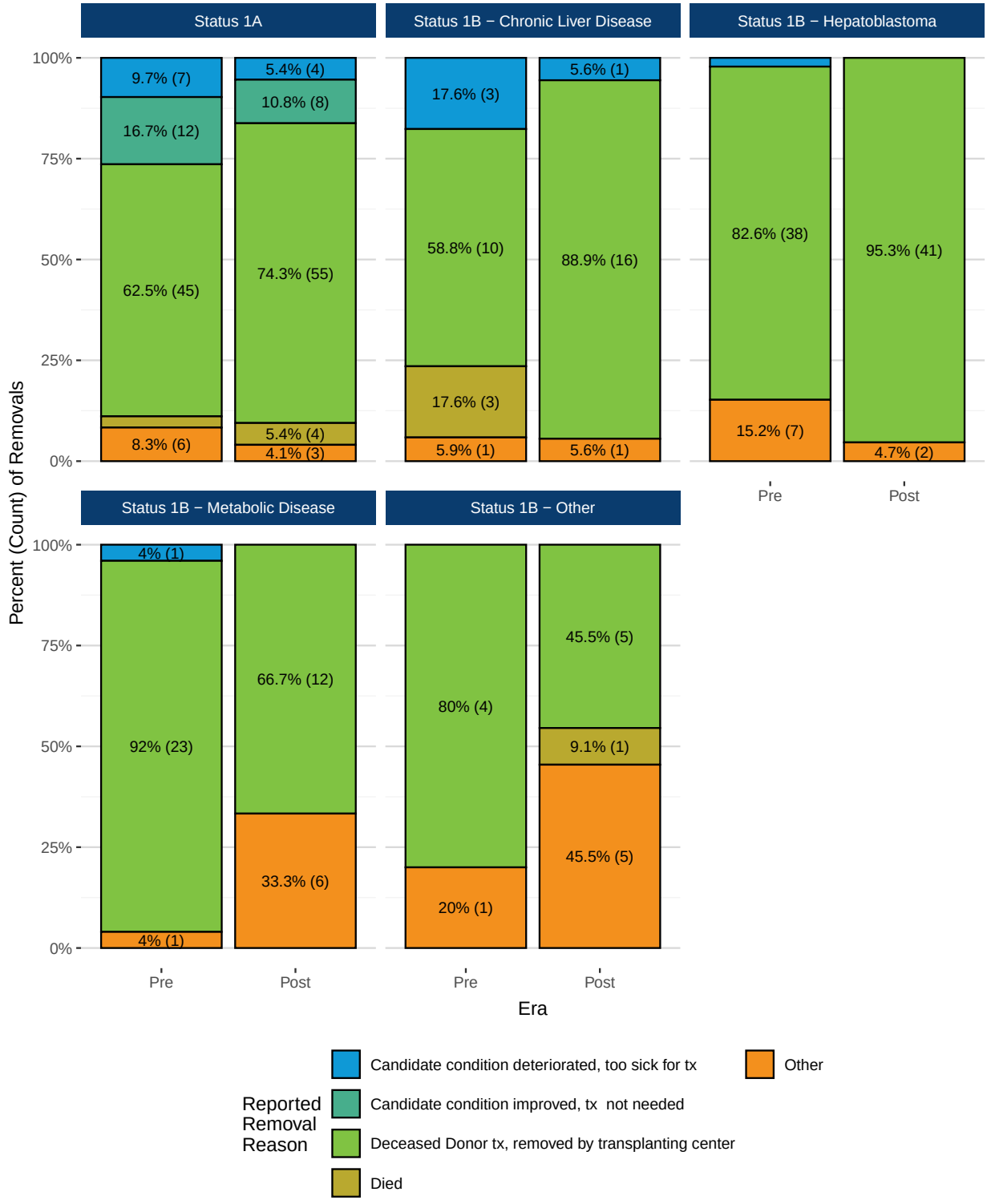


Table 25. Count and Percent of Pediatric (Age <18) Liver Candidates with Status 1A and 1B who were Removed from the Waiting List by Reported Removal Reason and Era

Reported Removal Reason	Pre	Post
Deceased Donor tx, removed by transplanting center	120 (72.7%)	129 (78.7%)
Living Donor tx, removed by transplanting center	13 (7.9%)	9 (5.5%)
Candidate condition deteriorated, too sick for tx	12 (7.3%)	5 (3.0%)
Candidate condition improved, tx not needed	12 (7.3%)	8 (4.9%)
Died	5 (3.0%)	5 (3.0%)
Transplant at another center (multi-listed)	3 (1.8%)	3 (1.8%)
Other	0 (0.0%)	4 (2.4%)
Transferred to another center	0 (0.0%)	1 (0.6%)
Total	165 (100.0%)	164 (100.0%)

Figure 30 and **Table 26** 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 proportion of removals for deceased donor transplant increased pre- to post-policy for the following Status 1A and 1B candidate diagnosis sub-groups: "Status 1A" (Pre: 72(43.6%); Post: 74(45.1%)), "1B - Chronic Liver Disease" (Pre: 17(10.3%); Post: 18(11%)) and "1B - Hepatoblastoma" (Pre: 46(27.9%); Post: 43(26.2%)). The proportion of removals for deceased donor transplant increased pre- to post-policy for the following 1B candidate diagnosis sub-groups: "1B - Metabolic Disease" (Pre: 25(15.2%); Post: 18(11%)) and "1B - Other" (Pre: 5(3%); Post: 11(6.7%)).

Figure 30. 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; all other removal reasons are grouped into the Other category.

Table 26. 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

	Status 1A		Status 1B Chronic Liver Disease		Status 1B Hepatoblastoma		Status 1B Metabolic Disease		Status 1B Other	
Reported Removal Reason	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Candidate condition deteriorated, too sick for tx	7 (9.7%)	4 (5.4%)	3 (17.6%)	1 (5.6%)	1 (2.2%)	0 (0.0%)	1 (4.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Candidate condition improved, tx not needed	12 (16.7%)	8 (10.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Deceased Donor tx, removed by transplanting center	45 (62.5%)	55 (74.3%)	10 (58.8%)	16 (88.9%)	38 (82.6%)	41 (95.3%)	23 (92.0%)	12 (66.7%)	4 (80.0%)	5 (45.5%)
Died	2 (2.8%)	4 (5.4%)	3 (17.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (9.1%)
Other	6 (8.3%)	3 (4.1%)	1 (5.9%)	1 (5.6%)	7 (15.2%)	2 (4.7%)	1 (4.0%)	6 (33.3%)	1 (20.0%)	5 (45.5%)
Total	72 (100.0%)	74 (100.0%)	17 (100.0%)	18 (100.0%)	46 (100.0%)	43 (100.0%)	25 (100.0%)	18 (100.0%)	5 (100.0%)	11 (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 31 and **Table 27** show the number of pediatric (age <18 at time of transplant) Status 1A and 1B liver transplants by policy era. There were 326 total transplants among pediatric Status 1A and 1B recipients in the study period. 158 (48.5%) of these transplants occurred in the pre-policy era and 168 (51.5%) occurred in the post-policy era.

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

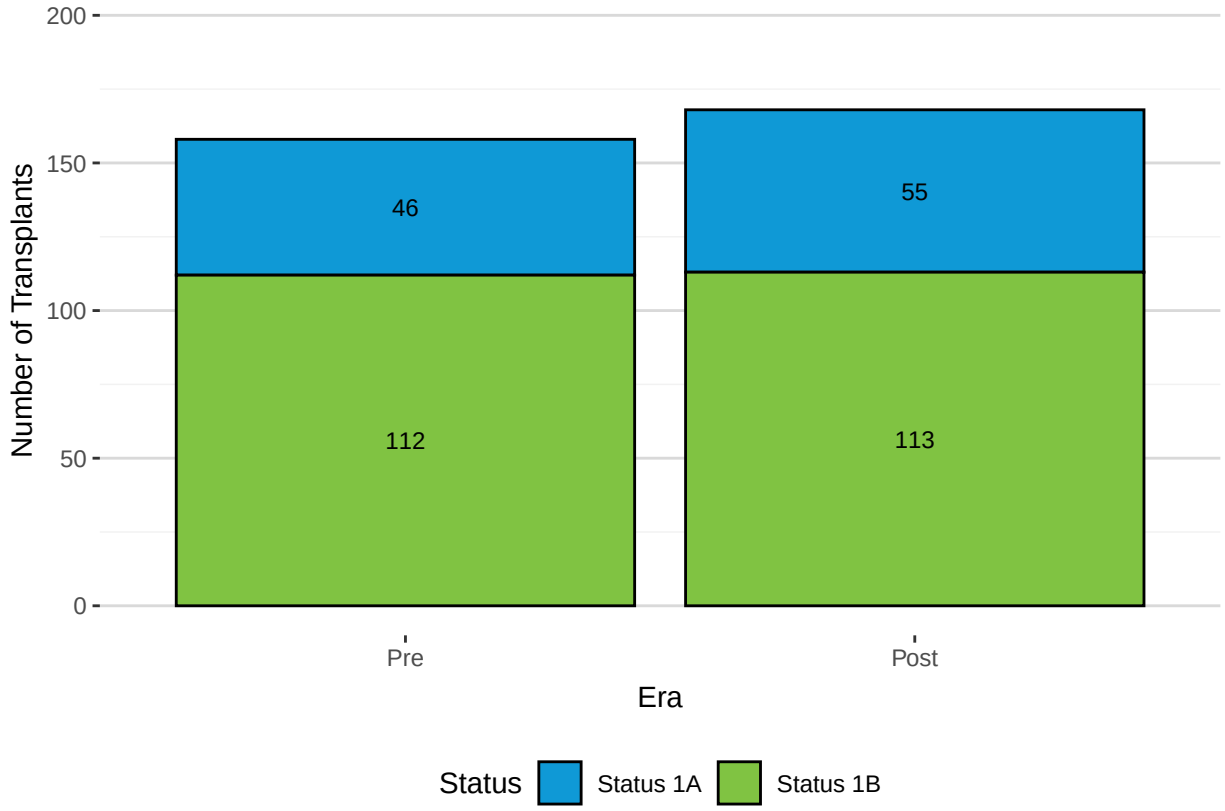


Table 27. Count and Percent of Pediatric (Age <18 at Transplant) Status 1A and 1B Liver Transplants by Era

Status	Pre	Post
Status 1A	46 (29.1%)	55 (32.7%)
Status 1B	112 (70.9%)	113 (67.3%)
Total	158 (100.0%)	168 (100.0%)

Figure 32 and **Table 28** 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: 46 (41.1%)), whereas in the post-policy era, Status 1B recipients with hepatoblastoma made up the largest proportion of transplants (Post: 41 (36.3%)). In both policy eras, Status 1B recipients with "Other" diagnosis made up the smallest proportion of transplants (Pre: 3 (2.7%); Post: 7 (6.2%)). 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: 46 (41.1%); Post: 31 (27.4%)).

Figure 32. Count and Percent of Pediatric (Age <18 at Transplant) Status 1B Liver Transplants by Diagnosis and Era

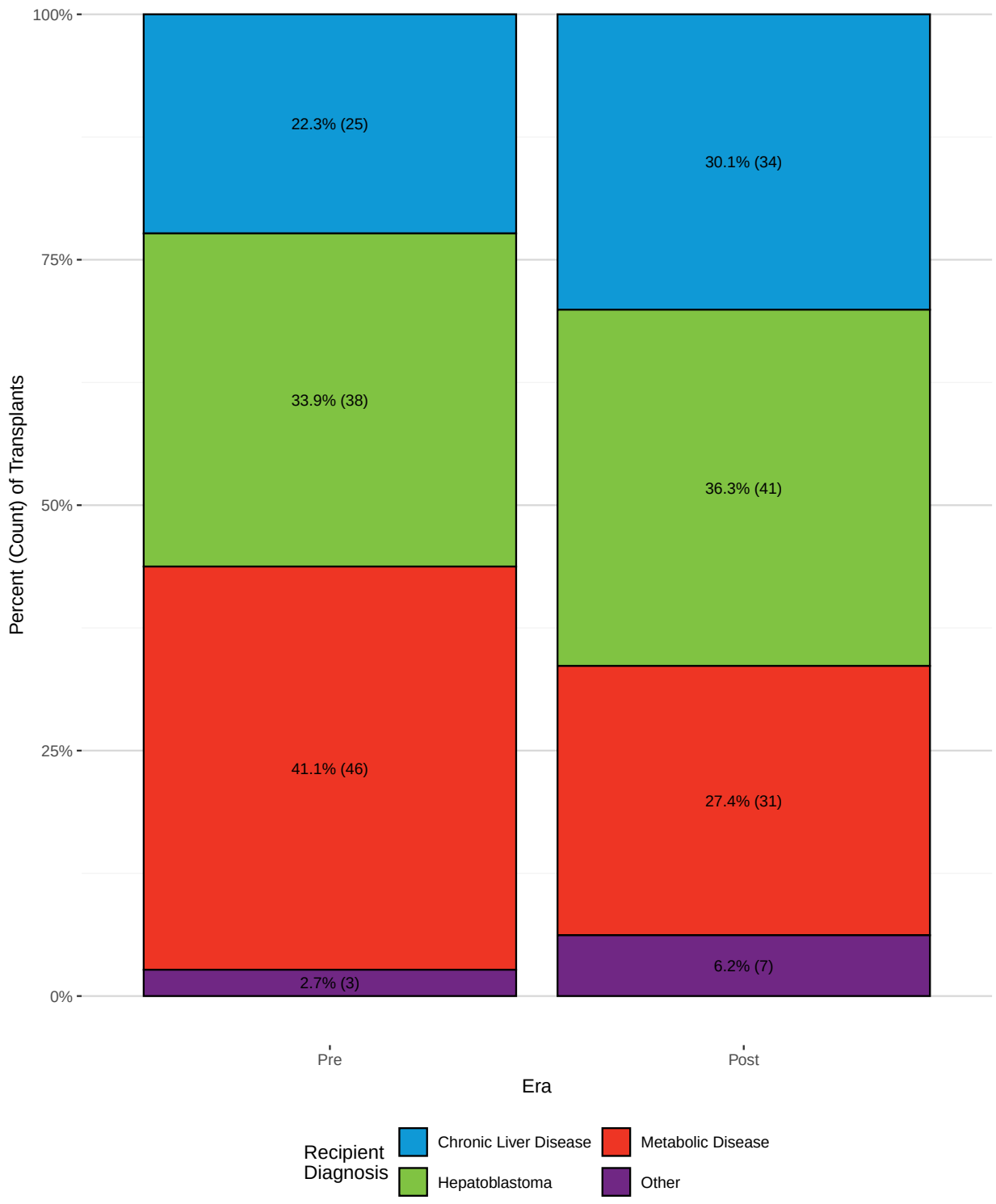


Table 28. Count and Percent of Pediatric (Age <18 at Transplant) Status 1B Liver Transplants by Diagnosis and Era

Recipient Diagnosis	Pre	Post
Chronic Liver Disease	25 (22.3%)	34 (30.1%)
Hepatoblastoma	38 (33.9%)	41 (36.3%)
Metabolic Disease	46 (41.1%)	31 (27.4%)
Other	3 (2.7%)	7 (6.2%)
Total	112 (100.0%)	113 (100.0%)

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

This section summarizes outcomes for both pediatric Status 1B forms and the unique pediatric Status 1B cases submitted in the pre- and post-policy era. A unique pediatric Status 1B case could have had multiple form submissions. Due to the small number of pediatric Status 1B cases sent to the Pediatric Review Board that closed without a majority or that were not approved, 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.

Figure 33 and **Table 29** 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. 263 pediatric Status 1B forms were submitted pre-policy, compared to 238 pediatric Status 1B forms submitted post-policy. A greater number and proportion of forms were auto-approved in the post-policy era compared to the pre-policy era (Pre: 185 (70.3%); Post: 221 (92.9%)).

Figure 33. Count and Percent of Pediatric Status 1B Forms by Auto-Approved vs. Not and Era

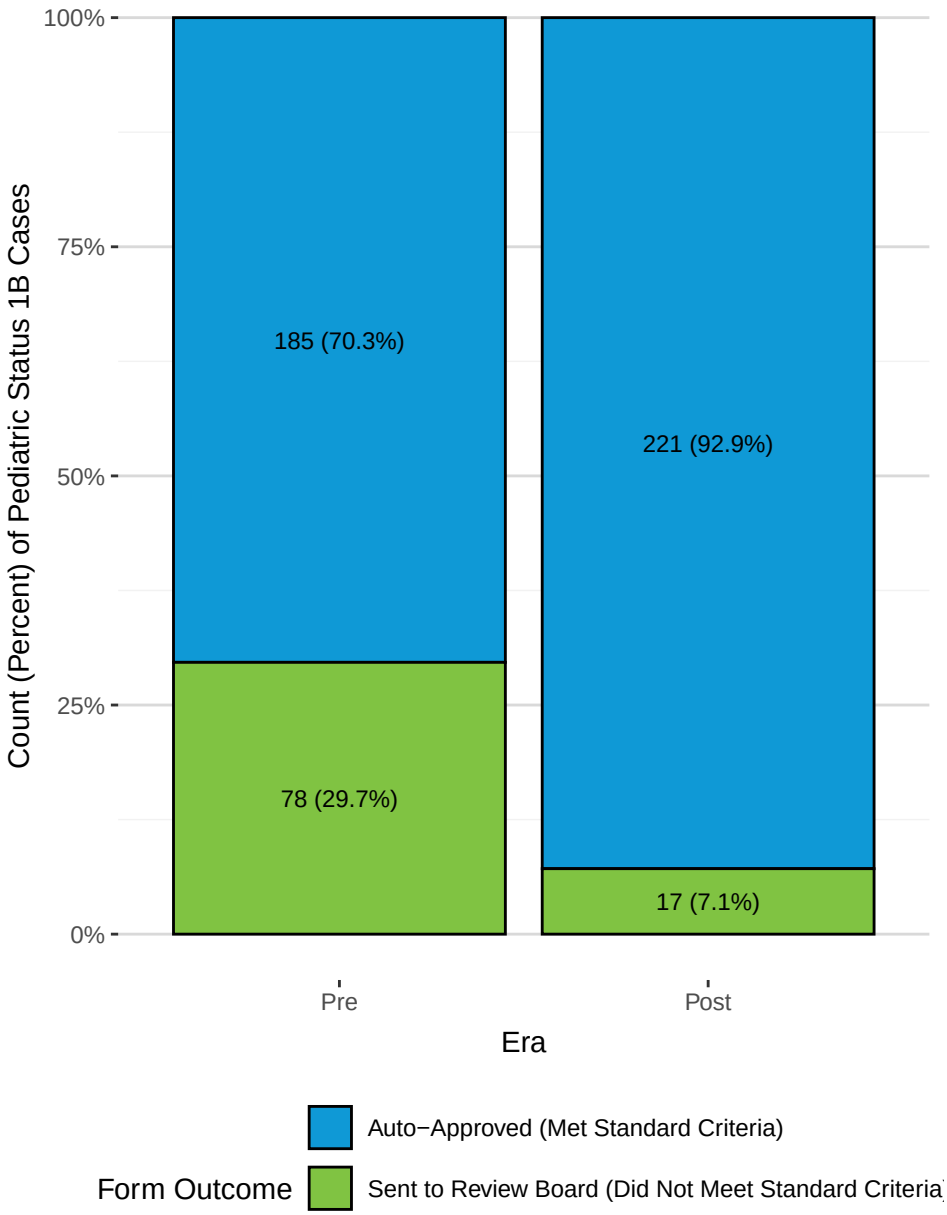
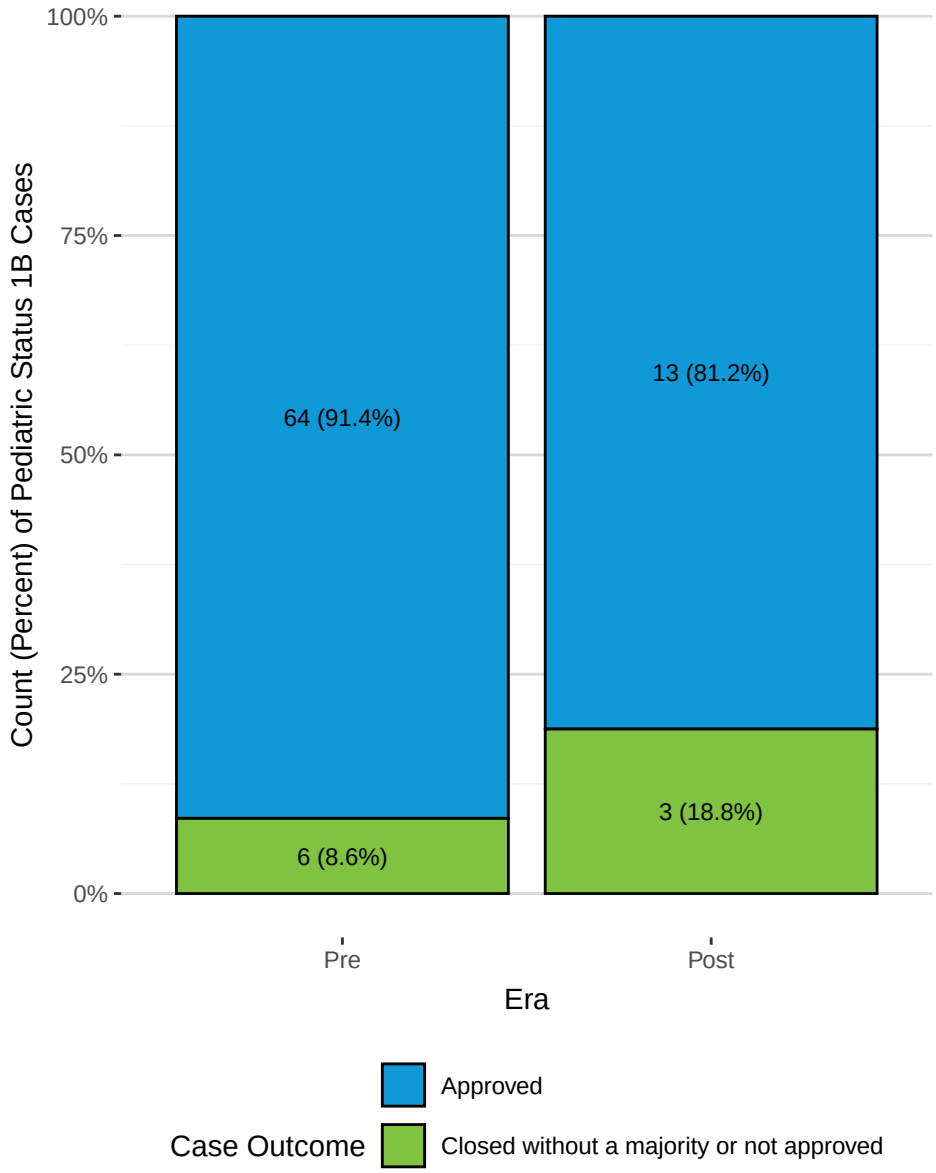


Table 29. Count and Percent of Pediatric Status 1B Forms by Auto-Approved vs. Not and Era

Form Outcome	Pre	Post
Auto-Approved (Met Standard Criteria)	185 (70.3%)	221 (92.9%)
Sent to Review Board (Did Not Meet Standard Criteria)	78 (29.7%)	17 (7.1%)
Total	263 (100.0%)	238 (100.0%)

Figure 34 and **Table 30** show the number and percent of unique 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. 70 pediatric Status 1B cases did not meet standard criteria pre-policy, whereas only 16 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: 64 (91.4%); Post: 13 (81.2%)).

Figure 34. 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 not approved are combined into one category.

Table 30. Count and Percent of Pediatric Status 1B Cases Sent to Review Board by Case Outcome and Era

Case Outcome	Pre	Post
Approved	64 (91.4%)	13 (81.2%)
Closed without a majority or not approved	3 (4.3%)	2 (12.5%)
Disapproved	3 (4.3%)	1 (6.2%)
Total	70 (100.0%)	16 (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 not approved (i.e., Pre: 6 (8.6%); Post: 3 (18.8%)), turndown reasons for these cases are not summarized in this report. However, **Table 31** 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 31. Number and Percent of Criteria Not Met for Pediatric Status 1B Requests that Do Not Meet Standard Criteria by Case Outcome and Era

	Approved	
Criteria Not Met for Status 1B Requests that Do Not Meet Standard Critera	Pre	Post
Chronic liver disease BUT calculated MELD/PELD score is less than or equal to 25	38 (59.4%)	0 (0.0%)
Candidate does not have chronic liver disease, non-metastatic hepatoblastoma, or metabolic disease	13 (20.3%)	3 (23.1%)
Metabolic disease BUT candidate does not have an approved MELD/PELD Exception meeting standard criteria for metabolic disease for at least 30 days	6 (9.4%)	6 (46.2%)
Metabolic disease BUT candidate does not have urea cycle defects or organic acidemias	3 (4.7%)	0 (0.0%)
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 (3.1%)	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 (1.6%)	0 (0.0%)
Non-metastatic Hepatoblastoma BUT no biopsy	1 (1.6%)	2 (15.4%)
Chronic Liver Disease BUT Candidate is not on a mechanical ventilator, dialysis, CVVH, or CVVHD and does not have a GI Bleed requiring at least 1 mL/kg of red blood cell replacement for extensions (both liver and liver-intestine)	0 (0.0%)	1 (7.7%)
Chronic Liver Disease BUT Candidate is not on a mechanical ventilator, not on a dialysis, CVVH, or CVVHD and does not have a GI Bleed requiring at least 30 mL/kg of red blood cell replacement within previous 96 hours or 20 mL/kg in previous 24 hours (for Liver Only candidate)	0 (0.0%)	1 (7.7%)
Total	64 (100.0%)	13 (100.0%)

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

Conclusion

During the 12-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 overall, for females, and for males, whereas the transplant rate for females was slightly (but not significantly) higher than for males in the post-policy era. Transplant rates increased for both height and body surface area groups post-policy but candidate size transplant rate discrepancies still remain similar to the pre-policy era. 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. The median allocation MELD score at transplant remained the same across policy eras for males and decreased slightly for females. It is worth highlighting that there is no longer a statistically significant difference in transplant rates between the sexes post-policy.

Under PELD-Cr, there were no statistically significant changes in transplant rates and waiting list removal rates due to death or to sick. In particular, transplant rates increased slightly (but not significantly) for both the 0-2 and 3-11 age groups. Waiting list removal rates due to death or too sick increased very slightly for the 0-2 age group and decreased slightly for the 3-11 age group (but neither were significant). The median PELD score at transplant decreased across policy eras, as did the interquartile range. The extent of skewness for the PELD score also decreased, meaning the median PELD score was made closer to the average PELD score in the post-policy.

Under the Status 1A and 1B modifications, the number of pediatric Status 1A and 1B liver transplants increased pre- to post-policy. Pediatric Status 1B recipients with chronic liver disease and hepatoblastoma made up the largest proportion of transplants in the post-policy era, a shift from metabolic disease making up the largest portion of transplant in the pre-policy era, while recipients with other diagnosis made up the smallest proportion of transplants in the post-policy era. The number of pediatric Status 1B cases that did not meet standard criteria decreased, and while the number of those cases that were not approved also decreased, the proportion of those cases that were not approved did increase.

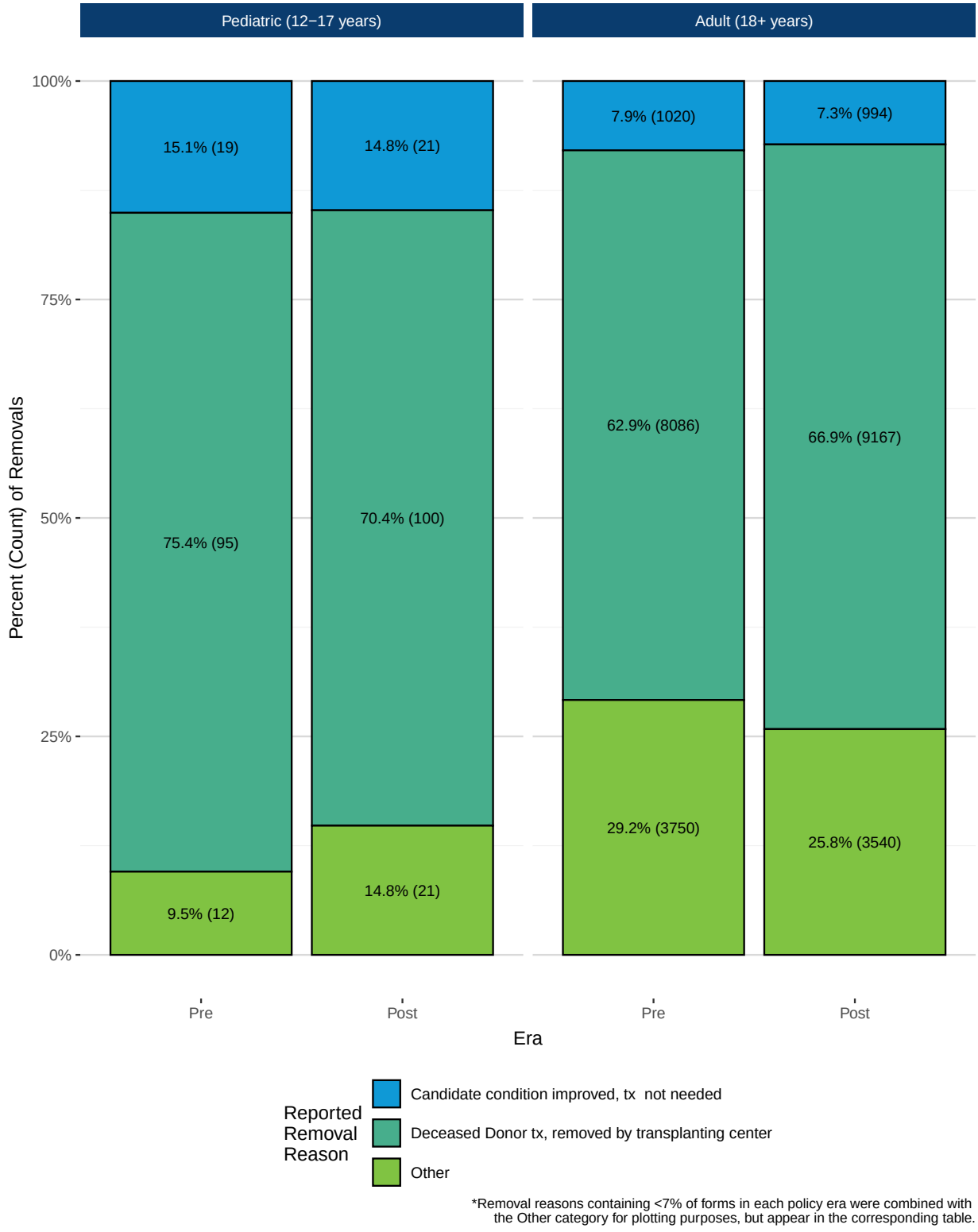
Appendix

Additional MELD 3.0 Results

Additional MELD 3.0 Results Sub-Section: Age

This sub-section stratifies the analyses shown in the main "MELD 3.0 Results" section by age group (12-17 years vs. 18+ years) 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

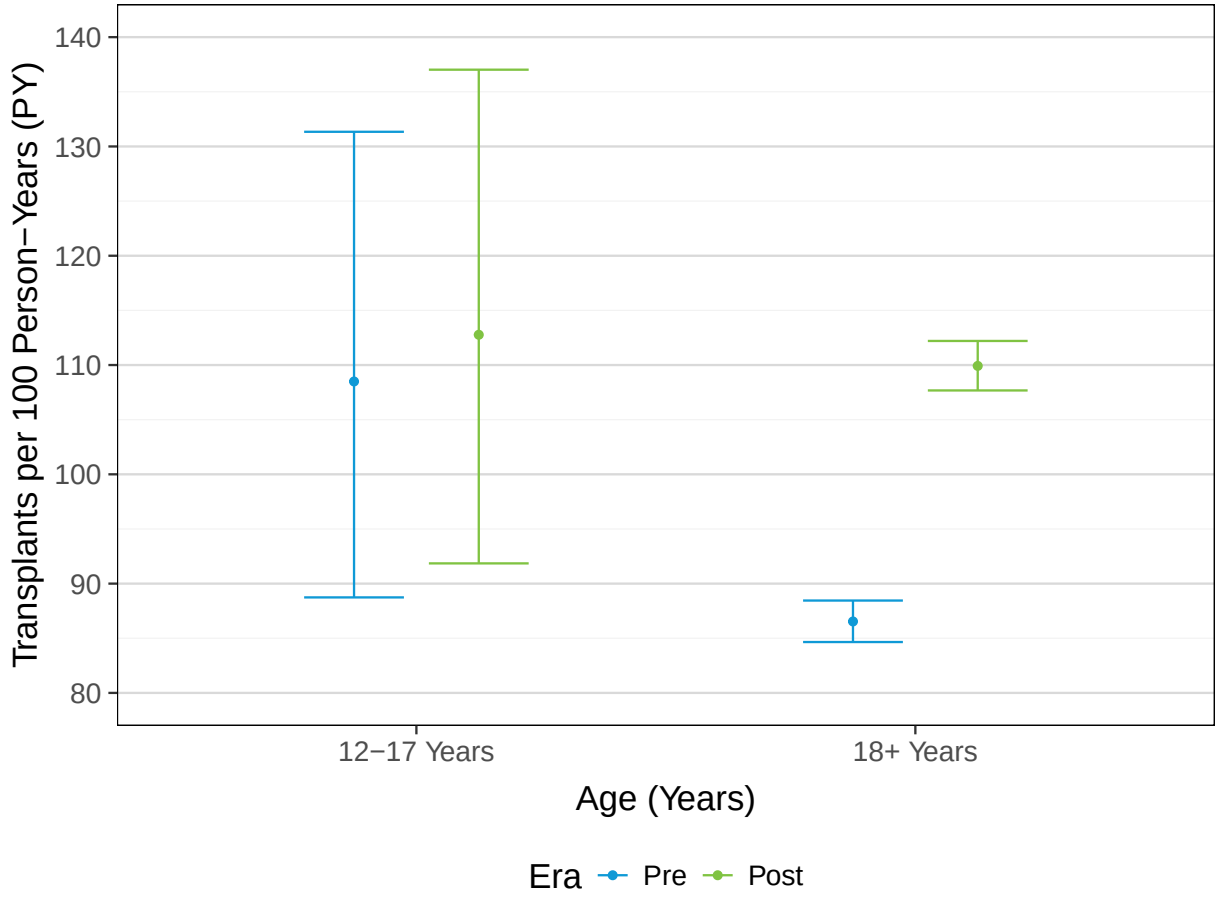


*Removal reasons containing <7% of forms in each policy era were combined with the Other category for plotting purposes, but appear in the corresponding table.

Appendix Table 1. 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

	Pediatric (12-17 years)		Adult (18+ years)	
Reported Removal Reason	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	95 (75.4%)	100 (70.4%)	8,086 (62.9%)	9,167 (66.9%)
Candidate condition improved, tx not needed	19 (15.1%)	21 (14.8%)	1,020 (7.9%)	994 (7.3%)
Candidate condition deteriorated, too sick for tx	4 (3.2%)	5 (3.5%)	892 (6.9%)	788 (5.8%)
Other	2 (1.6%)	2 (1.4%)	854 (6.6%)	828 (6.0%)
Died	1 (0.8%)	4 (2.8%)	808 (6.3%)	775 (5.7%)
Living Donor tx, removed by transplanting center	3 (2.4%)	5 (3.5%)	555 (4.3%)	524 (3.8%)
Transplant at another center (multi-listed)	1 (0.8%)	3 (2.1%)	284 (2.2%)	257 (1.9%)
Unable to contact candidate	0 (0.0%)	0 (0.0%)	153 (1.2%)	127 (0.9%)
Refused transplant	0 (0.0%)	0 (0.0%)	116 (0.9%)	130 (0.9%)
Transferred to another center	1 (0.8%)	1 (0.7%)	73 (0.6%)	88 (0.6%)
Patient died during TX procedure	0 (0.0%)	0 (0.0%)	8 (0.1%)	16 (0.1%)
Candidate Removed in Error	0 (0.0%)	1 (0.7%)	5 (0.0%)	1 (0.0%)
Transplanted in another country	0 (0.0%)	0 (0.0%)	2 (0.0%)	6 (0.0%)
Total	126 (100.0%)	142 (100.0%)	12,856 (100.0%)	13,701 (100.0%)

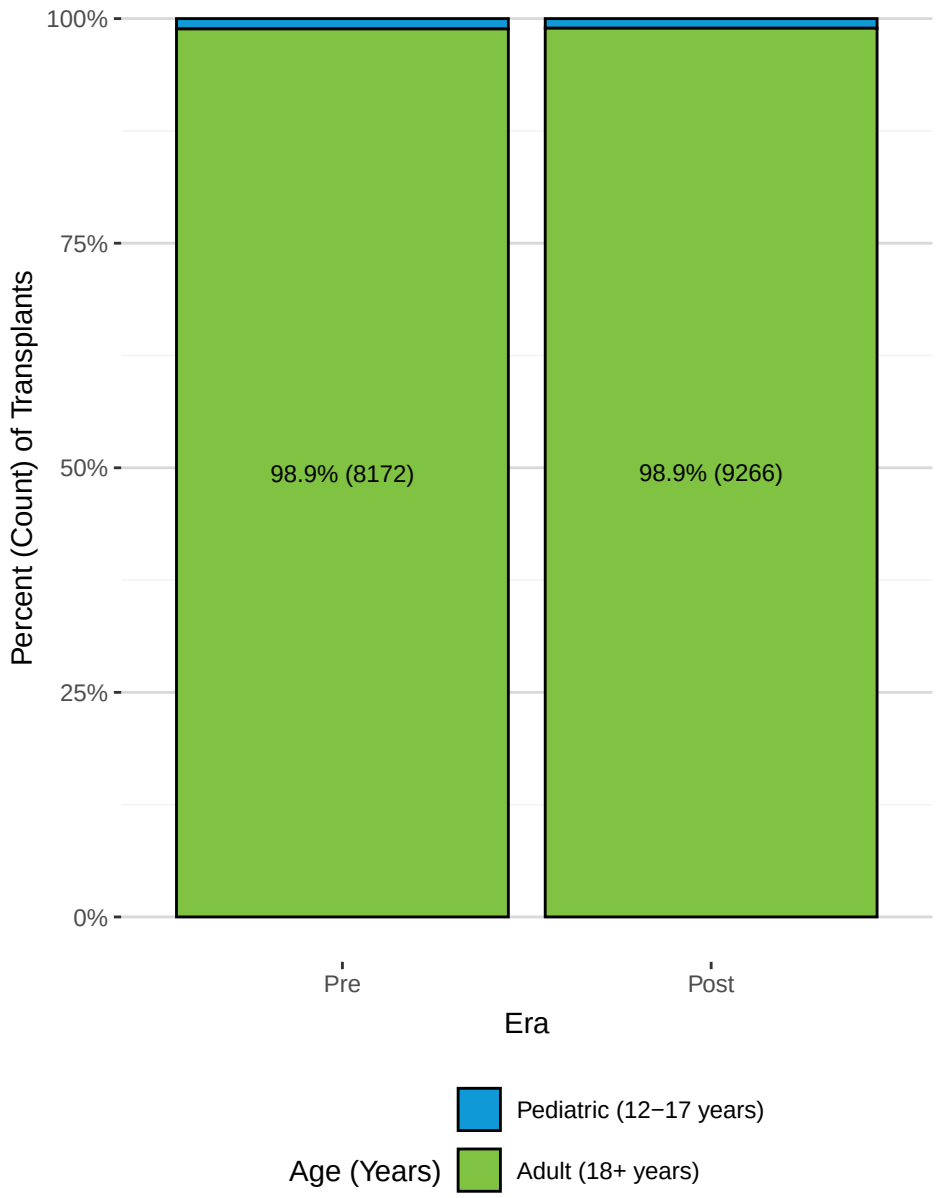
Appendix Figure 2. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Age and Era



Appendix Table 2. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Age and Era

		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	Age (Years)	N	N	PY	Estimate	95% CI
Pre	12-17 Years	233	105	96.8	108.50	(88.74, 131.34)
	18+ Years	21206	8029	9278.1	86.54	(84.65, 88.45)
Post	12-17 Years	249	101	89.6	112.77	(91.85, 137.02)
	18+ Years	21510	9104	8282.3	109.92	(107.67, 112.20)

Appendix Figure 3. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Age at Transplant and Era

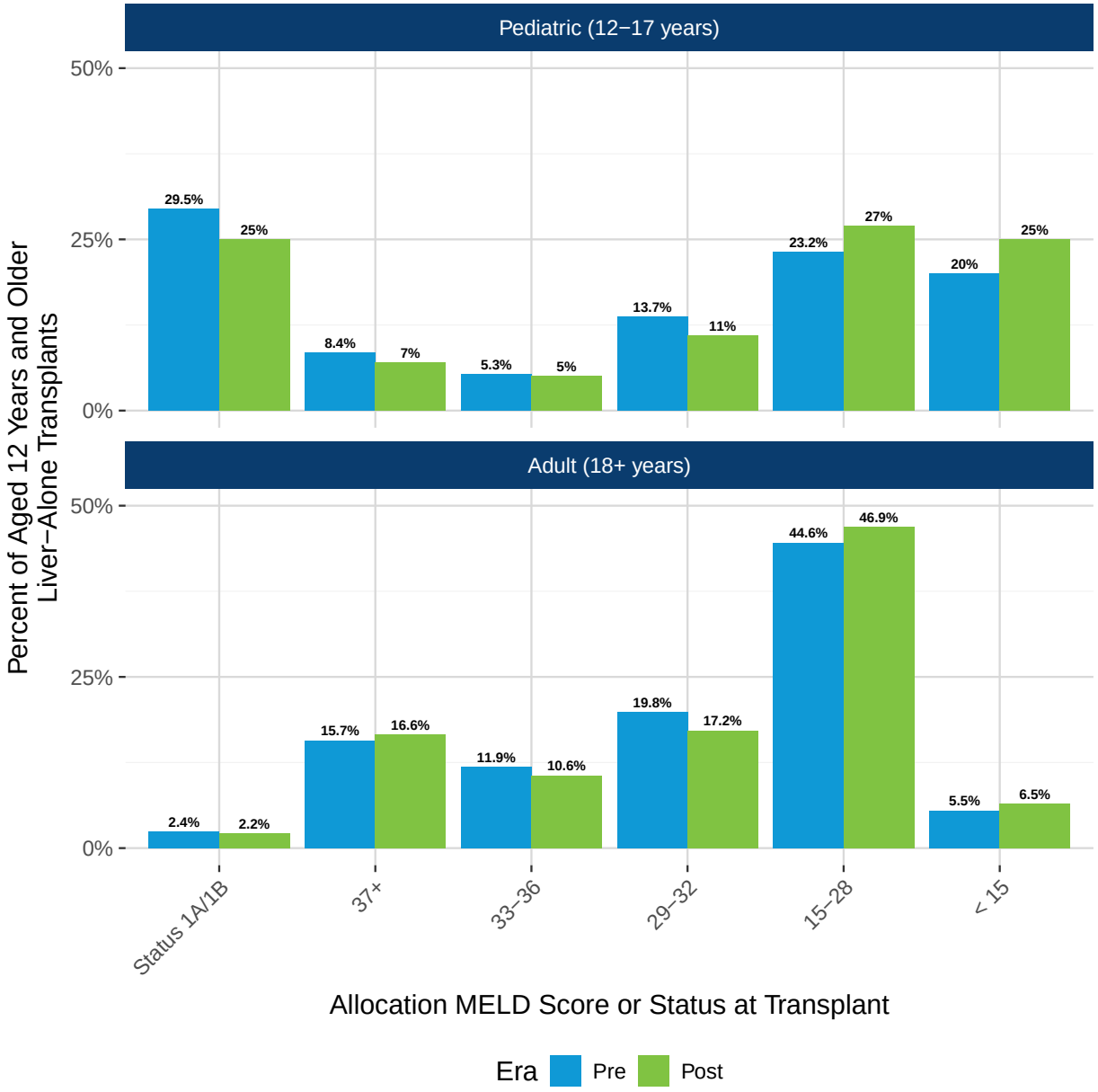


*Label is omitted for age groups that contain <2% of transplants.

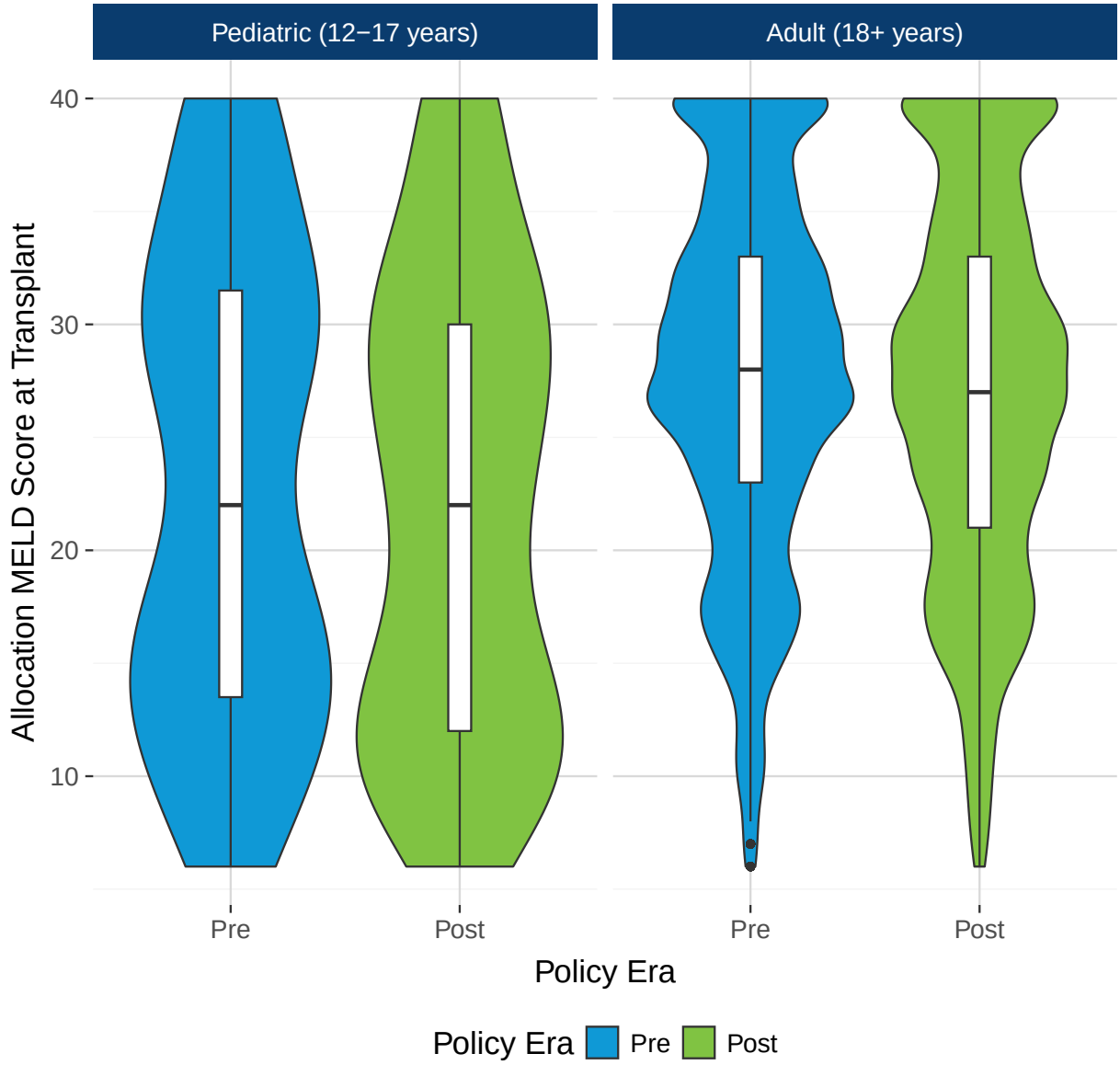
Appendix Table 3. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Age at Transplant and Era

Age (Years)	Pre	Post
Pediatric (12-17 years)	95 (1.1%)	100 (1.1%)
Adult (18+ years)	8,172 (98.9%)	9,266 (98.9%)
Total	8,267 (100.0%)	9,366 (100.0%)

Appendix Figure 4. 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 5. 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, 28 (29.47%) and 200 (2.45%) Status 1A/1B recipients were in the Pediatric (12−17 years) and Adult (18+ years) age groups, respectively.
Post−policy, 25 (25%) and 203 (2.19%) Status 1A/1B recipients were in the Pediatric (12−17 years) and Adult (18+ years) age groups, respectively.

Appendix Table 4. Summary of Allocation PELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Age at Transplant and Era

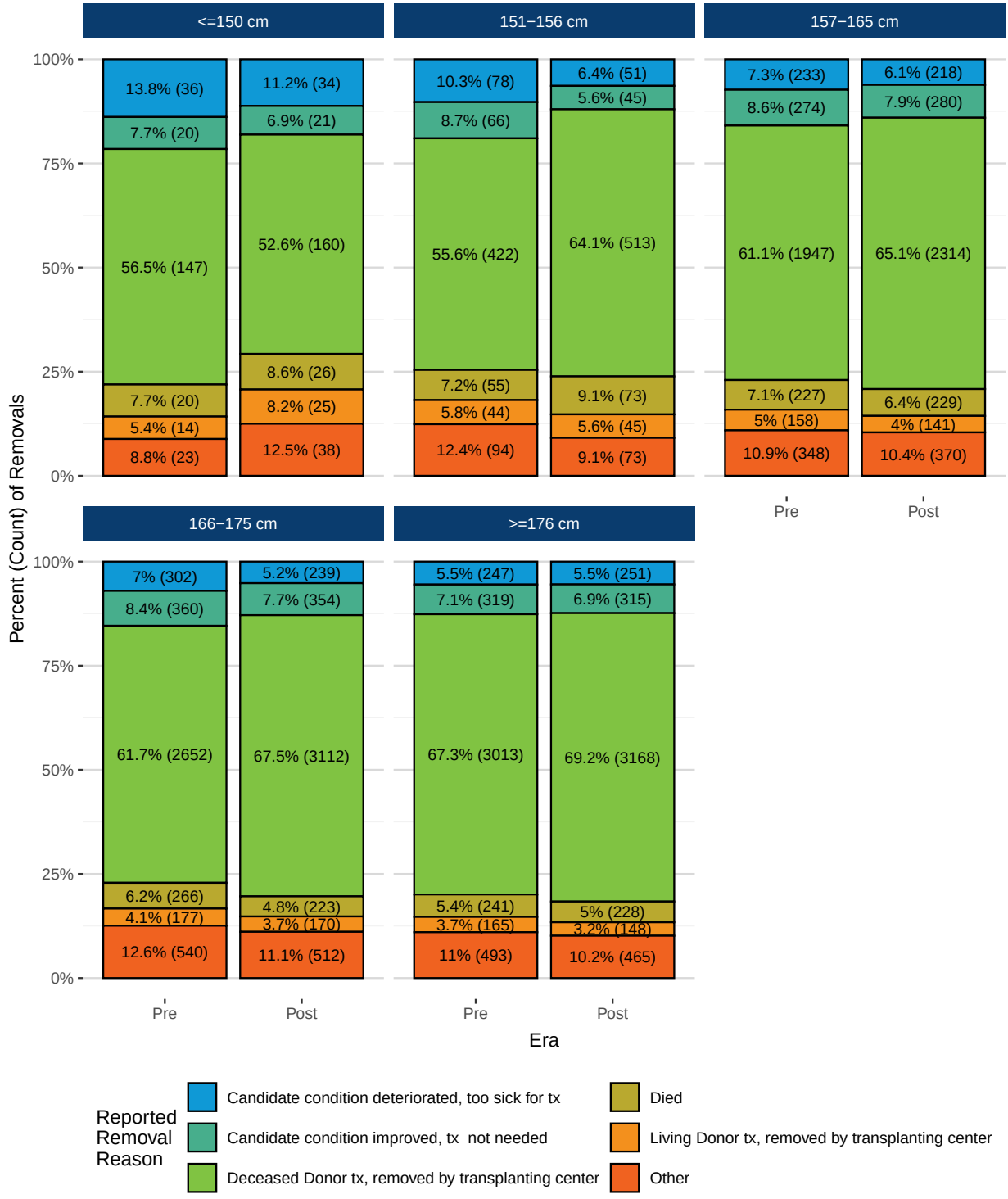
Age (Years)	Policy Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
Pediatric (12-17 years)	Pre	67	6	13.5	22	31.5	40	18
	Post	75	6	12.0	22	30.0	40	18
Adult (18+ years)	Pre	7972	6	23.0	28	33.0	40	10
	Post	9063	6	21.0	27	33.0	40	12

Status 1A/1B recipients were excluded because they do not have allocation MELD scores at transplant
Pre-policy, 28 (29.47%) and 200 (2.45%) Status 1A/1B recipients were in the Pediatric (12-17 years) and Adult (18+ years) age groups, respectively. Post-policy, 25 (25%) and 203 (2.19%) Status 1A/1B recipients were in the Pediatric (12-17 years) and Adult (18+ years) age groups, respectively.

Additional MELD 3.0 Results Sub-Section: Gross Anatomical Size

This sub-section stratifies the analyses shown in the main "MELD 3.0 Results" section by gross anatomical size (i.e., height and body surface area) groups as appropriate. Note that these results should be interpreted cautiously, as some subgroups have small sample sizes.

Appendix Figure 6. 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.
5 registrations missing height at time of removal were excluded.

Appendix Table 5. 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

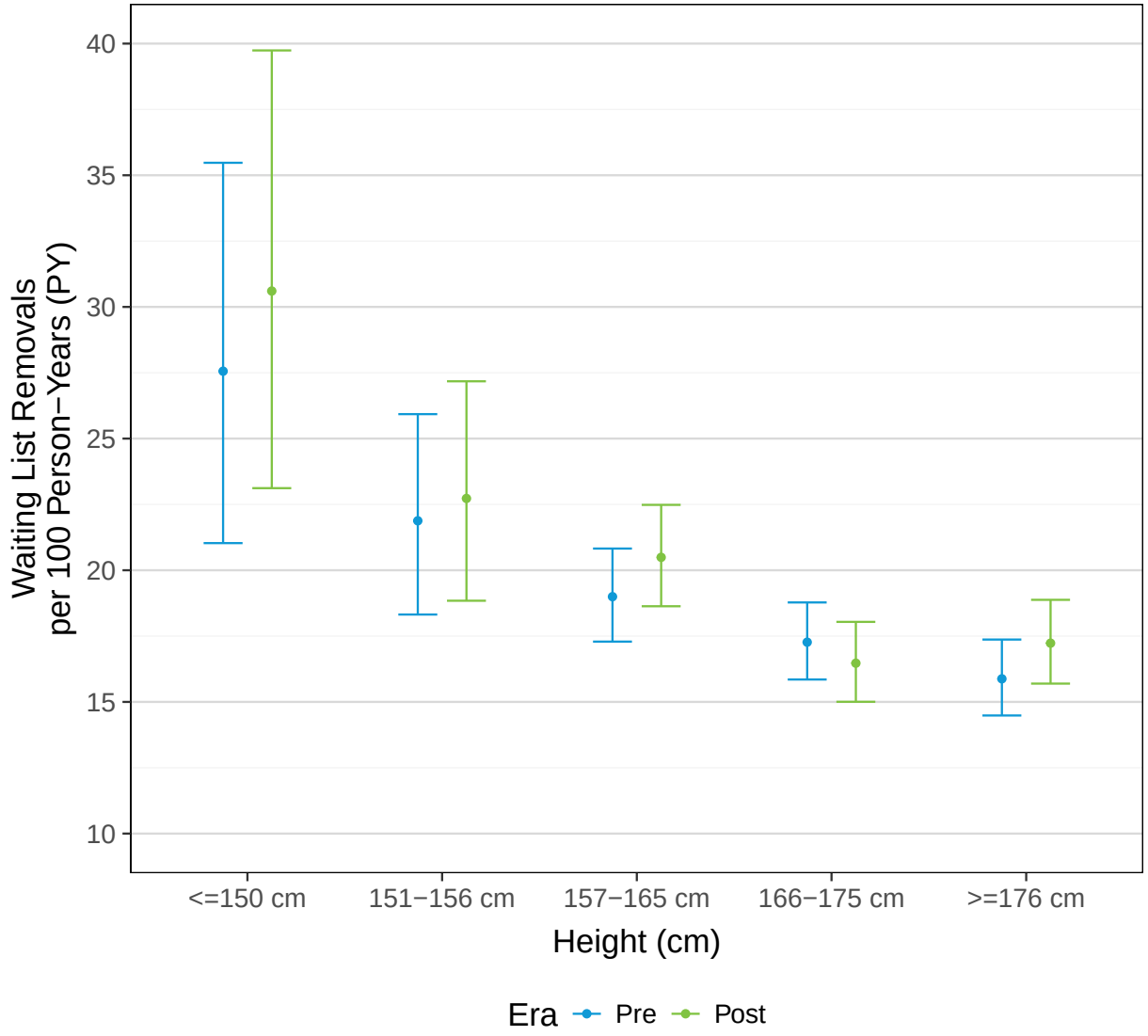
	<=150 cm		151-156 cm		157-165 cm		166-175 cm		>=176 cm	
Reported Removal Reason	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Candidate condition deteriorated, too sick for tx	36 (13.8%)	34 (11.2%)	78 (10.3%)	51 (6.4%)	233 (7.3%)	218 (6.1%)	302 (7.0%)	239 (5.2%)	247 (5.5%)	251 (5.5%)
Candidate condition improved, tx not needed	20 (7.7%)	21 (6.9%)	66 (8.7%)	45 (5.6%)	274 (8.6%)	280 (7.9%)	360 (8.4%)	354 (7.7%)	319 (7.1%)	315 (6.9%)
Candidate Removed in Error	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.0%)	3 (0.1%)	1 (0.0%)	2 (0.0%)	0 (0.0%)
Deceased Donor tx, removed by transplanting center	147 (56.5%)	160 (52.6%)	422 (55.6%)	513 (64.1%)	1,947 (61.1%)	2,314 (65.1%)	2,652 (61.7%)	3,112 (67.5%)	3,013 (67.3%)	3,168 (69.2%)
Died	20 (7.7%)	26 (8.6%)	55 (7.2%)	73 (9.1%)	227 (7.1%)	229 (6.4%)	266 (6.2%)	223 (4.8%)	241 (5.4%)	228 (5.0%)
Living Donor tx, removed by transplanting center	14 (5.4%)	25 (8.2%)	44 (5.8%)	45 (5.6%)	158 (5.0%)	141 (4.0%)	177 (4.1%)	170 (3.7%)	165 (3.7%)	148 (3.2%)
Other	16 (6.2%)	17 (5.6%)	64 (8.4%)	41 (5.1%)	203 (6.4%)	215 (6.1%)	299 (7.0%)	302 (6.6%)	273 (6.1%)	254 (5.6%)
Patient died during TX procedure	0 (0.0%)	1 (0.3%)	4 (0.5%)	1 (0.1%)	1 (0.0%)	3 (0.1%)	2 (0.0%)	7 (0.2%)	1 (0.0%)	4 (0.1%)
Refused transplant	2 (0.8%)	2 (0.7%)	2 (0.3%)	7 (0.9%)	30 (0.9%)	33 (0.9%)	55 (1.3%)	48 (1.0%)	27 (0.6%)	40 (0.9%)
Transferred to another center	0 (0.0%)	2 (0.7%)	4 (0.5%)	7 (0.9%)	21 (0.7%)	25 (0.7%)	24 (0.6%)	31 (0.7%)	25 (0.6%)	24 (0.5%)
Transplant at another center (multi-listed)	2 (0.8%)	10 (3.3%)	12 (1.6%)	10 (1.2%)	59 (1.9%)	60 (1.7%)	104 (2.4%)	78 (1.7%)	108 (2.4%)	102 (2.2%)
Transplanted in another country	0 (0.0%)	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.1%)	1 (0.0%)	2 (0.0%)	1 (0.0%)	1 (0.0%)
Unable to contact candidate	3 (1.2%)	5 (1.6%)	8 (1.1%)	7 (0.9%)	34 (1.1%)	31 (0.9%)	52 (1.2%)	43 (0.9%)	56 (1.3%)	40 (0.9%)

Total	260 (100.0%)	304 (100.0%)	759 (100.0%)	800 (100.0%)	3,187 (100.0%)	3,552 (100.0%)	4,297 (100.0%)	4,610 (100.0%)	4,478 (100.0%)	4,575 (100.0%)

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

5 registrations missing height at time of removal were excluded.

Appendix Figure 7. 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



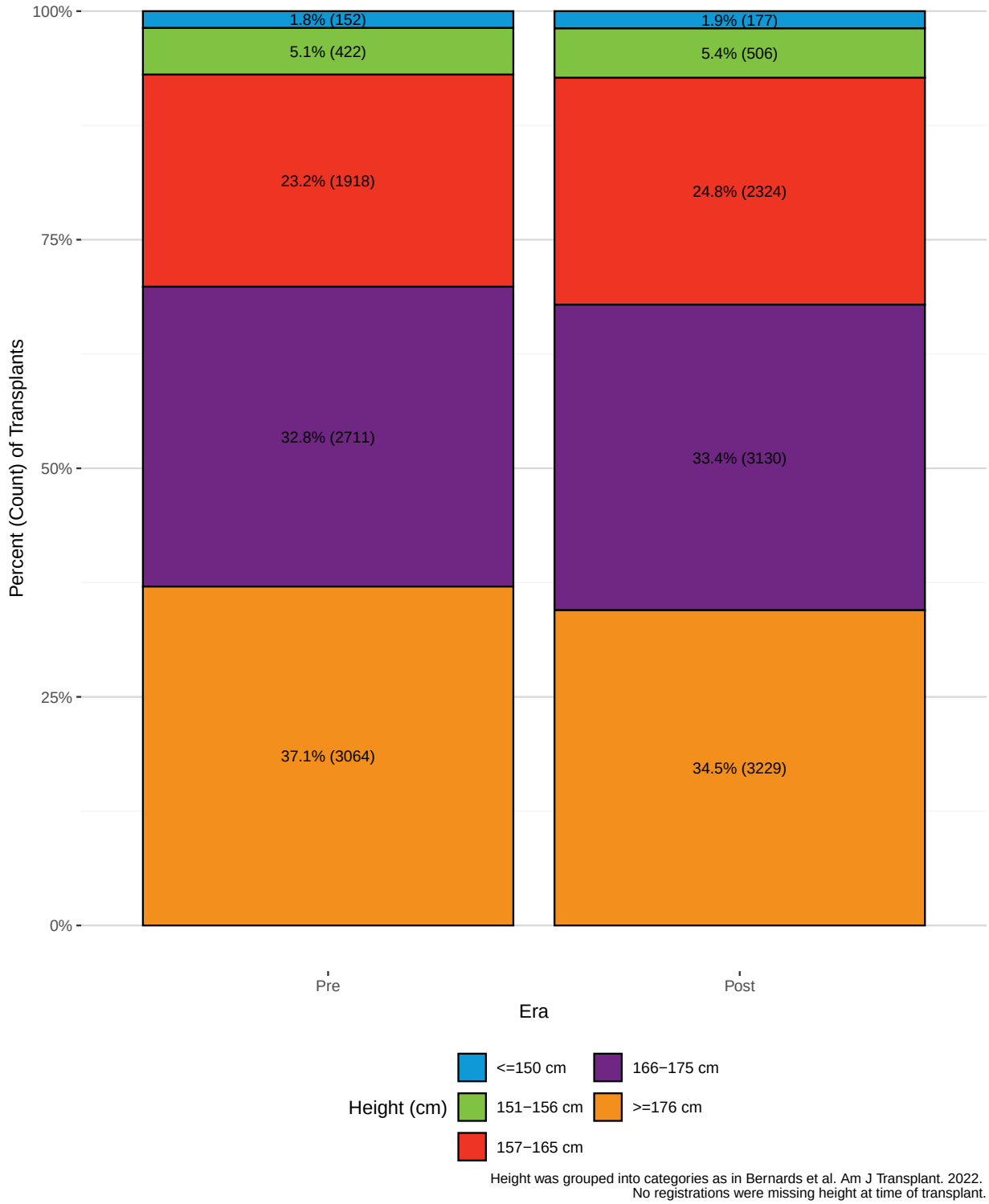
Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time.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

Appendix Table 6. 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

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	Height (cm)	N	N	PY	Estimate	95% CI
Pre	<=150 cm	466	60	217.7	27.56	(21.03, 35.47)
	151-156 cm	1309	133	607.9	21.88	(18.32, 25.93)
	157-165 cm	5375	455	2395.3	19.00	(17.29, 20.82)
	166-175 cm	7181	547	3167.8	17.27	(15.85, 18.78)
	>=176 cm	7168	477	3004.3	15.88	(14.48, 17.37)
Post	<=150 cm	481	56	183.0	30.60	(23.12, 39.74)
	151-156 cm	1330	120	528.0	22.73	(18.84, 27.18)
	157-165 cm	5705	446	2176.7	20.49	(18.63, 22.48)
	166-175 cm	7280	464	2817.2	16.47	(15.01, 18.04)
	>=176 cm	7036	462	2681.2	17.23	(15.70, 18.88)

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

Appendix Figure 8. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Height at Transplant and Era



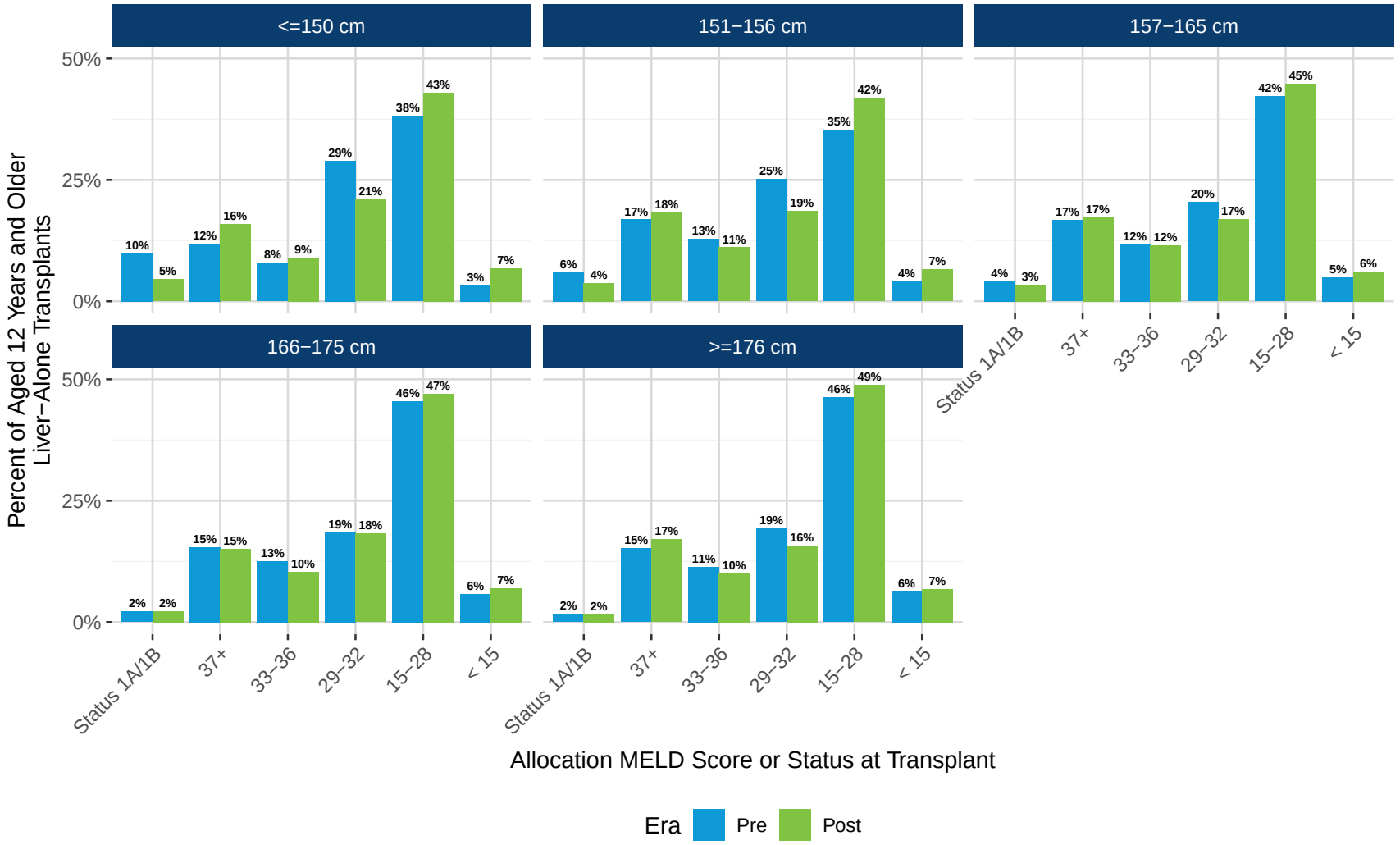
Height was grouped into categories as in Bernards et al. Am J Transplant. 2022.
No registrations were missing height at time of transplant.

Appendix Table 7. 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	152 (1.8%)	177 (1.9%)
151-156 cm	422 (5.1%)	506 (5.4%)
157-165 cm	1,918 (23.2%)	2,324 (24.8%)
166-175 cm	2,711 (32.8%)	3,130 (33.4%)
>=176 cm	3,064 (37.1%)	3,229 (34.5%)
Total	8,267 (100.0%)	9,366 (100.0%)

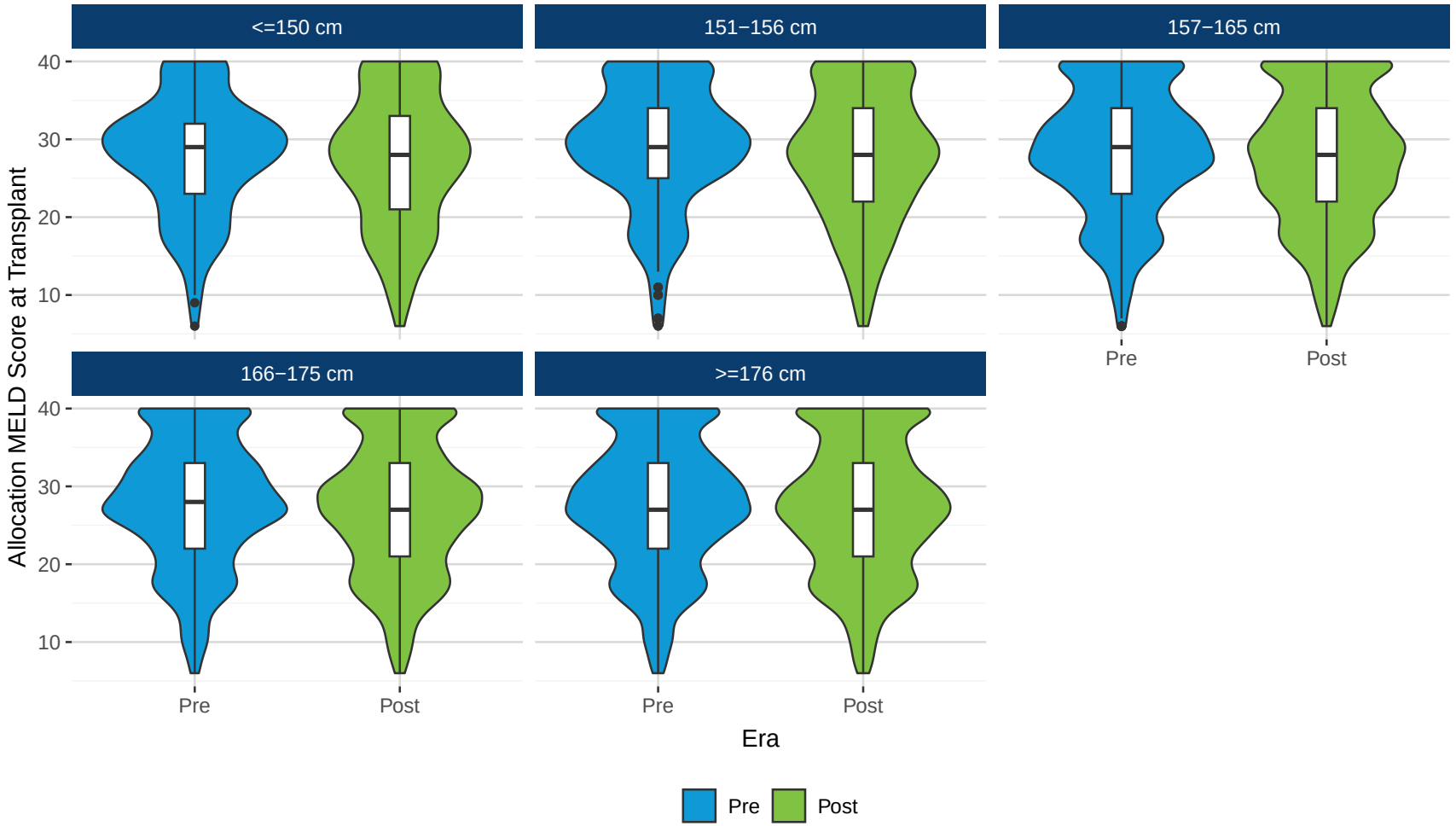
Height was grouped into categories as in Bernards et al. Am J Transplant. 2022.
No registrations with missing height at time of transplant.

Appendix Figure 9. Distribution of Allocation MELD Score or Status at Transplant for Liver-Alone 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 10. Distribution of Allocation MELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Height at Transplant and Era



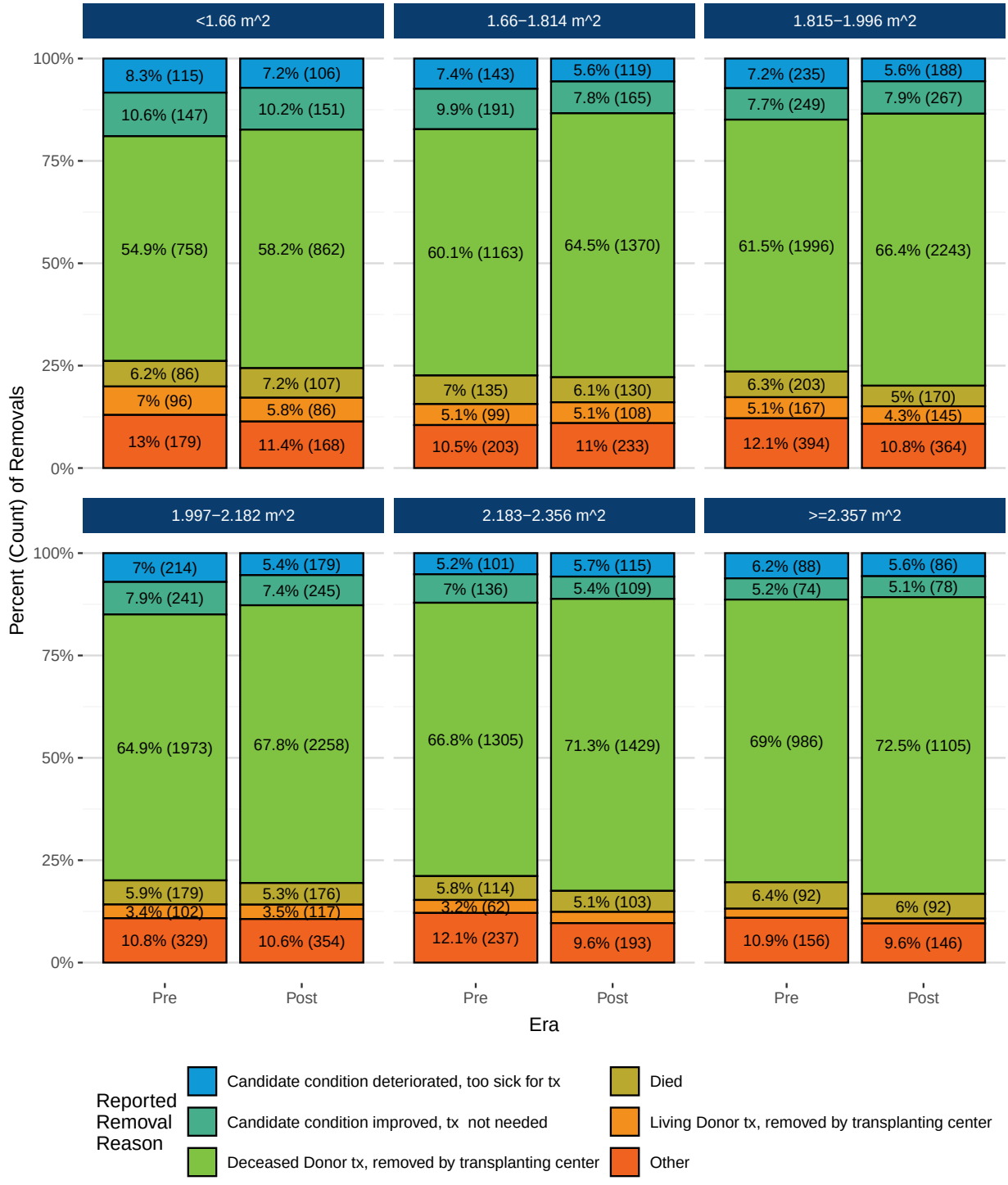
Recipients who received transplant while in Status 1A/1B were excluded because they do not have allocation MELD scores at transplant.
Pre−policy, 15 (9.87%), 25 (5.92%), 79 (4.12%), 58 (2.14%), 51 (1.66%), and
0 (0%) Status 1A/1B recipients were in the <150 cm, 151−156 cm, 157−165 cm, 166−175 cm, >176 cm, and missing height groups, respectively.
Post−policy, 8 (4.52%), 19 (3.75%), 80 (3.44%),
71 (2.27%), 50 (1.55%),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 8. Summary of Allocation PELD Score at Transplant for Liver-Alone 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	137	6	23	29	32	40	9
	Post	169	6	21	28	33	40	12
151-156 cm	Pre	397	6	25	29	34	40	9
	Post	487	6	22	28	34	40	12
157-165 cm	Pre	1839	6	23	29	34	40	11
	Post	2244	6	22	28	34	40	12
166-175 cm	Pre	2653	6	22	28	33	40	11
	Post	3059	6	21	27	33	40	12
>=176 cm	Pre	3013	6	22	27	33	40	11
	Post	3179	6	21	27	33	40	12

Recipients who received transplant while in Status 1A/1B were excluded because they do not have allocation MELD scores at transplant. Pre-policy, 15 (9.87%), 25 (5.92%), 79 (4.12%), 58 (2.14%), 51 (1.66%), 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, 8 (4.52%), 19 (3.75%), 80 (3.44%), 71 (2.27%), 50 (1.55%), 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 11. 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



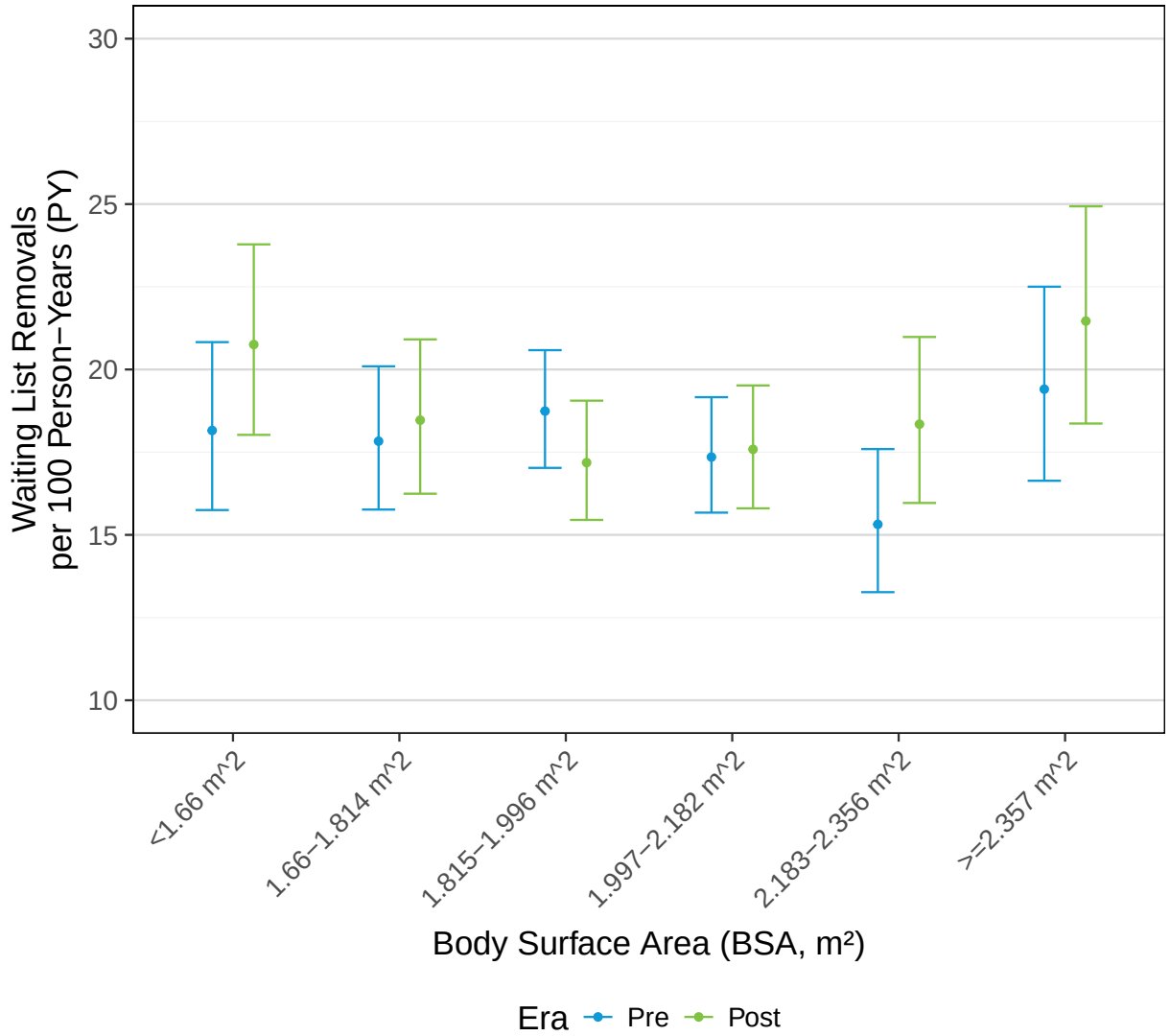
*Removal reasons containing <3% of forms in both policy eras were combined with the Other category for plotting purposes, but appear in the corresponding table. BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). 8 registrations with missing BSA at removal were excluded.

Appendix Table 9. 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

	<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	
Reported Removal Reason	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Candidate condition deteriorated, too sick for tx	115 (8.3%)	106 (7.2%)	143 (7.4%)	119 (5.6%)	235 (7.2%)	188 (5.6%)	214 (7.0%)	179 (5.4%)	101 (5.2%)	115 (5.7%)	88 (6.2%)	86 (5.6%)
Candidate condition improved, tx not needed	147 (10.6%)	151 (10.2%)	191 (9.9%)	165 (7.8%)	249 (7.7%)	267 (7.9%)	241 (7.9%)	245 (7.4%)	136 (7.0%)	109 (5.4%)	74 (5.2%)	78 (5.1%)
Candidate Removed in Error	0 (0.0%)	0 (0.0%)	1 (0.1%)	2 (0.1%)	2 (0.1%)	0 (0.0%)	1 (0.0%)	0 (0.0%)	1 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Deceased Donor tx, removed by transplanting center	758 (54.9%)	862 (58.2%)	1,163 (60.1%)	1,370 (64.5%)	1,996 (61.5%)	2,243 (66.4%)	1,973 (64.9%)	2,258 (67.8%)	1,305 (66.8%)	1,429 (71.3%)	986 (69.0%)	1,105 (72.5%)
Died	86 (6.2%)	107 (7.2%)	135 (7.0%)	130 (6.1%)	203 (6.3%)	170 (5.0%)	179 (5.9%)	176 (5.3%)	114 (5.8%)	103 (5.1%)	92 (6.4%)	92 (6.0%)
Living Donor tx, removed by transplanting center	96 (7.0%)	86 (5.8%)	99 (5.1%)	108 (5.1%)	167 (5.1%)	145 (4.3%)	102 (3.4%)	117 (3.5%)	62 (3.2%)	55 (2.7%)	32 (2.2%)	18 (1.2%)
Other	116 (8.4%)	92 (6.2%)	113 (5.8%)	138 (6.5%)	220 (6.8%)	207 (6.1%)	190 (6.3%)	207 (6.2%)	120 (6.1%)	111 (5.5%)	96 (6.7%)	74 (4.9%)
Patient died during TX procedure	2 (0.1%)	3 (0.2%)	0 (0.0%)	1 (0.0%)	2 (0.1%)	5 (0.1%)	3 (0.1%)	3 (0.1%)	1 (0.1%)	2 (0.1%)	0 (0.0%)	2 (0.1%)
Refused transplant	11 (0.8%)	13 (0.9%)	14 (0.7%)	22 (1.0%)	31 (1.0%)	29 (0.9%)	29 (1.0%)	31 (0.9%)	19 (1.0%)	24 (1.2%)	12 (0.8%)	11 (0.7%)
Transferred to another center	11 (0.8%)	12 (0.8%)	12 (0.6%)	14 (0.7%)	14 (0.4%)	26 (0.8%)	13 (0.4%)	19 (0.6%)	16 (0.8%)	10 (0.5%)	8 (0.6%)	8 (0.5%)
Transplant at another center (multi-listed)	25 (1.8%)	27 (1.8%)	41 (2.1%)	37 (1.7%)	74 (2.3%)	59 (1.7%)	60 (2.0%)	67 (2.0%)	55 (2.8%)	36 (1.8%)	30 (2.1%)	34 (2.2%)
Transplanted in another country	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (0.1%)	2 (0.1%)	2 (0.1%)	0 (0.0%)	1 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Unable to contact candidate	14 (1.0%)	21 (1.4%)	22 (1.1%)	16 (0.8%)	49 (1.5%)	36 (1.1%)	33 (1.1%)	26 (0.8%)	25 (1.3%)	10 (0.5%)	10 (0.7%)	17 (1.1%)
Total	1,381 (100.0%)	1,480 (100.0%)	1,934 (100.0%)	2,125 (100.0%)	3,244 (100.0%)	3,377 (100.0%)	3,038 (100.0%)	3,329 (100.0%)	1,955 (100.0%)	2,004 (100.0%)	1,428 (100.0%)	1,525 (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).
8 registrations with missing BSA at removal were excluded.

Appendix Figure 12. Liver-Alone 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



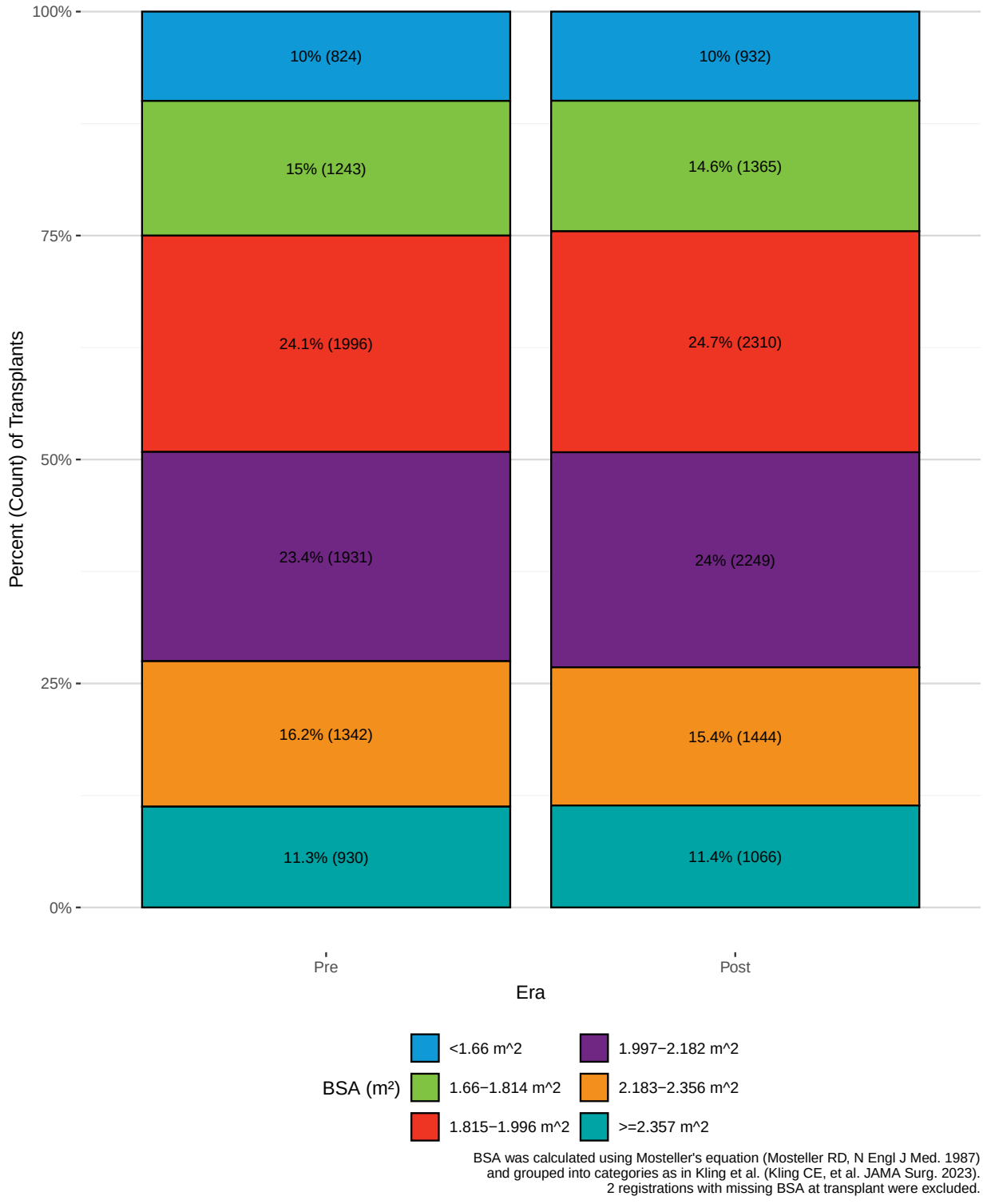
BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time. 26 registrations in the pre−policy era and 24 registrations in the post−policy era were excluded.

Appendix Table 10. Liver-Alone 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

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	BSA (m^2)	N	N	PY	Estimate	95% CI
Pre	<1.66 m^2	2433	204	1123.5	18.16	(15.75, 20.83)
	1.66-1.814 m^2	3312	269	1508.5	17.83	(15.76, 20.10)
	1.815-1.996 m^2	5408	437	2331.7	18.74	(17.03, 20.58)
	1.997-2.182 m^2	5154	390	2247.6	17.35	(15.67, 19.16)
	2.183-2.356 m^2	3108	200	1305.7	15.32	(13.27, 17.59)
	>=2.357 m^2	2288	175	901.9	19.40	(16.64, 22.50)
Post	<1.66 m^2	2521	207	997.4	20.75	(18.02, 23.78)
	1.66-1.814 m^2	3479	249	1348.3	18.47	(16.25, 20.91)
	1.815-1.996 m^2	5400	359	2089.1	17.18	(15.45, 19.06)
	1.997-2.182 m^2	5245	354	2012.9	17.59	(15.80, 19.52)
	2.183-2.356 m^2	3120	213	1161.0	18.35	(15.96, 20.98)
	>=2.357 m^2	2296	171	796.7	21.46	(18.37, 24.93)

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.
26 registrations in the pre-policy era and 24 registrations in the post-policy era were excluded.

Appendix Figure 13. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Body Surface Area (BSA) at Transplant and Era



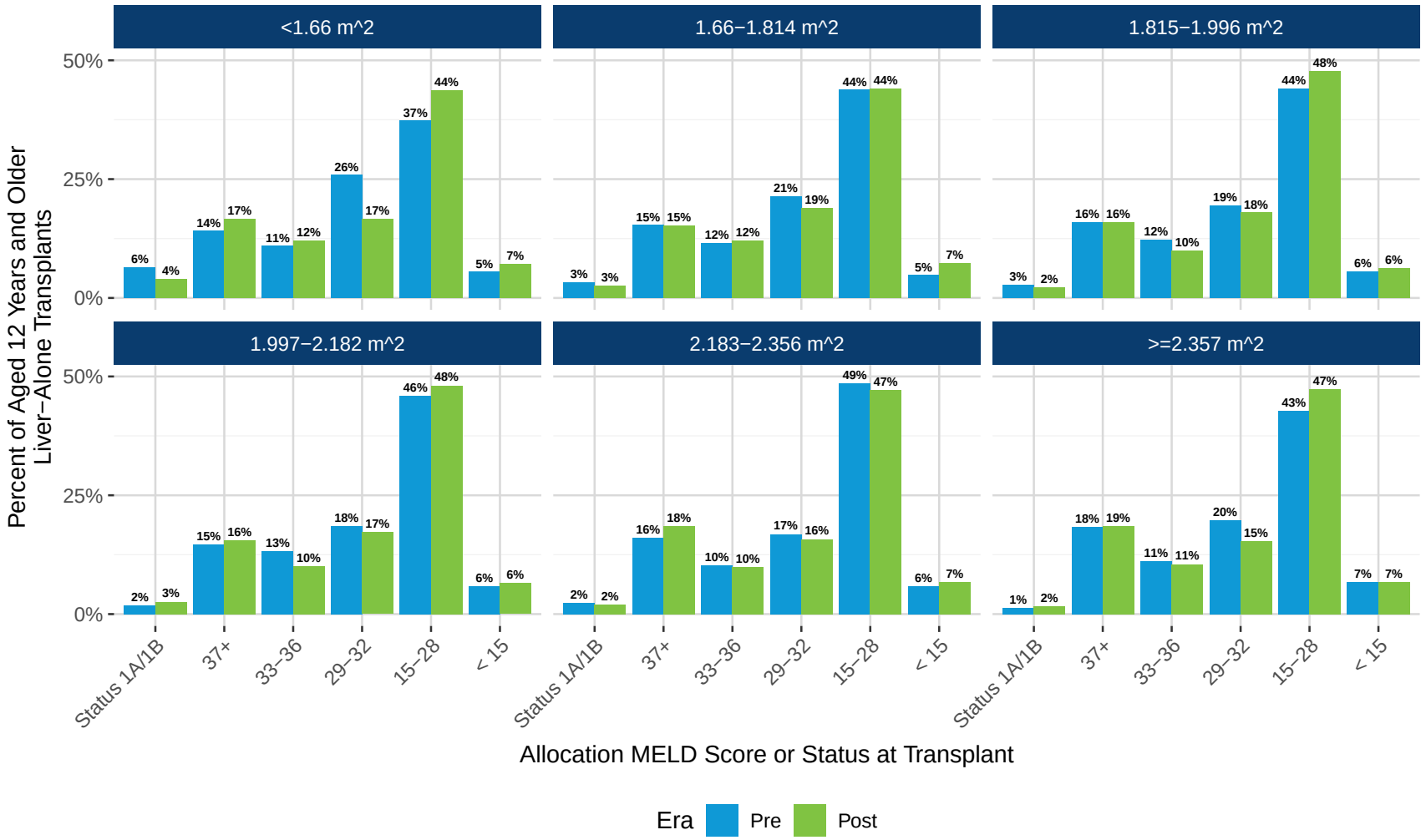
BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023).
2 registrations with missing BSA at transplant were excluded.

Appendix Table 11. 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	824 (10.0%)	932 (10.0%)
1.66-1.814 m^2	1,243 (15.0%)	1,365 (14.6%)
1.815-1.996 m^2	1,996 (24.1%)	2,310 (24.7%)
1.997-2.182 m^2	1,931 (23.4%)	2,249 (24.0%)
2.183-2.356 m^2	1,342 (16.2%)	1,444 (15.4%)
>=2.357 m^2	930 (11.3%)	1,066 (11.4%)
Total	8,266 (100.0%)	9,366 (100.0%)

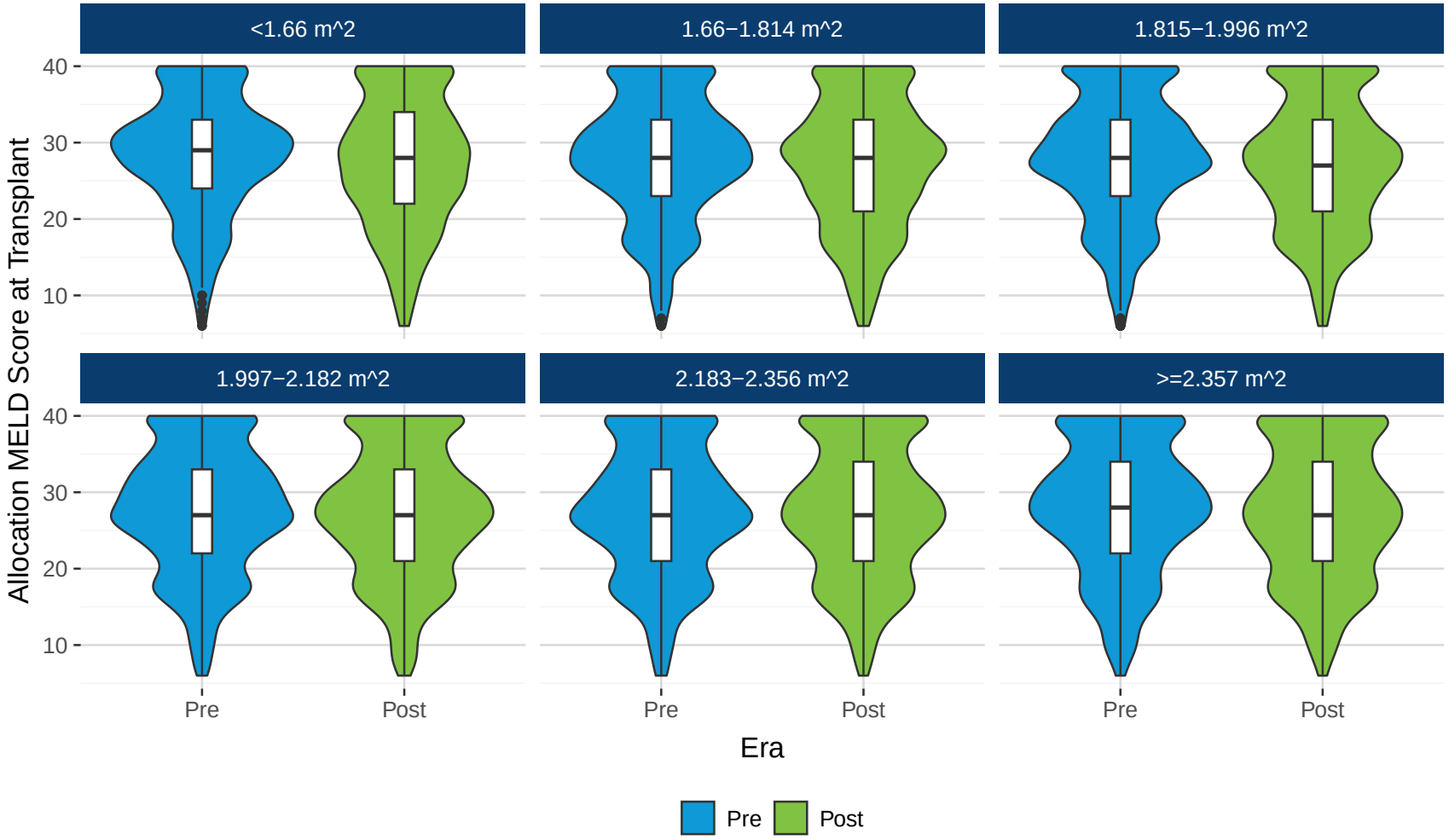
BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023).
2 registrations with missing BSA at transplant were excluded.

Appendix Figure 14. Distribution of Allocation MELD Score or Status at Transplant for Liver-Alone Transplant 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 Figure 15. Distribution of Allocation MELD Score at Transplant for Liver-Alone 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, 53 (6.43%), 41 (3.3%), 54 (2.71%), 36 (1.86%), 32 (2.38%), 12 (1.29%), and 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, 37 (3.97%), 35 (2.56%), 52 (2.25%), 59 (2.62%), 28 (1.94%), 17 (1.59%), and 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.

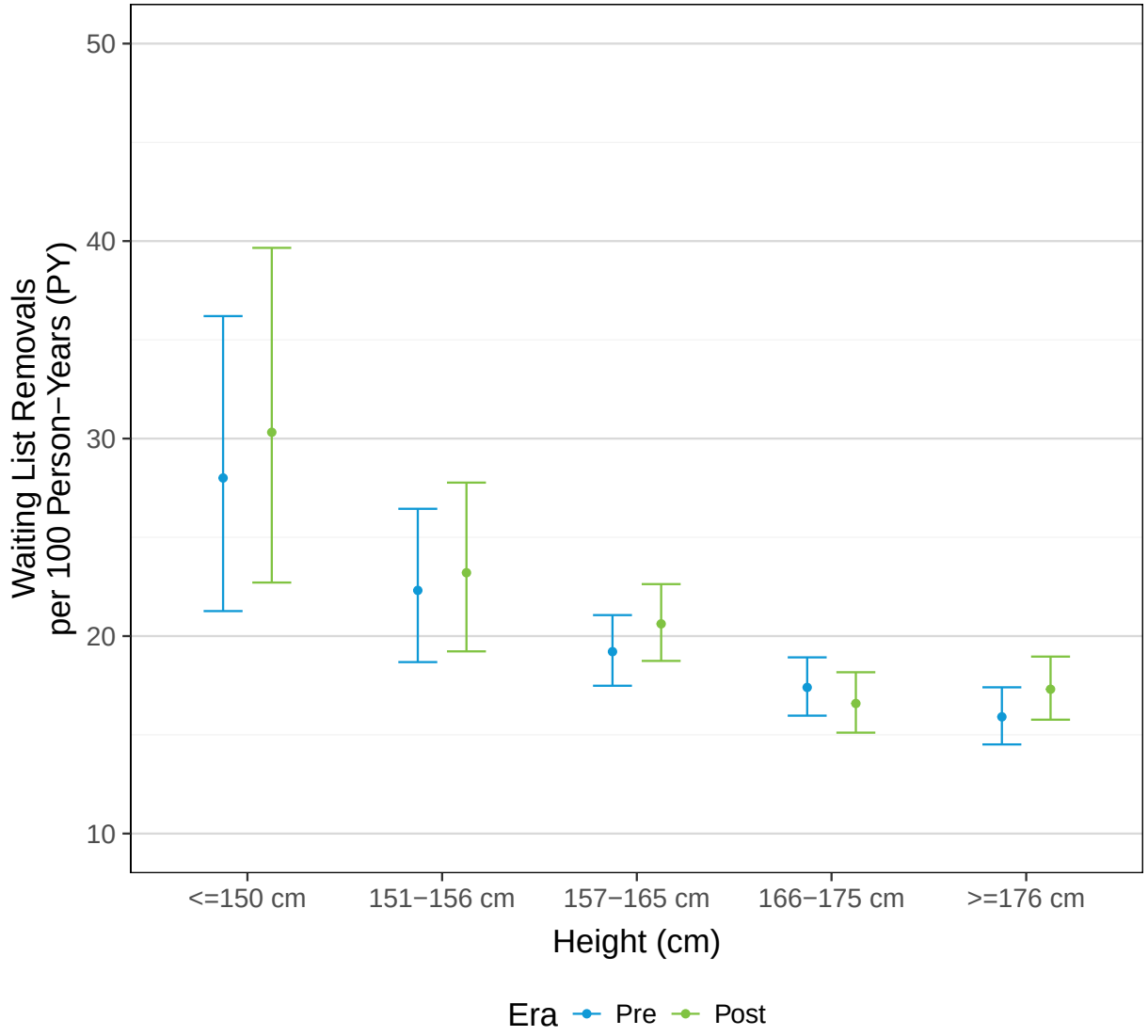
Appendix Table 12. Summary of Allocation PELD Score at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Body Surface Area (BSA) at Transplant and Era

BSA (m^2)	Policy Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum	Interquartile Range
<1.66 m^2	Pre	771	6	24	29	33	40	9
	Post	895	6	22	28	34	40	12
1.66-1.814 m^2	Pre	1202	6	23	28	33	40	10
	Post	1330	6	21	28	33	40	12
1.815-1.996 m^2	Pre	1942	6	23	28	33	40	10
	Post	2258	6	21	27	33	40	12
1.997-2.182 m^2	Pre	1895	6	22	27	33	40	11
	Post	2190	6	21	27	33	40	12
2.183-2.356 m^2	Pre	1310	6	21	27	33	40	12
	Post	1416	6	21	27	34	40	13
>=2.357 m^2	Pre	918	6	22	28	34	40	12
	Post	1049	6	21	27	34	40	13

Recipients who received transplant while in Status 1A/1B were excluded because they do not have allocation MELD scores at transplant. Pre-policy, 53 (6.43%) , 41 (3.3%) , 54 (2.71%) , 36 (1.86%) , 32 (2.38%) , 12 (1.29%) , and Status 1A/1B recipients were in the <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, and missing BSA groups, respectively.

Post-policy, 37 (3.97%) , 35 (2.56%) , 52 (2.25%) , 59 (2.62%) , 28 (1.94%) , 17 (1.59%) , and Status 1A/1B recipients were in the <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 and missing BSA groups, respectively.

Appendix Figure 16. 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



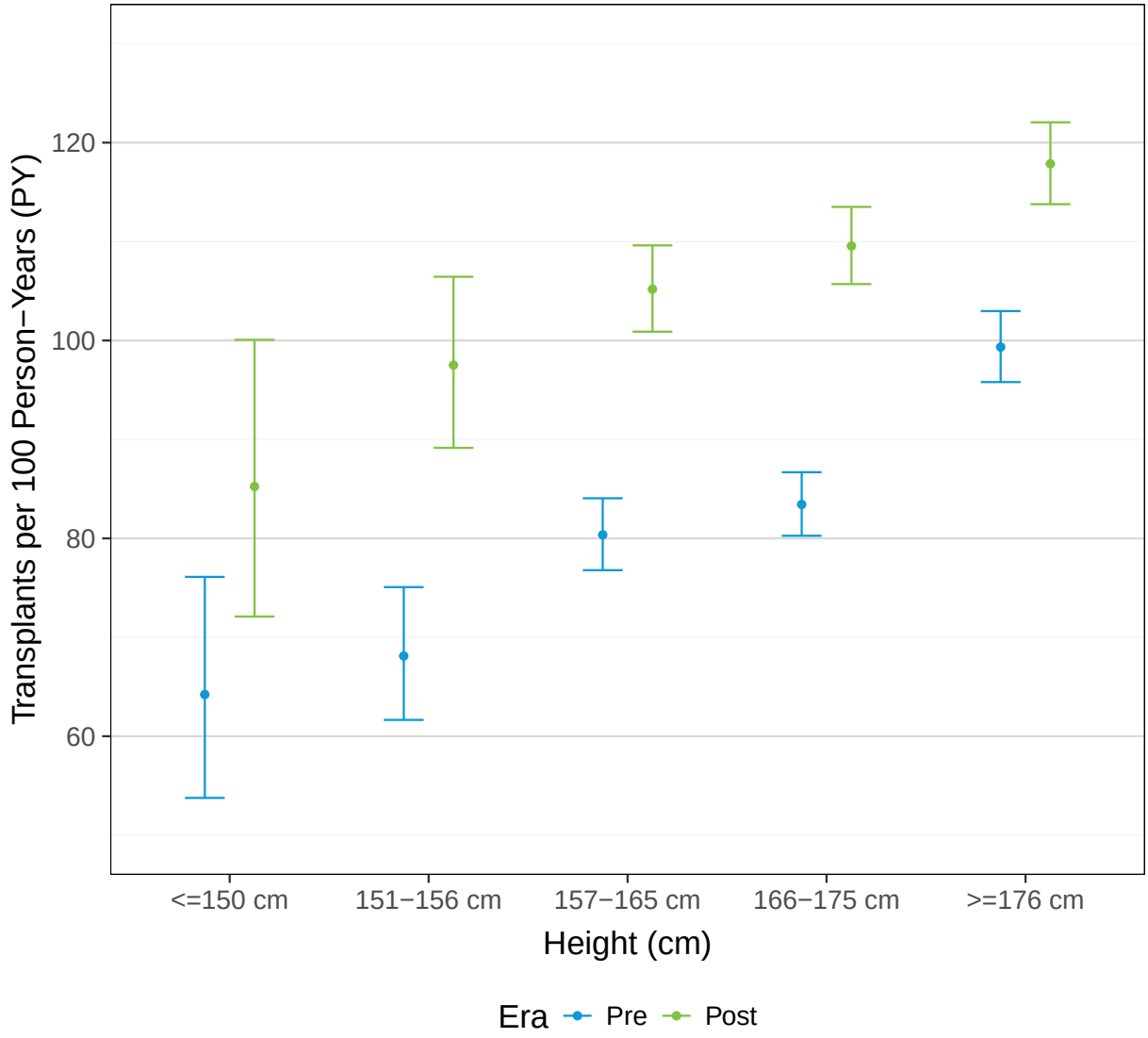
Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time.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

Appendix Table 13. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 18 Years and Older by Height and Era

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	Height (cm)	N	N	PY	Estimate	95% CI
Pre	<=150 cm	432	58	207.1	28.00	(21.26, 36.20)
	151-156 cm	1268	133	596.0	22.31	(18.68, 26.44)
	157-165 cm	5306	454	2363.2	19.21	(17.48, 21.06)
	166-175 cm	7121	546	3138.1	17.40	(15.97, 18.92)
	>=176 cm	7135	476	2991.8	15.91	(14.51, 17.41)
Post	<=150 cm	447	53	174.8	30.32	(22.71, 39.66)
	151-156 cm	1295	119	512.8	23.21	(19.23, 27.77)
	157-165 cm	5615	443	2148.6	20.62	(18.74, 22.63)
	166-175 cm	7211	463	2791.4	16.59	(15.11, 18.17)
	>=176 cm	7012	462	2669.2	17.31	(15.77, 18.96)

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

Appendix Figure 17. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 18 Years and Older by Height and Era



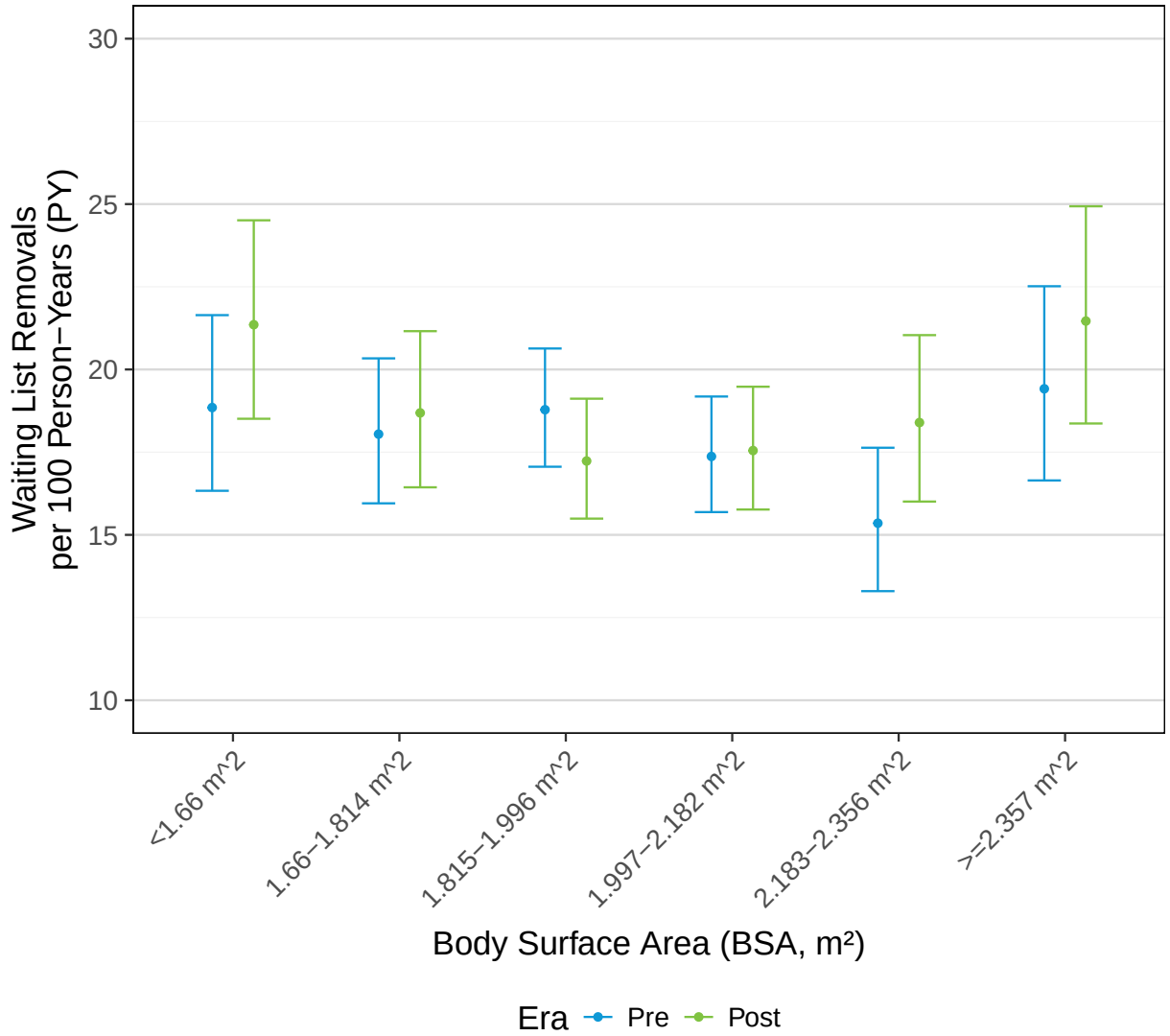
Height was grouped into categories as in Bernards et al. (Bernards S, et al. Am J Transplant. 2022). Height may change over time. Thus, registrations may appear in multiple height categories throughout their waiting period. Registrations missing height at a particular time were excluded at that time. 8 registrations in the pre−policy era and 9 registrations in the post−policy era were excluded.

Appendix Table 14. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 18 Years and Older by Height and Era

		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	Height (cm)	N	N	PY	Estimate	95% CI
Pre	<=150 cm	432	133	207.1	64.22	(53.77, 76.10)
	151-156 cm	1268	406	596.0	68.12	(61.65, 75.07)
	157-165 cm	5306	1899	2363.2	80.36	(76.78, 84.05)
	166-175 cm	7121	2618	3138.1	83.43	(80.26, 86.69)
	>=176 cm	7135	2972	2991.8	99.34	(95.80, 102.97)
Post	<=150 cm	447	149	174.8	85.23	(72.10, 100.07)
	151-156 cm	1295	500	512.8	97.51	(89.15, 106.44)
	157-165 cm	5615	2260	2148.6	105.19	(100.89, 109.61)
	166-175 cm	7211	3058	2791.4	109.55	(105.70, 113.50)
	>=176 cm	7012	3146	2669.2	117.86	(113.78, 122.05)

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

Appendix Figure 18. Liver-Alone 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



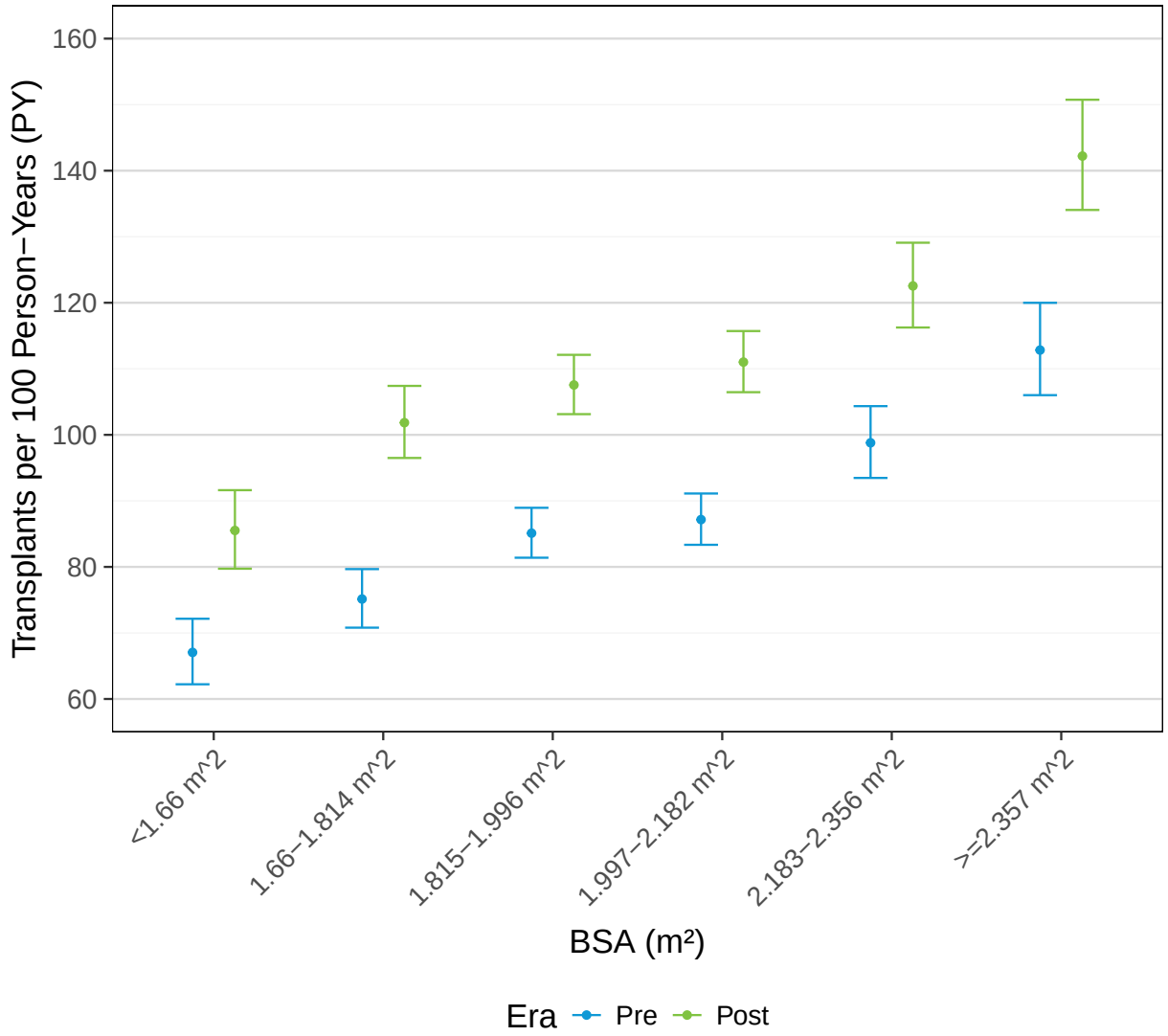
BSA was calculated using Mosteller's equation (Mosteller RD, N Engl J Med. 1987) and grouped into categories as in Kling et al. (Kling CE, et al. JAMA Surg. 2023). BSA depends on candidates' height and weight, which may change over time. Thus, registrations may appear in multiple BSA categories throughout their waiting period. Registrations with missing BSA at a particular time were excluded at that time. 25 registrations in the pre−policy era and 23 registrations in the post−policy era were excluded.

Appendix Table 15. Liver-Alone 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

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	BSA (m^2)	N	N	PY	Estimate	95% CI
Pre	<1.66 m^2	2293	201	1066.4	18.85	(16.33, 21.64)
	1.66-1.814 m^2	3272	269	1490.7	18.05	(15.95, 20.34)
	1.815-1.996 m^2	5371	435	2315.8	18.78	(17.06, 20.63)
	1.997-2.182 m^2	5145	390	2245.2	17.37	(15.69, 19.18)
	2.183-2.356 m^2	3100	200	1302.7	15.35	(13.30, 17.63)
	>=2.357 m^2	2285	175	901.3	19.42	(16.65, 22.52)
Post	<1.66 m^2	2374	202	946.0	21.35	(18.51, 24.51)
	1.66-1.814 m^2	3438	249	1332.5	18.69	(16.44, 21.16)
	1.815-1.996 m^2	5360	357	2071.6	17.23	(15.49, 19.12)
	1.997-2.182 m^2	5231	353	2011.5	17.55	(15.77, 19.48)
	2.183-2.356 m^2	3111	213	1157.9	18.40	(16.01, 21.04)
	>=2.357 m^2	2295	171	796.7	21.46	(18.37, 24.93)

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.
25 registrations in the pre-policy era and 23 registrations in the post-policy era were excluded.

Appendix Figure 19. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 18 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. 25 registrations in the pre−policy era and 23 registrations in the post−policy era were excluded.

Appendix Table 16. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 18 Years and Older by Body Surface Area (BSA) and Era

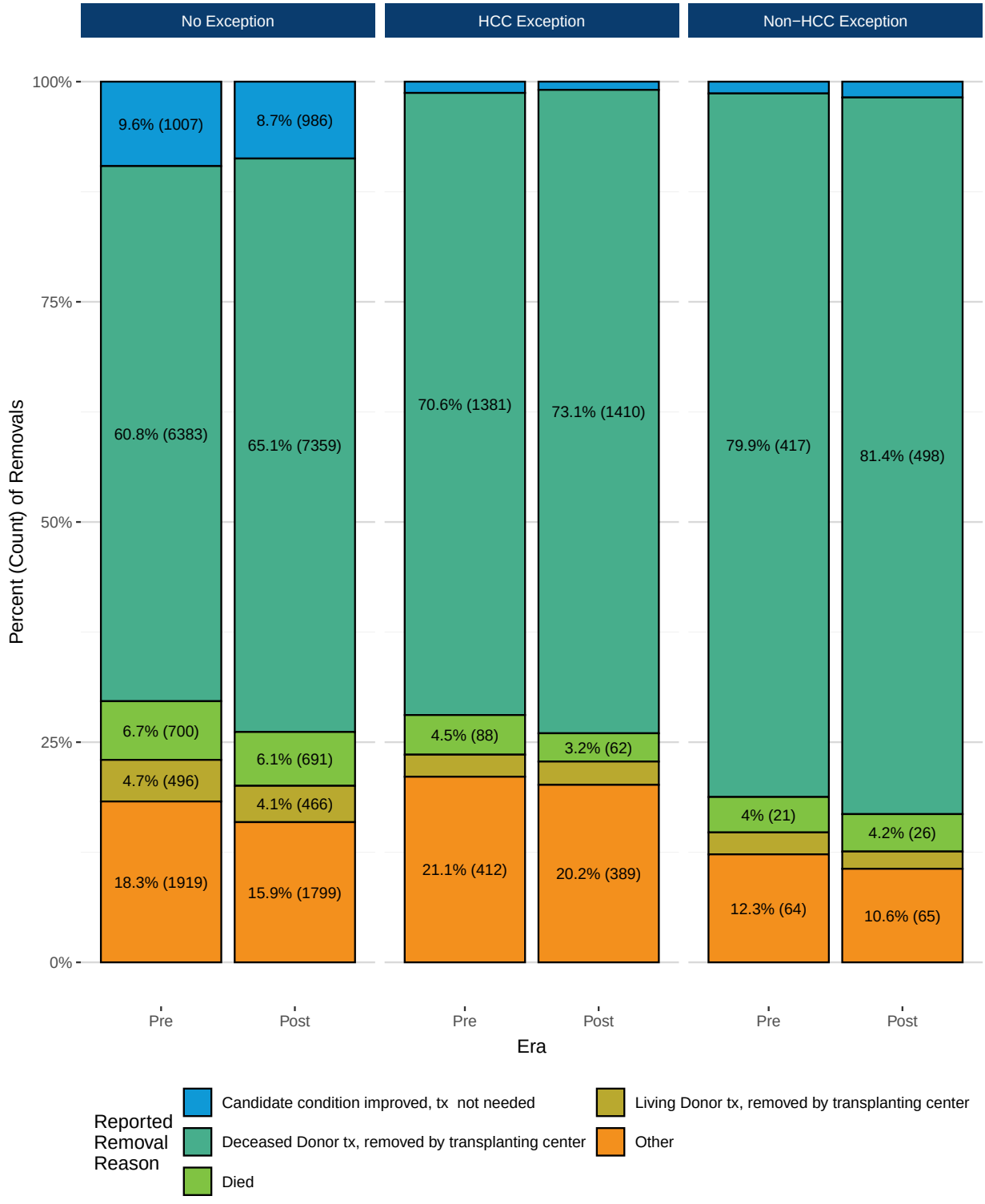
		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	BSA (m^2)	N	N	PY	Estimate	95% CI
Pre	<1.66 m^2	2293	715	1066.4	67.05	(62.22, 72.15)
	1.66-1.814 m^2	3272	1120	1490.7	75.13	(70.80, 79.67)
	1.815-1.996 m^2	5371	1971	2315.9	85.11	(81.39, 88.95)
	1.997-2.182 m^2	5145	1957	2245.2	87.16	(83.34, 91.11)
	2.183-2.356 m^2	3100	1287	1302.7	98.80	(93.47, 104.34)
	>=2.357 m^2	2285	1017	901.3	112.84	(106.01, 119.99)
Post	<1.66 m^2	2374	809	946.0	85.52	(79.73, 91.62)
	1.66-1.814 m^2	3438	1357	1332.5	101.84	(96.49, 107.41)
	1.815-1.996 m^2	5360	2228	2071.6	107.55	(103.13, 112.11)
	1.997-2.182 m^2	5231	2233	2011.5	111.01	(106.46, 115.72)
	2.183-2.356 m^2	3111	1419	1157.9	122.55	(116.25, 129.09)
	>=2.357 m^2	2295	1133	796.7	142.21	(134.05, 150.74)

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.
25 registrations in the pre-policy era and 23 registrations in the post-policy era were excluded.

Additional MELD 3.0 Results Sub-Section: Clinical Exception Type

This sub-section stratifies the analyses shown in the main "MELD 3.0 Results" section by 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 20. Count and Percent of Liver Candidates 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Exception Type, and Era

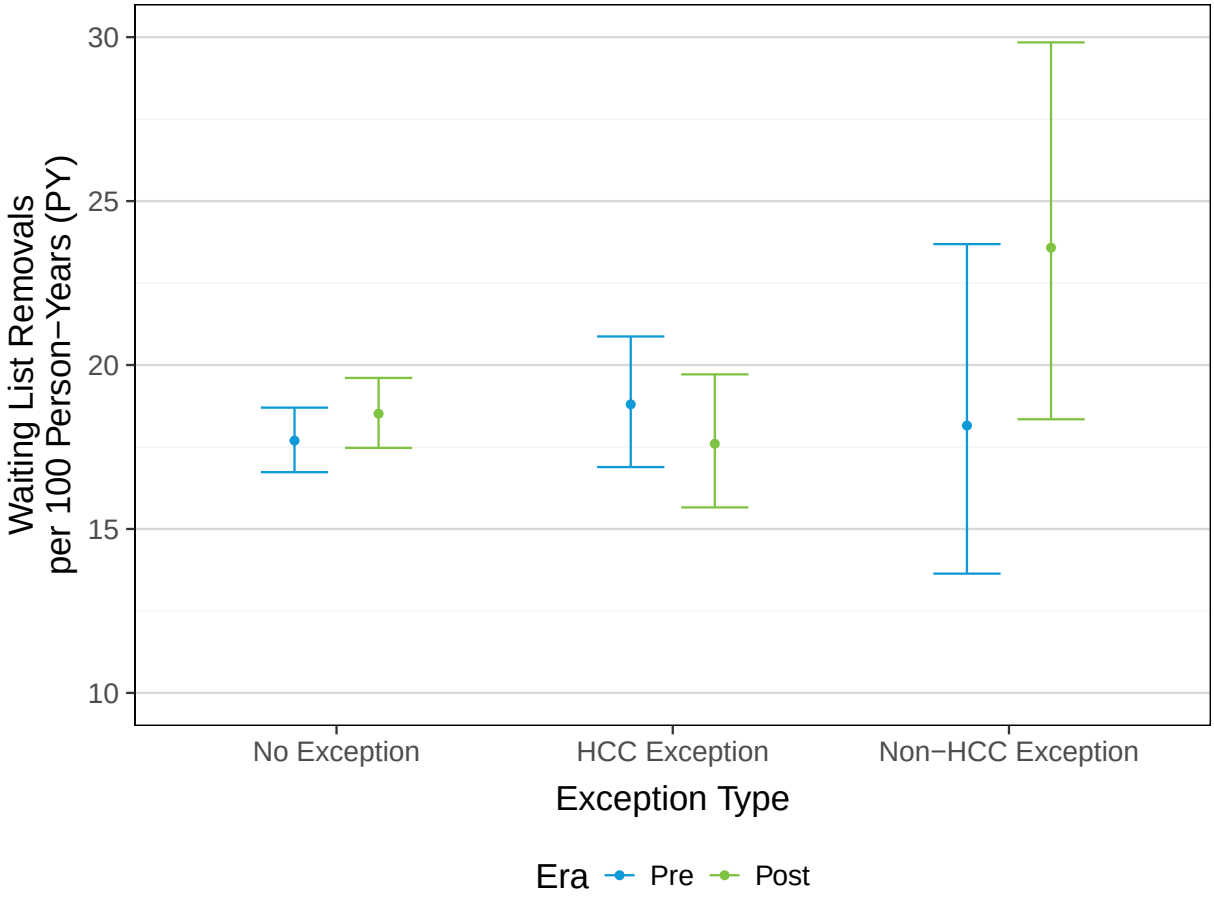


*Removal reasons containing <3% of forms in both policy eras were combined with the Other category for plotting purposes, but appear in the corresponding table.

Appendix Table 17. Count and Percent of Liver Candidates Aged 12 Years and Older Removed from the Waiting List by Reported Removal Reason, Exception Type, and Era

	No Exception		HCC Exception		Non-HCC Exception	
Reported Removal Reason	Pre	Post	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	6,383 (60.8%)	7,359 (65.1%)	1,381 (70.6%)	1,410 (73.1%)	417 (79.9%)	498 (81.4%)
Candidate condition improved, tx not needed	1,007 (9.6%)	986 (8.7%)	25 (1.3%)	18 (0.9%)	7 (1.3%)	11 (1.8%)
Other	740 (7.0%)	703 (6.2%)	103 (5.3%)	117 (6.1%)	13 (2.5%)	10 (1.6%)
Died	700 (6.7%)	691 (6.1%)	88 (4.5%)	62 (3.2%)	21 (4.0%)	26 (4.2%)
Candidate condition deteriorated, too sick for tx	689 (6.6%)	604 (5.3%)	181 (9.3%)	152 (7.9%)	26 (5.0%)	37 (6.0%)
Living Donor tx, removed by transplanting center	496 (4.7%)	466 (4.1%)	49 (2.5%)	51 (2.6%)	13 (2.5%)	12 (2.0%)
Transplant at another center (multi-listed)	201 (1.9%)	198 (1.8%)	69 (3.5%)	53 (2.7%)	15 (2.9%)	9 (1.5%)
Unable to contact candidate	148 (1.4%)	122 (1.1%)	4 (0.2%)	4 (0.2%)	1 (0.2%)	1 (0.2%)
Refused transplant	76 (0.7%)	91 (0.8%)	38 (1.9%)	38 (2.0%)	2 (0.4%)	1 (0.2%)
Transferred to another center	51 (0.5%)	67 (0.6%)	17 (0.9%)	17 (0.9%)	6 (1.1%)	5 (0.8%)
Patient died during TX procedure	8 (0.1%)	8 (0.1%)	0 (0.0%)	6 (0.3%)	0 (0.0%)	2 (0.3%)
Candidate Removed in Error	4 (0.0%)	2 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.2%)	0 (0.0%)
Transplanted in another country	2 (0.0%)	4 (0.0%)	0 (0.0%)	2 (0.1%)	0 (0.0%)	0 (0.0%)
Total	10,505 (100.0%)	11,301 (100.0%)	1,955 (100.0%)	1,930 (100.0%)	522 (100.0%)	612 (100.0%)

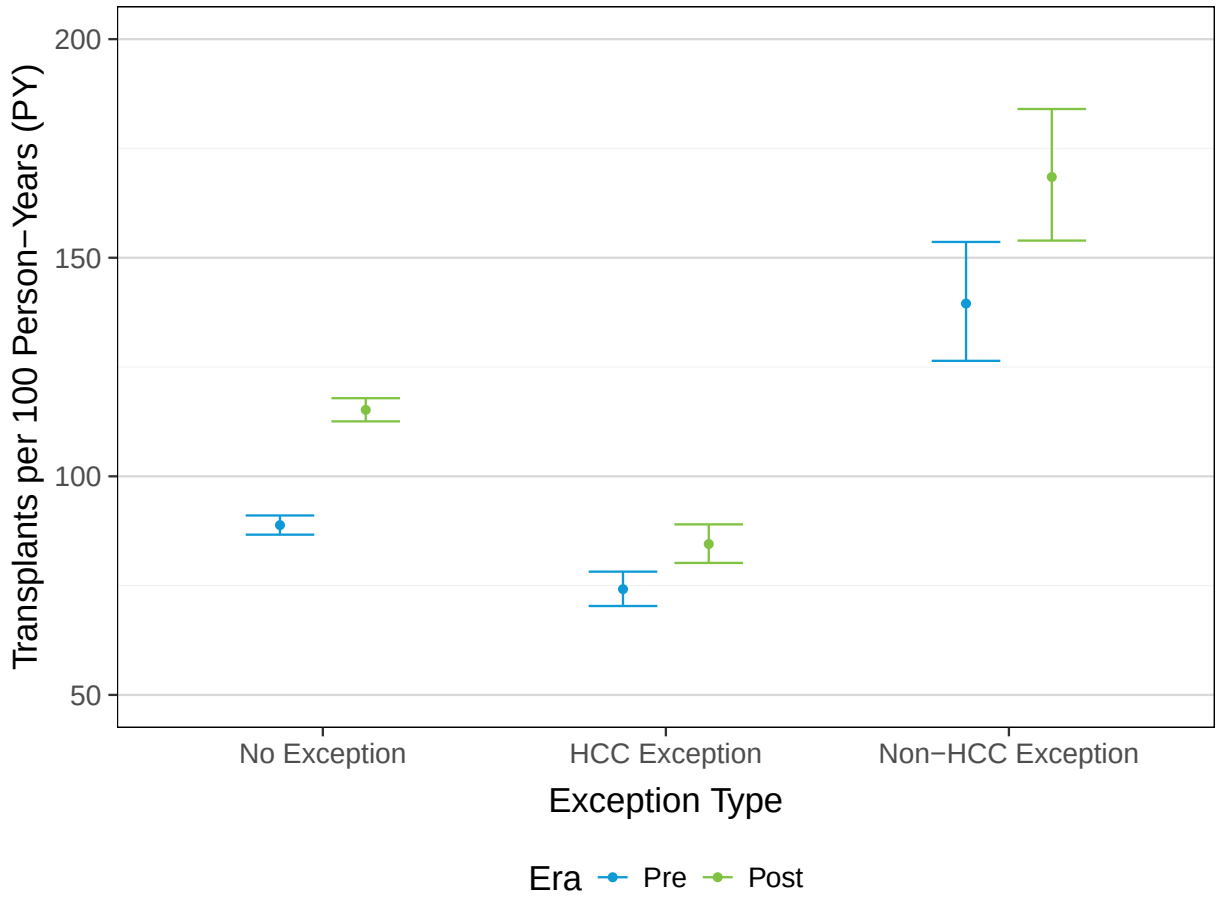
Appendix Figure 21. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 12 Years and Older by Exception Type and Era



Appendix Table 18. Liver-Alone 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

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	Exception Type	N	N	PY	Estimate	95% CI
Pre	No Exception	16757	1262	7131.5	17.70	(16.73, 18.70)
	HCC Exception	3651	352	1872.3	18.80	(16.89, 20.87)
	Non-HCC Exception	762	54	297.4	18.15	(13.64, 23.69)
Post	No Exception	17077	1174	6340.4	18.52	(17.47, 19.61)
	HCC Exception	3623	298	1693.2	17.60	(15.66, 19.72)
	Non-HCC Exception	853	69	292.6	23.58	(18.35, 29.84)

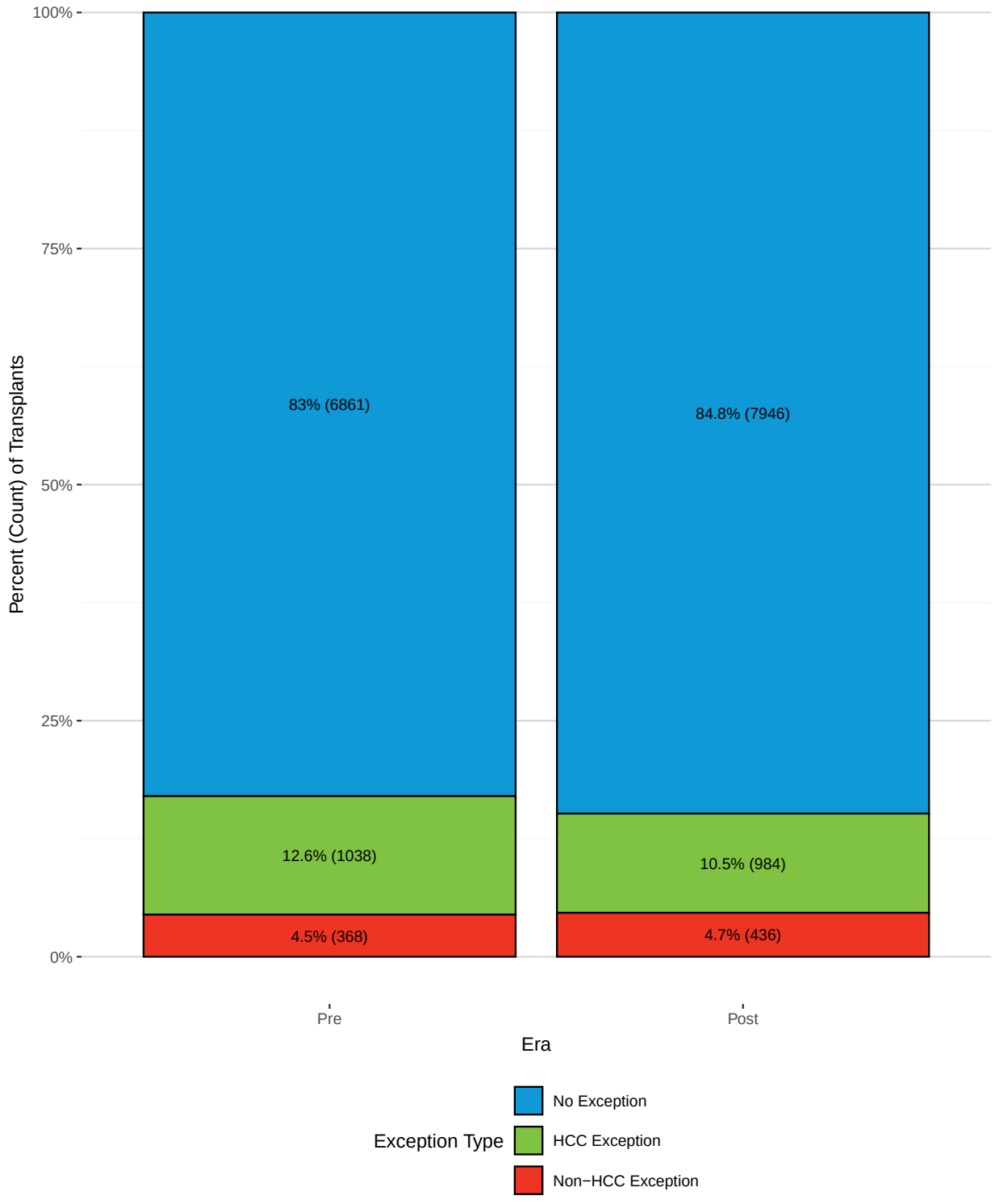
Appendix Figure 22. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Exception Type and Era



Appendix Table 19. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 12 Years and Older by Exception Type and Era

		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	Exception Type	N	N	PY	Estimate	95% CI
Pre	No Exception	16757	6335	7131.5	88.83	(86.66, 91.05)
	HCC Exception	3651	1389	1872.3	74.19	(70.34, 78.19)
	Non-HCC Exception	762	415	297.4	139.52	(126.42, 153.61)
Post	No Exception	17077	7304	6340.4	115.20	(112.57, 117.87)
	HCC Exception	3623	1431	1693.2	84.51	(80.19, 89.01)
	Non-HCC Exception	853	493	292.6	168.47	(153.92, 184.02)

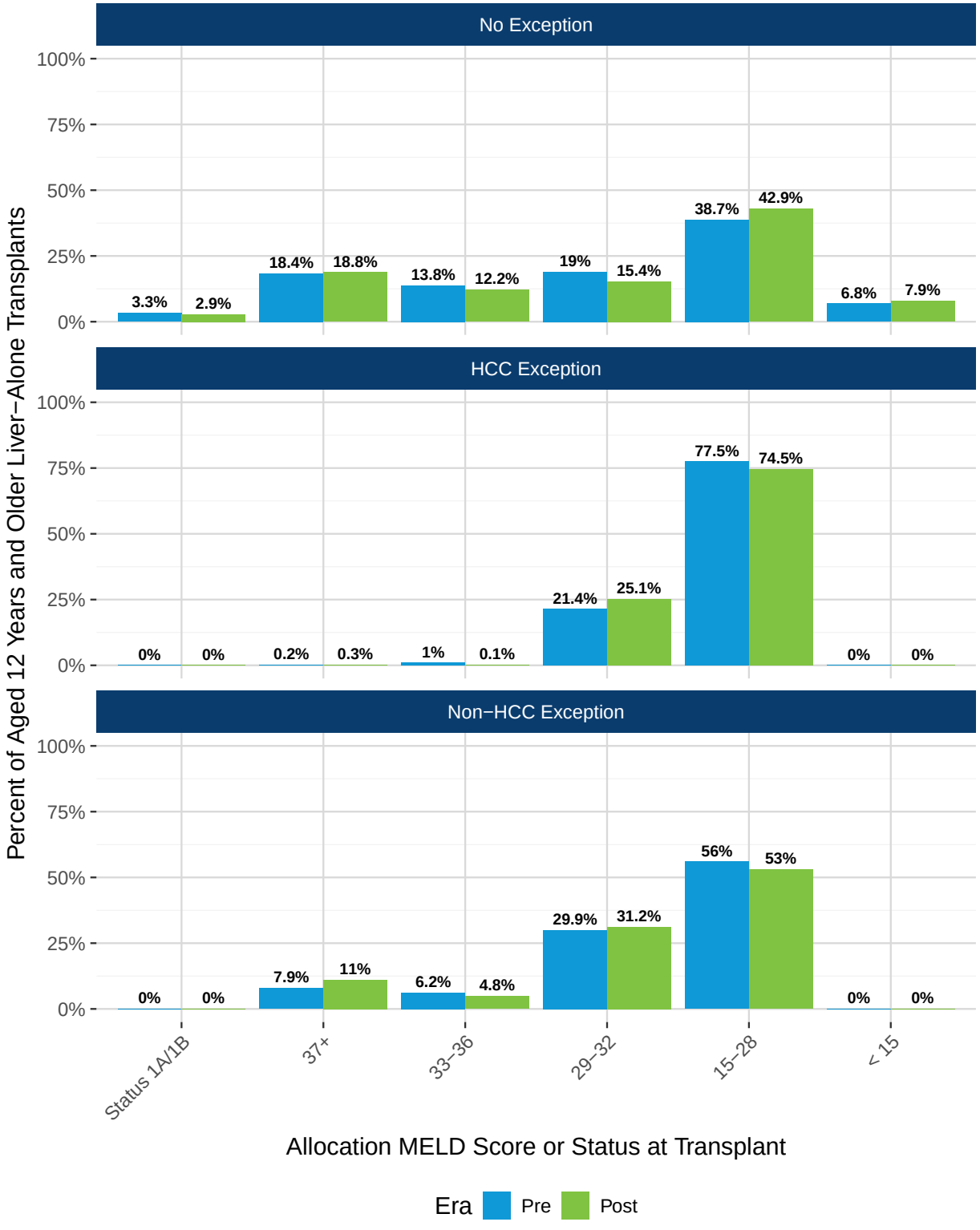
Appendix Figure 23. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Exception Type and Era



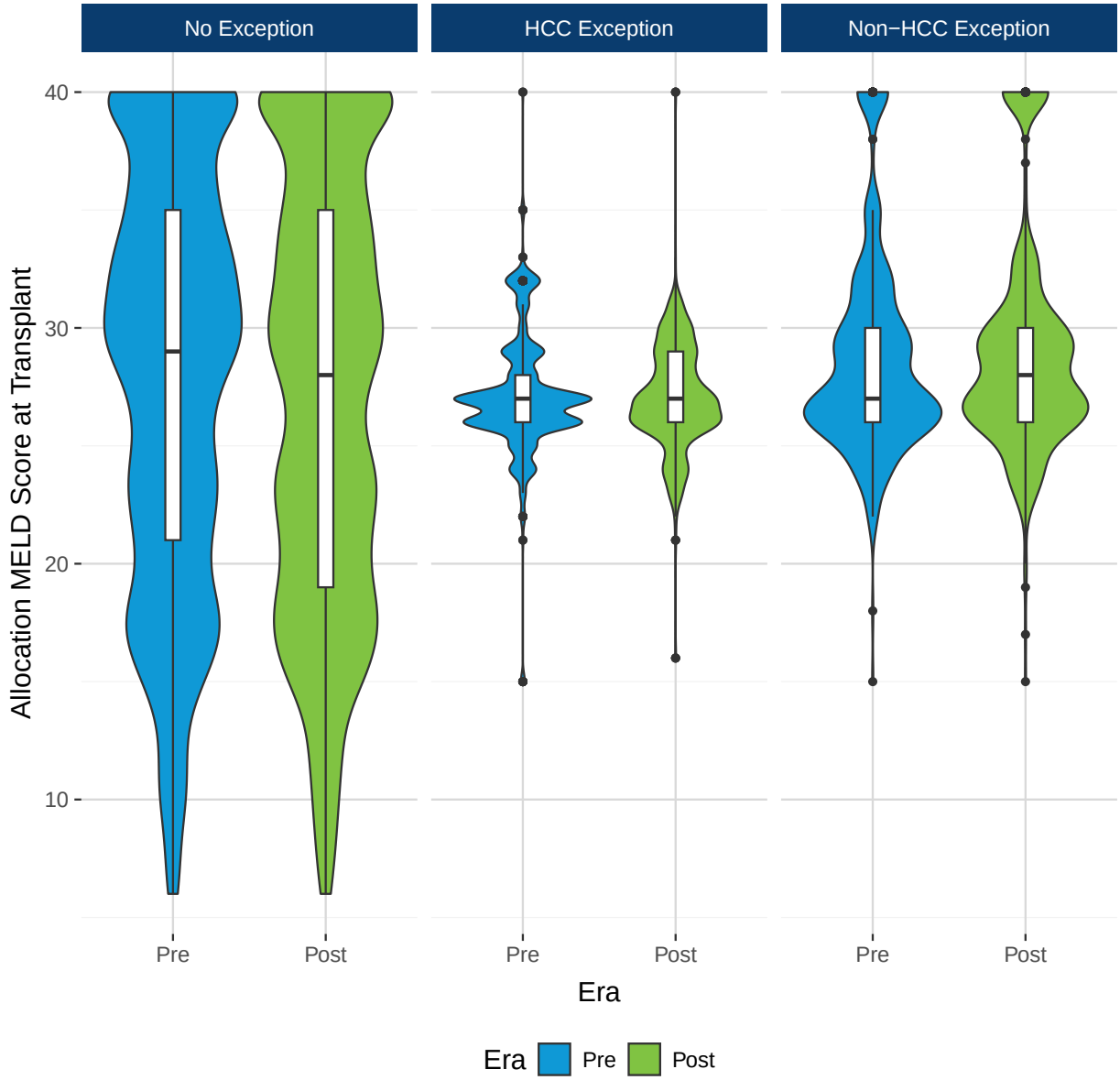
Appendix Table 20. Count and Percent of Liver Transplants among Recipients Aged 12 Years and Older by Exception Type and Era

Exception Type	Pre	Post
No Exception	6,861 (83.0%)	7,946 (84.8%)
HCC Exception	1,038 (12.6%)	984 (10.5%)
Non-HCC Exception	368 (4.5%)	436 (4.7%)
Total	8,267 (100.0%)	9,366 (100.0%)

Appendix Figure 24. Distribution of Allocation MELD Score or Status at Transplant for Liver-Alone Transplant Recipients Aged 12 Years and Older by Exception Type and Era



Appendix Figure 25. 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, 228 (3.32%) pre−policy recipients and 228 (2.87%) post−policy recipients were excluded.

Appendix Table 21. Summary of Allocation MELD Score at Transplant for Liver-Alone 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	6633	6	21	29	35	40	14
	Post	7718	6	19	28	35	40	16
HCC Exception	Pre	1038	15	26	27	28	40	2
	Post	984	16	26	27	29	40	3
Non-HCC Exception	Pre	368	15	26	27	30	40	4
	Post	436	15	26	28	30	40	4

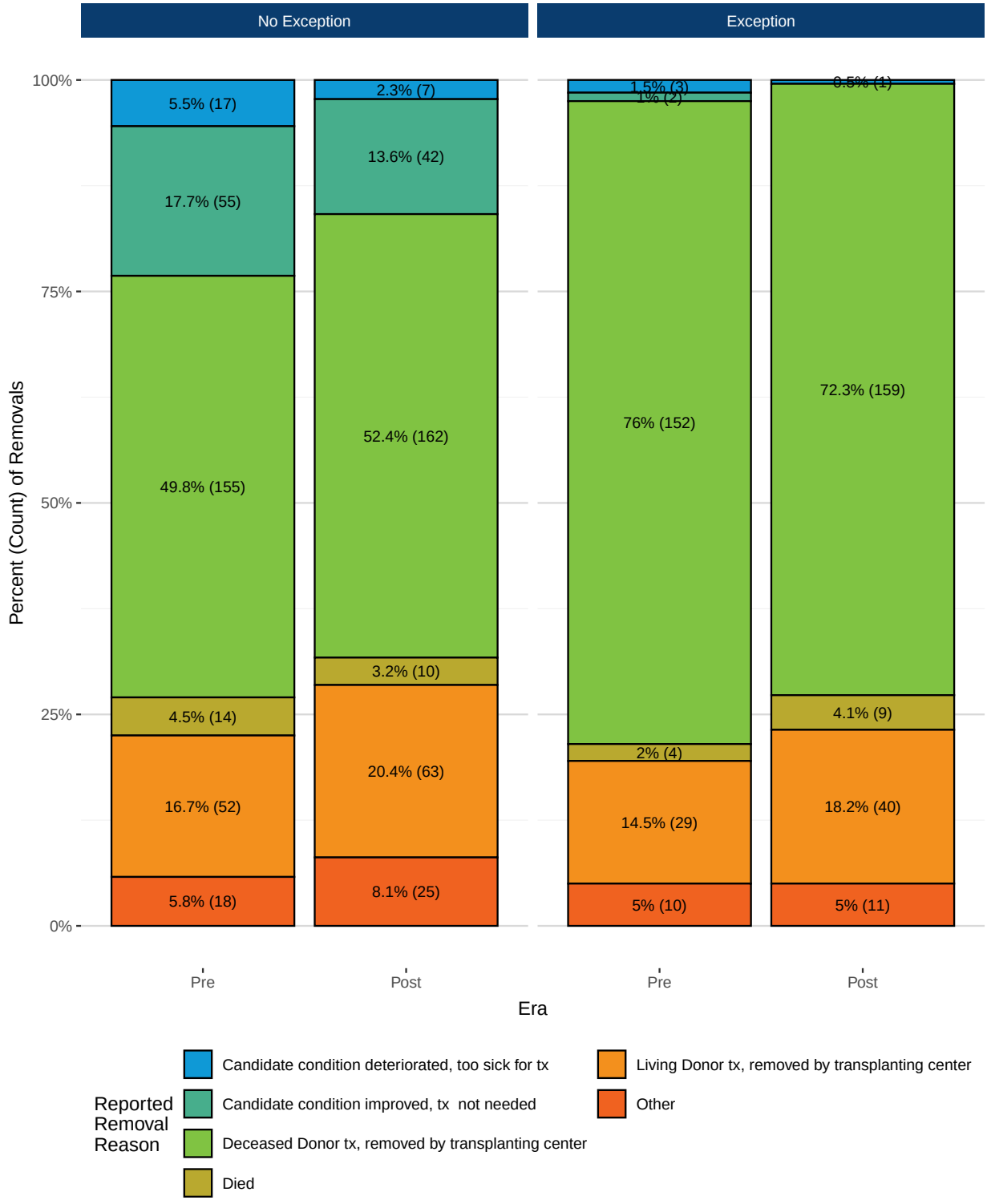
Status 1A/1B recipients do not have allocation MELD scores. As a result,
228 (3.32%) pre-policy recipients and 228 (2.87%) post-policy recipients were excluded.

Additional PELD-Cr Results

Additional PELD-Cr Results Sub-Section: Clinical Exception Type

This sub-section stratifies the analyses shown in the main "PELD-Cr Results" section by exception type (no exception vs. exception) as appropriate. 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 be interpreted cautiously as some subgroups have small sample sizes.

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

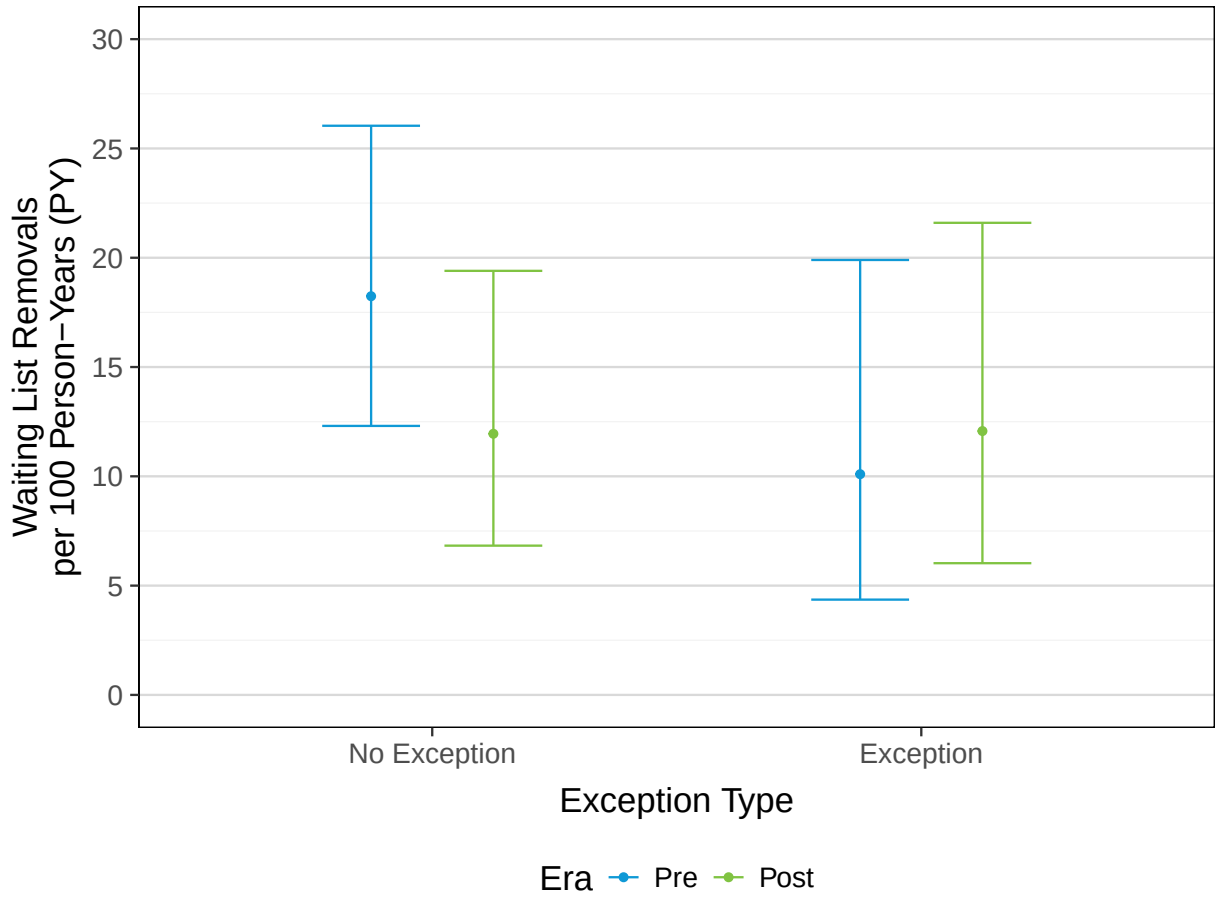


*Removal reasons containing <4 forms in both policy eras were combined with the Other category for plotting purposes, but appear in the corresponding table.

Appendix Table 22. Count and Percent of Liver Candidates Aged 0-11 Years Removed from the Waiting List by Reported Removal Reason, Exception Type, and Era

	No Exception		Exception	
Reported Removal Reason	Pre	Post	Pre	Post
Deceased Donor tx, removed by transplanting center	155 (49.8%)	162 (52.4%)	152 (76.0%)	159 (72.3%)
Candidate condition improved, tx not needed	55 (17.7%)	42 (13.6%)	2 (1.0%)	0 (0.0%)
Living Donor tx, removed by transplanting center	52 (16.7%)	63 (20.4%)	29 (14.5%)	40 (18.2%)
Candidate condition deteriorated, too sick for tx	17 (5.5%)	7 (2.3%)	3 (1.5%)	1 (0.5%)
Died	14 (4.5%)	10 (3.2%)	4 (2.0%)	9 (4.1%)
Transplant at another center (multi-listed)	12 (3.9%)	9 (2.9%)	5 (2.5%)	7 (3.2%)
Transferred to another center	4 (1.3%)	6 (1.9%)	4 (2.0%)	2 (0.9%)
Other	1 (0.3%)	9 (2.9%)	1 (0.5%)	1 (0.5%)
Refused transplant	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Patient died during TX procedure	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.5%)
Unable to contact candidate	0 (0.0%)	1 (0.3%)	0 (0.0%)	0 (0.0%)
Total	311 (100.0%)	309 (100.0%)	200 (100.0%)	220 (100.0%)

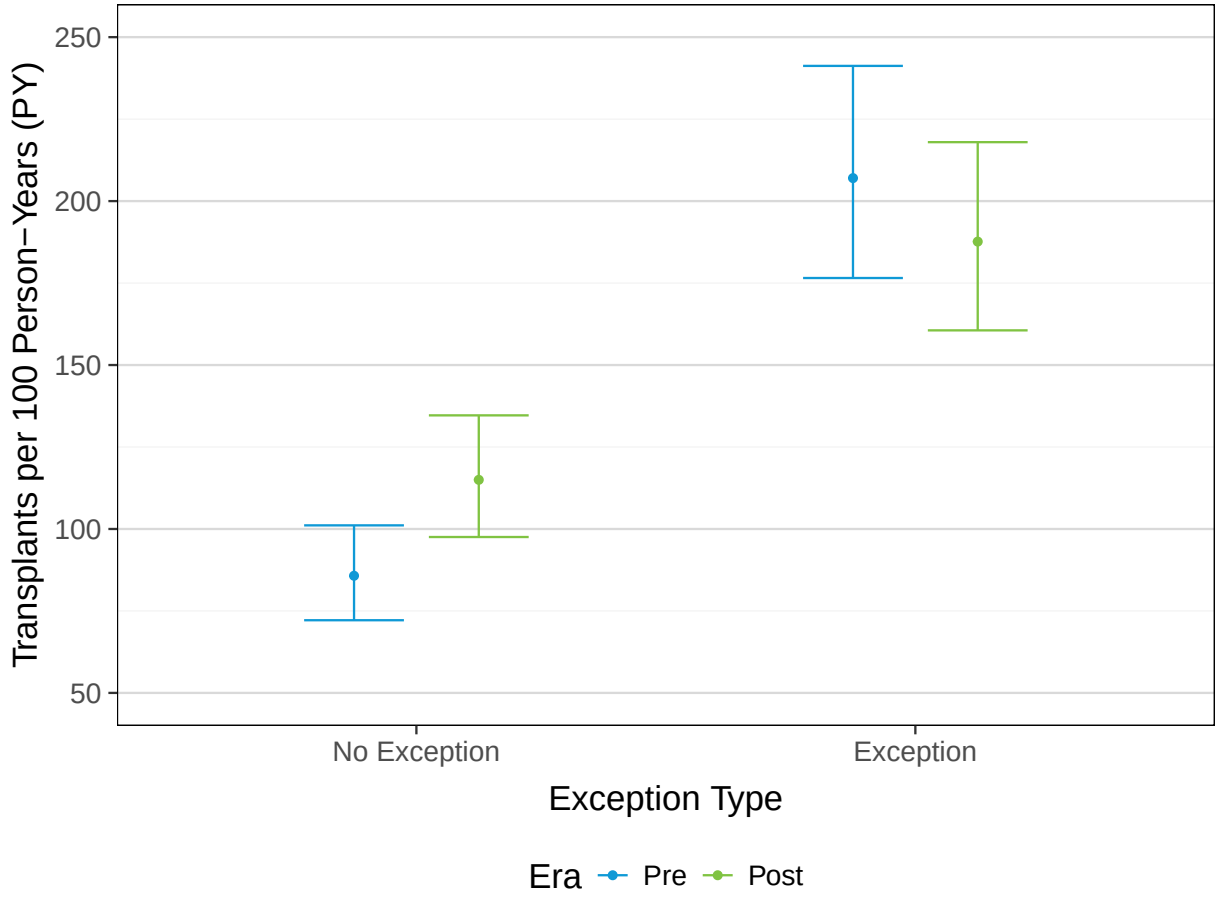
Appendix Figure 27. Liver-Alone Waiting List Deaths or Removals for Too Sick Per 100 Person-Years Waiting among Candidates Aged 0-11 Years by Exception Type and Era



Appendix Table 23. 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

		Ever Waiting	Death/Too Sick Events	Person-Years (PY)	Removals per 100 PY	
Era	Exception Type	N	N	PY	Estimate	95% CI
Pre	No Exception	470	30	164.5	18.24	(12.31, 26.04)
	Exception	272	8	79.2	10.10	(4.36, 19.90)
Post	No Exception	425	16	133.9	11.95	(6.83, 19.40)
	Exception	300	11	91.1	12.07	(6.03, 21.60)

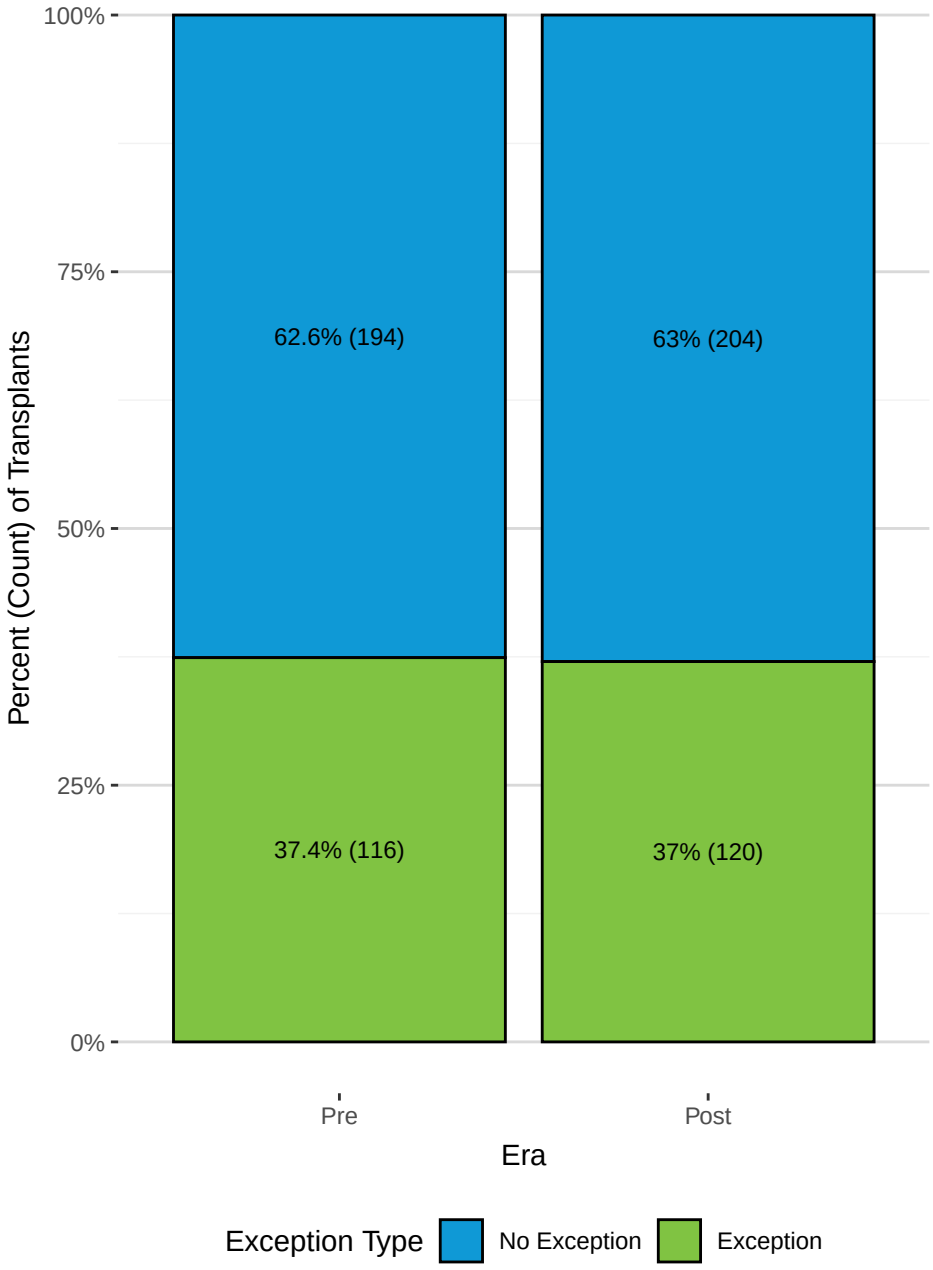
Appendix Figure 28. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years by Exception Type and Era



Appendix Table 24. Liver-Alone Transplant Rates Per 100 Active Person-Years Waiting among Candidates Aged 0-11 Years by Exception Type and Era

		Ever Waiting	Transplant Events	Active Person-Years (PY)	Transplants per 100 Active PY	
Era	Exception Type	N	N	PY	Estimate	95% CI
Pre	No Exception	470	141	164.5	85.73	(72.16, 101.10)
	Exception	272	164	79.2	207.01	(176.54, 241.23)
Post	No Exception	425	154	133.9	114.99	(97.54, 134.65)
	Exception	300	171	91.1	187.65	(160.58, 217.98)

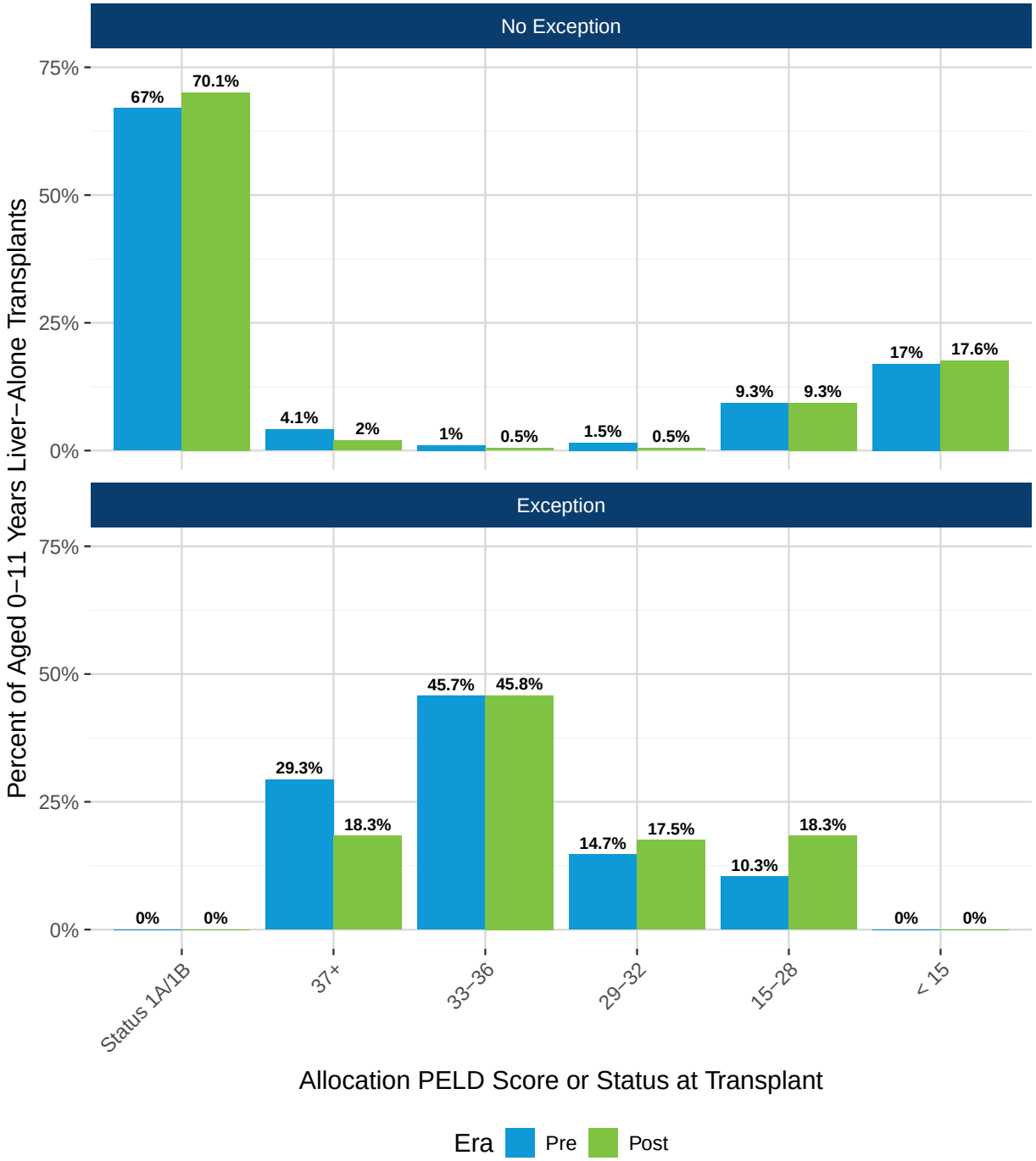
Appendix Figure 29. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years by Exception Type and Era



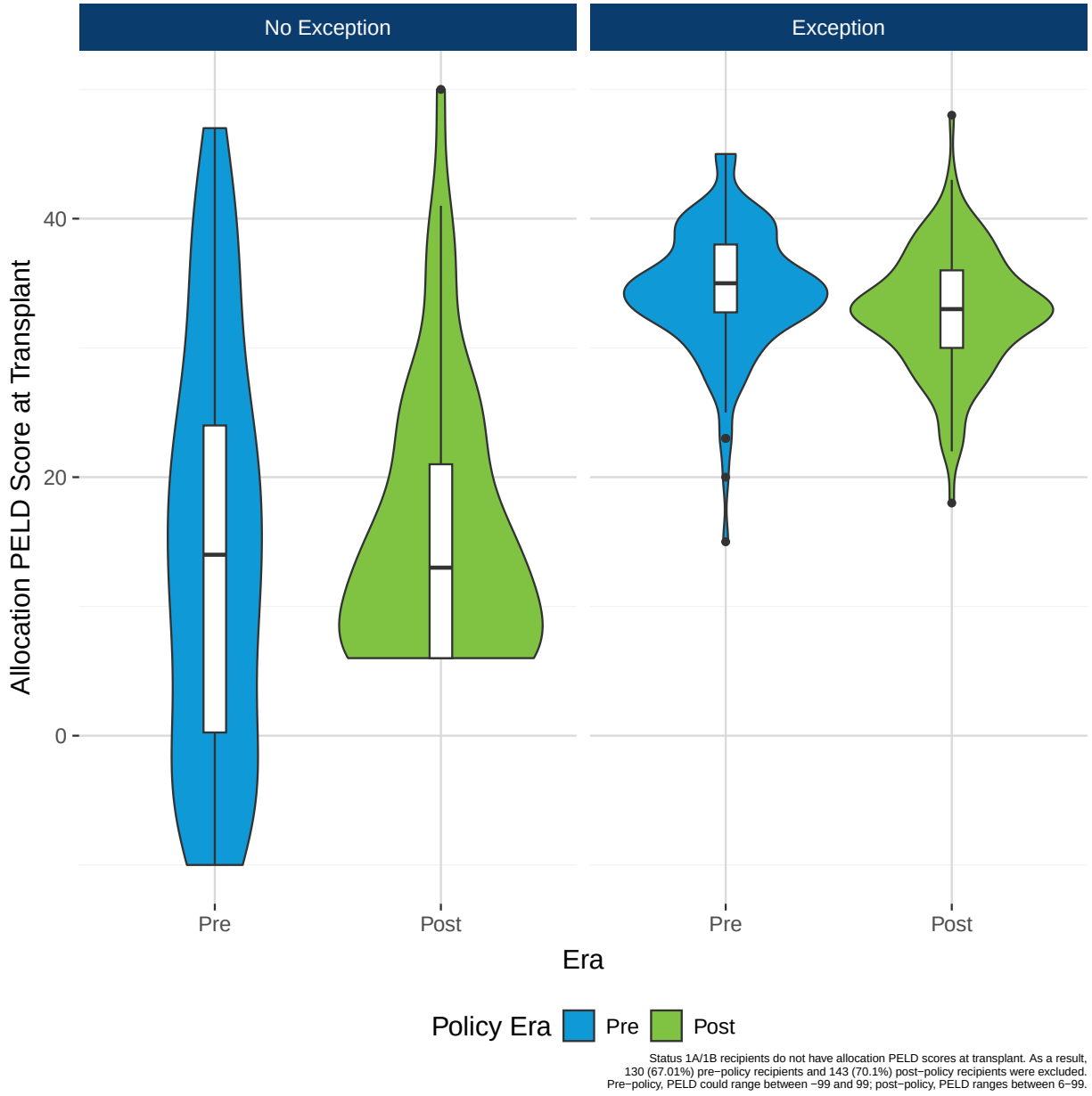
Appendix Table 25. Count and Percent of Liver Transplants among Recipients Aged 0-11 Years by Exception Type and Era

Exception Type	Pre	Post
No Exception	194 (62.6%)	204 (63.0%)
Exception	116 (37.4%)	120 (37.0%)
Total	310 (100.0%)	324 (100.0%)

Appendix Figure 30. 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 31. Distribution of Allocation PELD Score at Transplant for Liver-Alone Transplant Recipients Aged 0-11 Years by Exception Type and Era



Appendix Table 26. Summary of Allocation PELD Score at Transplant for Liver-Alone 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	64	-10	0	14	24	47	24
	Post	61	6	6	13	21	50	15
Exception	Pre	116	15	33	35	38	45	5
	Post	120	18	30	33	36	48	6

Status 1A/1B recipients do not have allocation PELD scores at transplant. As a result, 130 (67.01%) pre-policy recipients and 143 (70.1%) post-policy recipients were excluded.
Pre-policy, PELD could range between -99 and 99; post-policy, PELD ranges between 6 and 99.