Final Report

OPTN Liver & Intestinal Transplantation Committee | Descriptive Data Request

Out-of-the-Gate Monitoring of Liver and Intestine Acuity Circle Allocation, 6 Month Report
Removal of DSA and Region as Units of Allocation

DHHS Contract No. 250-2019-00001C
Date Completed: October 18, 2020

Prepared for:
Liver & Intestinal Transplantation Committee
Committee Meeting
Date of Meeting: October 22, 2020

By:
Samantha M. Noreen, Ph.D.,
Anne M. Zehner, M.P.H., Victor Melendez, M.Econ.
UNOS Research Department

Contents

Purpose

The purpose of this report is to provide an early look at high-level metrics revealing the performance of the system and any potential consequences of the that may require changes to policy, programming, or clinical practice. It contains information for responding to the media, general public, and transplant community in the 6 month period following implementation. This report, performed on behalf of the Organ Procurement and Transplantation Network (OPTN) Liver and Intestinal Transplantation Committee, will be followed by further reports at approximately 9 months, 1 year, and 2 years post-implementation. The OPTN will respond to further requests by the Committee as well as relay appropriate requests to the Scientific Registry of Transplant Recipients (SRTR) related to these changes.

Monitoring Plan

Monitoring of the effect of policy changes implemented on February 04, 2020 will focus on changes in the match process, waiting list population, liver transplant recipient population, and deceased donor utilization. Specifically analysis will provide comparisons pre- and post-policy implementation and include:

- Changes in the number of livers and intestines recovered and transplanted
- Impact on the national liver discard rate and utilization rate
- Changes in the median allocation Model for End-Stage Liver Disease (MELD) or Pediatric End-Stage Liver Disease (PELD) score at transplant
- Changes in the distance (in nautical miles, NM) from the donor hospital to the transplant center for deceased donor liver and intestine transplants
- Impact on the number of liver and intestine candidates removed from the waiting list by reported removal reason
- Changes in the sequence number of liver transplant recipient
- Changes in the time from an Organ Procurement Organization's (OPO) first electronic notification of an offer to cross clamp for deceased donor livers
- Changes in volumes of exception request forms automatically approved and those reviewed manually
- Approval rates of exception request forms
- Waiting list drop out rates by exception status
- Changes in deceased donor liver transplant recipients by exception status, and associated allocation scores

Cohorts

The cohorts examined contains periods of 182 days, or approximately 6 months of data after the liver policy change, and a pre-policy comparison period. For all figures and tables, we note that the World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020 and a national state of emergency was declared in the US on March 13, 2020. This report contains approximately 144 of 182 days in the Post (02/04/2020-08/04/2020) era under COVID, since the declaration of this national emergency.

- The **pre-policy era** for waitlist additions, removals, match runs, deceased donors, and liver MELD/PELD exception requests is from Tuesday, February 05, 2019 to Tuesday, August 06, 2019, to account for seasonal changes.
- The **post-policy** era beginning upon implementation of the policy change is from Tuesday, February 04, 2020 to Tuesday, August 04, 2020 for waitlist additions, removals, match runs, deceased donors, and liver MELD/PELD exception requests.
- The **pre- and post- policy eras for deceased donor transplants** are defined as February 05, 2019 - July 02, 2019 and February 04, 2020 - June 30, 2020, respectively, due to reporting lags.
- For the pre-policy cohort of liver MELD and PELD exception request forms, it should be noted that any forms submitted from February 05, 2019 to May 13, 2019 were under the regional review board system (RRB), and those submitted on or after May 14, 2019 were under the National Liver Review Board (NLRB) structure. The NLRB changed with the implementation of allocation changes as well on February 04, 2020.

The data sets listed below, each for the time periods previously specified, are used in the descriptive tables and graphs in this report:

- Registrations added to the waiting list for any liver transplant
- Registrations added to the waiting list for any intestine transplant
- Registrations ever waiting on the waitlist for a liver transplant
- Candidates that received a deceased donor, liver-alone transplant
- Candidates that received a deceased donor simultaneous liver-kidney transplant
- Candidates that received a deceased donor, intestine-alone transplant
- Candidates that received a deceased donor, liver multi-organ transplant
- Candidates that received a deceased donor, intestine multi-organ transplant
- All donors from which at least one organ was recovered for the purpose of transplantation
- Liver match runs with a final acceptance
- Liver MELD and PELD exception request forms

The following results are presented by era. This analysis is based on OPTN data as of October 16, 2020 and is subject to change based on any future data submission or correction.

Executive Summary

This report provides a review of the first six months under acuity circle (AC) allocation changes to evaluate any early indications that the policy may be trending towards achieving intended goals, as well as to evaluation potential intended and unintended consequences of the liver and intestine policy changes. Metrics are constrained to data points that are reliably available while allowing for the data submission lags allowed in OPTN policy in this report.

Associated changes for the National Liver Review Board (NLRB) are also included in this report, as this policy was also altered upon the implementation of the allocation changes. The NLRB was originally implemented on May 14, 2019, and post-AC policy the median transplant score (MTS) was changed such that median MELD at transplant was based on the median of the MELD scores at transplant within 250 nautical miles (NM) of a transplant program (excluding Status 1A/1B transplants, living donor transplants, DCD and $>$ 500 NM away donor transplants). The MTS for PELD candidates remained the same, calculated as the median of the PELD scores at transplant within the nation (same exclusions as for MELD).

For all figures and tables, we note that the World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020 and a national state of emergency was declared in the US on March 13, 2020. This report contains approximately 144 of the 182 days in the Post (02/04/2020-08/04/2020) era under COVID since the declaration of this national emergency, and given the impact that has been seen on the U.S. transplant and donation community (see data trends at unos.org/covid) the true impact of this policy change is very challenging to determine. For some metrics of interest, additional stratifications by multiple COVID-19 eras, are provided in the **Appendix** to better understand how this potentially interacted with the policy change. These additional eras are defined representing the heaviest-impacted period of time from March 13, 2020 to May 9, 2020 and the additional period of time with continual, albeit less-dramatic, impact from May 10, 2020 to the end of the post policy cohort.

The COVID-19 crisis has created challenges to conducting routine outpatient activities, including clinical testing, which are needed to obtain information required for transplant candidates, recipients, and living donors. Current OPTN policy requires that transplant programs submit numerous data for transplant recipients and living donors. The emergency policy from the OPTN Executive Committee relaxed requirements for follow-up form submission. The intent of the policy is to prevent unnecessary exposure risk to transplant recipients and living donors and to alleviate data burden for centers in the midst of COVID-19 crisis.

The TRF and LDF Data Submission During COVID-19 Amnesty Period emergency policy suspends the requirements for data collection and submission for the living donor follow-up (LDF), organ specific transplant recipient

follow-up (TRF), and recipient malignancy (PTM) forms. The suspension of these requirements is backdated to March 13, 2020 and has now been extended by the Executive Committee to expire on December 31, 2020 if the Executive Committee or Board of Directors has not acted before that date. This only applies to forms with an expected date during this timeframe. It does not suspend the requirement to report recipient death or graft failure, but extends the time frame for reporting that information for transplant recipients from 14 days to 30 days of knowledge of the event.

While changes pre- to post-policy must be considered in light of this national emergency, many of the results in this report align with the intended outcomes of the policy change that were supported by the SRTR modeling predictions prior to the implementation of this proposal. Some of the main findings from this report include:

- Decreased variance in median allocation MELD or PELD score at transplant when examined by different geographies, including state, DSA and by OPTN region
- Increased median allocation MELD or PELD score at transplant for DSAs with previously lower medians under previous policy
- Increased median allocation MELD or PELD score at transplant for deceased donor, non-exception, liver transplant recipients
- Increased percentage of non-exception transplant recipients, similar percentage of HCC exception transplant recipients, and decreased percentage of non-HCC exception transplant recipients
- Increased distance (nautical miles) from donor hospital to transplant program of recipient
- No changes in liver waiting list transplant rates, by candidate exception status
- Decreased liver waiting list mortality rates for non-exception transplant candidates
- Increased national liver discard rate and decreased national utilization rate
- Decreased removals from the liver waiting list due to death or too sick to transplant

Regarding the impact of the NLRB, trends continue in similar directions as to what was seen in the first nine months of this policy change under DSAs and OPTN regions for allocation. Here, comparisons pre- and post-implementation on February 4, 2020 must keep in mind the prior changes from regional review boards to the NLRB on May 14, 2019 in the pre-policy era. However, notable highlights include:

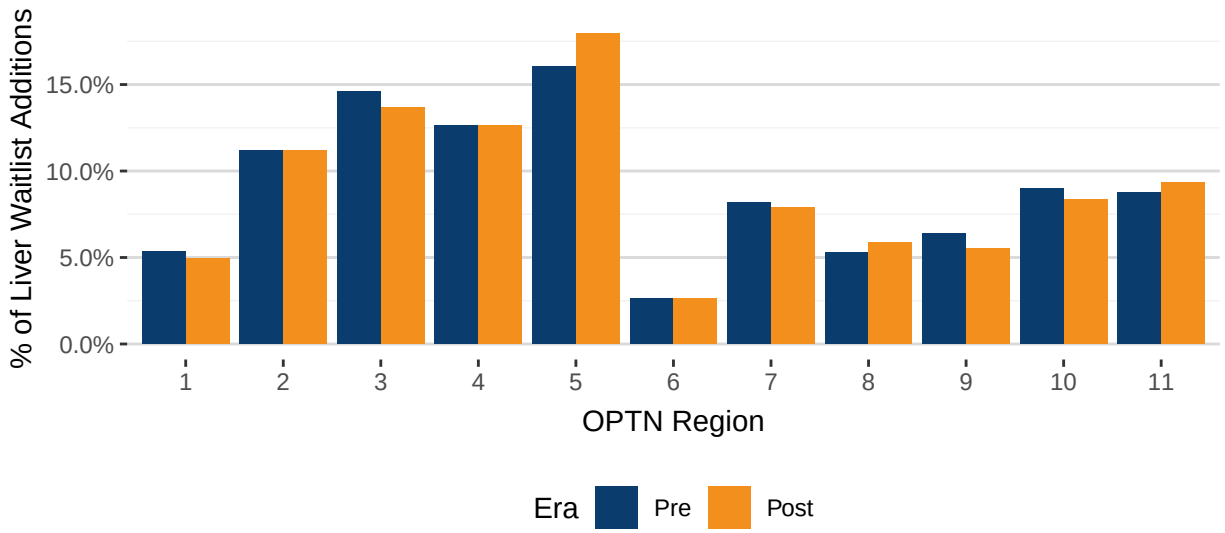
- Increased percentages of initial and extension request forms automatically approved, decreasing the forms requiring additional review
- Increased approval rates of initial and extension request forms
- Decreased time from exception request form submission to adjudication
- Decreased volume and percentage of non-HCC exception liver transplant recipients and similar volume and percentage of HCC exception transplant recipients
- Similar waiting list mortality (removals for death or too sick to transplant) and waiting list transplant rates, by exception status

Results

Section I. Liver Waiting List

Waitlist Additions

Figure 1. Registrations Added to Liver Waiting List by OPTN Region of Listing Center and Era



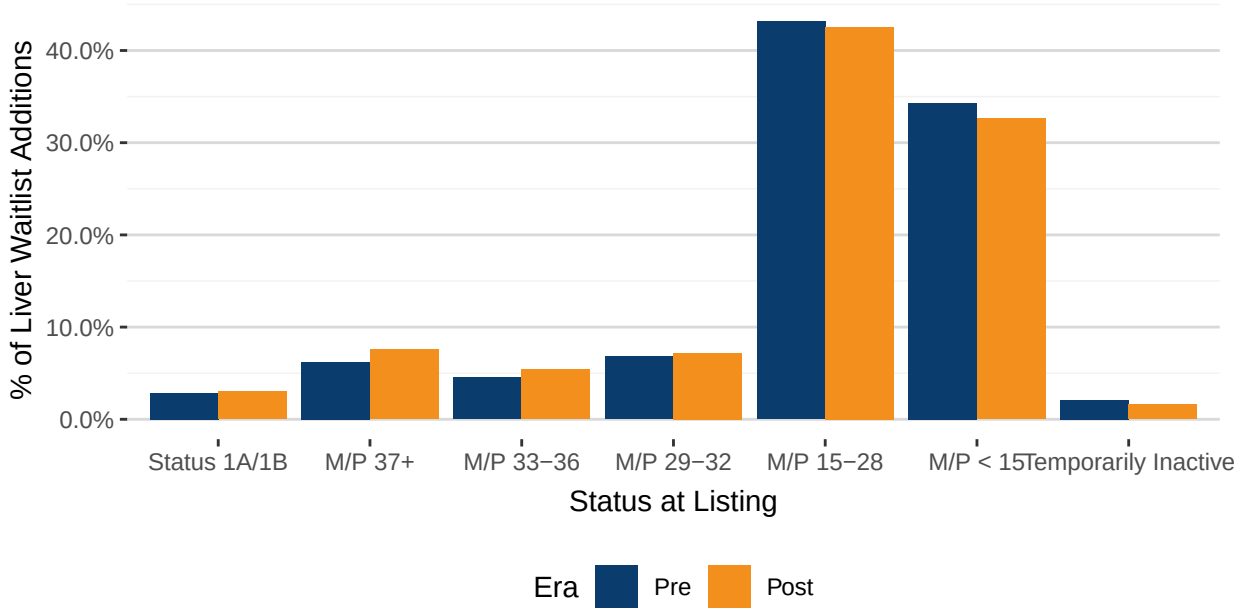
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 1. Number and Percent of Registrations Added to Liver Waiting List by OPTN Region of Listing Center and Era

	Policy Era	
OPTN Region	Pre	Post
1	366 (5.4%)	319 (5.0%)
2	760 (11.2%)	720 (11.2%)
3	994 (14.6%)	878 (13.6%)
4	860 (12.6%)	813 (12.6%)
5	1094 (16.1%)	1155 (18.0%)
6	178 (2.6%)	168 (2.6%)
7	557 (8.2%)	508 (7.9%)
8	360 (5.3%)	377 (5.9%)
9	435 (6.4%)	356 (5.5%)
10	611 (9.0%)	539 (8.4%)
11	595 (8.7%)	601 (9.3%)
Total	6810 (100.0%)	6434 (100.0%)

From the pre/post policy implementation eras, there were fewer new liver waitlist registrations overall. This was true for most OPTN regions; however, these changes in listing volume post-policy were impacted by the COVID emergency declaration. In addition, the proportions of waiting list additions among regions were fairly consistent pre- to post-policy.

Figure 2. Registrations Added to Liver Waiting List by Status at Listing and Era



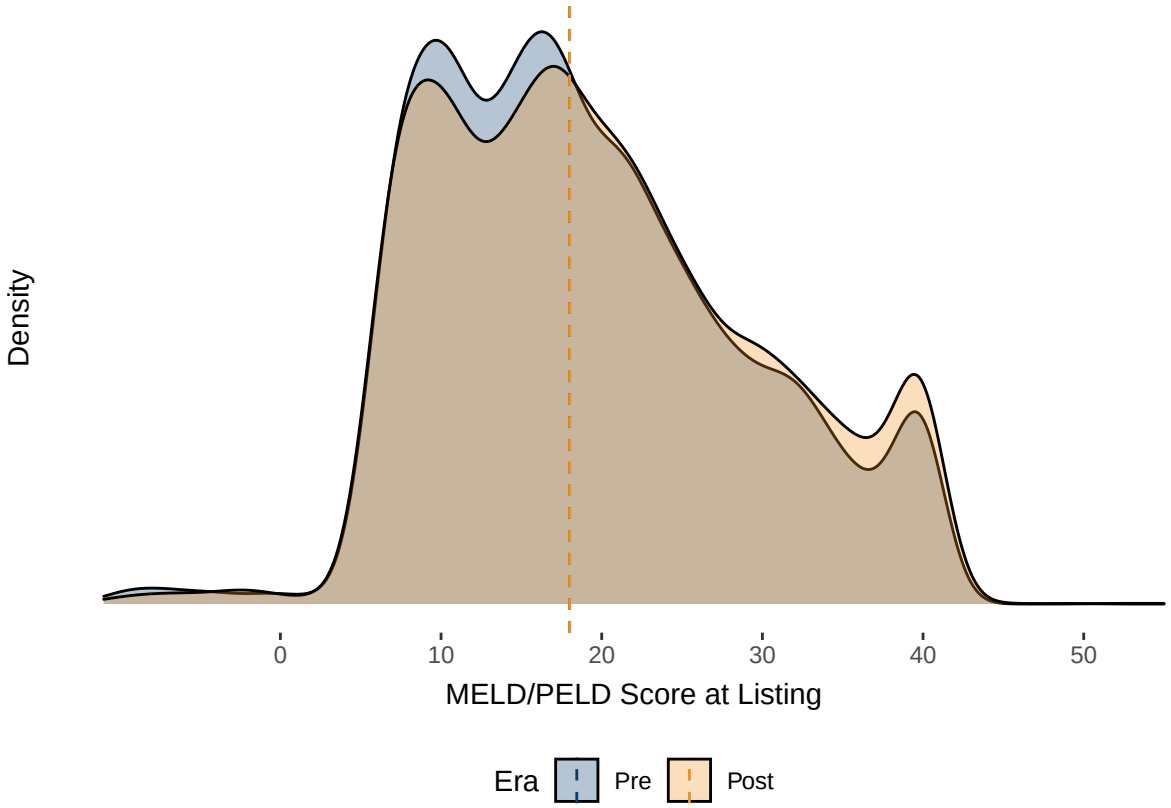
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 2. Number and Percent of Registrations Added to Liver Waiting List by Status at Listing and Era

	Policy Era	
Status at Listing	Pre	Post
Status 1A/1B	196 (2.9%)	195 (3.0%)
M/P 37+	423 (6.2%)	488 (7.6%)
M/P 33-36	310 (4.6%)	347 (5.4%)
M/P 29-32	463 (6.8%)	464 (7.2%)
M/P 15-28	2938 (43.1%)	2737 (42.5%)
M/P < 15	2337 (34.3%)	2099 (32.6%)
Temporarily Inactive	143 (2.1%)	104 (1.6%)
Total	6810 (100.0%)	6434 (100.0%)

From the pre/post policy implementation eras, there was a slight decrease in the post policy era of those being listed in temporarily inactive status, but these new additions must be considered in light of the COVID emergency declaration. However, the percentages among different statuses seem to be stable with small differences between pre- and post- policy change.

Figure 3. Distribution of MELD/PELD Score at Listing by Era, with Median Score



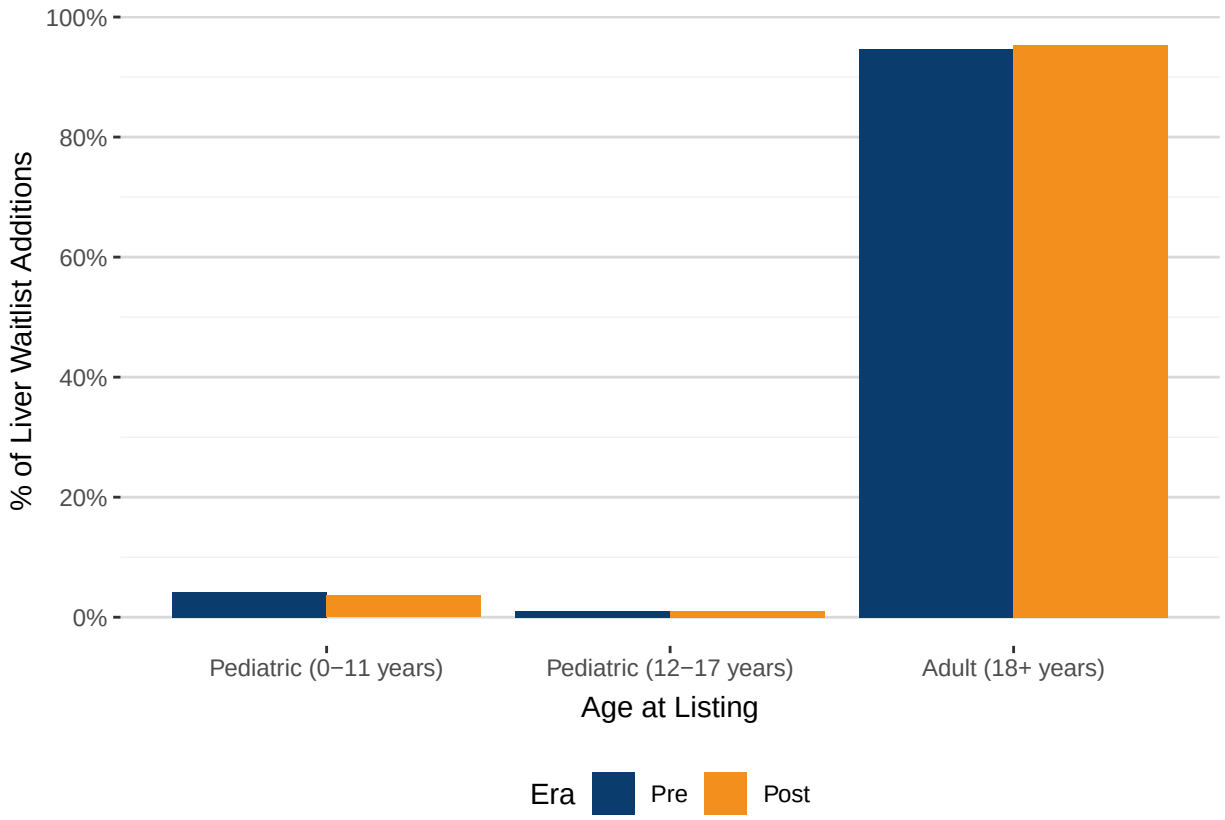
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 3. Distribution Statistics for MELD/PELD Score at Listing by Era

Policy Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum
Pre	6471	-11	11	18	25	55
Post	6135	-11	12	18	26	49

The slight shift in the MELD/PELD at listing post-implementation noted in the last table and graph can be seen from the density plot above as well. Due to the COVID emergency declaration, this finding should be interpreted with caution. However, the median MELD/PELD score for both eras was 18, and the distributions were similar pre/post-implementation.

Figure 4. Registrations Added to Liver Waiting List by Age at Listing and Era



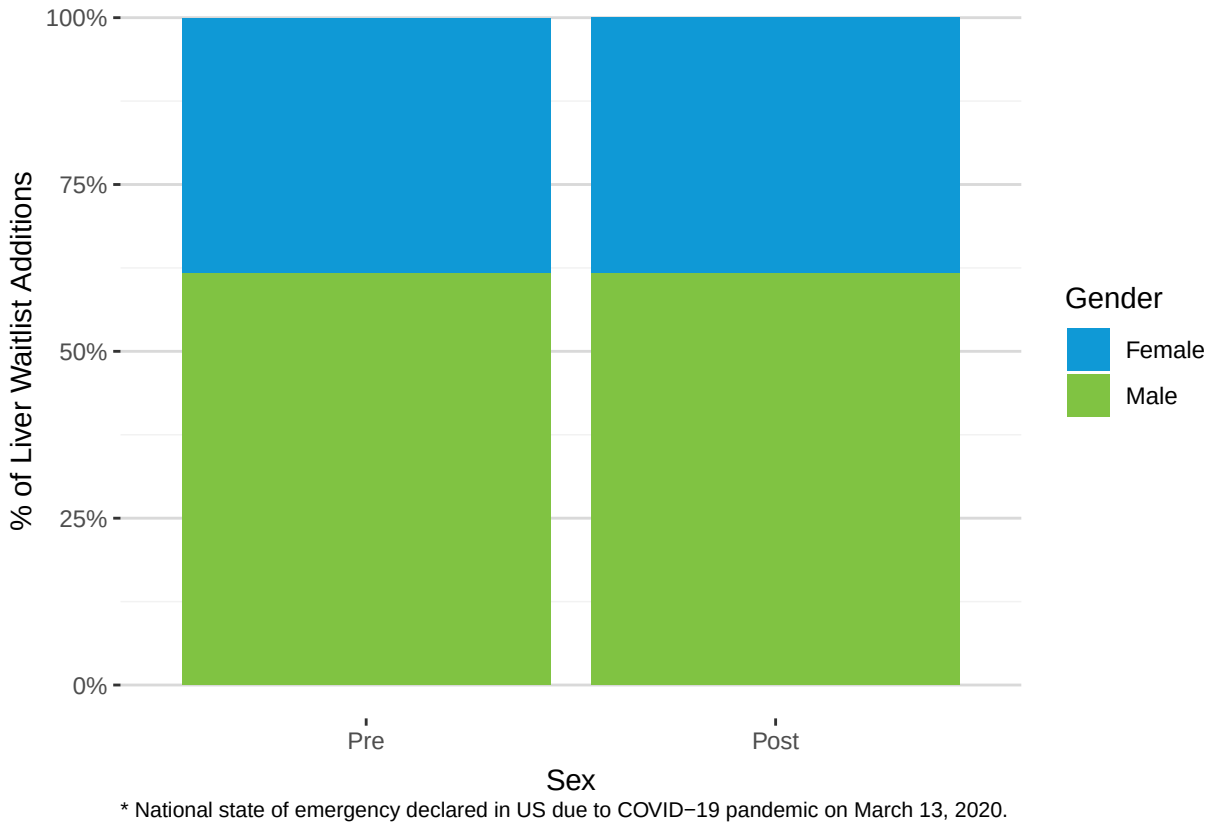
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 4. Number and Percent of Registrations Added to Liver Waiting List by Age Group and Era

	Policy Era	
Age Group	Pre	Post
Pediatric (0-11 years)	288 (4.2%)	231 (3.6%)
Pediatric (12-17 years)	73 (1.1%)	68 (1.1%)
Adult (18+ years)	6449 (94.7%)	6135 (95.4%)
Total	6810 (100.0%)	6434 (100.0%)

The percentage distribution by age group was consistent from pre- to post-implementation. Any differences post/policy must be considered in light of the COVID emergency declaration.

Figure 5. Registrations Added to Liver Waiting List by Sex and Era



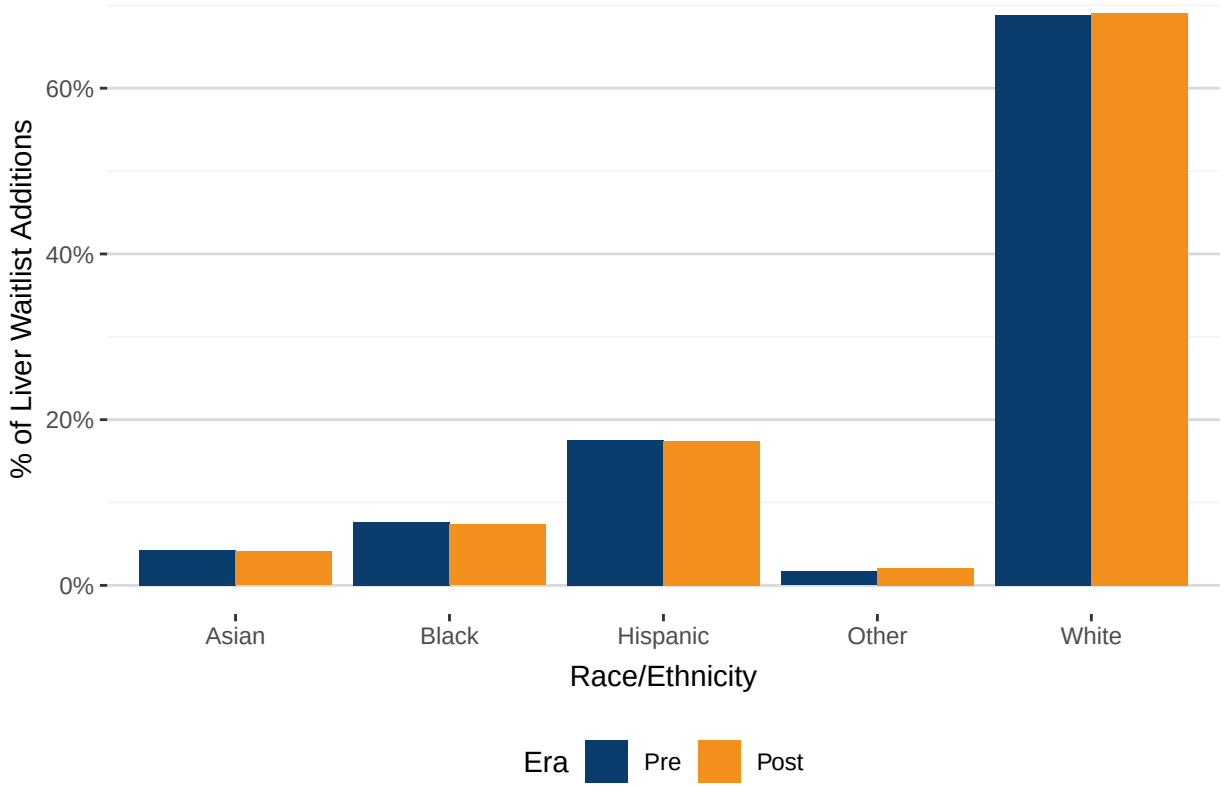
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 5. Number and Percent of Registrations Added to Liver Waiting List by Sex and Era

	Policy Era	
Sex	Pre	Post
Female	2611 (38.3%)	2464 (38.3%)
Male	4199 (61.7%)	3970 (61.7%)
Total	6810 (100.0%)	6434 (100.0%)

The figure above shows that there was no change in the distribution of gender among new liver waiting list registrations.

Figure 6. Registrations Added to Liver Waiting List by Race/Ethnicity and Era



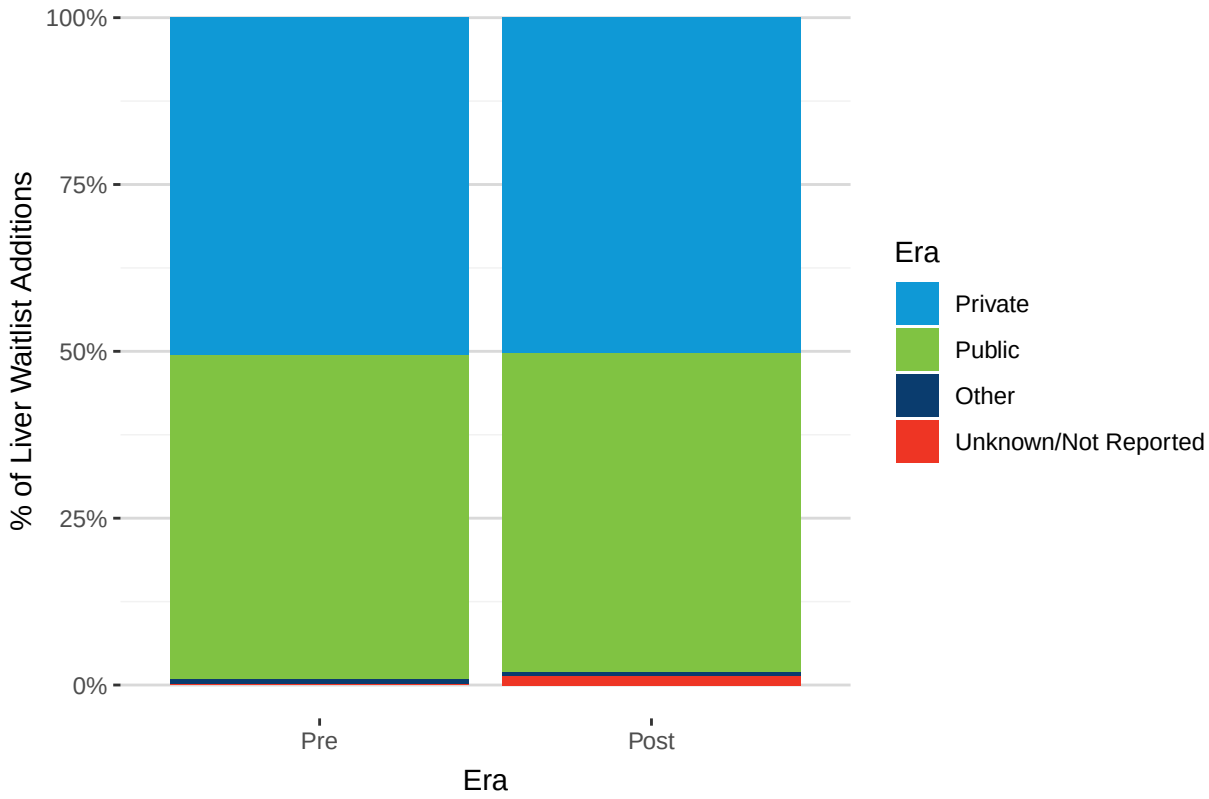
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 6. Number and Percent of Registrations Added to Liver Waiting List by Race/Ethnicity and Era

	Policy Era	
Race/Ethnicity	Pre	Post
Asian	289 (4.2%)	264 (4.1%)
Black	523 (7.7%)	473 (7.4%)
Hispanic	1196 (17.6%)	1119 (17.4%)
Other	115 (1.7%)	134 (2.1%)
White	4687 (68.8%)	4444 (69.1%)
Total	6810 (100.0%)	6434 (100.0%)

From the pre/post policy implementation eras, the proportions of new registrations by race/ethnicity remained stable. Changes in listing volume post-policy should be considered in light of the COVID emergency declaration.

Figure 7. Registrations Added to Liver Waiting List by Primary Payer and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

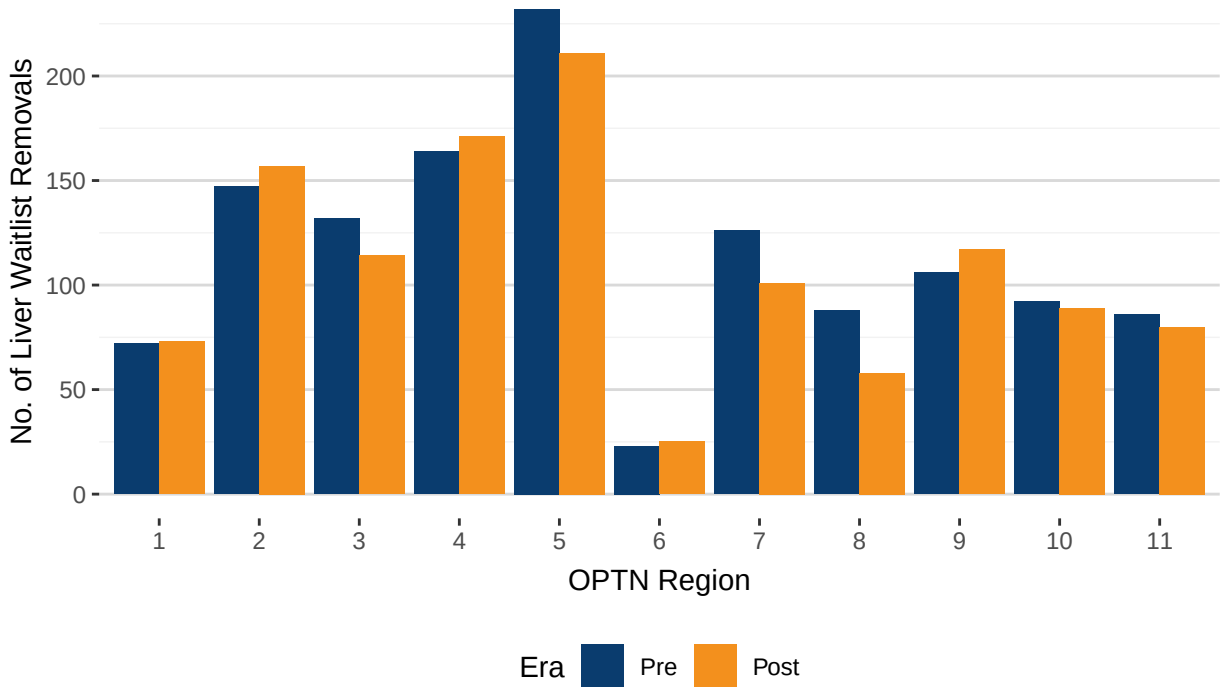
Table 7. Number and Percent of Registrations Added to Liver Waiting List by Primary Payer and Era

	Policy Era	
Primary Payer	Pre	Post
Private	3444 (50.6%)	3232 (50.2%)
Public	3308 (48.6%)	3080 (47.9%)
Other	54 (0.8%)	35 (0.5%)
Unknown/Not Reported	4 (0.1%)	87 (1.4%)
Total	6810 (100.0%)	6434 (100.0%)

From the pre/post policy implementation eras, there were decreases in percentages for those with private, public and other primary payment, and an increase in the percentage rate for those with unknown or not reported primary payer. This may be tied to temporary changes in practice related to the COVID-19 emergency.

Waitlist Removals

Figure 8. Liver Candidates Removed Due To Death or Too Sick to Transplant by OPTN Region



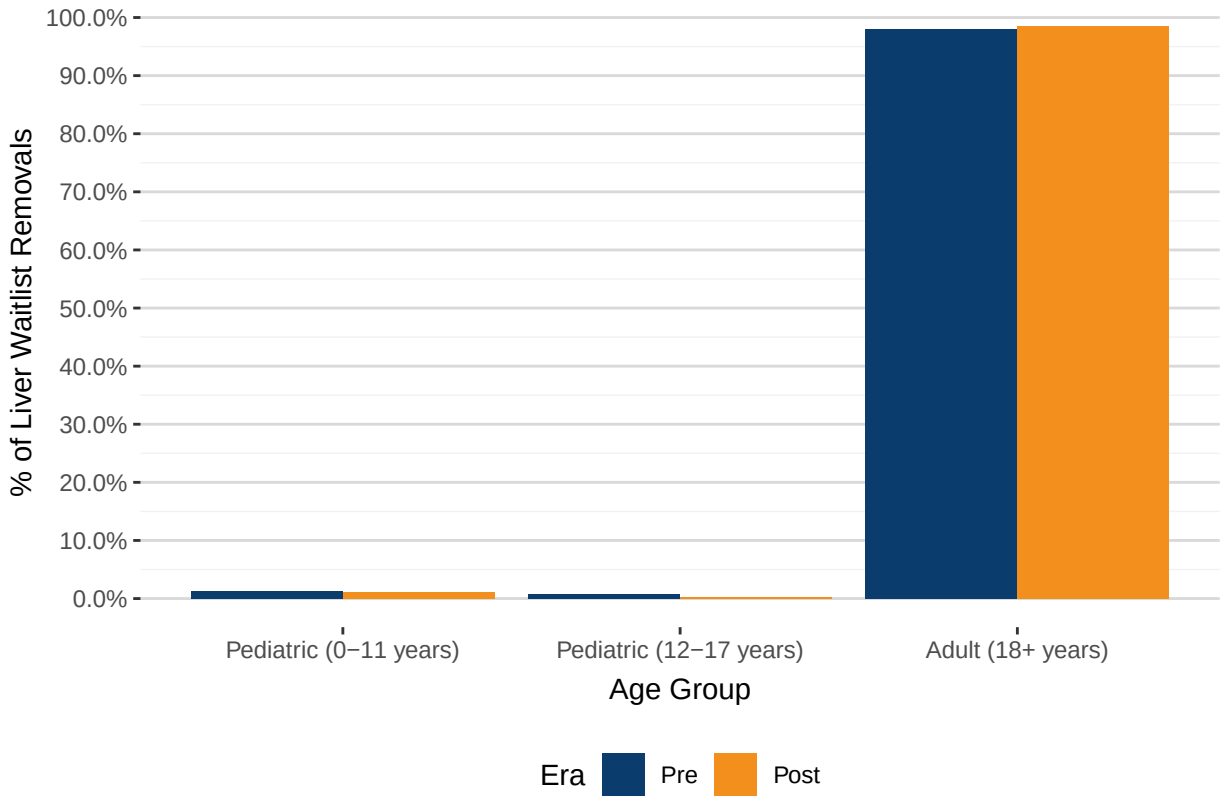
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 8. Number and Percent of Liver Candidates Removed Due To Death or Too Sick to Transplant by OPTN Region

	Policy Era	
OPTN Region	Pre	Post
1	72 (5.7%)	73 (6.1%)
2	147 (11.6%)	157 (13.1%)
3	132 (10.4%)	114 (9.5%)
4	164 (12.9%)	171 (14.3%)
5	232 (18.3%)	211 (17.6%)
6	23 (1.8%)	25 (2.1%)
7	126 (9.9%)	101 (8.4%)
8	88 (6.9%)	58 (4.8%)
9	106 (8.4%)	117 (9.8%)
10	92 (7.3%)	89 (7.4%)
11	86 (6.8%)	80 (6.7%)
Total	1268 (100.0%)	1196 (100.0%)

A lower percentage of waitlist removals for death or too sick to transplant occurred in OPTN Regions 3, 5, 7, 8, 10 and 11 and corresponding higher percentages occurred in OPTN Regions 1, 2, 4, 6, and 9. Overall, there were fewer removals in the post-policy era. Changes in removal volumes post-policy may have been impacted by the COVID emergency declaration.

Figure 9. Liver Candidates Removed Due To Death or Too Sick to Transplant by Age Group and Era



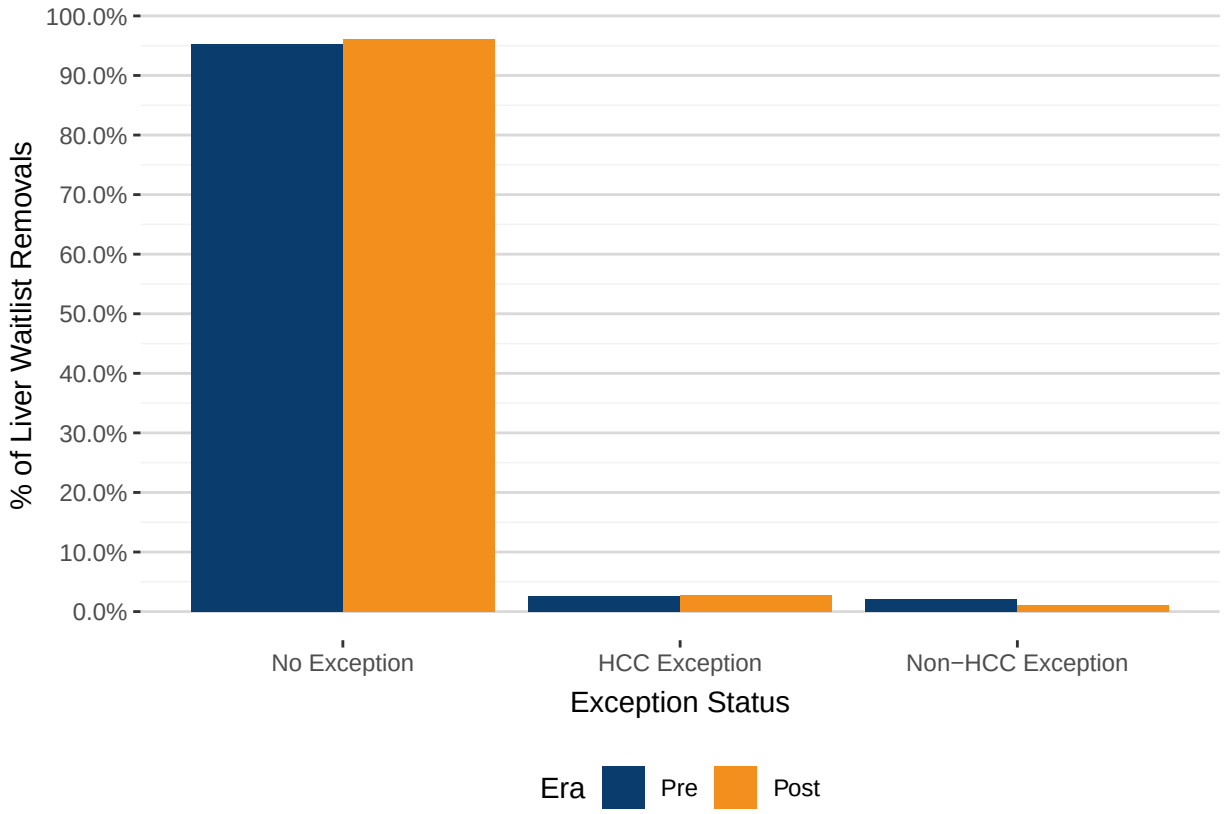
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 9. Number and Percent of Liver Candidates Removed Due To Death or Too Sick to Transplant by Age Group and Era

	Policy Era	
Age Group	Pre	Post
Pediatric (0-11 years)	16 (1.3%)	14 (1.2%)
Pediatric (12-17 years)	9 (0.7%)	4 (0.3%)
Adult (18+ years)	1243 (98.0%)	1178 (98.5%)
Total	1268 (100.0%)	1196 (100.0%)

Following policy implementation, the distribution of waitlist removals for death or too sick to transplant remained consistent across age categories.

Figure 10. Liver Candidates Removed Due To Death or Too Sick to Transplant by Exception Status and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 10. Number and Percent of Liver Candidates Removed Due To Death or Too Sick to Transplant by Exception Status and Era

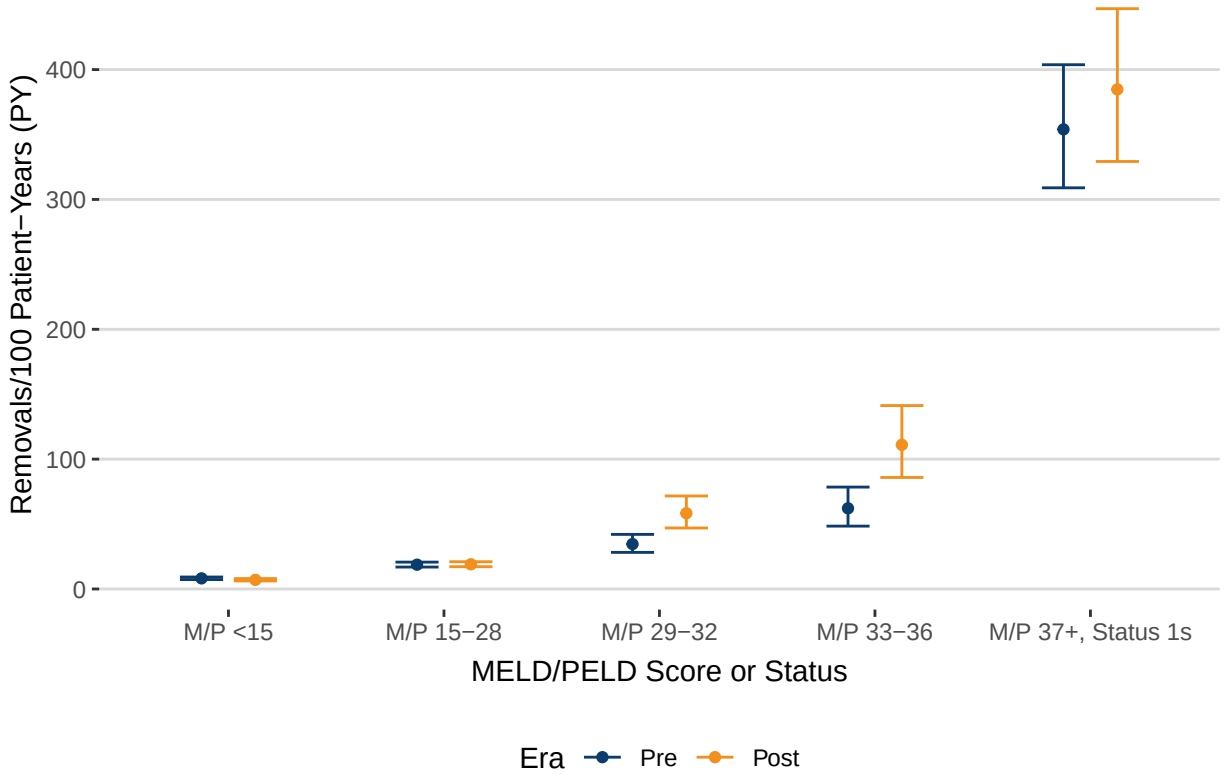
	Policy Era	
Exception Status	Pre	Post
No Exception	1209 (95.3%)	1149 (96.1%)
HCC Exception	33 (2.6%)	34 (2.8%)
Non-HCC Exception	26 (2.1%)	13 (1.1%)
Total	1268 (100.0%)	1196 (100.0%)

Following policy implementation, the proportion of waitlist removals for death or too sick to transplant remained almost identical for HCC Exceptions and a slight percentage change for those with no exception and non-HCC exception.

This also reflects changes made to the liver exception scoring and review structure. The first implementation of the National Liver Review Board policy was on May 14, 2019 (late pre-policy era) and additional changes to the structure of the NLRB occurred when the new allocation policy was implemented.

Waitlist Rates

Figure 11. Liver Waitlist Rates of Removal Due to Death or Too Sick to Transplant Per 100 Person-Years Waiting by MELD or PELD Score or Status and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 11. Liver Waitlist Rates of Removal Due to Death or Too Sick to Transplant Per 100 Person-Years Waiting by MELD or PELD Score or Status and Era

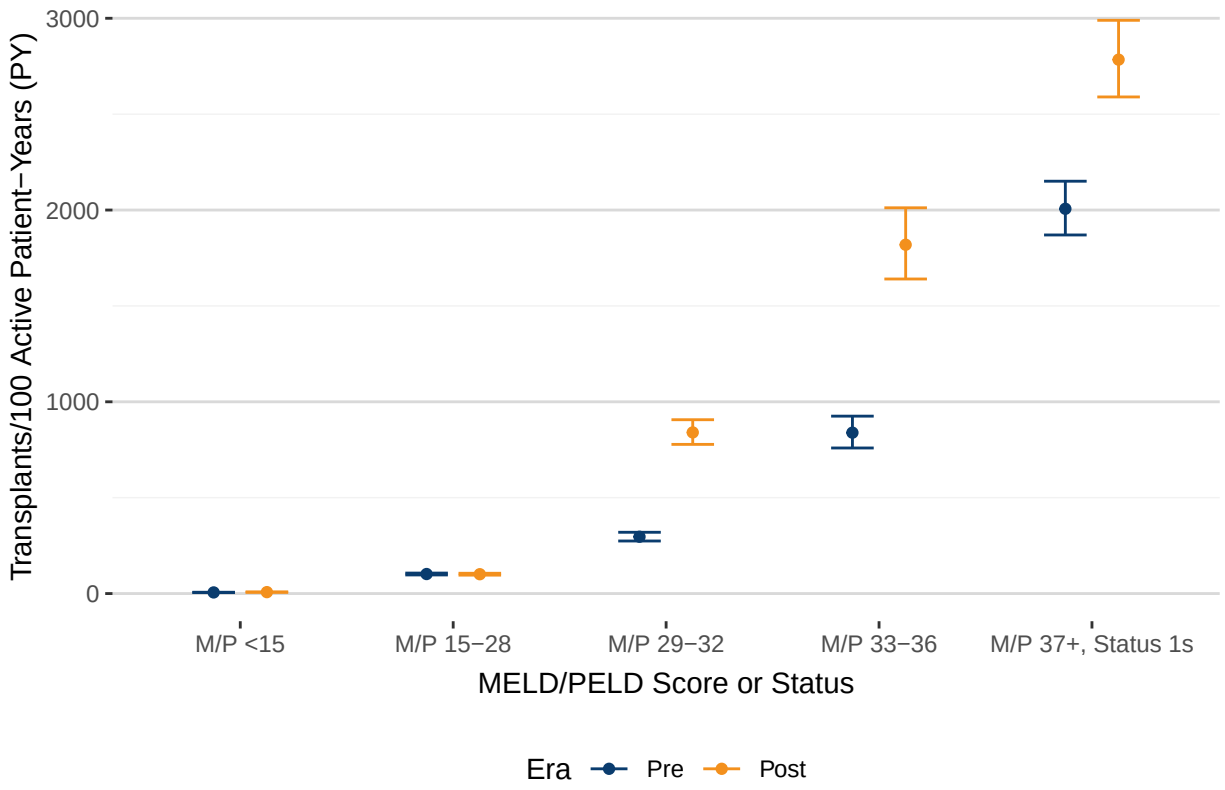
MELD/PELD Score or Status	Era	N Ever Waiting	N Removals	PY	Removals per 100 PY	95% CI
M/P <15	Pre	11249	273	3339.5	8.17	7.23, 9.2
	Post	10554	231	3280.8	7.04	6.16, 8.01
M/P 15-28	Pre	8978	384	2052.5	18.71	16.88, 20.68
	Post	8455	389	2046.9	19.00	17.16, 20.99
M/P 29-32	Pre	2538	101	292.0	34.59	28.18, 42.03
	Post	1724	91	156.0	58.35	46.98, 71.64
M/P 33-36	Pre	1230	70	112.7	62.11	48.42, 78.48
	Post	907	66	59.4	111.03	85.87, 141.26
M/P 37+, Status 1s	Pre	1256	222	62.7	353.98	308.95, 403.74
	Post	1113	171	44.4	384.73	329.23, 446.91

Rates of removal for death or too sick to transplant significantly increased post-implementation for MELD/PELD 29-32 and MELD/PELD 33-36 (as indicated by non-overlapping confidence intervals), but did not significantly change for all other status groups.

Rates of transplant significantly increased post-implementation for MELD/PELD 29-32, MELD/PELD 33-36, and MELD/PELD 37+/Status 1s (as indicated by non-overlapping confidence intervals), but did not significantly change for lower MELD/PELD score groups.

Changes in the amount of time patients ever waiting contributed and number of events, for each score group, determine the changes in rates. Both waitlist removal and transplant rates post-policy must be considered in light of the COVID emergency declaration.

Figure 12. Liver Transplant Rates Per 100 Active Person-Years Waiting by MELD or PELD Score or Status and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

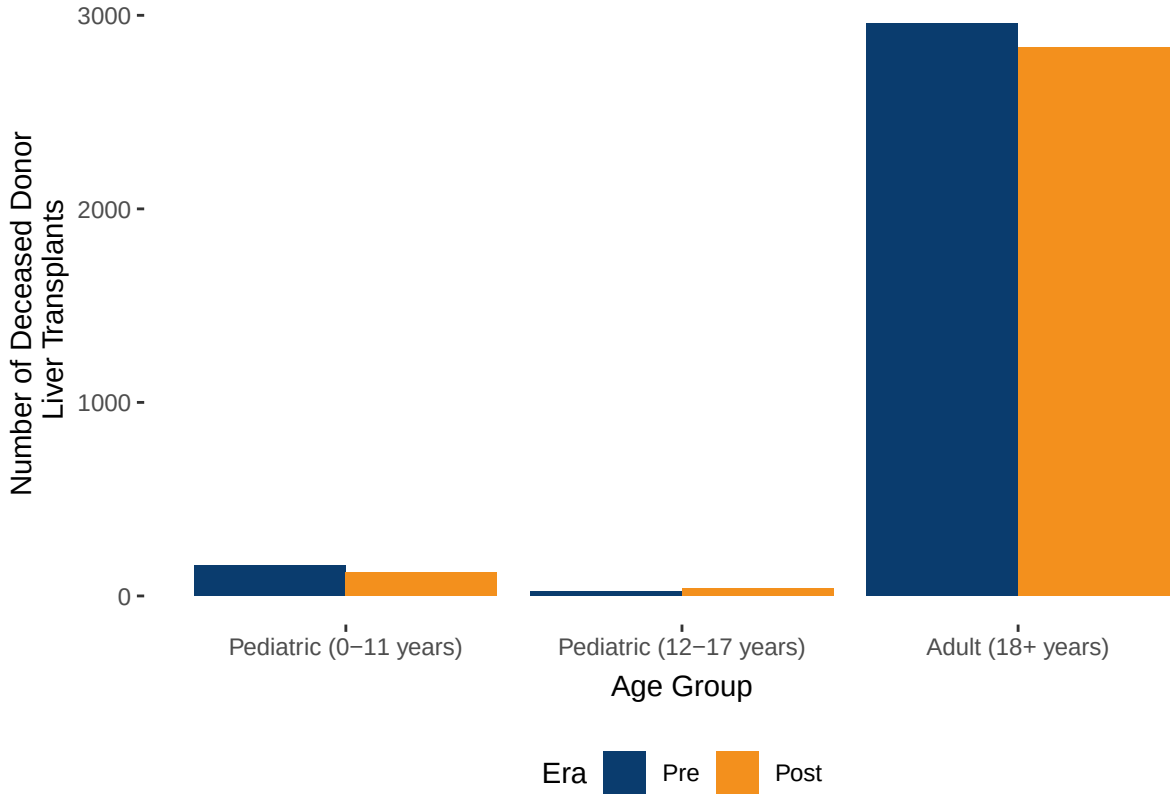
Table 12. Liver Transplant Rates Per 100 Active Person-Years Waiting by MELD or PELD Score or Status and Era

MELD/PELD Score or Status	Era	N Ever Waiting	N Transplants	Active PY	Transplants/100 Active PY	95% CI
M/P <15	Pre	10009	157	2695.6	5.82	4.95, 6.81
	Post	9364	191	2578.4	7.41	6.39, 8.54
M/P 15-28	Pre	8336	1702	1671.8	101.81	97.03, 106.76
	Post	7819	1644	1630.1	100.85	96.03, 105.85
M/P 29-32	Pre	2422	665	224.5	296.19	274.1, 319.58
	Post	1556	669	79.6	840.34	777.86, 906.5
M/P 33-36	Pre	1103	403	48.0	839.06	759.13, 925.11
	Post	820	379	20.8	1819.00	1640.46, 2011.68
M/P 37+, Status 1s	Pre	1212	802	40.0	2006.51	1870.03, 2150.32
	Post	1073	760	27.3	2784.30	2589.84, 2989.49

Section II. Deceased Donor Liver Transplants

Liver-Alone Transplants

Figure 13. Deceased Donor Liver Transplants by Age Group and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 13. Number and Percent of Deceased Donor Liver Transplants by Age Group and Era

	Policy Era		
Age Group	Pre	Post	Difference (Post-Pre)
Pediatric (0-11 years)	158 (5.0%)	121 (4.0%)	-37
Pediatric (12-17 years)	25 (0.8%)	40 (1.3%)	15
Adult (18+ years)	2957 (94.2%)	2836 (94.6%)	-121
Total	3140 (100.0%)	2997 (100.0%)	-143

From the pre/post policy implementation eras, deceased donor liver transplant volume fell for Pediatric (0-11 years) and Adult (18+ years) groups, while increasing slightly for older Pediatrics (12-17 years). However, the distributions remained fairly similar. These observations should be interpreted with caution as the COVID emergency that followed shortly after policy implementation impacted center transplant practices across the U.S.

Figure 14. Deceased Donor Liver Transplants by Sex and Era

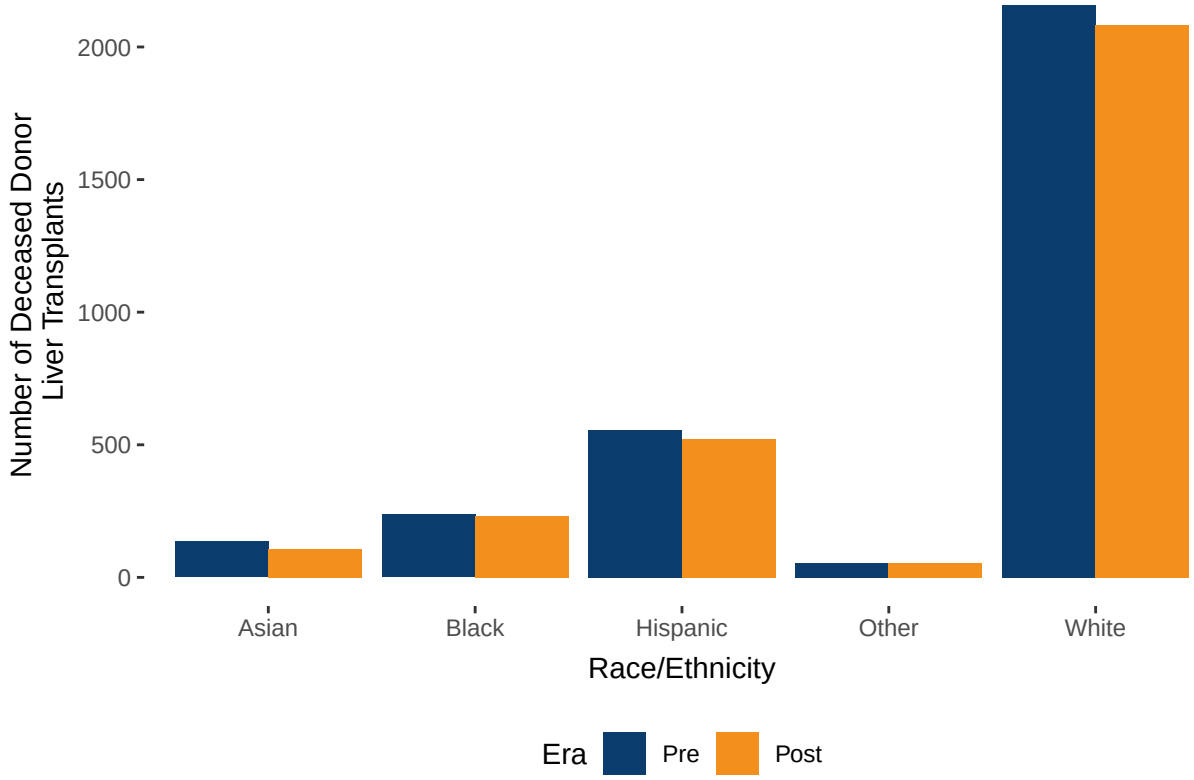
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 14. Number and Percent of Deceased Donor Liver Transplants by Sex and Era

	Policy Era		
Sex	Pre	Post	Difference (Post-Pre)
Female	1117 (35.6%)	1077 (35.9%)	-40
Male	2023 (64.4%)	1920 (64.1%)	-103
Total	3140 (100.0%)	2997 (100.0%)	-143

From the pre/post policy implementation eras, there was a decline in deceased donor liver transplant volume for both males and females. However, the overall percentage of all transplant recipients by sex remained unchanged.

Figure 15. Deceased Donor Liver Transplants by Race/Ethnicity and Era



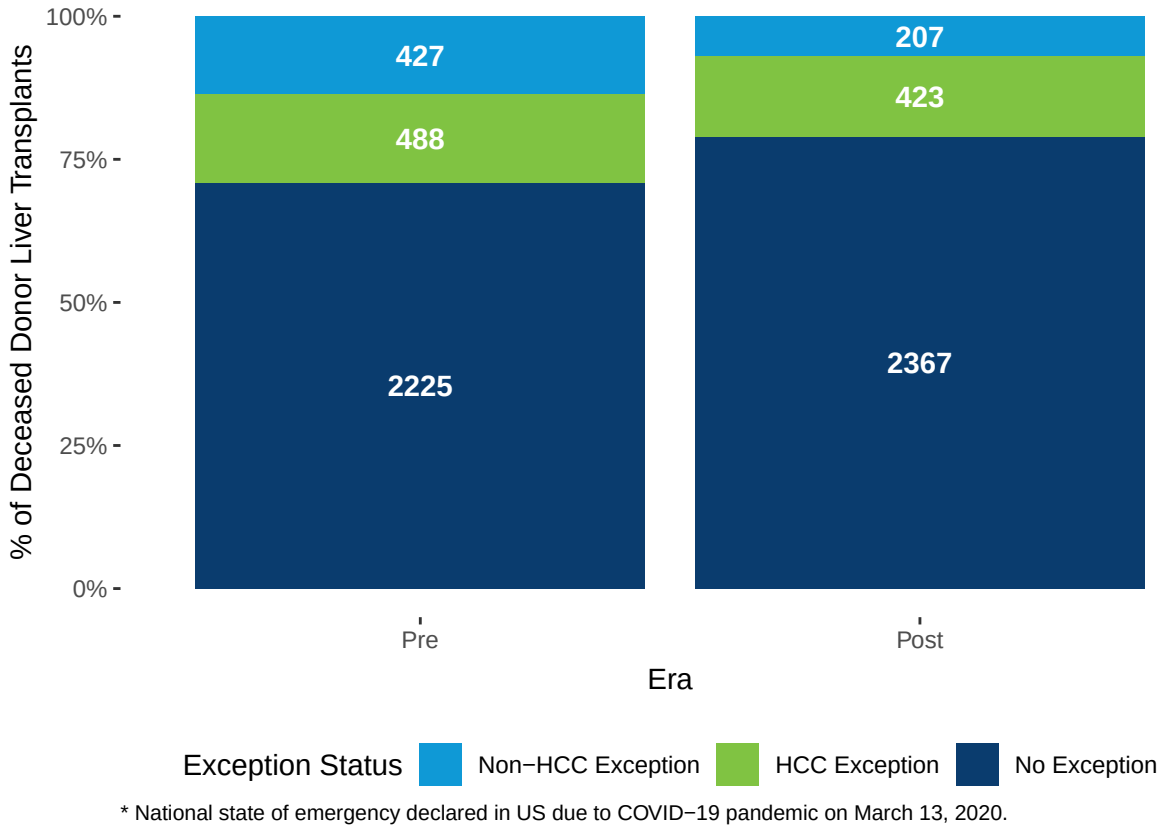
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 15. Number and Percent of Deceased Donor Liver Transplants by Race/Ethnicity and Era

	Policy Era		
Race/Ethnicity	Pre	Post	Difference (Post-Pre)
Asian	135 (4.3%)	106 (3.5%)	-29
Black	237 (7.5%)	232 (7.7%)	-5
Hispanic	555 (17.7%)	522 (17.4%)	-33
Other	55 (1.8%)	53 (1.8%)	-2
White	2158 (68.7%)	2084 (69.5%)	-74
Total	3140 (100.0%)	2997 (100.0%)	-143

Proportions of transplant recipients by race/ethnicity remained relatively unchanged pre- to post-policy. Changes in deceased donor transplant volume post-policy must be considered in light of the COVID emergency declaration.

Figure 16. Deceased Donor Liver Transplants by Exception Status and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

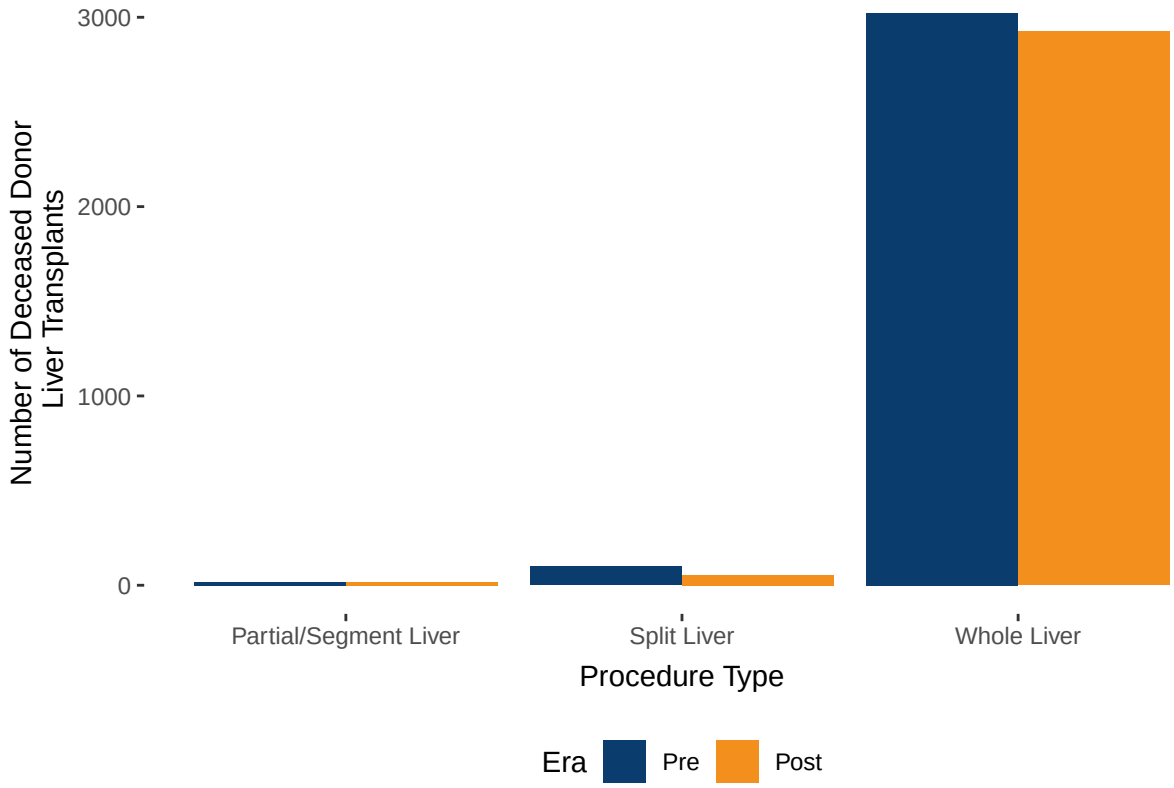
Table 16. Number and Percent of Deceased Donor Liver Transplants by Exception Status and Era

	Policy Era		
Exception Status	Pre	Post	Difference (Post-Pre)
No Exception	2225 (70.9%)	2367 (79.0%)	142
HCC Exception	488 (15.5%)	423 (14.1%)	-65
Non-HCC Exception	427 (13.6%)	207 (6.9%)	-220
Total	3140 (100.0%)	2997 (100.0%)	-143

Following policy implementation, the volume of deceased donor liver transplants decreased for those with an exception - HCC or otherwise - and increased for those with no exception. Non-HCC exception recipients dropped from 14% to just 7% of deceased donor, liver-alone transplant recipients. HCC exception recipients accounted for a similar percentage of transplants pre- and post-policy.

The distribution of liver transplants by exception status and era was significantly different when tested with Pearson's Chi square test of independence ($\chi^2_2 = 82.08$, p-value < 0.001). Post-hoc tests indicated that the increase in percentage of transplant recipients without exceptions and the decrease in percentage of transplant recipients with non-HCC exceptions were significant pre- to post-policy (no exception: $\chi^2_1 = 53.23$, adjusted p-value < 0.001, non-HCC exception: $\chi^2_1 = 73.41$, adjusted p-value < 0.001). This was not the case for the decrease in percentage of transplant recipients with HCC exceptions ($\chi^2_1 = 2.36$, adjusted p-value $= 0.374$). Changes in deceased donor transplant volume post-policy must be considered in light of the COVID emergency declaration.

Figure 17. Deceased Donor Liver Transplants by Procedure Type and Era



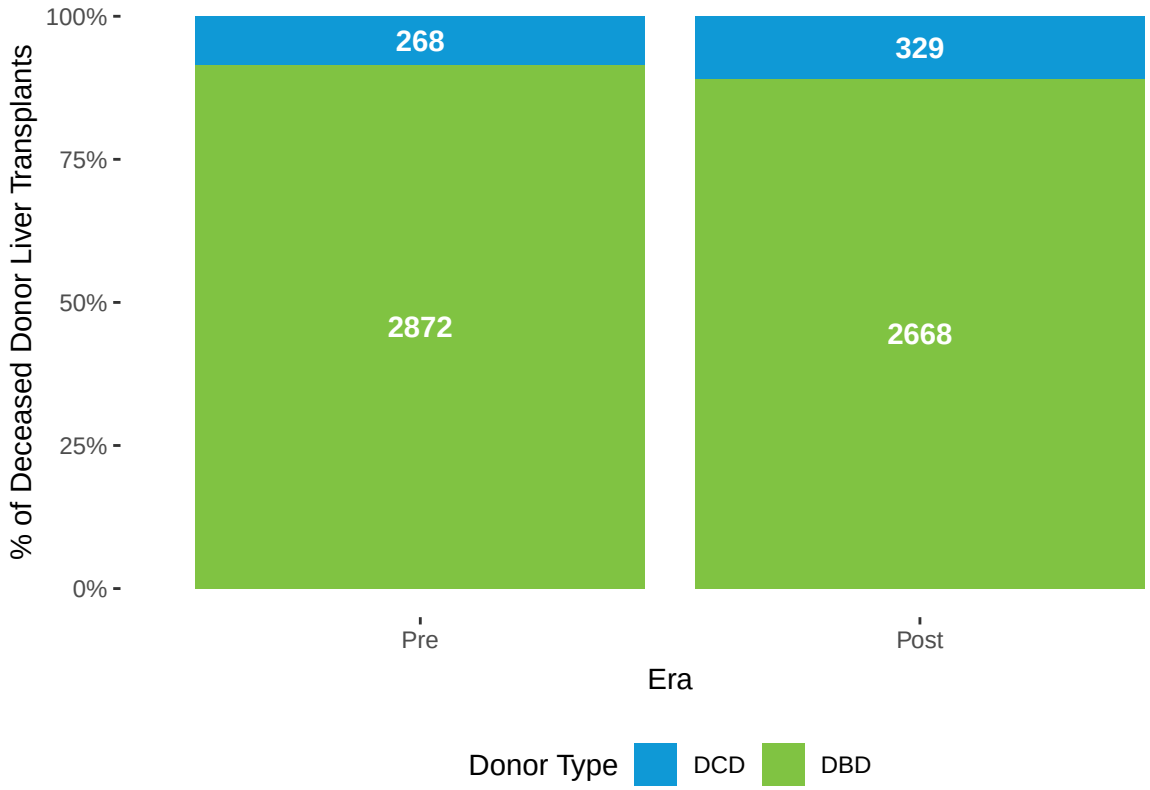
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 17. Number and Percent of Deceased Donor Liver Transplants by Procedure Type and Era

	Policy Era		
Procedure Type	Pre	Post	Difference (Post-Pre)
Partial/Segment Liver	17 (0.5%)	18 (0.6%)	1
Split Liver	100 (3.2%)	54 (1.8%)	-46
Whole Liver	3023 (96.3%)	2925 (97.6%)	-98
Total	3140 (100.0%)	2997 (100.0%)	-143

Following policy implementation, the volume of split liver and whole liver deceased donor transplants decreased, though the percentage of whole liver transplants as a share of total transplants increased slightly. The already small volumes of split liver transplants decreasing may be due to the decrease in pediatric deceased donor liver transplants. Additionally, changes in deceased donor transplant volume post-policy must be considered in light of the COVID emergency declaration.

Figure 18. Deceased Donor Liver Transplants by Donor Type and Era



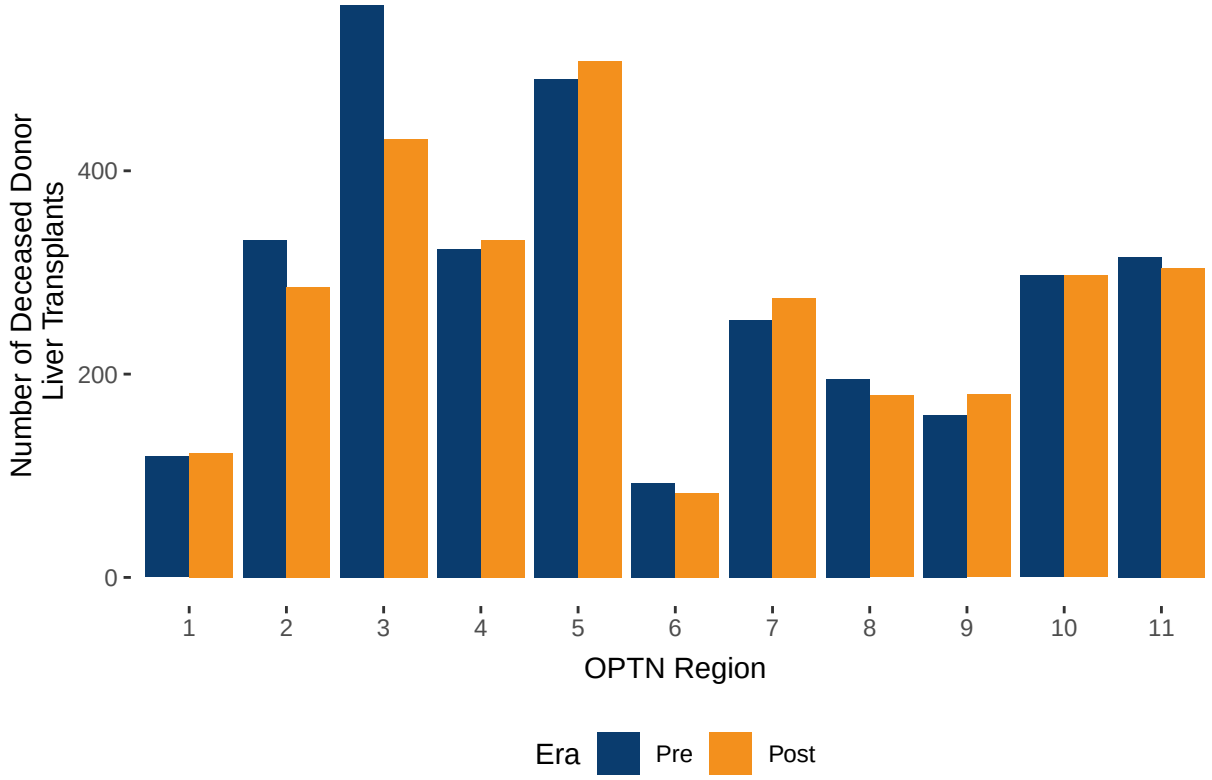
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 18. Number and Percent of Deceased Donor Liver Transplants by Donor Type and Era

	Policy Era		
Donor Type	Pre	Post	Difference (Post-Pre)
DCD	268 (8.5%)	329 (11.0%)	61
DBD	2872 (91.5%)	2668 (89.0%)	-204
Total	3140 (100.0%)	2997 (100.0%)	-143

Following policy implementation, the volume of deceased donor liver transplants from donation after circulatory death (DCD) donors increased, while it decreased for non-DCD donors. The change in percent distribution of transplants by donor type and era was significantly different ($\chi^2_1 = 10.14$, p-value $= 0.0014$). Changes in deceased donor transplant volume post-policy must be considered in light of the COVID emergency declaration.

Figure 19. Deceased Donor Liver Transplants by OPTN Region and Era



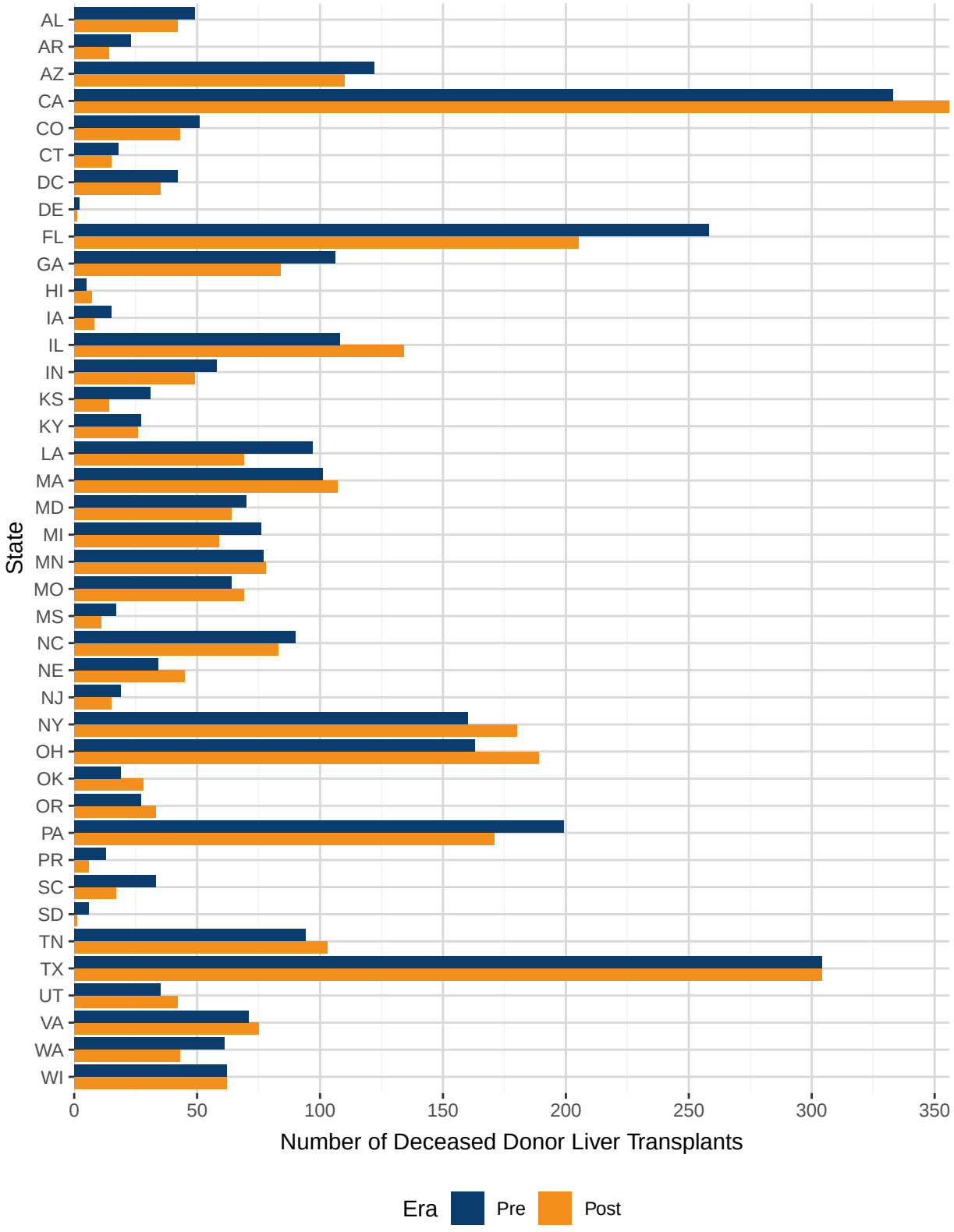
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 19. Number and Percent of Deceased Donor Liver Transplants by OPTN Region and Era

	Policy Era		
OPTN Region	Pre	Post	Difference (Post-Pre)
1	119 (3.8%)	122 (4.1%)	3
2	332 (10.6%)	286 (9.5%)	-46
3	563 (17.9%)	431 (14.4%)	-132
4	323 (10.3%)	332 (11.1%)	9
5	490 (15.6%)	508 (17.0%)	18
6	93 (3.0%)	83 (2.8%)	-10
7	253 (8.1%)	275 (9.2%)	22
8	195 (6.2%)	179 (6.0%)	-16
9	160 (5.1%)	180 (6.0%)	20
10	297 (9.5%)	297 (9.9%)	0
11	315 (10.0%)	304 (10.1%)	-11
Total	3140 (100.0%)	2997 (100.0%)	-143

From the pre/post policy implementation eras, some OPTN Regions saw drops in deceased donor liver transplant volume while others saw relatively little change. A few regions did experience a slight increase in transplants pre- to post-policy. Changes in deceased donor transplant volume must be considered in light of the COVID emergency declaration and its differential impact across the country. For more details on the differential impact of COVID-19, visit the **CDC COVID Data Tracker**. The next figures by DSA and state echo these results.

Figure 20. Deceased Donor Liver Transplants by State of Transplant Center and Era

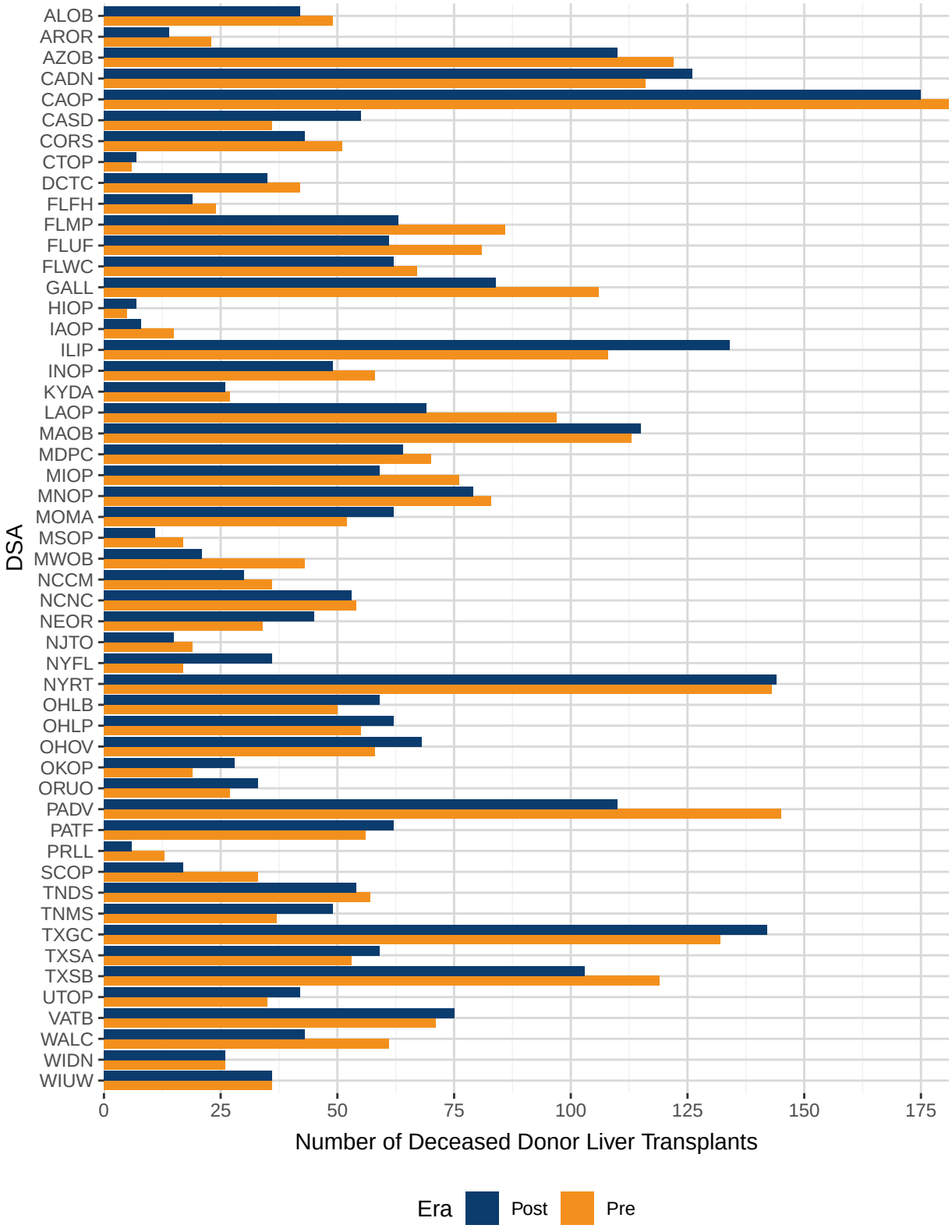


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 19. Number of Deceased Donor Liver Transplants by State and Era

	Policy Era		
State	Pre	Post	Difference (Post-Pre)
AL	49	42	-7
AR	23	14	-9
AZ	122	110	-12
CA	333	356	23
CO	51	43	-8
CT	18	15	-3
DC	42	35	-7
DE	2	1	-1
FL	258	205	-53
GA	106	84	-22
HI	5	7	2
IA	15	8	-7
IL	108	134	26
IN	58	49	-9
KS	31	14	-17
KY	27	26	-1
LA	97	69	-28
MA	101	107	6
MD	70	64	-6
MI	76	59	-17
MN	77	78	1
MO	64	69	5
MS	17	11	-6
NC	90	83	-7
NE	34	45	11
NJ	19	15	-4
NY	160	180	20
OH	163	189	26
OK	19	28	9
OR	27	33	6
PA	199	171	-28
PR	13	6	-7
SC	33	17	-16
SD	6	1	-5
TN	94	103	9
TX	304	304	0
UT	35	42	7
VA	71	75	4
WA	61	43	-18
WI	62	62	0
Total	3140	2997	-143

Figure 21. Deceased Donor Liver Transplants by DSA of Transplant Center and Era

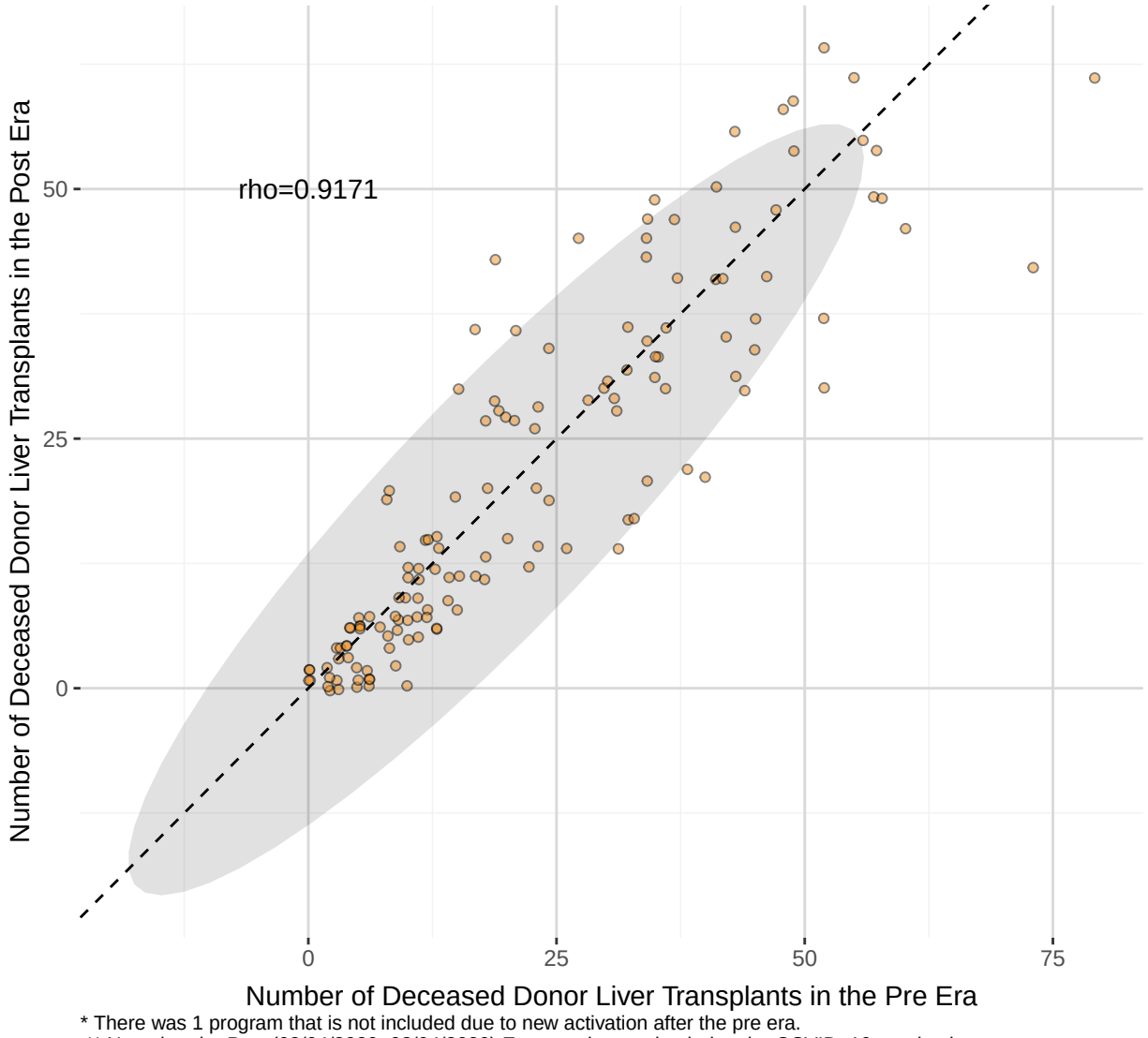


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 19. Number of Deceased Donor Liver Transplants by DSA and Era

	Policy Era				Policy Era		
DSA	Pre	Post	Difference (Post-Pre)	DSA	Pre	Post	Difference (Post-Pre)
ALOB	49	42	-7	NCCM	36	30	-6
AROR	23	14	-9	NCNC	54	53	-1
AZOB	122	110	-12	NEOR	34	45	11
CADN	116	126	10	NJTO	19	15	-4
CAOP	181	175	-6	NYFL	17	36	19
CASD	36	55	19	NYRT	143	144	1
CORS	51	43	-8	OHLB	50	59	9
CTOP	6	7	1	OHLP	55	62	7
DCTC	42	35	-7	OHOV	58	68	10
FLFH	24	19	-5	OKOP	19	28	9
FLMP	86	63	-23	ORUO	27	33	6
FLUF	81	61	-20	PADV	145	110	-35
FLWC	67	62	-5	PATF	56	62	6
GALL	106	84	-22	PRLL	13	6	-7
HIOP	5	7	2	SCOP	33	17	-16
IAOP	15	8	-7	TNDS	57	54	-3
ILIP	108	134	26	TNMS	37	49	12
INOP	58	49	-9	TXGC	132	142	10
KYDA	27	26	-1	TXSA	53	59	6
LAOP	97	69	-28	TXSB	119	103	-16
MAOB	113	115	2	UTOP	35	42	7
MDPC	70	64	-6	VATB	71	75	4
MIOP	76	59	-17	WALC	61	43	-18
MNOP	83	79	-4	WIDN	26	26	0
MOMA	52	62	10	WIUW	36	36	0
MSOP	17	11	-6	Total	3140	2997	-143
MWOB	43	21	-22				

Figure 22. Scatter Plot of Transplant Center Deceased Donor Liver Transplant Volume



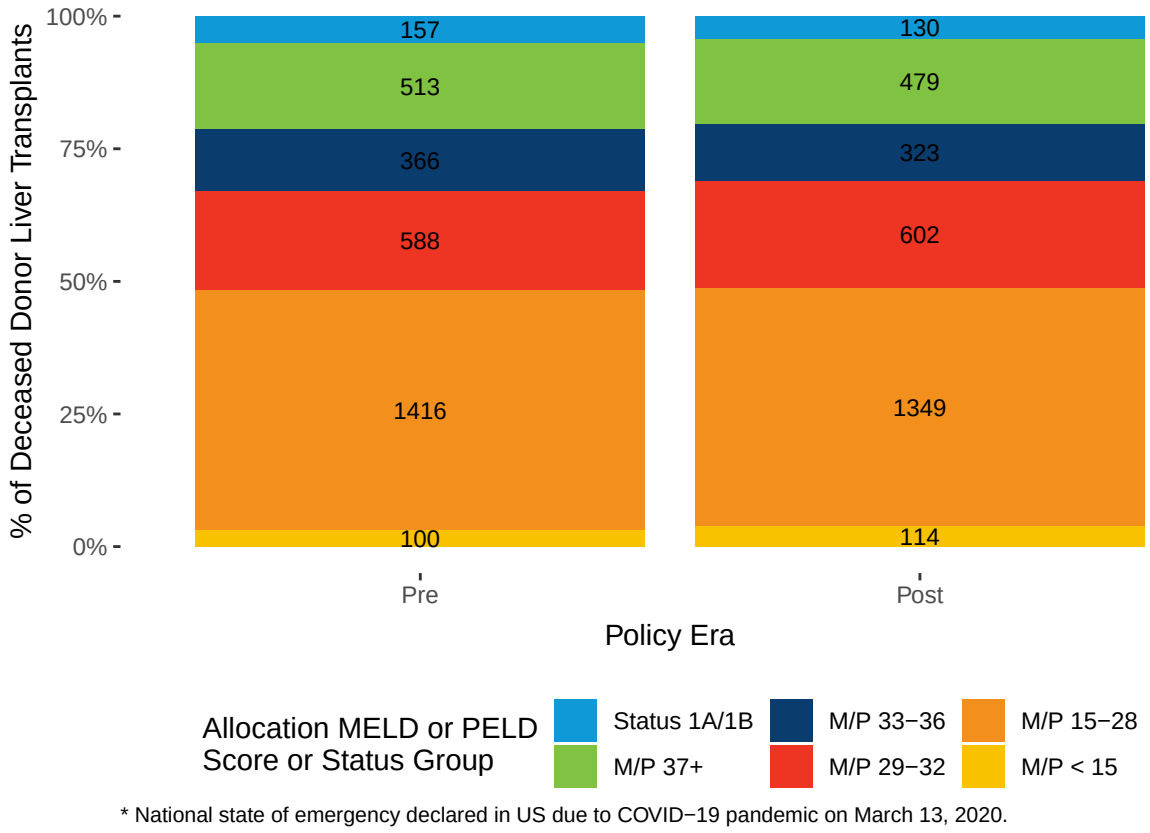
* There was 1 program that is not included due to new activation after the pre era.
** Note that the Post (02/04/2020−08/04/2020) Era contains weeks during the COVID−19 pandemic.

Any points along the diagonal dashed line indicate no changes in the absolute number of deceased donor liver transplants by program, pre- to post-policy. Points that fall above the diagonal represent programs that performed more deceased donor liver transplants post-policy compared to pre-policy. Points that fall below the diagonal represent programs that performed fewer deceased donor liver transplants post-policy compared to pre-policy.

The gray shaded region represents a 95% confidence ellipse, assuming a multivariate t-distribution, around the data points. While this is not a true statistical test of a hypothesis that there was a significant change in the number of deceased donor liver transplants performed, it provides some context as to how often and where programs that may fall outside of the rest of the group may be.

The majority of programs performed similar number of deceased donor liver transplants Pre (02/05/2019-08/06/2019) and Post (02/04/2020-08/04/2020) policy, overall. A Spearman's rank correlation (rho) is provided to measure the strength and direction of the monotonic, not necessarily linear, relationship between the number of deceased donor liver transplants by program pre- and post-policy. There is a strong positive, monotonic relationship between these two measures.

Figure 23. Deceased Donor Liver Transplants by Allocation MELD or PELD Score or Status and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

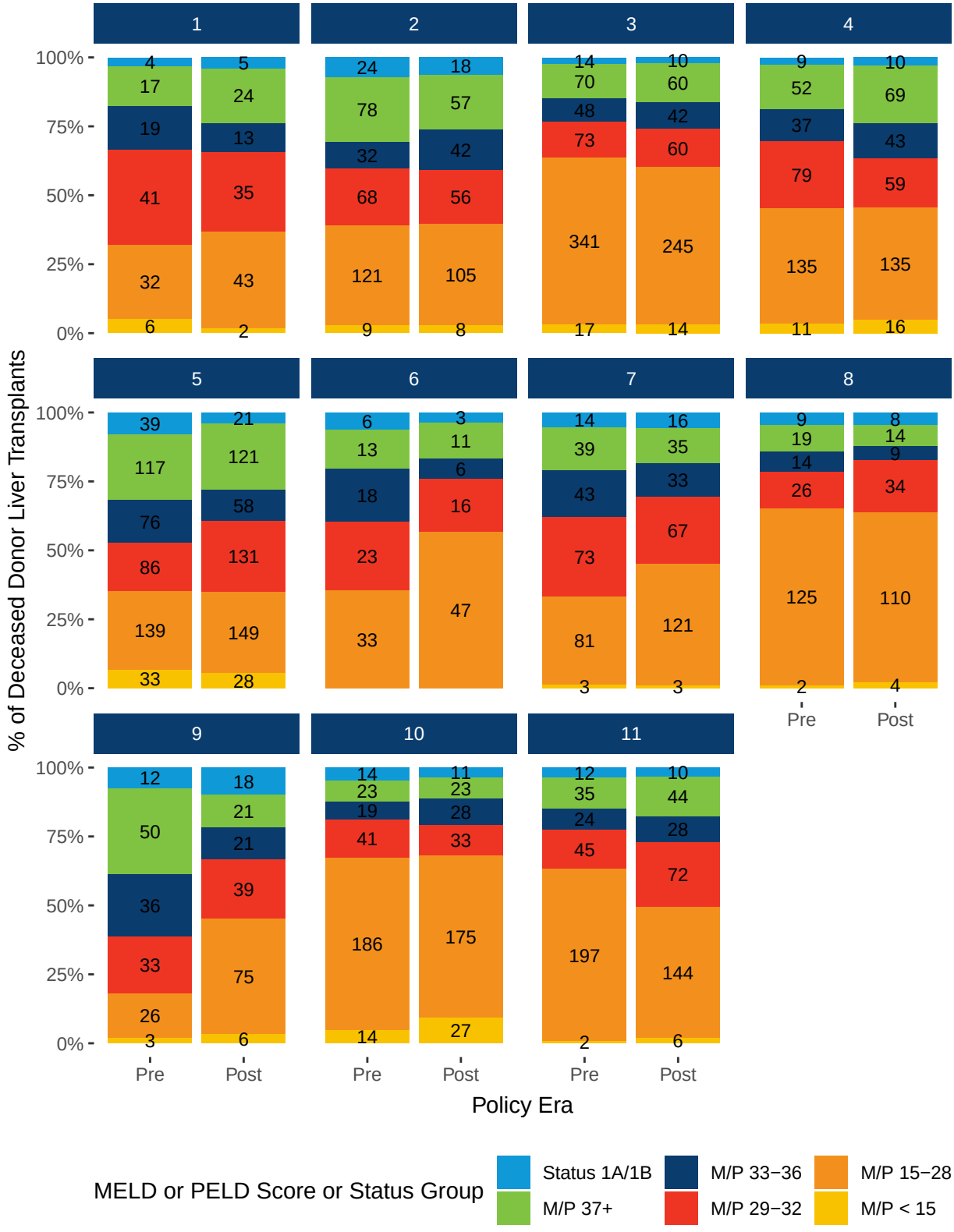
Table 20. Number and Percent of Deceased Donor Liver Transplants by Allocation MELD or PELD Score/Status Group and Era

	Policy Era		
Score or Status Group	Pre	Post	Difference (Post-Pre)
Status 1A/1B	157 (5.0%)	130 (4.3%)	-27
M/P 37+	513 (16.3%)	479 (16.0%)	-34
M/P 33-36	366 (11.7%)	323 (10.8%)	-43
M/P 29-32	588 (18.7%)	602 (20.1%)	14
M/P 15-28	1416 (45.1%)	1349 (45.0%)	-67
M/P < 15	100 (3.2%)	114 (3.8%)	14
Total	3140 (100.0%)	2997 (100.0%)	-143

Similar percentages of transplants occurred within each score group pre- and post-policy. Additional graphics to understand the potential impact of COVID-19 in the post-policy era are included in the **Appendix**.

Changes in recipient score at transplant were variable across the country. This is illustrated by OPTN region in the following figure; however, these changes may be even more variable when considered at smaller units such as DSAs, states, or transplant programs due to smaller sample sizes and the differential impact of COVID-19 across the country. Associated table included in **Appendix**. Possible changes in allocation score distributions should be interpreted with caution in light of the COVID emergency declaration.

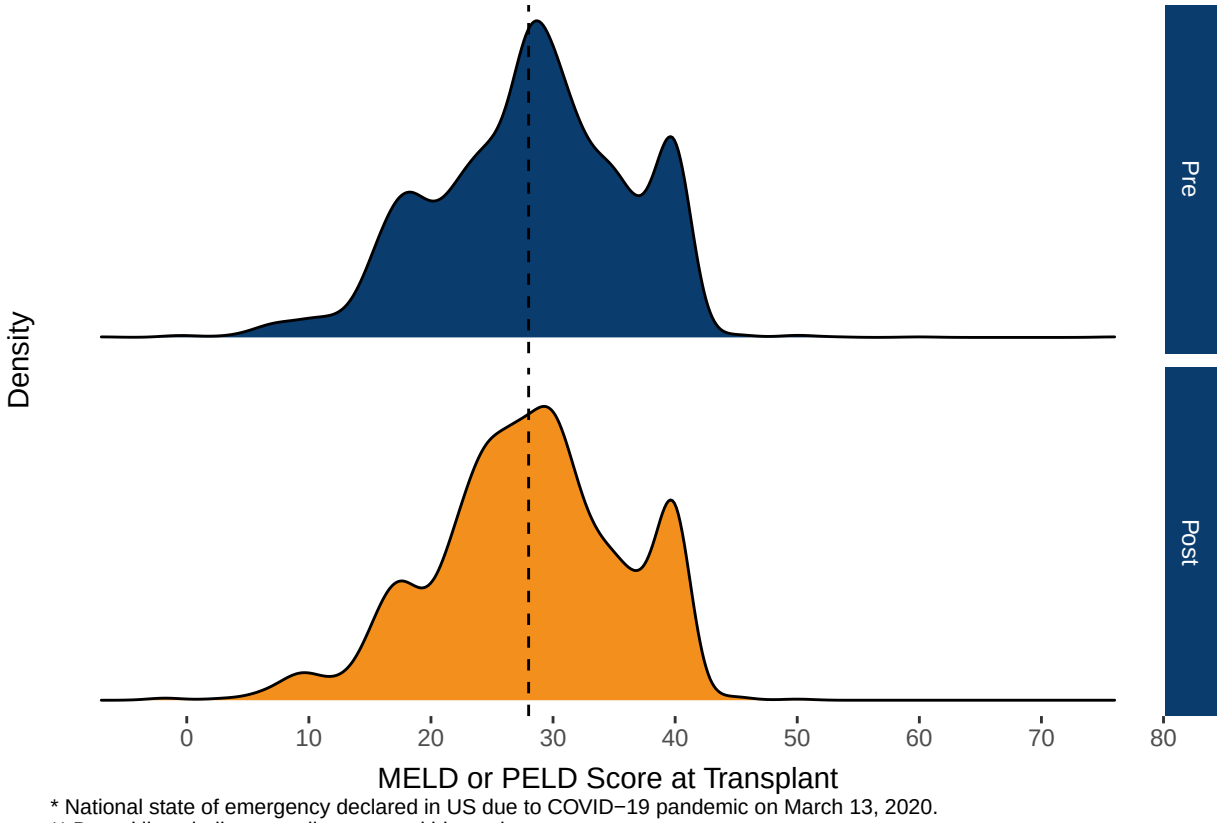
Figure 24. Deceased Donor Liver Transplants by MELD or PELD Score or Status, OPTN Region of Transplant Center, and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

It was hypothesized that there would be an increase in the median transplant score immediately following the policy change, implying an influx of high MELD or PELD candidates receiving transplants. The figure below shows the distribution of allocation scores at transplant with the median denoted by the vertical dotted line for each policy era. This excludes any Status 1A or Status 1B deceased donor liver transplants.

Figure 25. Distribution of Deceased Donor Liver Recipient Allocation MELD or PELD Score at Transplant by Era



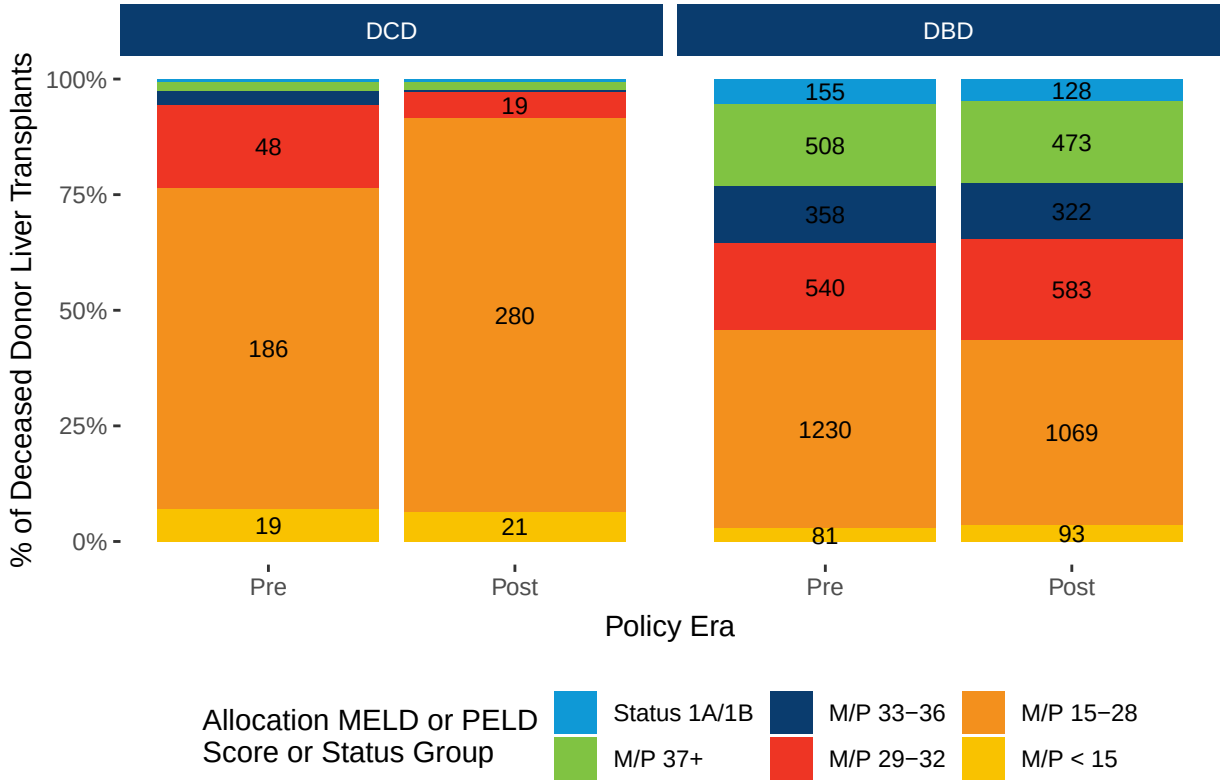
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate median score within each era.

Table 21. Distribution of Deceased Donor Liver Recipient Allocation MELD or PELD Score at Transplant by Era

		Allocation MELD or PELD at Transplant					
Policy Era	N	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Pre	2983	-7	23	28	28	34	76
Post	2867	-2	23	28	28	33	50

The median transplant score remained unchanged at 28 for both policy eras, but there was a shift in MELD/PELD at transplant pre- to post-implementation seen from the density plot. The differences in distributions were statistically significant (Kolmogorov-Smirnov test $D = 0.06$, p-value < 0.001). Due to the COVID emergency declaration, this finding should be interpreted with caution.

Figure 26. Deceased Donor Liver Transplants by Allocation MELD or PELD Score or Status, Donor Type, and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Groups with n < 10 do not show label.

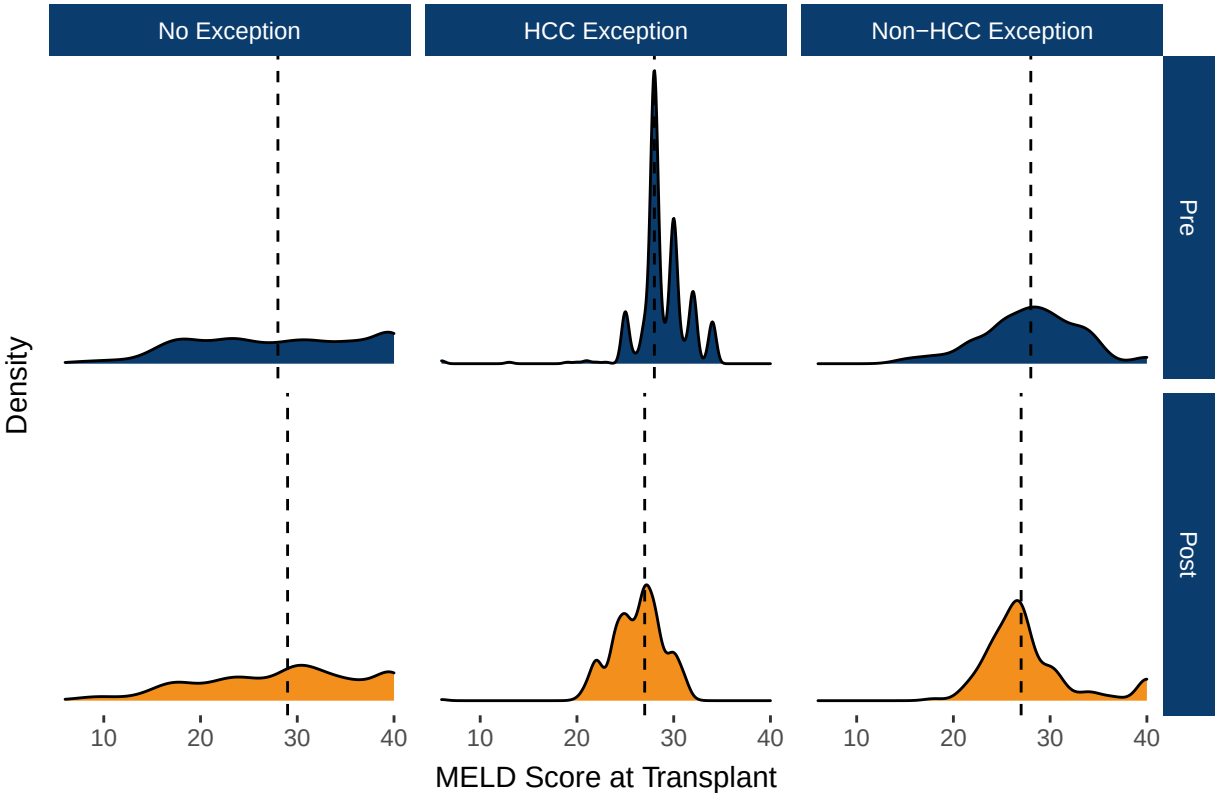
Table 22. Number and Percent of Deceased Donor Liver Transplants by Allocation MELD or PELD Score or Status and Era

		Policy Era	
Donor Type	Score or Status Group	Pre	Post
DCD	Status 1A/1B	2 (0.7%)	2 (0.6%)
	M/P 37+	5 (1.9%)	6 (1.8%)
	M/P 33-36	8 (3.0%)	1 (0.3%)
	M/P 29-32	48 (17.9%)	19 (5.8%)
	M/P 15-28	186 (69.4%)	280 (85.1%)
	M/P < 15	19 (7.1%)	21 (6.4%)
DBD	Status 1A/1B	155 (5.4%)	128 (4.8%)
	M/P 37+	508 (17.7%)	473 (17.7%)
	M/P 33-36	358 (12.5%)	322 (12.1%)
	M/P 29-32	540 (18.8%)	583 (21.9%)
	M/P 15-28	1230 (42.8%)	1069 (40.1%)
	M/P < 15	81 (2.8%)	93 (3.5%)

There was a substantial difference in distribution of allocation scores for transplant recipients of DCD versus DBD donors, both pre- and post-policy. Differences pre- to post-policy in the proportion of score groups was

most notable for DCD donors. Due to the COVID emergency declaration, this finding should be interpreted with caution.

Figure 27. Distribution of Adult Deceased Donor Liver Recipient Allocation MELD Score at Transplant by Exception Status and Era



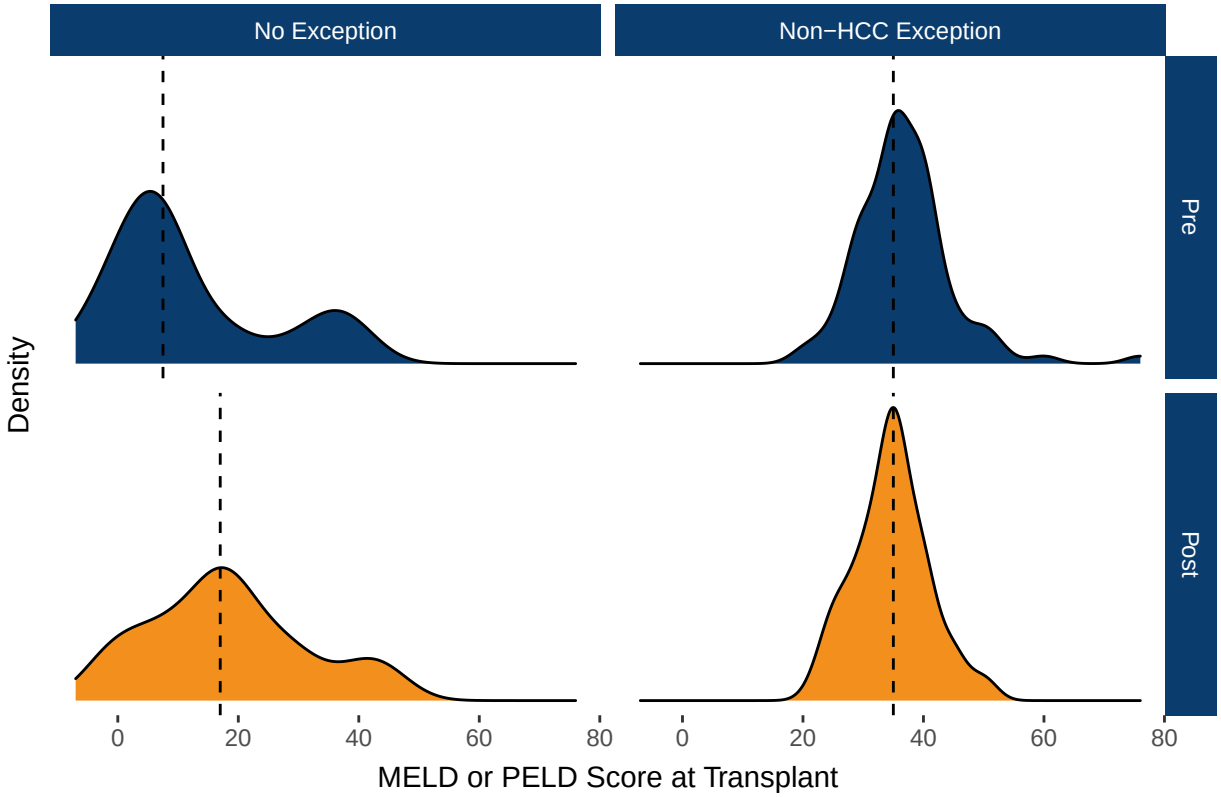
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate median score within each era.

Table 23. Summary of Adult Deceased Donor Liver Recipient Allocation MELD Score at Transplant by Exception Status and Era

			Allocation MELD at Transplant					
Exception Status	Policy Era	N	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
No Exception	Pre	2044	6	21	28	28	36	40
	Post	2196	6	22	28	29	35	40
HCC Exception	Pre	488	6	28	29	28	30	34
	Post	423	6	25	26	27	28	32
Non-HCC Exception	Pre	339	15	25	28	28	32	40
	Post	141	18	25	28	27	29	40

The distributions of allocation MELD or PELD scores at transplant by exception status for adult (age 18+) recipients show changes in distributions, particular for HCC and non-HCC exception recipients. The median score increased for non-exception recipients from 28 to 29 pre- to post-policy, decreased for HCC exception recipients (28 to 27) and decreased for non-HCC exception recipients (28 to 27).

Figure 28. Distribution of Pediatric Deceased Donor Liver Recipient Allocation MELD or PELD Score at Transplant by Exception Status and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate median score within each era.

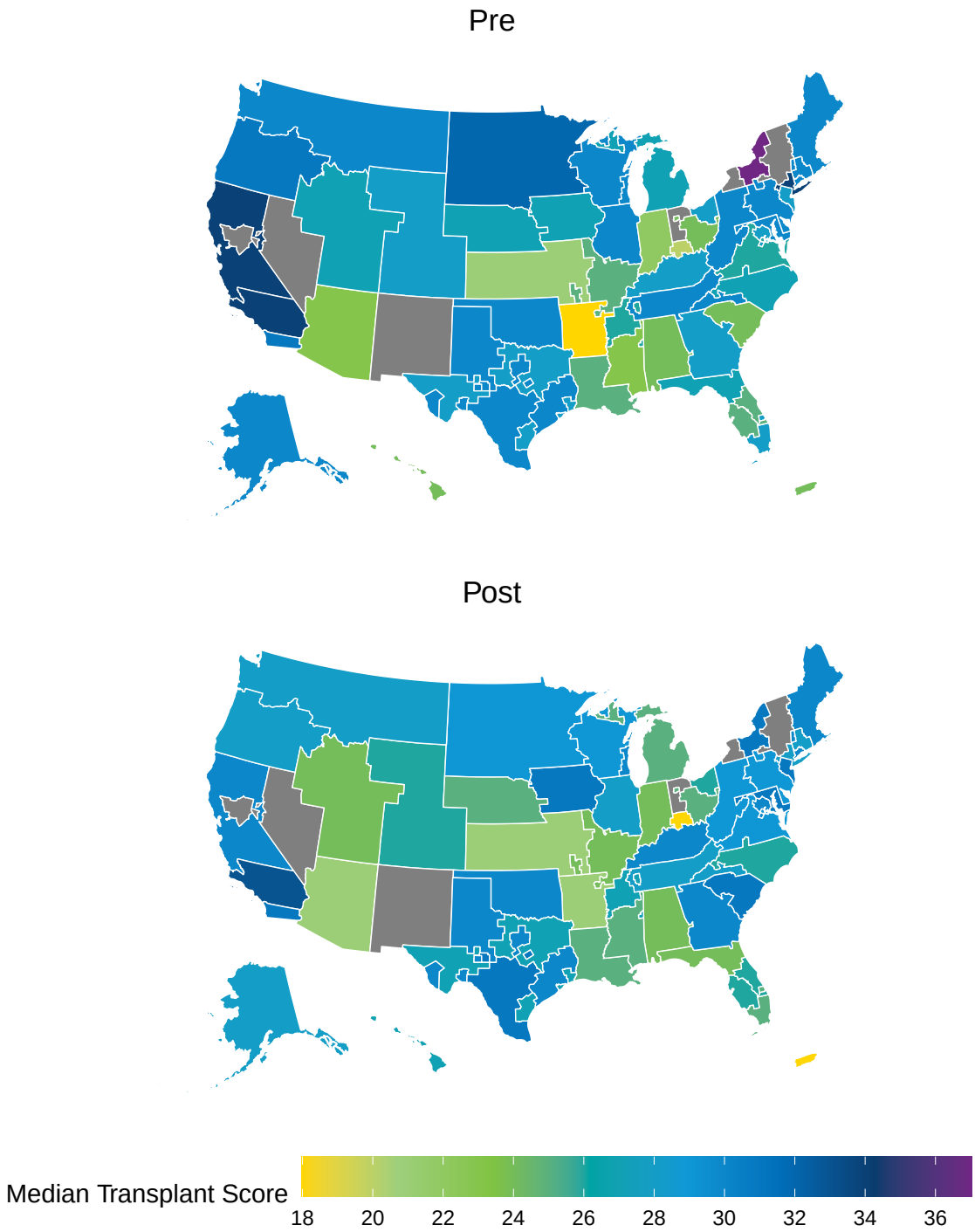
Table 24. Summary of Pediatric Deceased Donor Liver Recipient Allocation MELD Score at Transplant by Exception Status and Era

			Allocation MELD/PELD at Transplant					
Exception Status	Policy Era	N	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
No Exception	Pre	24	-7	4	12	7.5	18	39
	Post	41	-2	10	18	17.0	25	45
Non-HCC Exception	Pre	88	20	31	37	35.0	40	76
	Post	66	22	30	35	35.0	38	50

Similarly reviewing allocation MELD and PELD scores at transplant for pediatric recipients (age < 18), there have been changes in the distribution of scores by exception status. For non-exception transplant recipients, the median transplant score from to pre- to post-policy. While the median score was 35 in both policy eras for non-HCC exception transplant recipients, there was a shift in many of the high-PELD scores over 35 towards this median post-policy.

The range of median transplant scores by donation service area (DSA) was 18 to 37 in the pre-policy era. This excluded Status 1A and 1B transplants, and only included deceased liver donors. In the post-policy era, the range of median transplant scores by DSA was 18 to 33. Strong Memorial Hospital, University of Rochester Medical Center (NYFL) experienced the largest decrease in median transplant score, from 37 to 33, while We Are Sharing Hope SC (SCOP) experienced the largest increase in median transplant score, from 24 to 30.

Figure 29. Median Deceased Donor Liver Recipient Allocation MELD or PELD Score at Transplant by DSA of Transplant Center and Era



It was also crucial to quantify the variation in median allocation MELD or PELD at transplant between different units. In all instances except by Transplant Center, the standard deviation of the median transplant scores decreased post-policy, indicating less variation in median transplant scores. As expected, the change in standard deviation pre- to post-policy was smaller as the unit of geography also got smaller. Changes in allocation score variation should be interpreted with caution in light of the COVID emergency declaration.

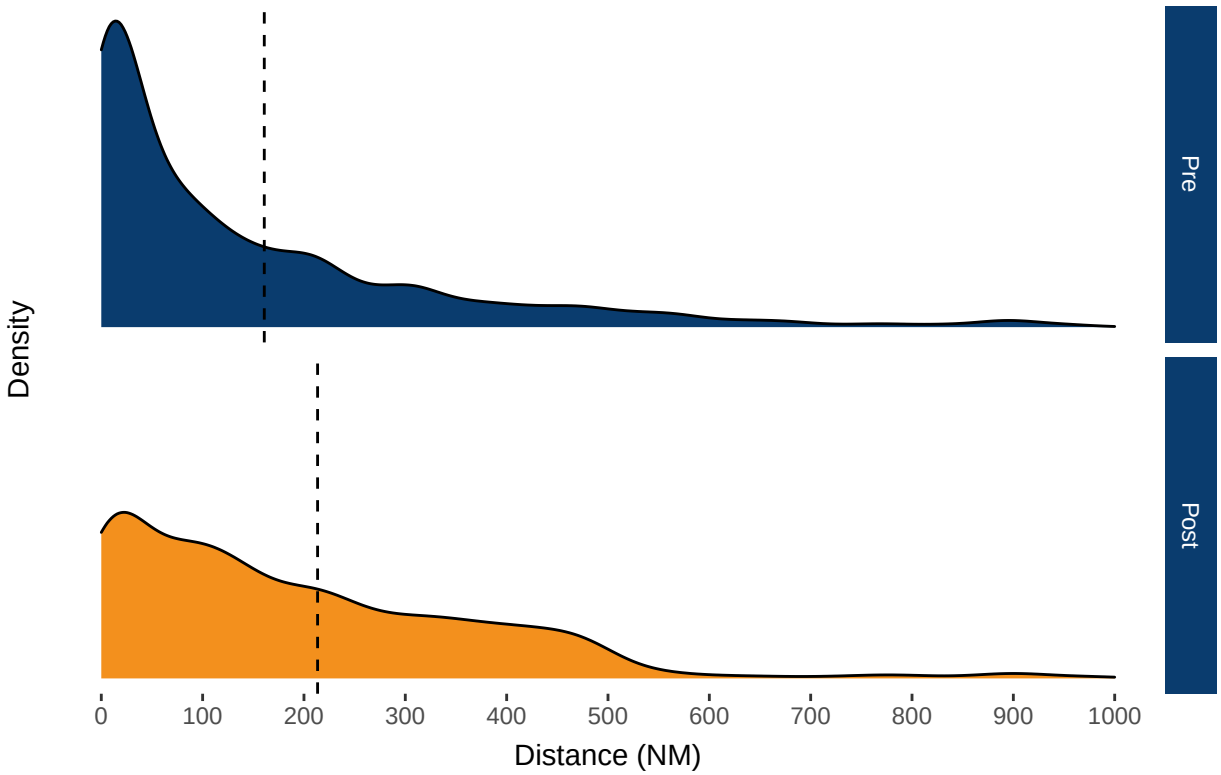
Table 25. Standard Deviation of Allocation MELD or PELD Score at Transplant By Era

	Policy Era	
Unit of Median Transplant Score	Pre	Post
OPTN Region	2.83	2.05
DSA	3.71	3.40
State	4.00	3.70
Transplant Center	4.81	4.87

Since the allocation change removed DSA and OPTN region as units of allocation and now uses 150, 250, and 500 NM radii-circles around the donor hospital of the potential liver donor, the distance that deceased donor livers travel has been of interest. Based on information that is reported to the OPTN, this is defined as the distance between donor hospital and transplant center.

The average distance from donor hospital to transplant center significantly increased from 160.8 NM pre- to 213.4 NM post-policy (t=8.76, p <0.001).

Figure 30. Distribution of Distance from Donor Hospital to Transplant Center for Deceased Donor Liver Transplants by Era

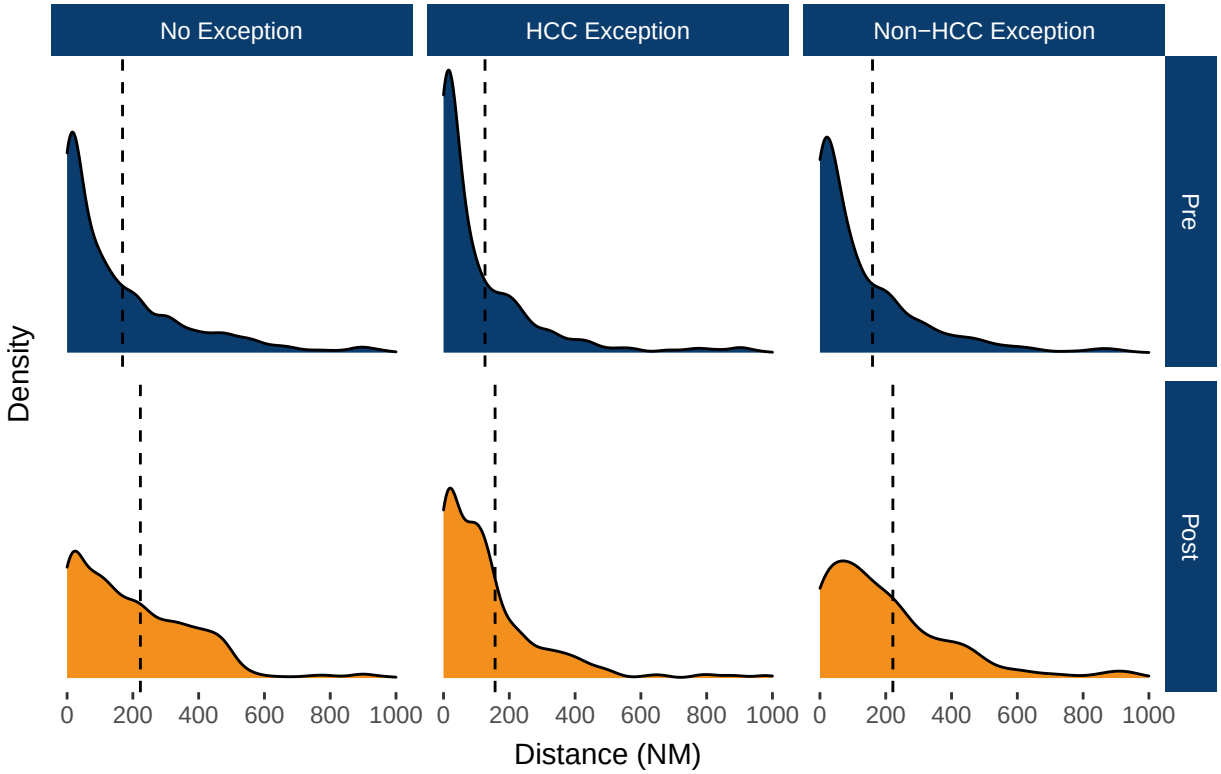


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate average distance within each era.
*** There were 38 pre−policy and 53 post policy transplants > 1000 NM that were excluded.

Table 26. Summary of Distance from Donor Hospital to Transplant Center for Deceased Donor Liver Transplants by Era

	Distance (NM)					
Policy Era	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Pre	0	12	160.84	78	215.25	2218
Post	0	51	213.44	147	312.00	2327

Figure 31. Distribution of Distance from Donor Hospital to Transplant Center for Deceased Donor Liver Transplants by Exception Status and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate average distance within each era.
*** There were 38 pre−policy and 53 post policy transplants > 1000 NM that were excluded.

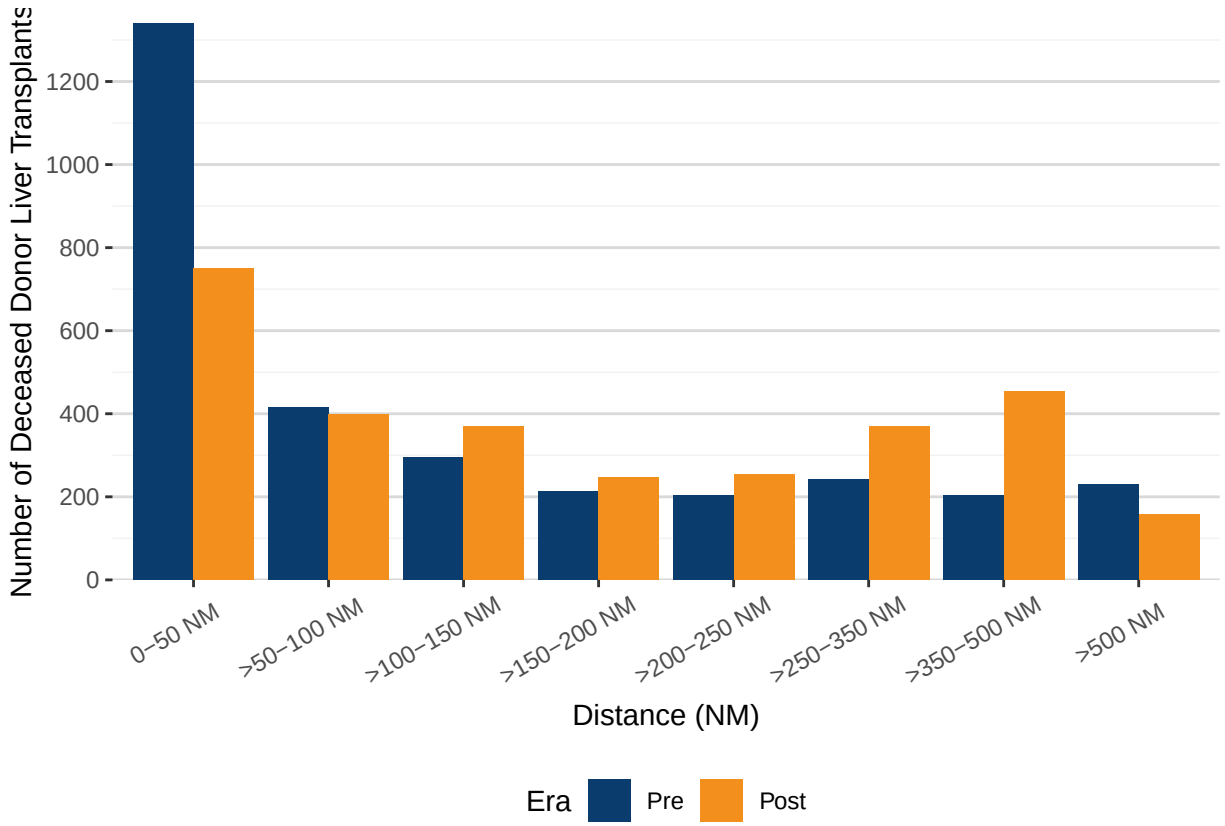
Table 27. Summary of Distance from Donor Hospital to Transplant Center for Deceased Donor Liver Transplants by Exception Status and Era

		Distance (NM)					
Exception Status	Policy Era	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
No Exception	Pre	0	14.0	168.66	85	228.0	2218
	Post	0	58.0	222.86	166	328.0	2327
HCC Exception	Pre	0	8.0	126.16	45	165.5	1257
	Post	0	21.0	156.78	94	191.5	1888
Non-HCC Exception	Pre	0	13.5	159.76	72	203.0	2036
	Post	0	66.0	221.59	155	299.5	1535

The average distance from donor hospital to transplant center increased from 168.7 to 222.9 NM for non-exception transplant recipients, 126.2 to 156.8 NM for HCC exception transplant recipients, and 159.8 to 221.6 NM for non-HCC exception transplant recipients pre- to post-policy.

The figure below shows that the largest shift has been from deceased donor livers going to transplant centers within 0-50 NM pre-policy to further distances post-policy. There was an increase in livers over 100 NM out to 500 NM.

Figure 32. Deceased Donor Liver Transplants by Distance and Era



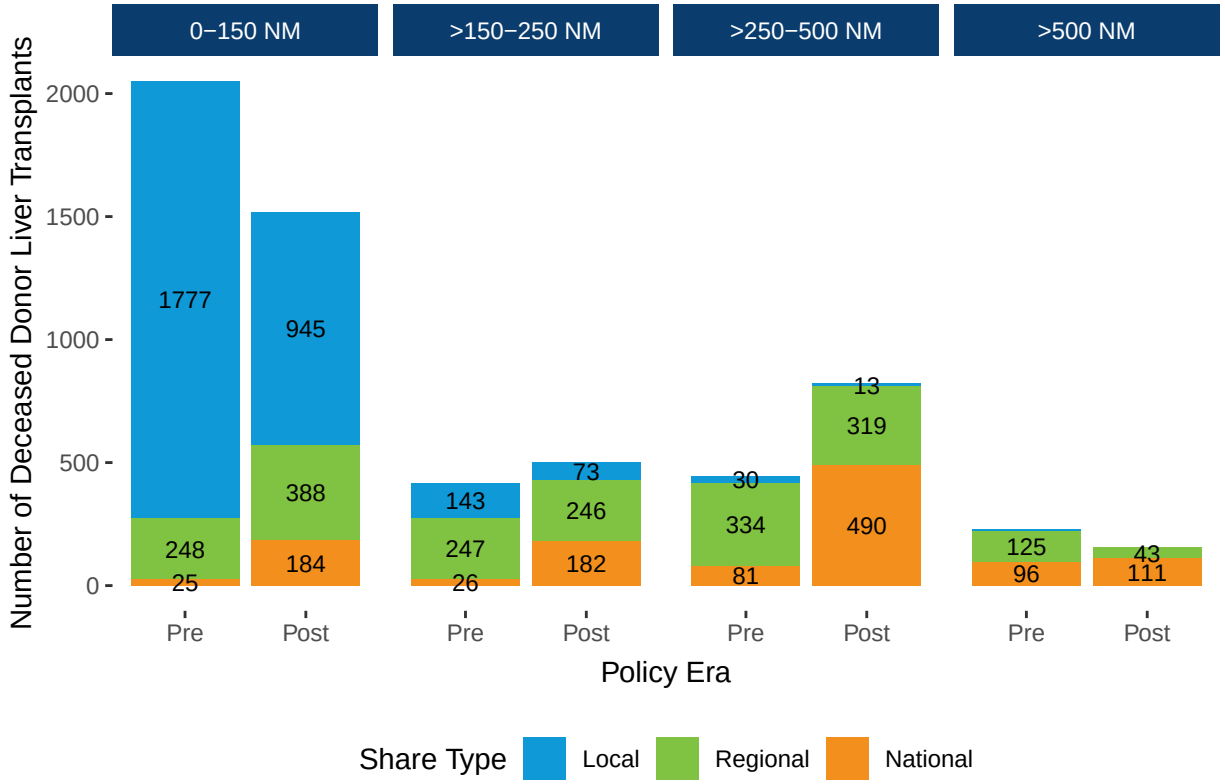
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 28. Number and Percent of Deceased Donor Liver Transplants by Distance and Era

	Policy Era		
Distance Group	Pre	Post	Difference (Post - Pre)
0-50 NM	1340 (42.7%)	749 (25.0%)	-591
>50-100 NM	415 (13.2%)	399 (13.3%)	-16
>100-150 NM	295 (9.4%)	369 (12.3%)	74
>150-200 NM	212 (6.8%)	247 (8.2%)	35
>200-250 NM	204 (6.5%)	254 (8.5%)	50
>250-350 NM	241 (7.7%)	369 (12.3%)	128
>350-500 NM	204 (6.5%)	453 (15.1%)	249
>500 NM	229 (7.3%)	157 (5.2%)	-72
Total	3140 (100.0%)	2997 (100.0%)	-143

The next figure illustrates the relationship between the share types (local, regional, national) used in allocation pre-policy and the distance classifications used in allocation post-policy.

Figure 33. Deceased Donor Liver Transplants by Classification Distance, Share Type, and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Labels for counts < 10 are not included.

While just under two-thirds of liver transplants were local (transplant center within same DSA as donor hospital) in the pre-policy era, this dropped to approximately one-third during the post-policy era. There are fairly equal percentages of liver transplants in the local, regional, and national share types during the post-policy era.

As in previous figures and tables, there was a decrease in liver transplants occurring within 150 NM of the donor hospital. There has been a subsequent increase in the liver transplants occurring over 150 NM but within 500 NM of the donor hospital, corresponding to the >150-250 NM and >250-500 NM classifications.

Table 29. Number and Percent of Deceased Donor Liver Transplants by Donor Share Type and Era

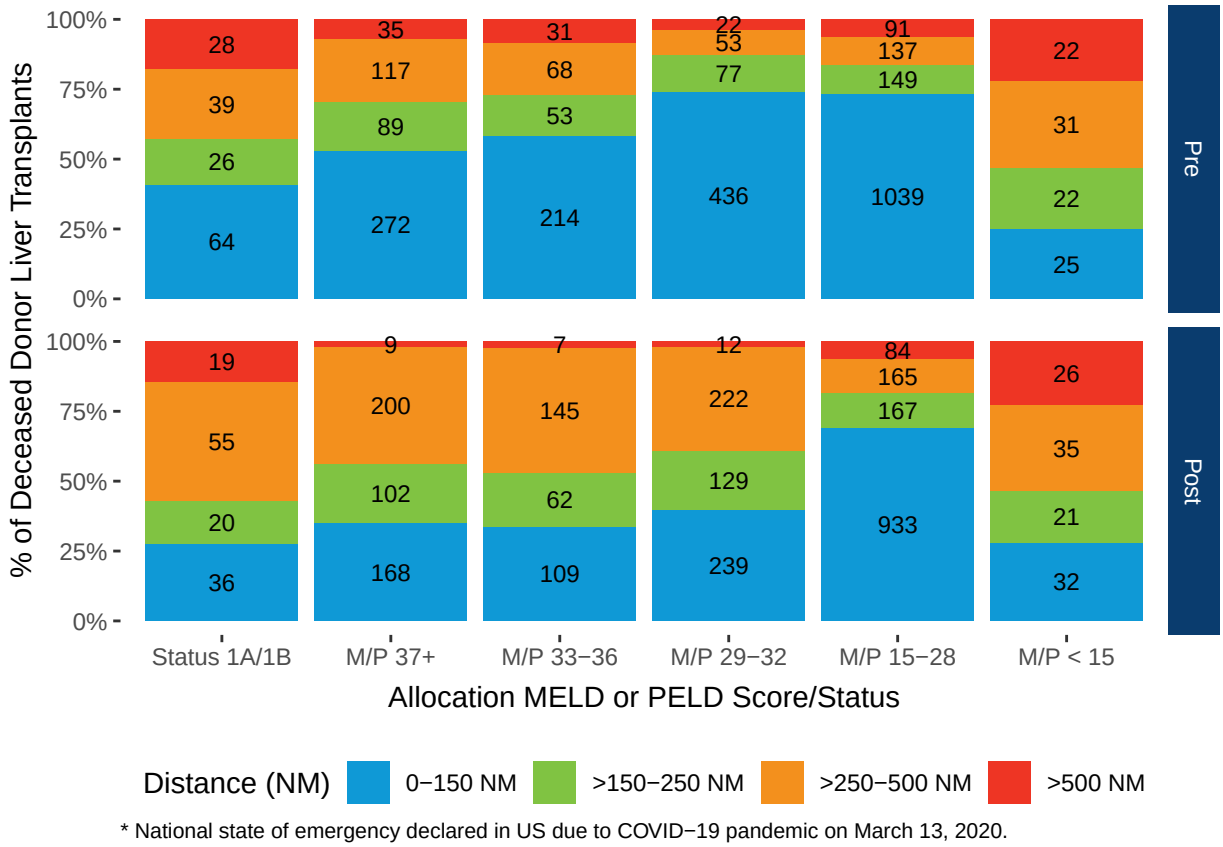
	Policy Era		
Share Type	Pre	Post	Difference (Post-Pre)
Local	1958 (62.4%)	1034 (34.5%)	-924
Regional	954 (30.4%)	996 (33.2%)	42
National	228 (7.3%)	967 (32.3%)	739
Total	3140 (100.0%)	2997 (100.0%)	-143

Table 30. Number and Percent of Deceased Donor Liver Transplants by Classification Distance and Era

	Policy Era		
Classification	Pre	Post	Difference (Post-Pre)
0-150 NM	2050 (65.3%)	1517 (50.6%)	-533
>150-250 NM	416 (13.2%)	501 (16.7%)	85
>250-500 NM	445 (14.2%)	822 (27.4%)	377
>500 NM	229 (7.3%)	157 (5.2%)	-72
Total	3140 (100.0%)	2997 (100.0%)	-143

There is a substantial change in the distribution of distance between donor hospital and transplant program pre- to post-policy by score group. Notably in the post-policy era, the higher allocation score groups have larger proportions of livers coming from further away, while the distribution of distance for MELD and PELD scores 15-28 and $<$ 15 remained similar to pre-policy.

Figure 34. Deceased Donor Liver Transplants by MELD or PELD Score or Status, Classification Distance, and Era



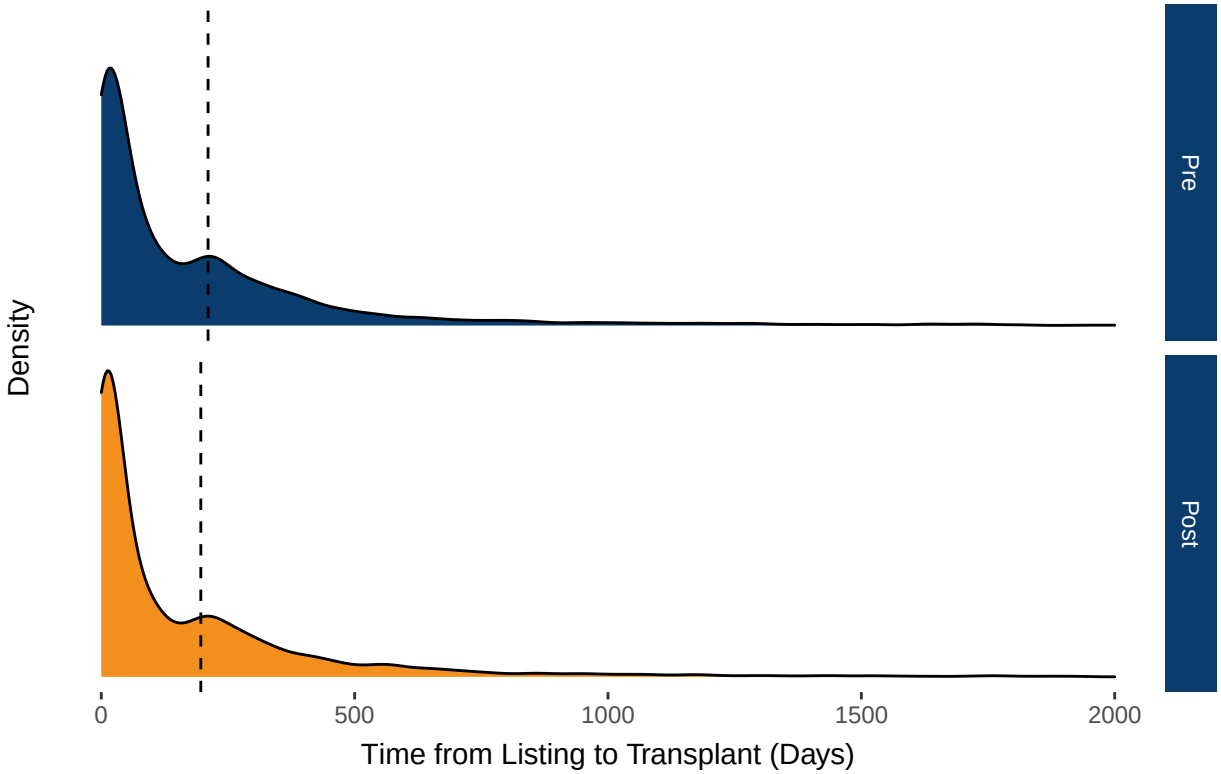
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 31. Number and Percent of Deceased Donor Liver Transplants by MELD or PELD Score/Status Group, Classification Distance, and Era

Score or Status Group	Classification Distance	Policy Era	
		Pre	Post
Status 1A/1B	0-150 NM	64 (40.8%)	36 (27.7%)
	>150-250 NM	26 (16.6%)	20 (15.4%)
	>250-500 NM	39 (24.8%)	55 (42.3%)
	>500 NM	28 (17.8%)	19 (14.6%)
M/P 37+	0-150 NM	272 (53.0%)	168 (35.1%)
	>150-250 NM	89 (17.3%)	102 (21.3%)
	>250-500 NM	117 (22.8%)	200 (41.8%)
	>500 NM	35 (6.8%)	9 (1.9%)
M/P 33-36	0-150 NM	214 (58.5%)	109 (33.7%)
	>150-250 NM	53 (14.5%)	62 (19.2%)
	>250-500 NM	68 (18.6%)	145 (44.9%)
	>500 NM	31 (8.5%)	7 (2.2%)
M/P 29-32	0-150 NM	436 (74.1%)	239 (39.7%)
	>150-250 NM	77 (13.1%)	129 (21.4%)
	>250-500 NM	53 (9.0%)	222 (36.9%)
	>500 NM	22 (3.7%)	12 (2.0%)
M/P 15-28	0-150 NM	1039 (73.4%)	933 (69.2%)
	>150-250 NM	149 (10.5%)	167 (12.4%)
	>250-500 NM	137 (9.7%)	165 (12.2%)
	>500 NM	91 (6.4%)	84 (6.2%)
M/P < 15	0-150 NM	25 (25.0%)	32 (28.1%)
	>150-250 NM	22 (22.0%)	21 (18.4%)
	>250-500 NM	31 (31.0%)	35 (30.7%)
	>500 NM	22 (22.0%)	26 (22.8%)

The average days waiting from listing to deceased donor liver transplant decreased from 210.7 days to 196.4 days pre- to post-policy. This change was not statistically significant (t=-1.42, p=0.156). Changes in time from listing to transplant post-policy must be considered in light of the COVID emergency declaration.

Figure 35. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant by Era

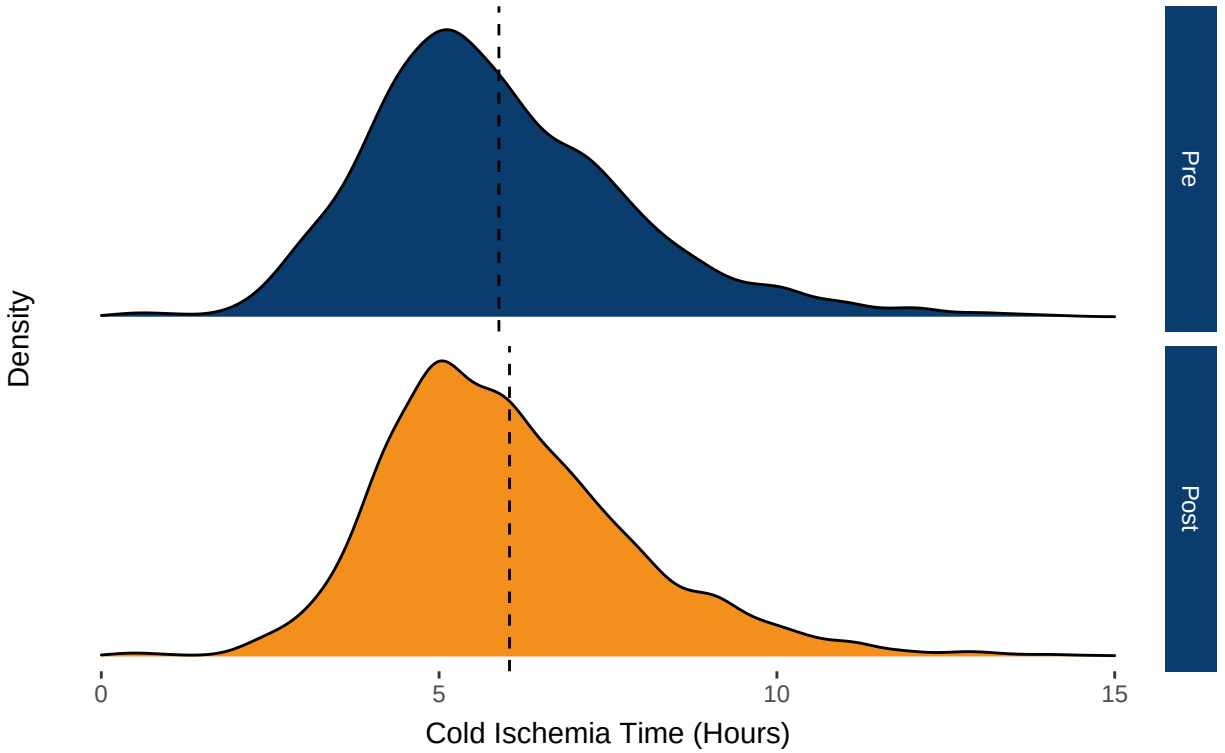


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate average time waiting within each era.
*** There were 28 pre−policy and 29 post−policy transplant recipients with > 2000 days that are not included.

Table 32. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant by Era

	Time (hours)							
Policy Era	Minimum	10th Percentile	25th Percentile	Median	Mean	75th Percentile	90th Percentile	Maximum
Pre	0	4	13	80	210.70	260	492.1	5104
Post	0	3	7	55	196.41	238	479.2	6987

Figure 36. Distribution of Cold Ischemia Time by Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate average cold ischemia time within each era.
*** There were 15 pre−policy and 115 post−policy transplant recipients with missing cold ischemia time that are not included.
^ There were 5 pre−policy and 4 post−poicy transplant recipients with cold ischemia time > 15 hours not included.

The average cold ischemia time increased from 5.89 hours pre- to 6.04 hours post-policy. Changes in cold ischemia time post-policy must take into consideration the missingness of this measurement for a larger number of transplants at this time as well as the COVID emergency declaration.

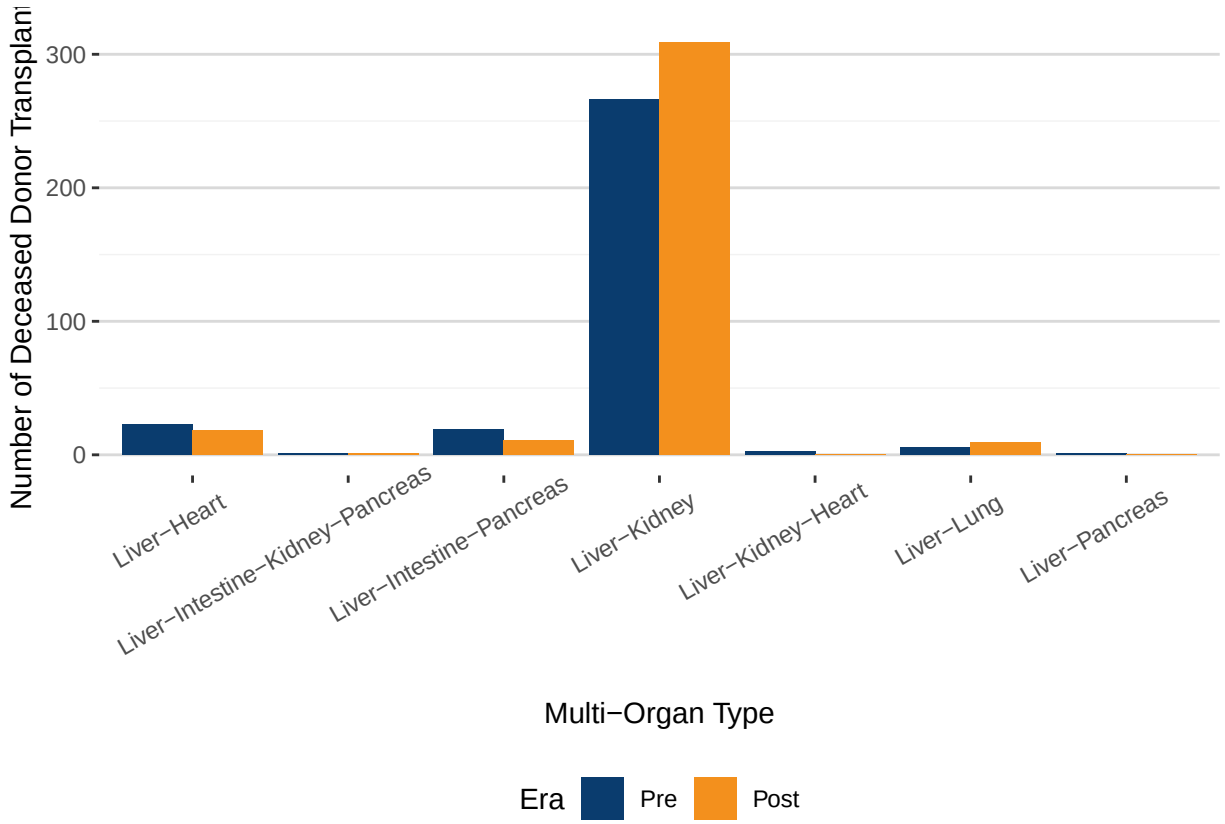
Table 33. Distribution of Cold Ischemia Time and Era

		Time (hours)							
Policy Era	N	Minimum	10th Percentile	25th Percentile	Median	Mean	75th Percentile	90th Percentile	Maximum
Pre	3125	0.28	3.7	4.52	5.57	5.89	7	8.37	34.67
Post	2882	0.07	4.0	4.75	5.77	6.04	7	8.50	43.00

Liver Multi-Organ Transplants

While liver-alone transplants make up the vast majority of deceased liver donor recipients, about 10% are recipients of liver multi-organ transplants. The largest liver-multi-organ category is liver-kidney transplants, which saw an increase in volume and percentage of liver transplants pre- to post-policy. Any other combinations accounted for less than 1% of liver transplants, respectively, during both policy eras.

Figure 37. Deceased Donor Liver Transplants by Multi-Organ Type and Era

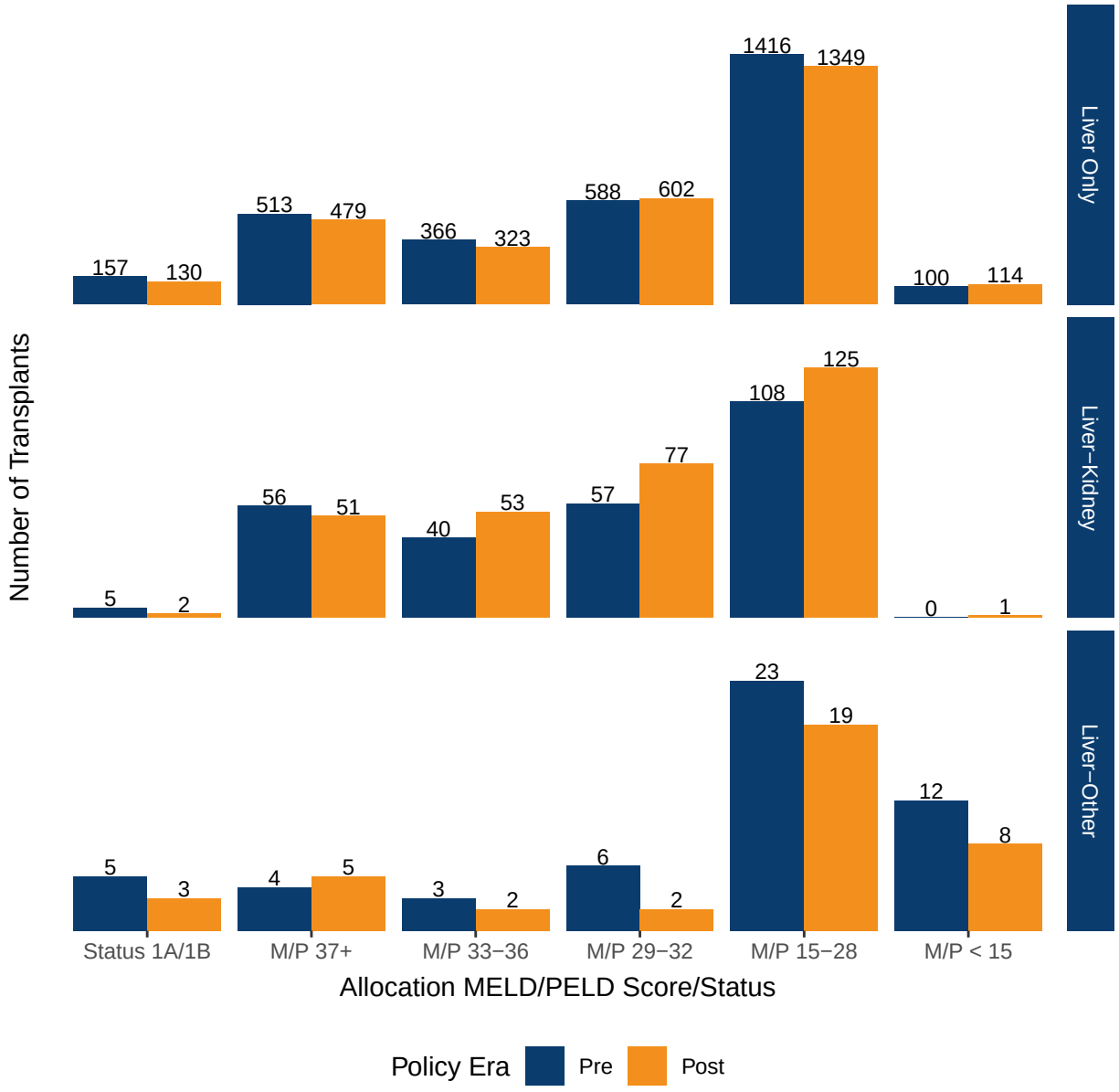


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 34. Number and Percent of Deceased Donor Liver Transplants by Multi-Organ Type and Era

	Policy Era		
Multi-Organ Type	Pre	Post	Difference (Post - Pre)
Liver Only	3140 (90.8%)	2997 (89.6%)	-143
Liver-Heart	23 (0.7%)	18 (0.5%)	-5
Liver-Intestine-Kidney-Pancreas	1 (0.0%)	1 (0.0%)	0
Liver-Intestine-Pancreas	19 (0.5%)	11 (0.3%)	-8
Liver-Kidney	266 (7.7%)	309 (9.2%)	43
Liver-Kidney-Heart	3 (0.1%)	0 (0.0%)	-3
Liver-Lung	6 (0.2%)	9 (0.3%)	3
Liver-Pancreas	1 (0.0%)	0 (0.0%)	-1
Total	3459 (100.0%)	3345 (100.0%)	-114

Figure 39. Deceased Donor Liver Transplants by Multi-Organ Type, MELD or PELD Score or Status, and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Similar volumes by allocation MELD or PELD score or status occurred pre- to post-policy for all multi-organ types. Changes in allocation score distributions should be interpreted with caution in light of the COVID emergency declaration.

Table 35. Number and Percent of Deceased Donor Liver Transplants by Multi-Organ Type, Classification Distance, and Era

Multi-Organ Type	Classification Distance	Policy Era	
		Pre	Post
Liver Only	0-150 NM	2050 (65.3%)	1517 (50.6%)
	>150-250 NM	416 (13.2%)	501 (16.7%)
	>250-500 NM	445 (14.2%)	822 (27.4%)
	>500 NM	229 (7.3%)	157 (5.2%)
Liver-Kidney	0-150 NM	168 (63.2%)	168 (54.4%)
	>150-250 NM	36 (13.5%)	52 (16.8%)
	>250-500 NM	49 (18.4%)	80 (25.9%)
	>500 NM	13 (4.9%)	9 (2.9%)
Liver-Other	0-150 NM	22 (41.5%)	18 (46.2%)
	>150-250 NM	7 (13.2%)	7 (17.9%)
	>250-500 NM	14 (26.4%)	7 (17.9%)
	>500 NM	10 (18.9%)	7 (17.9%)

Changes in distribution of distance from donor hospital to transplant program were similar for liver-kidney transplant recipients to those for liver-alone transplant recipients. The distribution of distance was relatively stable for other liver multi-organ transplant recipients, though this may be more variable over time due to the small sample size. Changes in distributions should be interpreted with caution in light of the COVID emergency declaration.

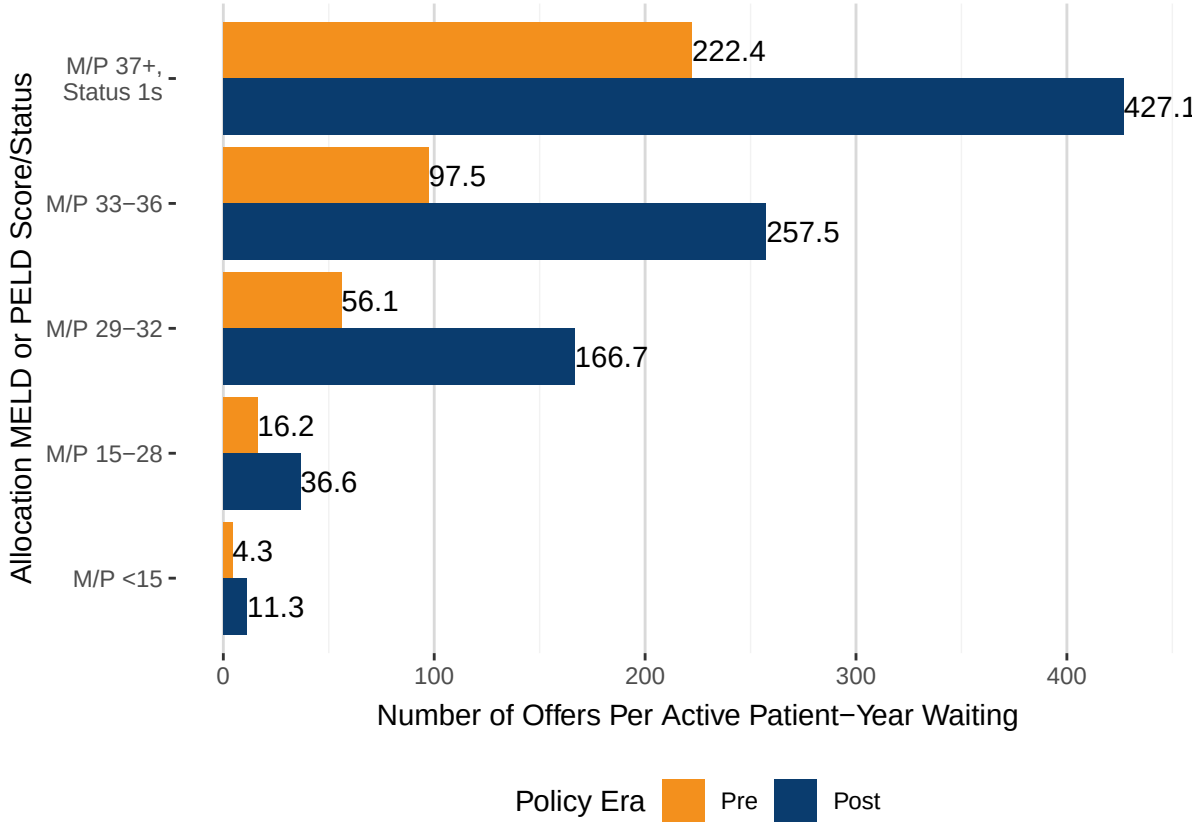
For all multi-organ groups, a more even split in the percentage of transplants shared locally, regionally, and nationally occurred post-policy.

Table 41. Number and Percent of Deceased Donor Liver Transplants by Multi-Organ Type, Share Type, and Era

Multi-Organ Type	Share Type	Policy Era	
		Pre	Post
Liver Only	Local	1958 (62.4%)	1034 (34.5%)
	Regional	954 (30.4%)	996 (33.2%)
	National	228 (7.3%)	967 (32.3%)
Liver-Kidney	Local	171 (64.3%)	106 (34.3%)
	Regional	77 (28.9%)	107 (34.6%)
	National	18 (6.8%)	96 (31.1%)
Liver-Other	Local	18 (34.0%)	11 (28.2%)
	Regional	11 (20.8%)	14 (35.9%)
	National	24 (45.3%)	14 (35.9%)

Section III. Offer and Acceptance Rates

Figure 41. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status and Era



Patient years takes into account both the number of people at a given score/status as well at the amount of time each person spends at the given score/status. For example, if candidate Z spent 9 months at a MELD of 25 and 3 months at a MELD of 31, they would contribute 0.75 person-years to the MELD/PELD 15-28 group, and 0.25 person-years to the MELD/PELD 29-32 group. Summing this for all candidates on the waiting list contributing time during the era makes up the denominator of the offers per active patient-year waiting metric. Active patient-years are used since candidates are not able to receive offers when inactive.

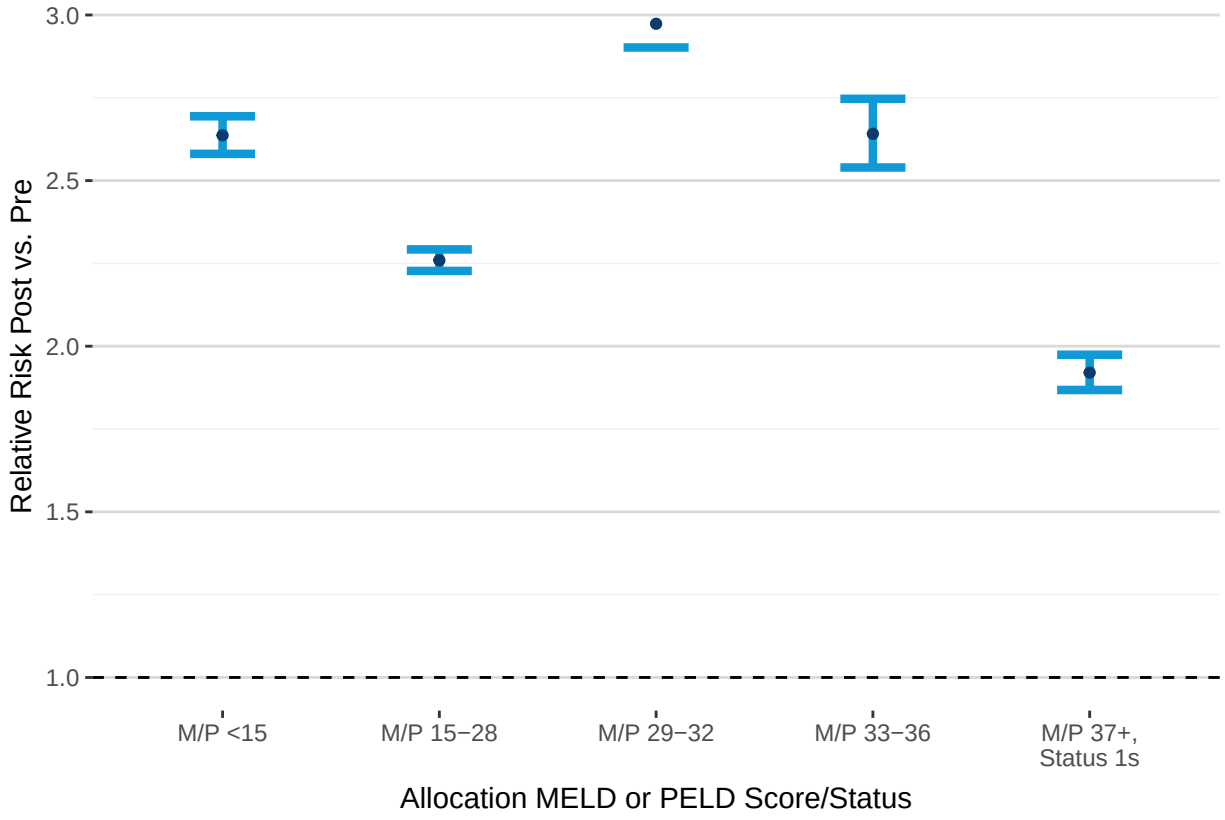
The numerator sums the number of offers received by candidates within the particular score/status. So, if the same candidate Z received one offer at their MELD 25, and 7 offers at MELD 31, these would be added to the numerator for the respective score groups.

Table 37. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status and Era

Score Group	Policy Era	Patients Ever Waiting	Offers	Person-Years	Offers per Active PY	95% CI
M/P <15	Pre	10010	11604	2696.36	4.30	(4.23, 4.38)
	Post	9365	29263	2578.72	11.35	(11.22, 11.48)
M/P 15-28	Pre	8334	27042	1671.28	16.18	(15.99, 16.37)
	Post	7814	59552	1628.85	36.56	(36.27, 36.86)
M/P 29-32	Pre	2421	12581	224.37	56.07	(55.1, 57.06)
	Post	1557	13268	79.58	166.74	(163.91, 169.6)
M/P 33-36	Pre	1103	4667	47.87	97.49	(94.71, 100.32)
	Post	820	5350	20.78	257.48	(250.63, 264.48)
M/P 37+, Status 1s	Pre	1212	8844	39.77	222.38	(217.77, 227.06)
M/P 37+,	Post	1073	11576	27.11	427.05	(419.31, 434.9)

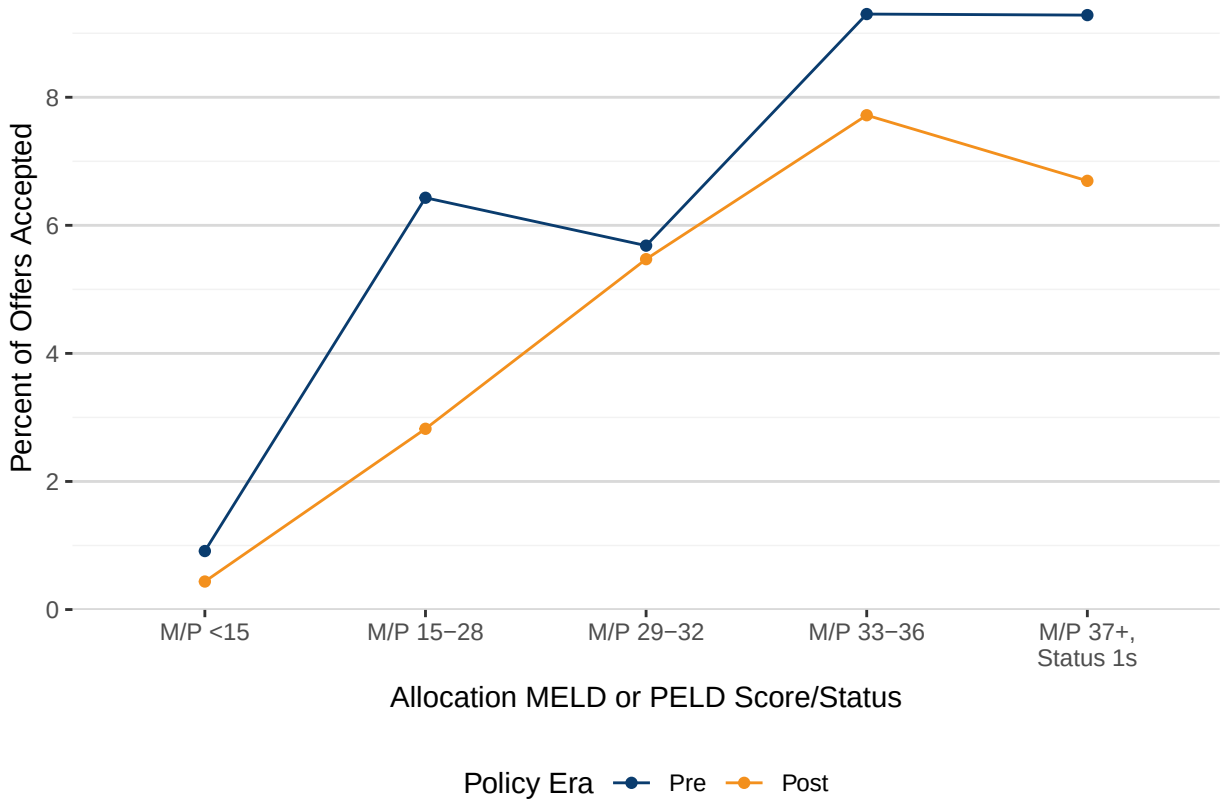
For all allocation MELD/PELD scores/statuses, there was an increase in the rate of offers per active patient-year waiting in the post-policy era. This was equivalent to a 1.87-fold increase from pre- to post-policy for MELD/PELD 37+ and Status 1s, on the low end and a 2.75-fold increase for MELD/PELD 29-32 on the high end.

Figure 42. Relative Risk Comparing Post- to Pre-Policy Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status



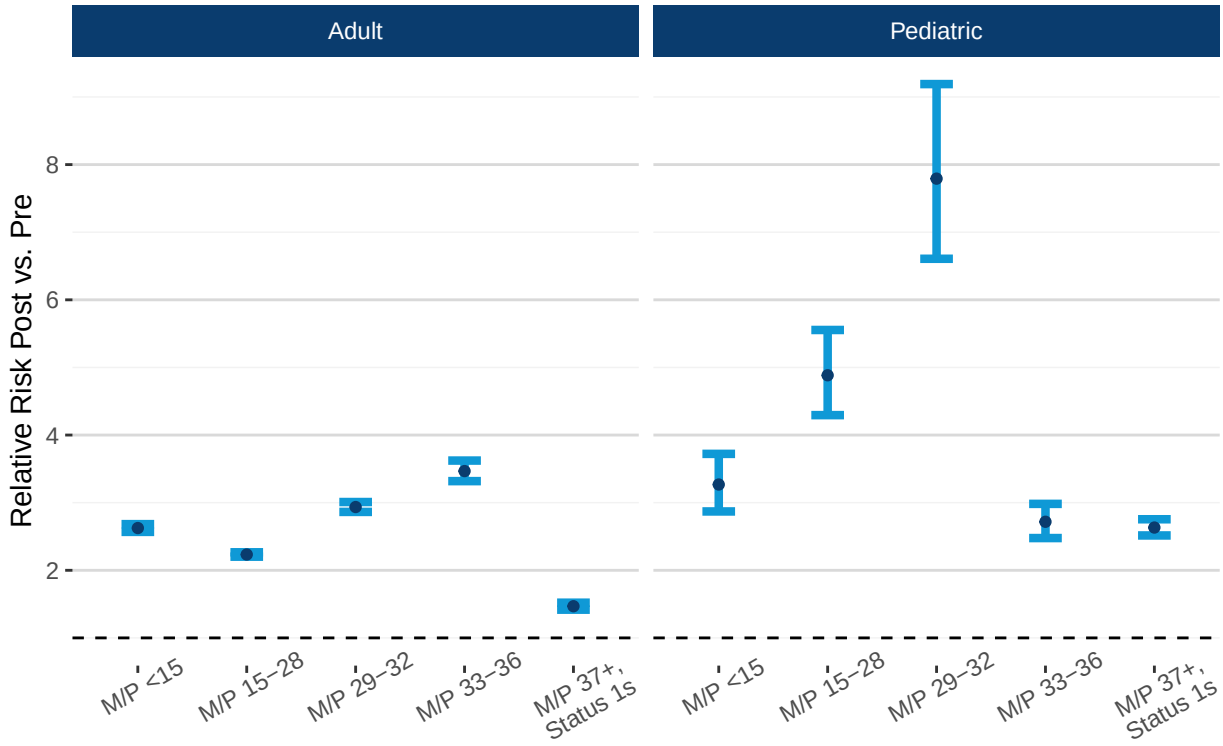
Finally, changes in the percent of offers accepted reflect that for most score groups, the number of offers accepted was remained similar even though the overall number of offers has increased. This is indicated by the lower percentage in the post-policy era. Only The MELD/PELD 29-32 score group indicates that with additional offers per patient-year waiting, there has been an increase in offers accepted. This may indicate that the offers received for this group of candidates are better quality, hence the increase in acceptances along with increase in offer rates.

Figure 43. Percent of Offers Accepted by Allocation MELD or PELD Score or Status and Era



For all allocation MELD/PELD scores/statuses for both adult (18+ years) and pediatric (< 18 years) candidates, there was an increase in the rate of offers per active patient-year waiting in the post-policy era. These increases were more pronounced for pediatric candidates. The most marked increase was for pediatric candidates with MELD/PELD scores 29-32, with an 8.16-fold increase in the risk of offers per patient-year waiting pre- to post-policy. The relatively small increase by 39% in the risk of offers per patient-year waiting pre- to post-policy for adult candidates with MELD/PELD 37+ or Status 1s could be due to these candidates already receiving a high priority and thus larger quantity of offers under the prior allocation policy.

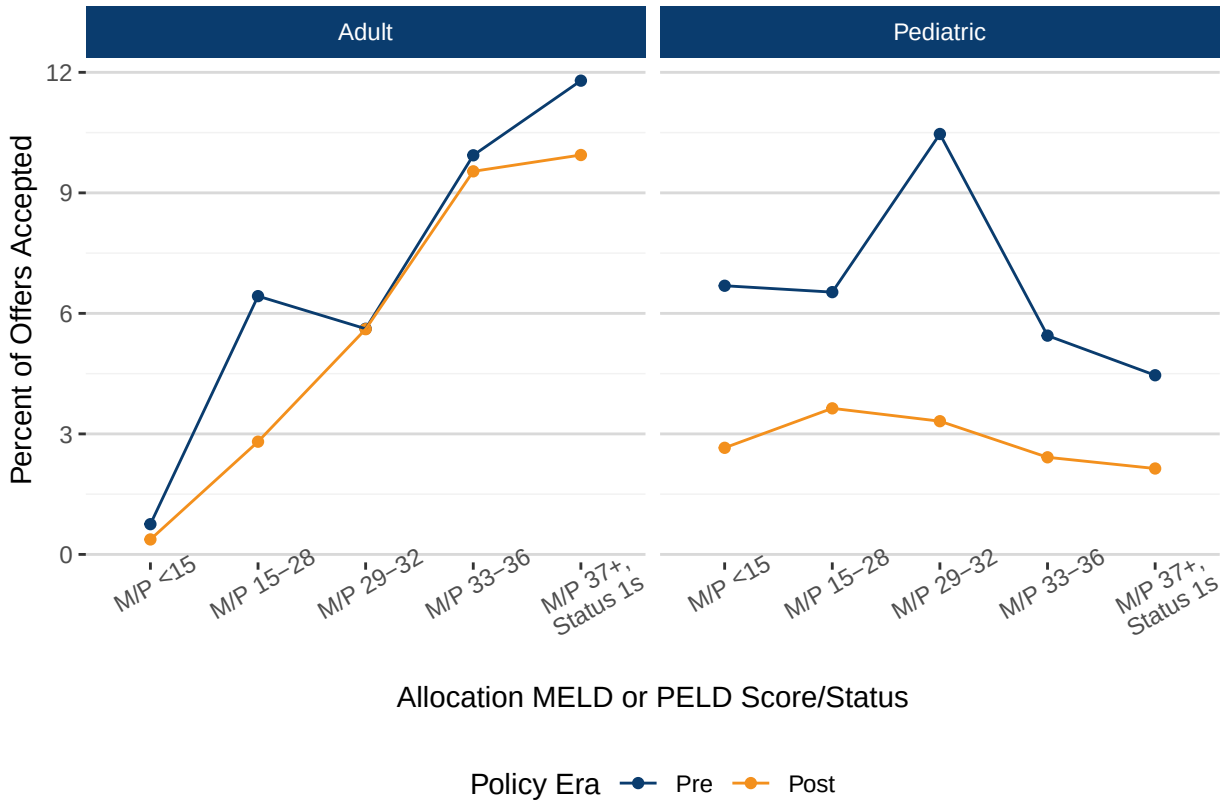
Figure 44. Relative Risk Comparing Post- to Pre-Policy Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status and Age at Listing



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Acceptance rate patterns for adult (18+ years) candidates mirror the overall patterns seen above. Acceptance rates for pediatric (< 18 years) candidates are lower in the post-policy era for all allocation score groups, which is likely due to the increases in overall number of offers with a similar number of offers accepted.

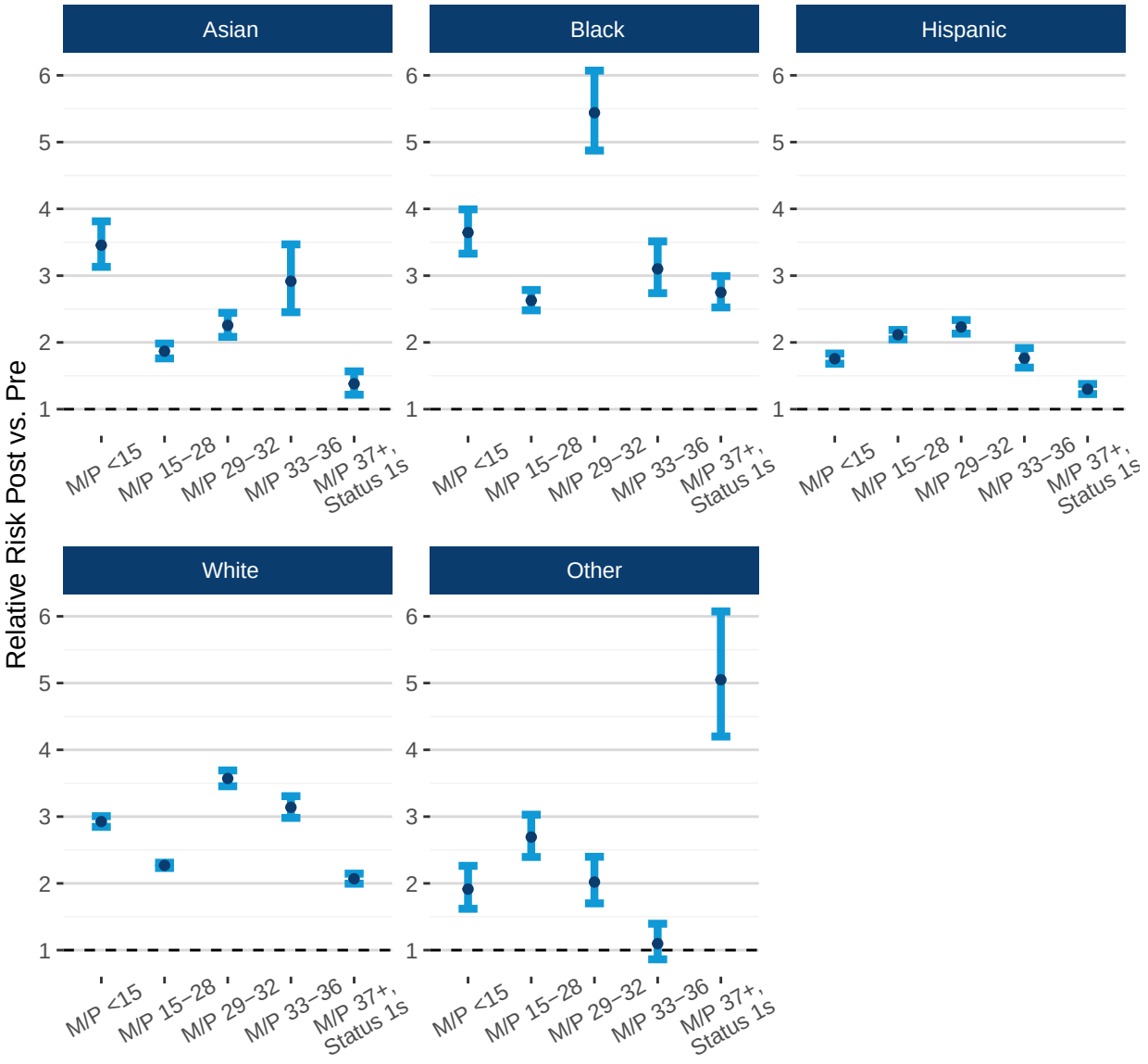
Figure 45. Percent of Offers Accepted by Allocation MELD or PELD Score or Status, Age at Listing, and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Across allocation score groups, all race/ethnicities experienced increases in offers per patient-year waiting pre- to post-policy era. The anomaly to this was for Other race/ethnicity, with MELD/PELD scores 33-36; no significant change occurred in offer rates.

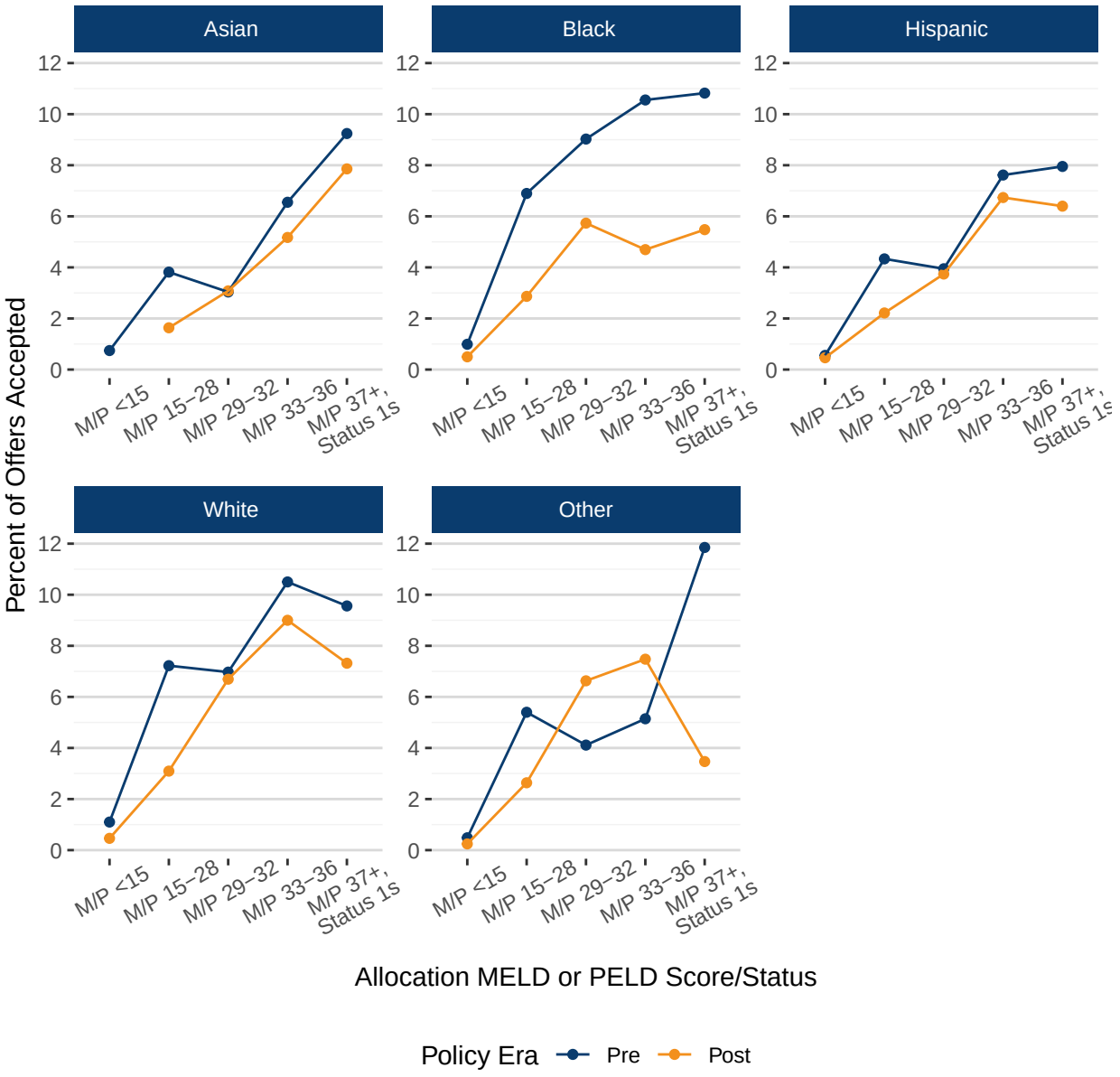
Figure 48. Relative Risk Post- Versus Pre-Policy of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status and Race/Ethnicity



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Notably, Asian, White and Other race/ethnicity candidates with MELD/PELD scores 29-32 had higher acceptance rates post policy, even with higher offer rates. Other race/ethnicity with MELD/PELD scores 33-36 also had a higher percentage of offers accepted, while those with MELD/PELD scores 37+ or Status 1s had much lower percentages of offers accepted post-policy.

Figure 49. Percent of Offers Accepted by Allocation MELD or PELD Score or Status, Race/Ethnicity, and Era

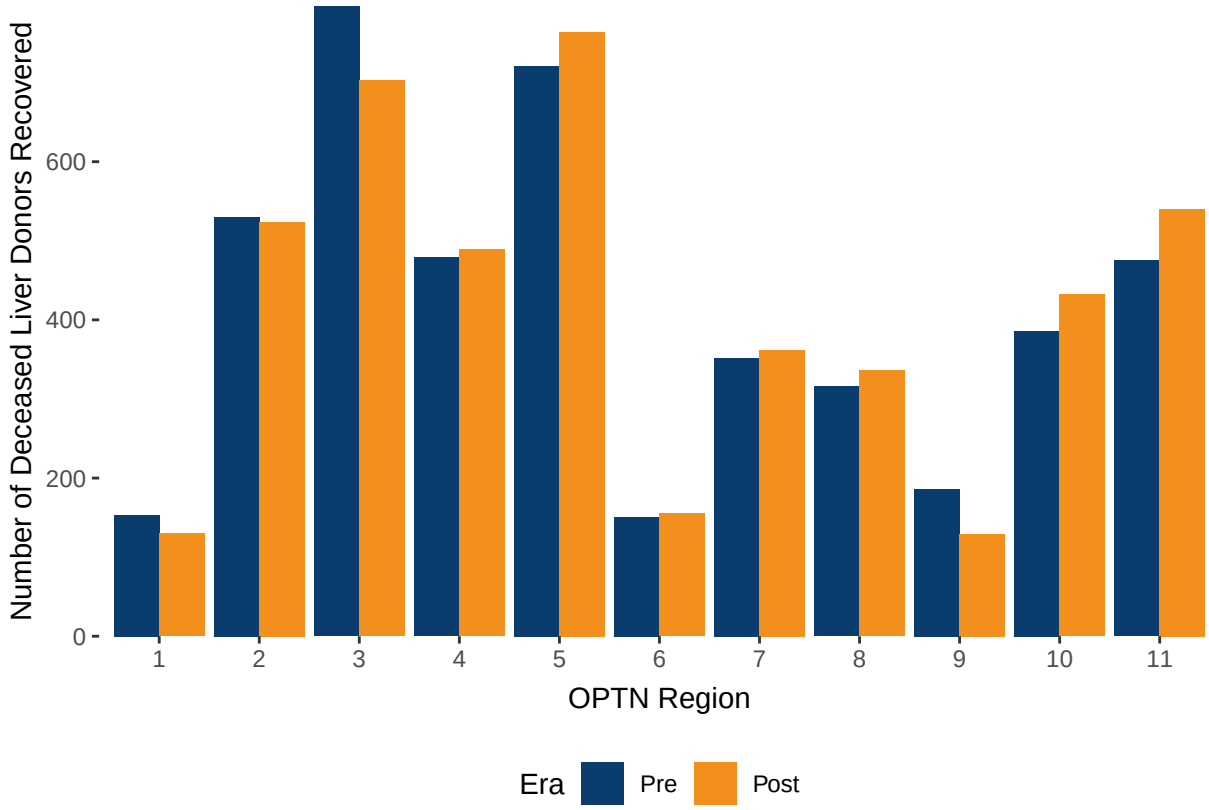


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Section IV. Liver Utilization

Overall, there was an increase in deceased liver donors recovered in the nation post-policy. However, this was variable across the country. OPTN Regions 1, 2, 3, and 9 experienced various magnitudes of decreases in liver donors recovered. Changes in deceased liver donors recovered post-policy must be considered in light of the COVID emergency declaration.

Figure 53. Deceased Liver Donors Recovered by OPTN Region and Era



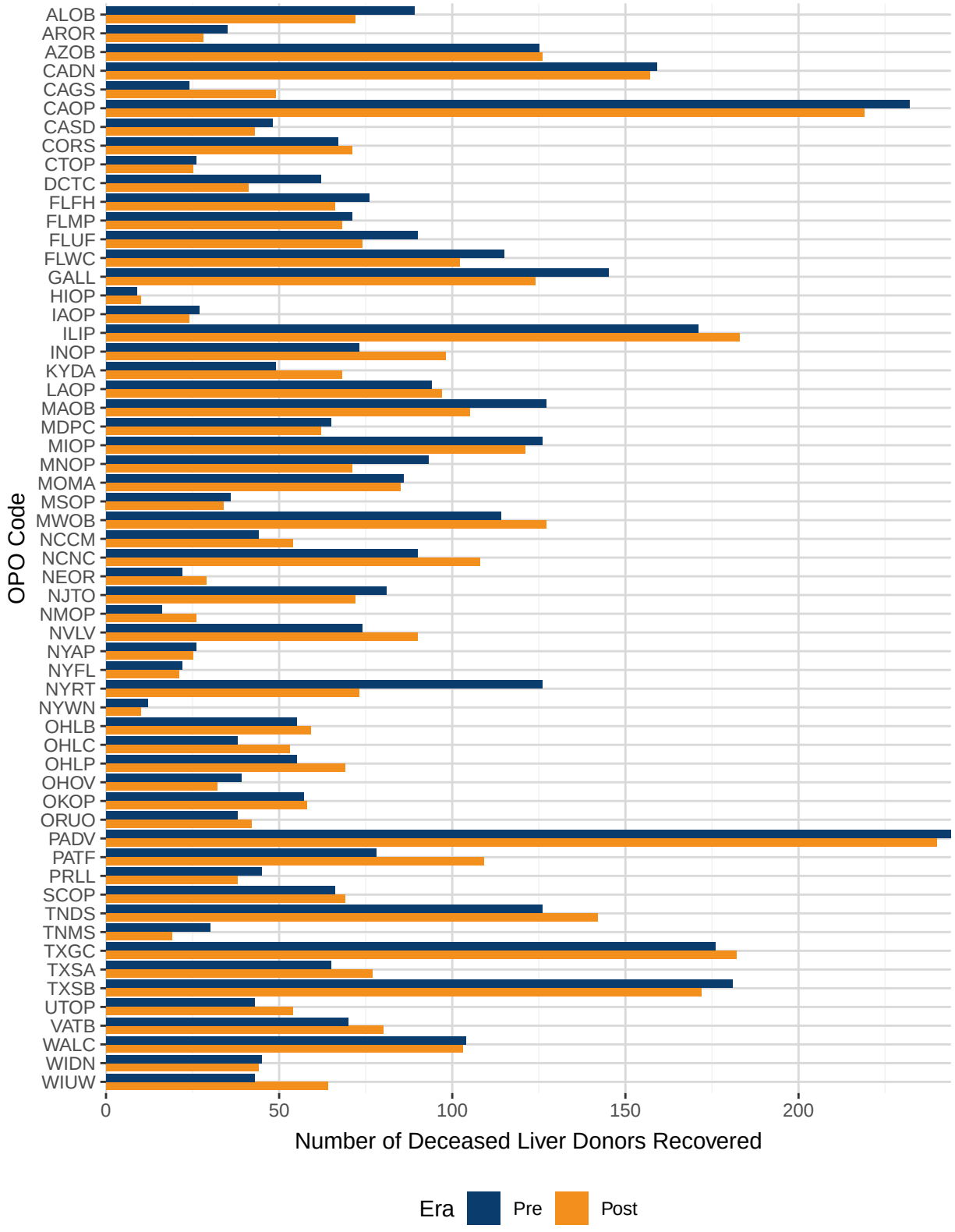
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 41. Number of Deceased Liver Donors Recovered by OPTN Region and Era

	Policy Era		
OPTN Region	Pre	Post	Difference (Post-Pre)
1	153	130	-23
2	530	524	-6
3	796	703	-93
4	479	489	10
5	721	764	43
6	151	155	4
7	352	362	10
8	316	336	20
9	186	129	-57
10	386	432	46
11	475	540	65
Total	4545	4564	19

Results are also provided by OPO in the following figure and table, highlighting similar trends in that donors recovered was variable across the country and were most likely due to the differential impact of the COVID emergency.

Figure 54. Deceased Liver Donors Recovered by OPO and Era

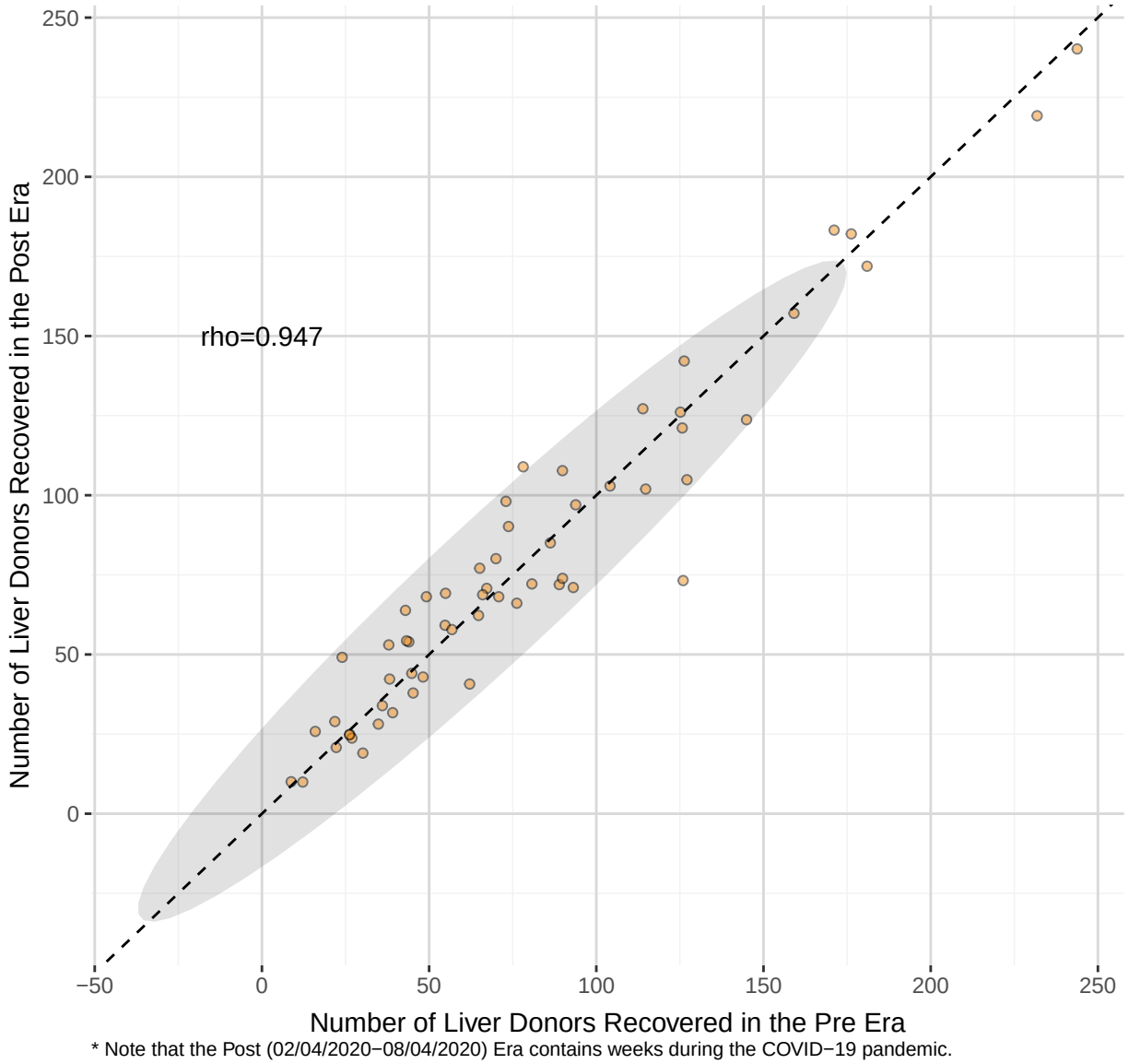


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 41. Number of Deceased Liver Donors Recovered by OPO and Era

	Policy Era				Policy Era		
OPO Code	Pre	Post	Difference (Post-Pre)	OPO Code	Pre	Post	Difference (Post-Pre)
ALOB	89	72	-17	NCNC	90	108	18
AROR	35	28	-7	NEOR	22	29	7
AZOB	125	126	1	NJTO	81	72	-9
CADN	159	157	-2	NMOP	16	26	10
CAGS	24	49	25	NVLV	74	90	16
CAOP	232	219	-13	NYAP	26	25	-1
CASD	48	43	-5	NYFL	22	21	-1
CORS	67	71	4	NYRT	126	73	-53
CTOP	26	25	-1	NYWN	12	10	-2
DCTC	62	41	-21	OHLB	55	59	4
FLFH	76	66	-10	OHLC	38	53	15
FLMP	71	68	-3	OHLP	55	69	14
FLUF	90	74	-16	OHOV	39	32	-7
FLWC	115	102	-13	OKOP	57	58	1
GALL	145	124	-21	ORUO	38	42	4
HIOP	9	10	1	PADV	244	240	-4
IAOP	27	24	-3	PATF	78	109	31
ILIP	171	183	12	PRLL	45	38	-7
INOP	73	98	25	SCOP	66	69	3
KYDA	49	68	19	TNDS	126	142	16
LAOP	94	97	3	TNMS	30	19	-11
MAOB	127	105	-22	TXGC	176	182	6
MDPC	65	62	-3	TXSA	65	77	12
MIOP	126	121	-5	TXSB	181	172	-9
MNOP	93	71	-22	UTOP	43	54	11
MOMA	86	85	-1	VATB	70	80	10
MSOP	36	34	-2	WALC	104	103	-1
MWOB	114	127	13	WIDN	45	44	-1
NCCM	44	54	10	WIUW	43	64	21
				Total	4545	4564	19

Figure 55. Scatter Plot of OPO Volume by Era



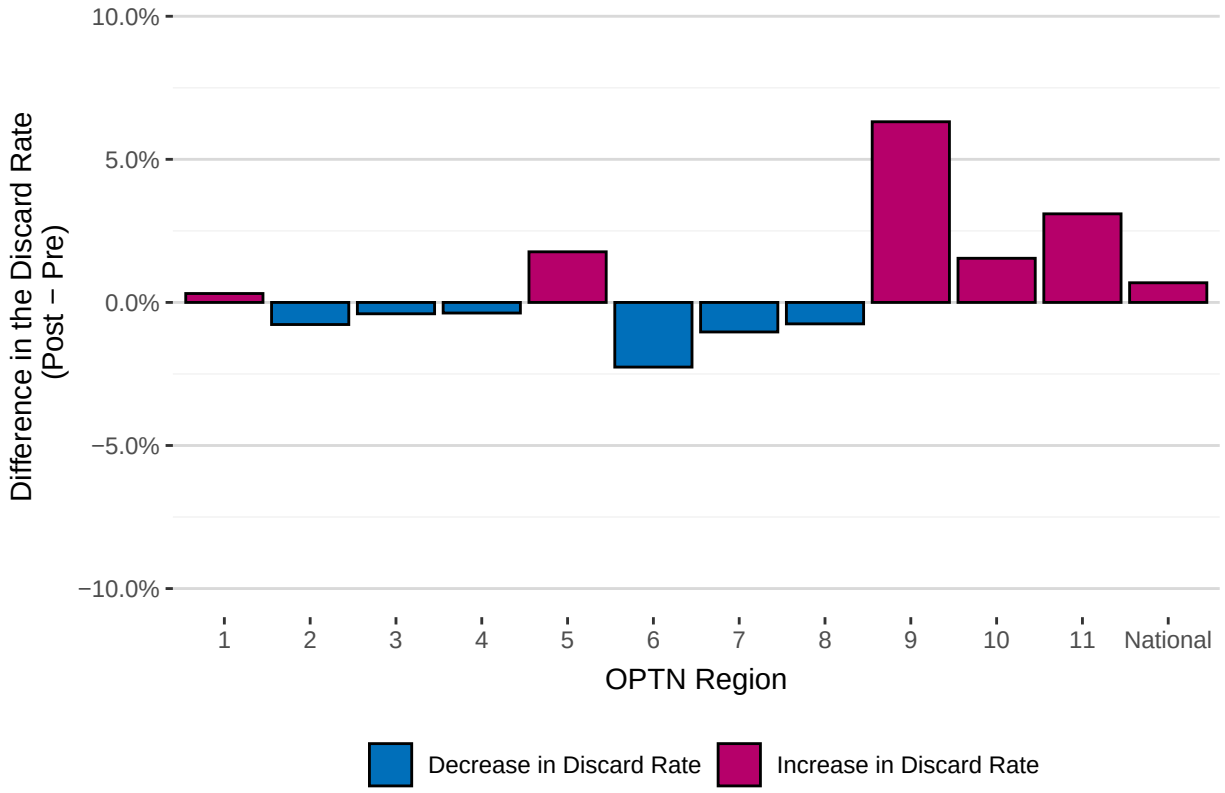
* Note that the Post (02/04/2020−08/04/2020) Era contains weeks during the COVID−19 pandemic.

Any points along the diagonal dashed line indicate no changes in the absolute number of deceased liver donors recovered by an Organ Procurement Organization (OPO), pre- to post-policy. Points that fall above the diagonal represent OPOs that recovered more deceased liver donors post-policy compared to pre-policy. Points that fall below the diagonal represent OPOs that recovered fewer liver donors post-policy compared to pre-policy.

The gray shaded region represents a 95% confidence ellipse, assuming a multivariate t-distribution, around the data points. While this is not a true statistical test of a hypothesis that there was a significant change in the number of liver donors recovered, it provides some context as to how often and where OPOs that may fall outside of the rest of the group may be.

The vast majority of OPOs recovered similar number of livers Pre (02/05/2019-08/06/2019) and Post (02/04/2020-08/04/2020) policy, overall. A Spearman's rank correlation (rho) is provided to measure the strength and direction of the monotonic, not necessarily linear, relationship between the number of deceased liver donors recovered by OPO pre- and post-policy. There is a strong positive, monotonic relationship between these two measures.

Figure 56. Liver Discard Rate by OPTN Region



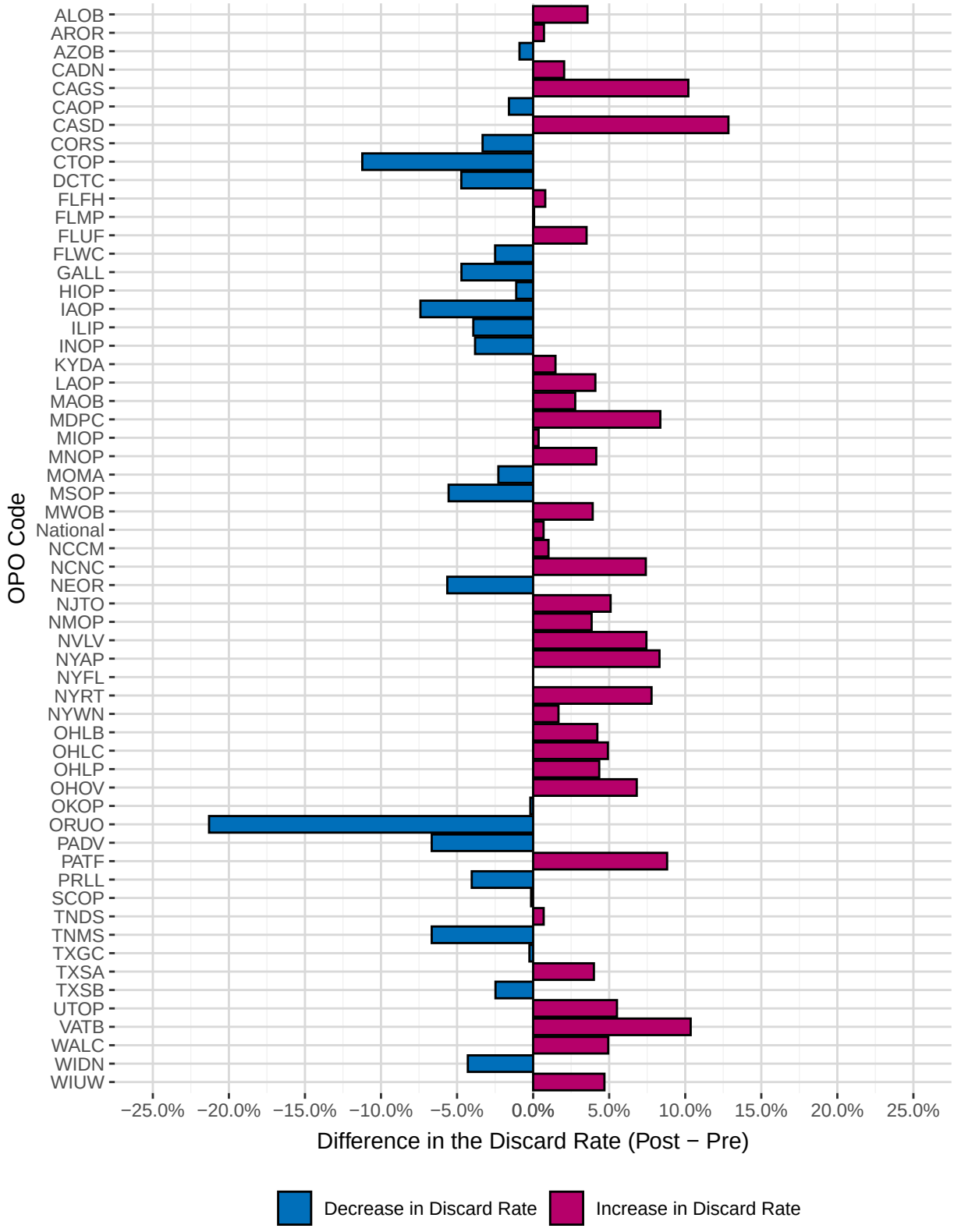
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 41. Liver Discard Rate by OPTN Region and Era

	Pre Policy Era			Post Policy Era			
OPTN Region	N Recovered	N Not Transplanted	Discard Rate	N Recovered	N Not Transpanted	Discard Rate	Discard Rate Difference (Post - Pre)
1	153	16	10.46	130	14	10.77	0.31
2	530	84	15.85	524	79	15.08	-0.77
3	796	36	4.52	703	29	4.13	-0.39
4	479	39	8.14	489	38	7.77	-0.37
5	721	92	12.76	764	111	14.53	1.77
6	151	19	12.58	155	16	10.32	-2.26
7	352	26	7.39	362	23	6.35	-1.04
8	316	24	7.59	336	23	6.85	-0.74
9	186	7	3.76	129	13	10.08	6.32
10	386	28	7.25	432	38	8.80	1.55
11	475	24	5.05	540	44	8.15	3.10
National	4545	395	8.69	4564	428	9.38	0.69

Discard rate is defined as the number of livers transplanted over the number of deceased liver donors recovered, multiplied by 100 to get a percentage. Nationally the liver discard rate increased slightly. Changes in discard rates by OPTN region differ. These changes must be considered in light of the COVID emergency declaration.

Figure 57. Liver Discard Rate by DSA



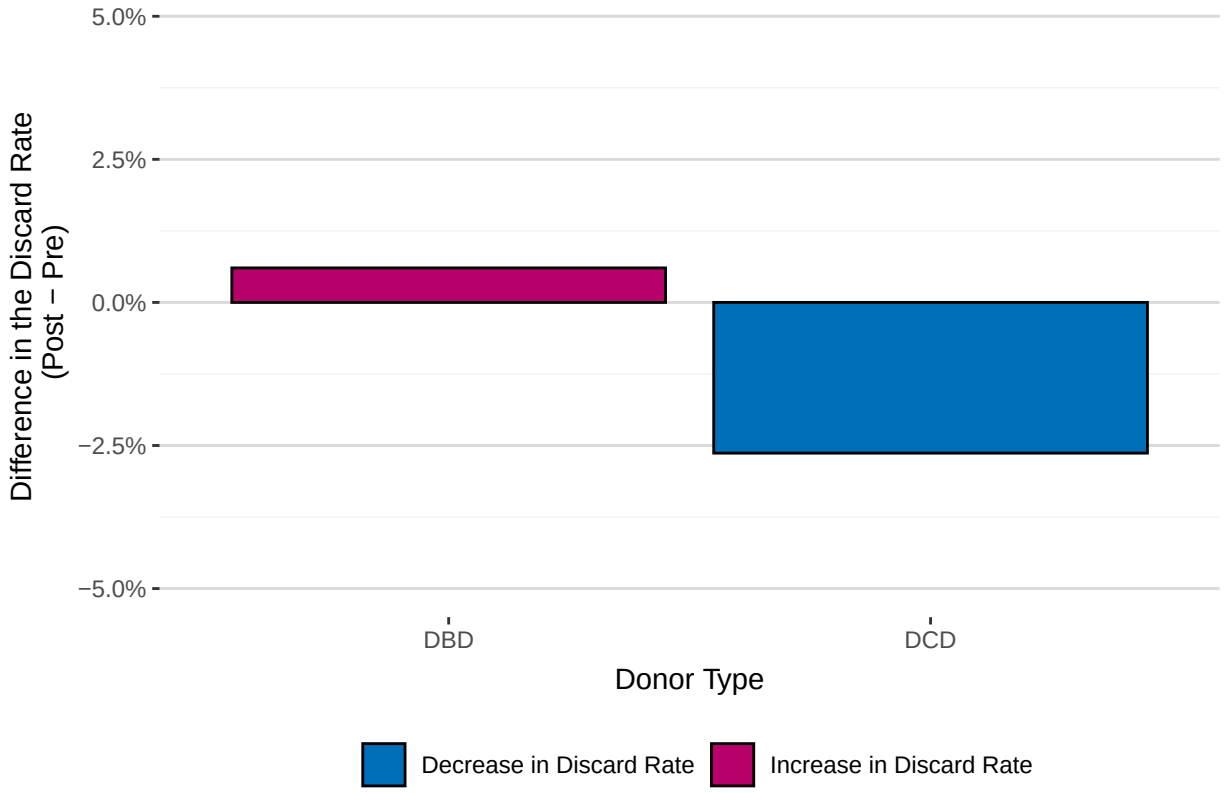
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 42. Liver Discard Rate by DSA and Era

	Policy Era				Policy Era		
OPO Code	Pre	Post	Difference (Post-Pre)	OPO Code	Pre	Post	Difference (Post-Pre)
ALOB	3.37	6.94	3.57	NCNC	5.56	12.96	7.40
AROR	2.86	3.57	0.71	NEOR	9.09	3.45	-5.64
AZOB	12.8	11.9	-0.9	NJTO	7.41	12.50	5.09
CADN	10.06	12.1	2.04	NMOP	0.00	3.85	3.85
CAGS	0	10.2	10.2	NVLV	8.11	15.56	7.45
CAOP	19.4	17.81	-1.59	NYAP	7.69	16.00	8.31
CASD	10.42	23.26	12.84	NYFL	0.00	0.00	0.00
CORS	8.96	5.63	-3.33	NYRT	3.17	10.96	7.79
CTOP	19.23	8	-11.23	NYWN	8.33	10.00	1.67
DCTC	19.35	14.63	-4.72	OHLB	12.73	16.95	4.22
FLFH	5.26	6.06	0.8	OHLC	2.63	7.55	4.92
FLMP	1.41	1.47	0.06	OHLP	0.00	4.35	4.35
FLUF	10	13.51	3.51	OHOV	2.56	9.38	6.82
FLWC	3.48	0.98	-2.5	OKOP	10.53	10.34	-0.19
GALL	5.52	0.81	-4.71	ORUO	23.68	2.38	-21.30
HIOP	11.11	10	-1.11	PADV	25.00	18.33	-6.67
IAOP	7.41	0	-7.41	PATF	1.28	10.09	8.81
ILIP	9.94	6.01	-3.93	PRLL	6.67	2.63	-4.04
INOP	10.96	7.14	-3.82	SCOP	3.03	2.90	-0.13
KYDA	0	1.47	1.47	TNDS	6.35	7.04	0.69
LAOP	1.06	5.15	4.09	TNMS	6.67	0.00	-6.67
MAOB	8.66	11.43	2.77	TXGC	7.39	7.14	-0.25
MDPC	6.15	14.52	8.37	TXSA	7.69	11.69	4.00
MIOP	8.73	9.09	0.36	TXSB	8.29	5.81	-2.48
MNOP	4.3	8.45	4.15	UTOP	9.30	14.81	5.51
MOMA	5.81	3.53	-2.28	VATB	7.14	17.50	10.36
MSOP	5.56	0	-5.56	WALC	8.65	13.59	4.94
MWOB	7.89	11.81	3.92	WIDN	11.11	6.82	-4.29
NCCM	4.55	5.56	1.01	WIUW	0.00	4.69	4.69
				National	8.69	9.38	0.69

Changes in discard rates pre- to post- policy vary even more when examined by DSA. Again, these changes must be considered in light of the COVID emergency declaration.

Figure 58. Liver Discard Rate by Donor Type



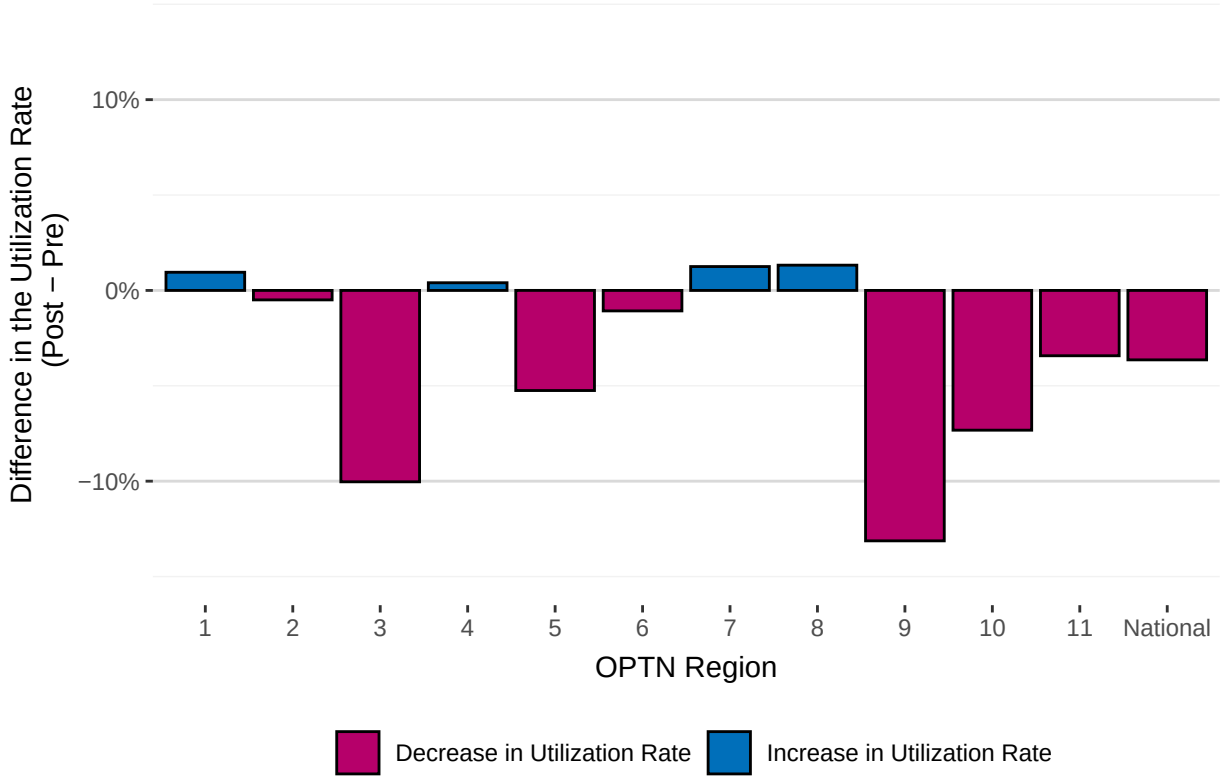
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 43. Liver Discard Rate by Donor Type and Era

	Policy Era		
Donor Type	Pre	Post	Difference (Post - Pre)
DBD	6.49	7.09	0.60
DCD	27.46	24.83	-2.63
National	8.69	9.38	0.69

While there was a slight increase in the discard rate of Donation by Brain Death (DBD) donors, there was a decrease in the discard rate of Donation by Circulatory Death (DCD) donors, pre- to post-policy. A larger percentage of those DCD liver donors recovered for purposes of transplant were ultimately transplanted. These changes must be considered in light of the COVID emergency declaration and subsequent changes in practice.

Figure 59. Liver Utilization Rate by OPTN Region



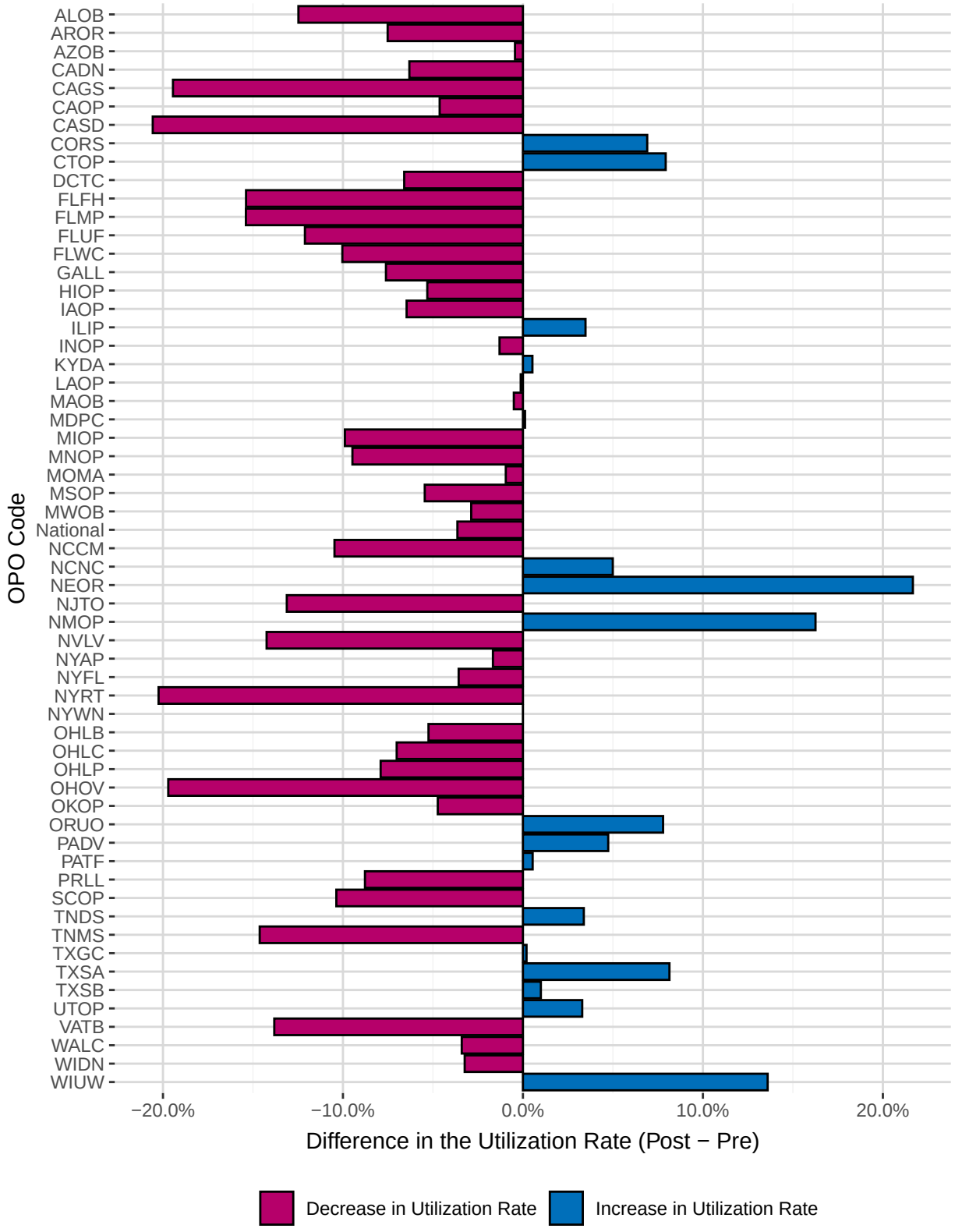
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 44. Liver Utilization Rate by OPTN Region and Era

	Policy Era		
OPTN Region	Pre	Post	Difference (Post - Pre)
1	65.71	66.67	0.96
2	65.24	64.74	-0.50
3	83.35	73.32	-10.03
4	72.15	72.55	0.40
5	70.99	65.74	-5.25
6	60.73	59.66	-1.07
7	70.69	71.94	1.25
8	65.13	66.46	1.33
9	70.27	57.14	-13.13
10	77.52	70.19	-7.33
11	72.08	68.66	-3.42
National	71.92	68.28	-3.64

Liver utilization rate is defined as the number of livers transplanted over the total number of organ donors recovered, multiplied by 100 to get a percentage. Nationally, the liver utilization rate decreased post-policy; this was similar for most OPTN regions as well. Changes in deceased liver donor utilization rate must be considered in light of the COVID emergency declaration.

Figure 60. Liver Utilization Rate by DSA



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 45. Liver Utilization Rate by DSA and Era

	Policy Era				Policy Era		
OPO Code	Pre	Post	Difference (Post-Pre)	OPO Code	Pre	Post	Difference (Post-Pre)
ALOB	87.76	75.28	-12.48	NCNC	68.00	72.99	4.99
AROR	91.89	84.38	-7.51	NEOR	58.33	80.00	21.67
AZOB	70.44	70	-0.44	NJTO	74.29	61.17	-13.12
CADN	72.5	66.19	-6.31	NMOP	55.17	71.43	16.26
CAGS	89.29	69.84	-19.45	NVLV	83.33	69.09	-14.24
CAOP	67.86	63.23	-4.63	NYAP	60.00	58.33	-1.67
CASD	72.13	51.56	-20.57	NYFL	78.57	75.00	-3.57
CORS	62.89	69.79	6.9	NYRT	73.96	53.72	-20.24
CTOP	61.76	69.7	7.94	NYWN	50.00	50.00	0.00
DCTC	68	61.4	-6.6	OHLB	69.44	64.20	-5.24
FLFH	75	59.62	-15.38	OHLC	86.05	79.03	-7.02
FLMP	77.78	62.39	-15.39	OHLP	78.87	70.97	-7.90
FLUF	80.2	68.09	-12.11	OHOV	102.56	82.86	-19.70
FLWC	84.85	74.81	-10.04	OKOP	54.26	49.52	-4.74
GALL	83.54	75.93	-7.61	ORUO	47.62	55.41	7.79
HIOP	44.44	39.13	-5.31	PADV	59.87	64.61	4.74
IAOP	65	58.54	-6.46	PATF	63.93	64.47	0.54
ILIP	70.45	73.93	3.48	PRLL	87.50	78.72	-8.78
INOP	82.72	81.42	-1.3	SCOP	71.28	60.91	-10.37
KYDA	70	70.53	0.53	TNDS	69.59	72.97	3.38
LAOP	86.92	86.79	-0.13	TNMS	90.63	76.00	-14.63
MAOB	66.48	65.97	-0.51	TXGC	75.93	76.13	0.20
MDPC	73.49	73.61	0.12	TXSA	72.09	80.23	8.14
MIOP	70	60.11	-9.89	TXSB	76.15	77.14	0.99
MNOP	78.95	69.47	-9.48	UTOP	62.90	66.20	3.30
MOMA	63.36	62.41	-0.95	VATB	72.22	58.41	-13.81
MSOP	85	79.55	-5.45	WALC	68.84	65.44	-3.40
MWOB	69.74	66.86	-2.88	WIDN	72.73	69.49	-3.24
NCCM	82.69	72.22	-10.47	WIUW	57.33	70.93	13.60
				National	71.92	68.28	-3.64

Changes in utilization rates pre- to post- policy vary even more when examined by DSA, though again most DSAs experienced a decrease at varying magnitudes. These changes must be considered in light of the COVID emergency declaration.

Figure 61. Liver Utilization Rate by Donor Type

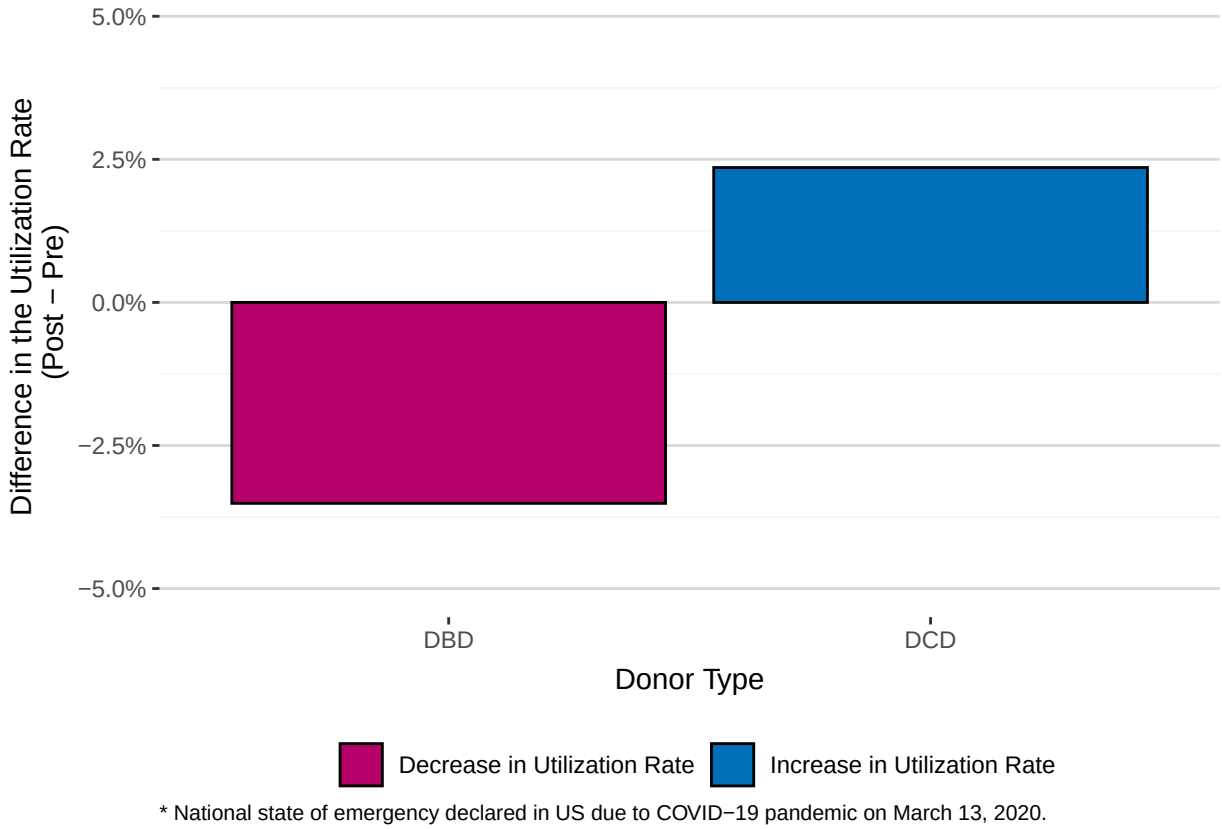


Table 46. Liver Utilization Rate by Donor Type and Era

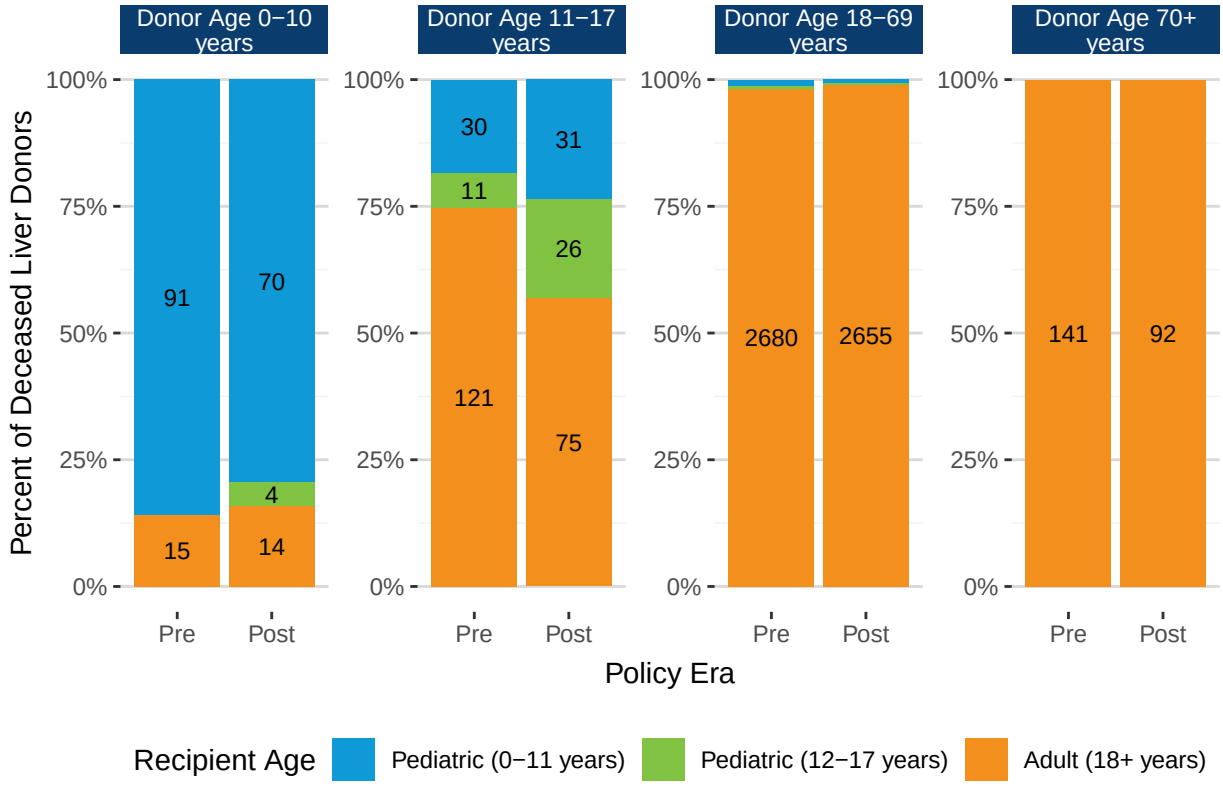
	Policy Era		
Donor Type	Pre	Post	Difference (Post - Pre)
DBD	84.50	80.99	-3.51
DCD	27.03	29.39	2.36
National	71.92	68.28	-3.64

Similar to patterns seen in liver discard rates, there was a decrease in utilization rates for DBD donors and increase in utilization of DCD donors post-policy. These changes must be considered in light of the COVID emergency declaration and subsequent changes in practice.

With the changes to allocation priority of pediatric candidates for pediatric donors, monitoring the age of transplant recipients of particular age groups of donors was of interest. The distributions and volumes below must be considered in light of the COVID emergency declaration.

Donors under 3 continued to go to transplant recipients of similarly young ages. There was an increase in older pediatric age 12-17 transplant recipients of young pediatric (age < 11 years) donors, and similar proportions of adult recipients of young pediatric donors pre- to post-policy. On the other hand, there were increases in the number and percentage of all pediatric recipients (ages 0-11 and 12-17) of older pediatric (age 11-17) donors post-policy.

Figure 62. Deceased Liver Donor Age Group by Deceased Donor Liver Transplant Recipient Age Group and Era



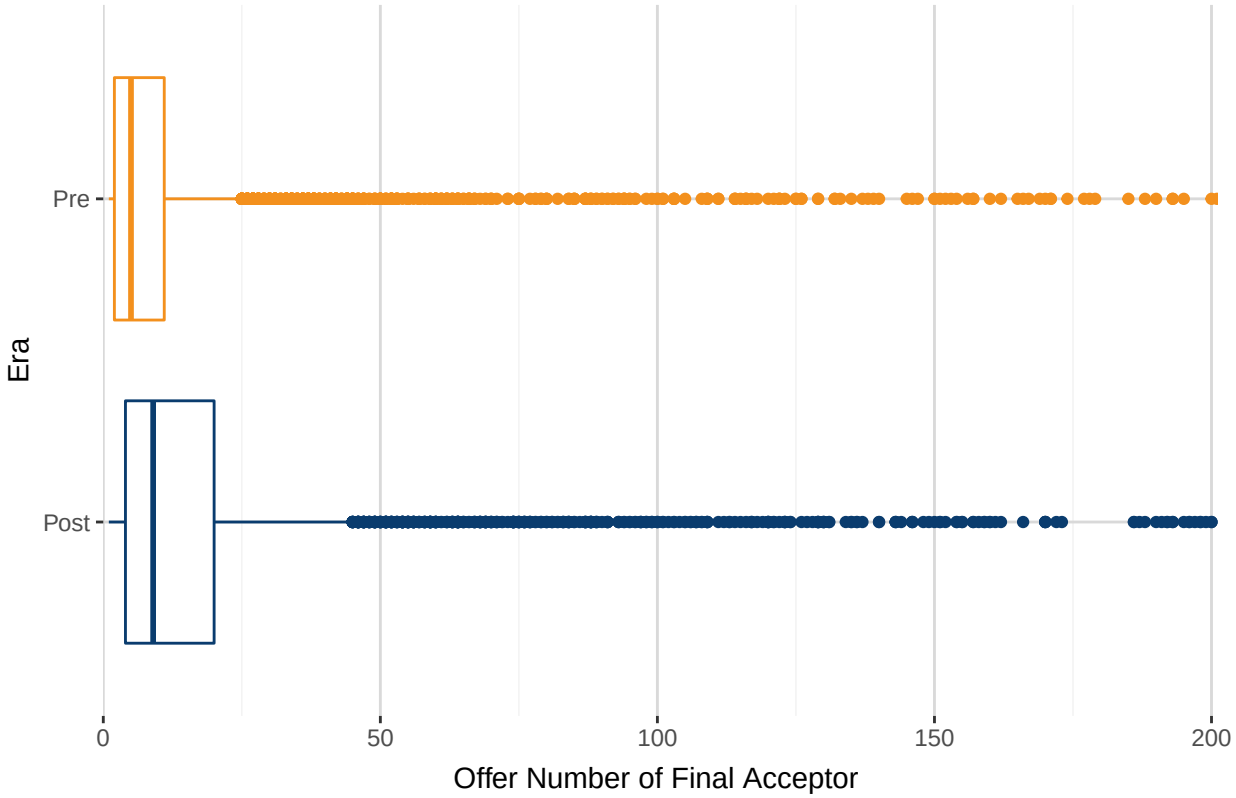
* National state of emergency declared in US due to COVID–19 pandemic on March 13, 2020.
** Counts for Donor Age 18–69 years that were < 40 are not included.

Table 47. Deceased Liver Donor Age Group by Deceased Donor Liver Transplant Recipient Age Group and Era

		Policy Era		
Donor Age	Recipient Age	Pre	Post	Difference (Post-Pre)
Pediatric (0-10 years)	Pediatric (0-11 years)	91 (85.8%)	70 (79.5%)	-21
	Pediatric (12-17 years)	0 (0.0%)	4 (4.5%)	4
	Adult (18+ years)	15 (14.2%)	14 (15.9%)	-1
Pediatric (11-17 years)	Pediatric (0-11 years)	30 (18.5%)	31 (23.5%)	1
	Pediatric (12-17 years)	11 (6.8%)	26 (19.7%)	15
	Adult (18+ years)	121 (74.7%)	75 (56.8%)	-46
Adult (18-69 years)	Pediatric (0-11 years)	37 (1.4%)	20 (0.7%)	-17
	Pediatric (12-17 years)	14 (0.5%)	10 (0.4%)	-4
	Adult (18+ years)	2680 (98.1%)	2655 (98.9%)	-25
Adult (70+ years)	Adult (18+ years)	141 (100.0%)	92 (100.0%)	-49

The distribution of the sequence number of the final acceptor on liver match runs is shown below. "Final acceptor" is used, as it is possible for two liver segments to be placed on the same match run; in these cases, the last of these is used if both segments are placed. Accepting candidate sequence number increased pre- to post-policy, as indicated by the shift in the first quartile, median, and 3rd quartile of the boxplot. The maximum sequence number also increased post-policy, shifting the mean as well. Changes in final acceptor sequence number must be considered in light of the COVID emergency declaration.

Figure 63. Distribution of Sequence Number of Final Acceptor on Liver Match Run by Era

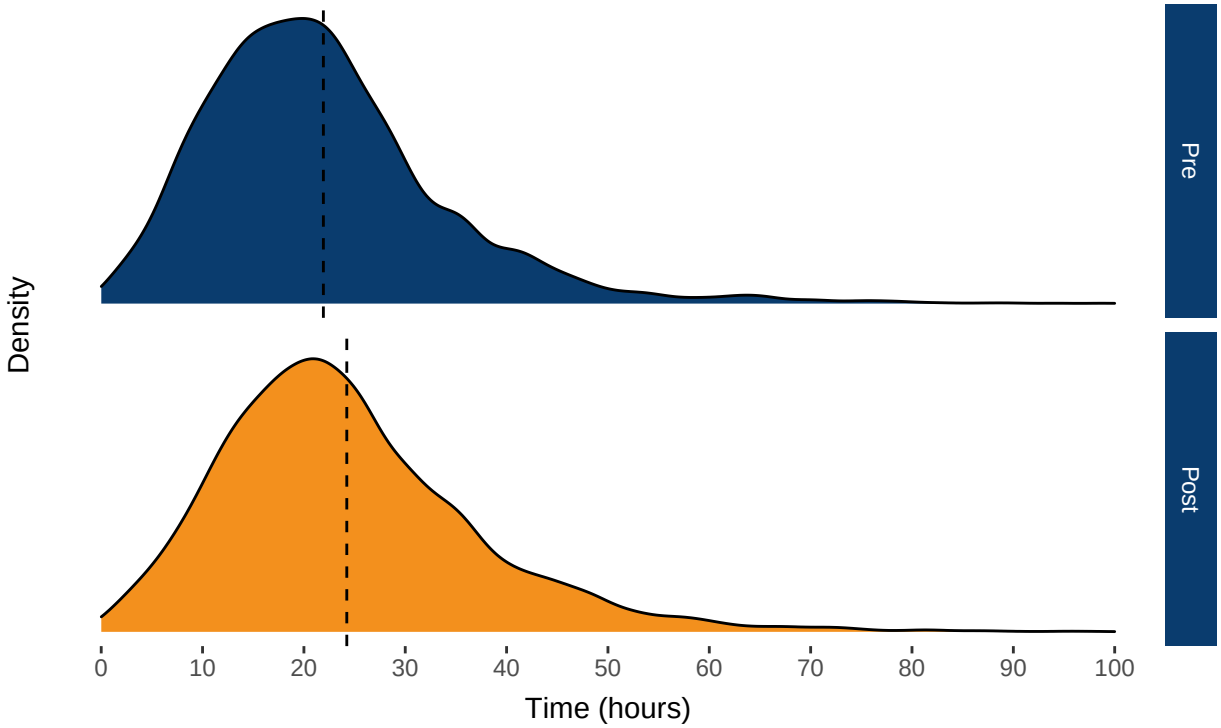


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** There were 196 final acceptances in the pre−policy era and 229 in the post era with an offer number over 200.

Table 48. Distribution of Sequence Number of Final Acceptor on Liver Match Run by Era

	Policy Era	
Final Acceptor Sequence Number	Pre	Post
N Matches	4227	4225
Minimum	1	1
25th Percentile	2	4
Median	5	9
Mean	80	99
75th Percentile	14	24
90th Percentile	46	77
Maximum	7079	7555

Figure 64. Distribution of Time from First Electronic Offer to Cross Clamp for Deceased Liver Donors by Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Black dotted line indicates the mean in each corresponding era.
*** There were 2 donors pre−policy and 1 post−policy missing time from first offer to cross clamp.
^ There were 6 donors pre−policy and 3 post−policy with time > 100 hours that are not included.
^^There were 33 donors pre−policy and 31 donors post−policy that were first offered pre−cross clamp and are not included.

Table 49. Distribution of Time from First Electronic Offer to Cross Clamp for Deceased Liver Donors by Era

	Policy Era	
Time (Hours)	Pre	Post
N Matches Ran	5340.0	5592.0
Minimum	0.0	0.0
25th Percentile	13.8	15.6
Median	20.2	22.5
Mean	22.1	24.4
75th Percentile	27.6	30.9
Maximum	353.9	108.0

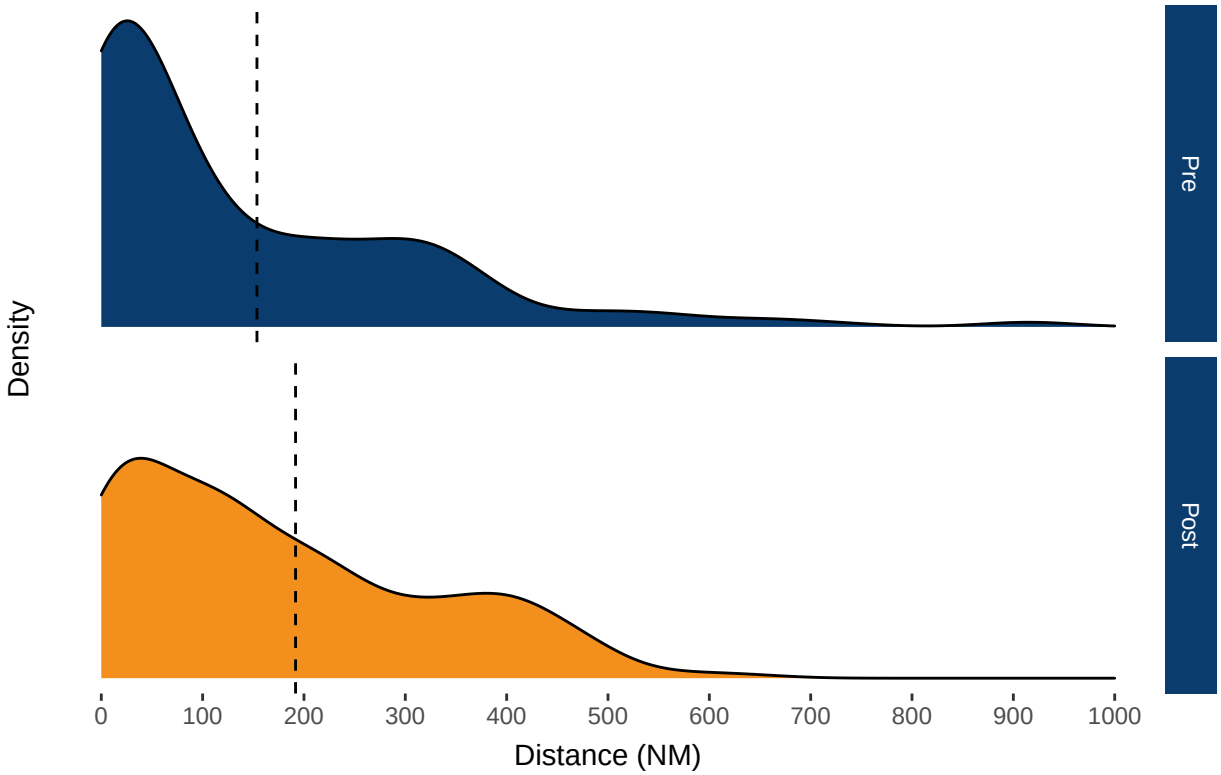
Average time from first electronic offer being sent to actual cross clamp time increased by 2.31, or roughly two and a half hours, pre- to post-policy. This increase was statistically significant ($t = 9.25$, p-value < 0.001). However, changes must be considered in light of the COVID emergency declaration.

Section V. Simultaneous Liver-Kidney

There were a total of 266 deceased donor SLK transplants pre-policy and 309 post-policy.

The changes in distribution of distance from donor hospital to transplant center mirrored those seen for liver-alone transplants. The increase from an average distance of 153.6 NM to 191.69 NM was statistically significant (t=2.05, p-value = 0.041).

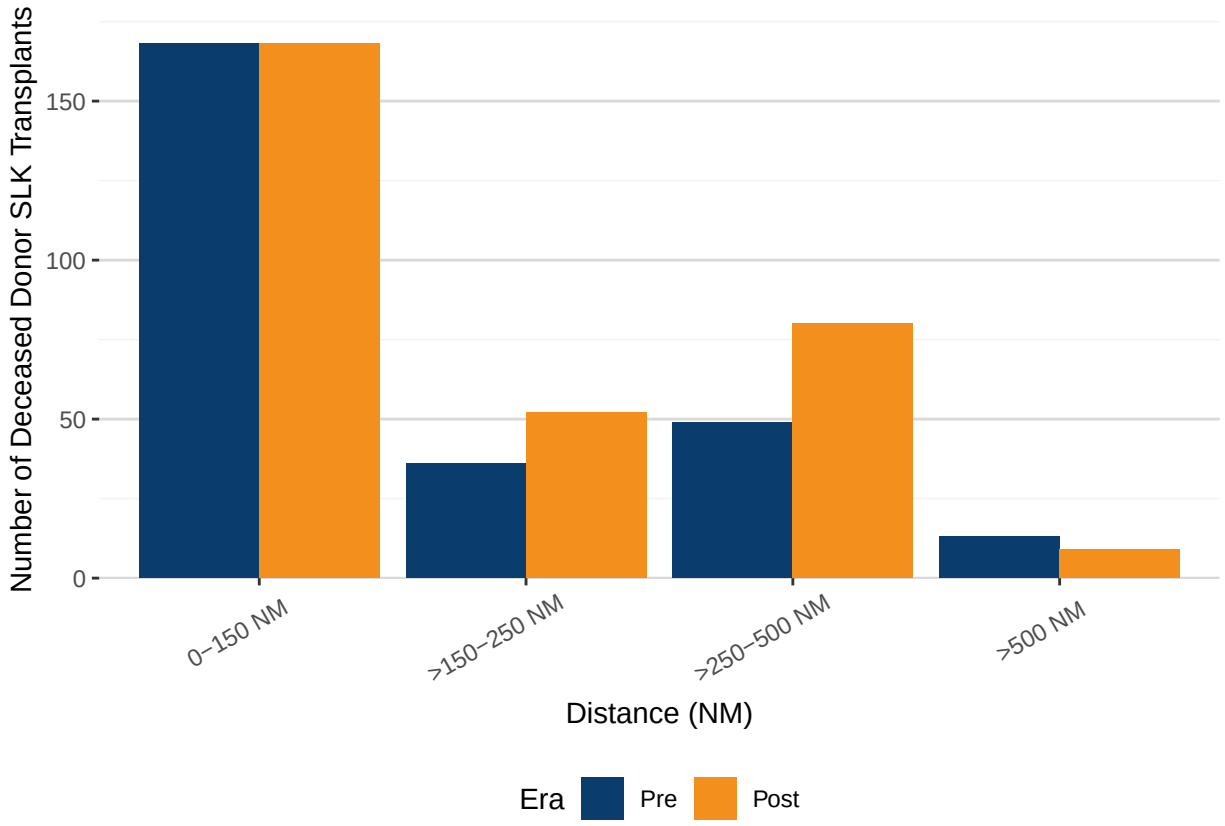
Figure 65. Distribution of Distance from Donor Hospital to Transplant Center for Deceased Donor SLK Transplants by Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate average distance within each era.
*** There were 38 pre−policy and 53 post policy transplants > 1000 NM that were excluded.

Similarly, the figure below summarizes this distance in a discretized manner. As was seen for deceased donor liver-alone transplants, SLKs traveling over 150 NM to 500 NM from the donor hospital have increased, while those staying within 150 NM have remained unchanged pre- to post-policy.

Figure 66. Deceased Donor Liver Transplants by Classification Distance and Era



* National state of emergency declared in US due to COVID–19 pandemic on March 13, 2020.

Table 50. Number of Deceased Donor SLK Transplants by Classification Distance and Era

	Policy Era		
Distance Group	Pre	Post	Difference (Post - Pre)
0-150 NM	168 (63.2%)	168 (54.4%)	0
>150-250 NM	36 (13.5%)	52 (16.8%)	16
>250-500 NM	49 (18.4%)	80 (25.9%)	31
>500 NM	13 (4.9%)	9 (2.9%)	-4
Total	266 (100.0%)	309 (100.0%)	43

Patterns in share type distribution changes are similar to those seen for deceased donor liver-alone transplants. There are fairly equal percentages of liver transplants in the local, regional, and national share types during the post-policy era. Distributions of share type during the pre-policy era were also similar to those for liver-alone transplants.

Table 51. Number of Deceased Donor SLK Transplants by Donor Share Type and Era

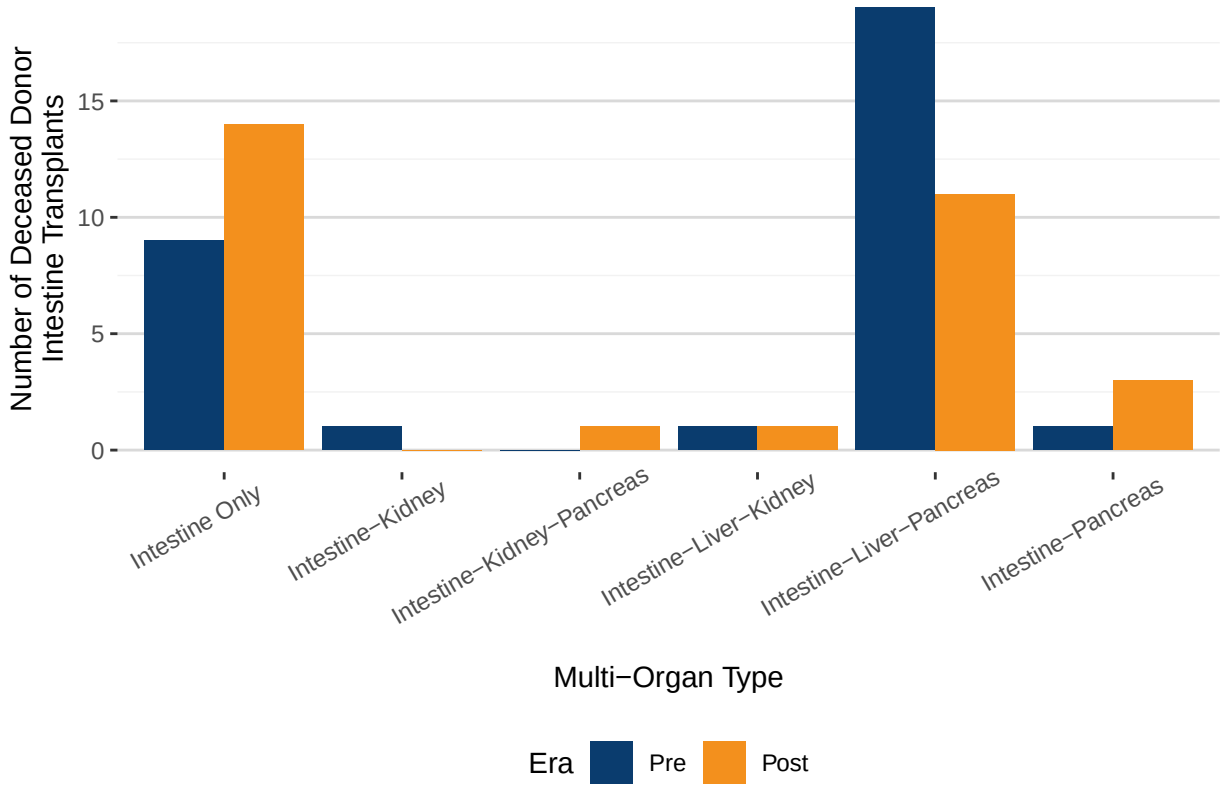
	Policy Era		
Share Type	Pre	Post	Difference (Post-Pre)
Local	171 (64.3%)	106 (34.3%)	-65
Regional	77 (28.9%)	107 (34.6%)	30
National	18 (6.8%)	96 (31.1%)	78
Total	266 (100.0%)	309 (100.0%)	43

Section VI. Intestine

There were 57 intestine candidates added to the waiting list pre-policy and 74 post-policy. A total of 40 intestine donors were recovered pre-policy and 37 intestine donors were recovered post-policy. Almost the same number of deceased donor intestine transplants occurred pre- and post-policy (31 pre and 30 post). Note that this includes all deceased donor intestine recipients. Below illustrates the distribution of intestine-alone versus intestine-multi-organ transplants in each policy era. Neither time period had any intestine candidate waitlist removals due to death or too sick to transplant.

While the number of deceased donor intestine transplants was similar in both eras, there was an increase in intestine-alone and intestine-pancreas transplant recipients with the trade-off being fewer intestine-liver-pancreas transplant recipients in the post-policy era.

Figure 68. Deceased Donor Intestine Transplants by Multi-Organ Type and Era



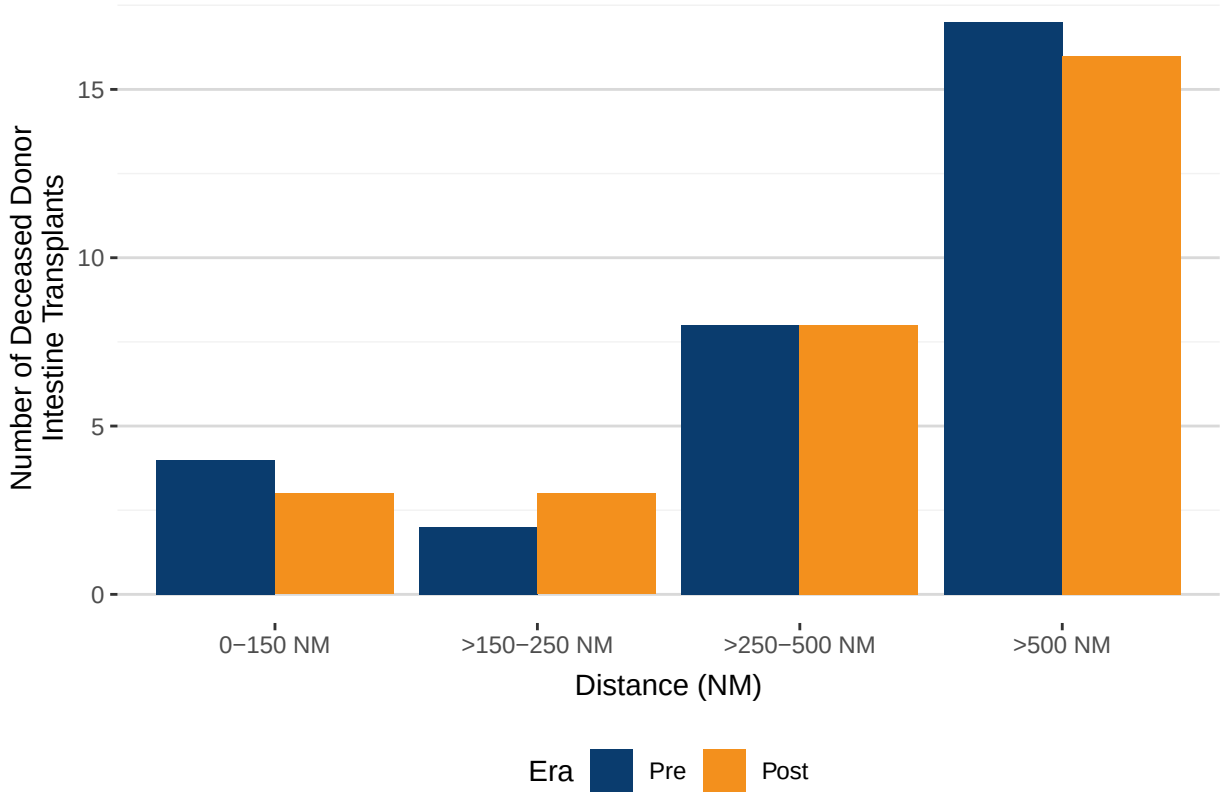
* National state of emergency declared in US due to COVID–19 pandemic on March 13, 2020.

Table 52. Number of Deceased Donor Intestine Transplants by Multi-Organ Type and Era

	Policy Era		
Multi-Organ Type	Pre	Post	Difference (Post - Pre)
Intestine Only	9 (29.0%)	14 (46.7%)	5
Intestine-Kidney	1 (3.2%)	0 (0.0%)	-1
Intestine-Kidney-Pancreas	0 (0.0%)	1 (3.3%)	1
Intestine-Liver-Kidney	1 (3.2%)	1 (3.3%)	0
Intestine-Liver-Pancreas	19 (61.3%)	11 (36.7%)	-8
Intestine-Pancreas	1 (3.2%)	3 (10.0%)	2
Total	31 (100.0%)	30 (100.0%)	-1

The distributions of intestine transplants in the classification distance groups as well as share types were similar between the two policy eras.

Figure 69. Deceased Donor Intestine Transplants by Classification Distance and Era



* National state of emergency declared in US due to COVID–19 pandemic on March 13, 2020.

Table 53. Number of Deceased Donor Intestine Transplants by Classification Distance and Era

	Policy Era		
Classification Distance	Pre	Post	Difference (Post - Pre)
0-150 NM	4 (12.9%)	3 (10.0%)	-1
>150-250 NM	2 (6.5%)	3 (10.0%)	1
>250-500 NM	8 (25.8%)	8 (26.7%)	0
>500 NM	17 (54.8%)	16 (53.3%)	-1
Total	31 (100.0%)	30 (100.0%)	-1

Section VII. Blood Type Variance

The distribution of blood type of new liver listings pre- and post-policy differs for both Hawaii and Puerto Rico transplant programs more starkly than for the nation, most likely due to the small numbers. This also held true for removals due to death or too sick to transplant. Changes in volumes of new listings and removals should be interpreted with caution in light of the COVID emergency declaration.

Table 54. Number and Percent of Registrations Added to Liver Waiting List for Hawaii, Puerto Rico, and Nationally by Candidate ABO and Era

		Policy Era	
Listing Center	Candidate ABO	Pre	Post
HIQM-TX1	A	1 (9.1%)	6 (60.0%)
	AB	0 (0.0%)	0 (0.0%)
	B	1 (9.1%)	2 (20.0%)
	O	9 (81.8%)	2 (20.0%)
PRSJ-TX1	A	10 (43.5%)	4 (30.8%)
	AB	0 (0.0%)	0 (0.0%)
	B	1 (4.3%)	1 (7.7%)
	O	12 (52.2%)	8 (61.5%)
National	A	2560 (37.6%)	2442 (38.0%)
	AB	250 (3.7%)	270 (4.2%)
	B	809 (11.9%)	745 (11.6%)
	O	3191 (46.9%)	2977 (46.3%)

Table 55. Number and Percent of Removals Due to Death or Too Sick to Transplant for Hawaii, Puerto Rico, and Nationally by Candidate ABO and Era

		Policy Era	
Listing Center	Candidate ABO	Pre	Post
HIQM-TX1	A	1 (50.0%)	1 (50.0%)
	AB	0 (0.0%)	0 (0.0%)
	B	0 (0.0%)	1 (50.0%)
	O	1 (50.0%)	0 (0.0%)
PRSJ-TX1	A	0 (0.0%)	3 (75.0%)
	AB	0 (0.0%)	0 (0.0%)
	B	2 (40.0%)	0 (0.0%)
	O	3 (60.0%)	1 (25.0%)
National	A	489 (38.6%)	460 (38.5%)
	AB	24 (1.9%)	32 (2.7%)
	B	140 (11.0%)	114 (9.5%)
	O	615 (48.5%)	590 (49.3%)

Distributions of deceased donor, liver-alone transplant recipients by blood type differ in Hawaii and Puerto Rico compared to nationally due to the small volumes. There were more A, AB, and B transplant recipients in Hawaii and fewer in Puerto Rico post-policy compared to pre-policy.

Table 56. Number and Percent of Deceased Donor Liver-Alone Transplants for Hawaii, Puerto Rico, and Nationally by Recipient ABO and Era

		Policy Era	
Transplant Center	Recipient ABO	Pre	Post
HIQM-TX1	A	1 (20.0%)	2 (28.6%)
	AB	1 (20.0%)	0 (0.0%)
	B	0 (0.0%)	2 (28.6%)
	O	3 (60.0%)	3 (42.9%)
PRSJ-TX1	A	4 (30.8%)	1 (16.7%)
	AB	0 (0.0%)	0 (0.0%)
	B	1 (7.7%)	0 (0.0%)
	O	8 (61.5%)	5 (83.3%)
National	A	1117 (35.6%)	1126 (37.6%)
	AB	166 (5.3%)	161 (5.4%)
	B	440 (14.0%)	373 (12.4%)
	O	1417 (45.1%)	1337 (44.6%)

The total number of deceased liver donors recovered in Hawaii and Puerto Rico were similar pre- and post-policy. The distribution of these donors by blood type differs pre- to post-policy, though this is due to the small volumes. Changes in volumes of recovered liver donors should be interpreted with caution in light of the COVID emergency declaration.

Table 57. Number and Percent of Deceased Liver Donors Recovered for Hawaii, Puerto Rico, and Nationally by Donor ABO and Era

		Policy Era	
Recovering OPO	Donor ABO	Pre	Post
HIOP-OP1	A	2 (22.2%)	1 (10.0%)
	AB	1 (11.1%)	0 (0.0%)
	B	0 (0.0%)	1 (10.0%)
	O	6 (66.7%)	8 (80.0%)
PRLL-OP1	A	14 (31.1%)	17 (44.7%)
	AB	0 (0.0%)	0 (0.0%)
	B	4 (8.9%)	4 (10.5%)
	O	27 (60.0%)	17 (44.7%)
National	A	1634 (36.0%)	1718 (37.6%)
	AB	133 (2.9%)	135 (3.0%)
	B	555 (12.2%)	532 (11.7%)
	O	2223 (48.9%)	2179 (47.7%)

Overall, the discard rates for Hawaii and Puerto Rico decreased post-policy.

Table 58. Liver Discard Rate for Hawaii, Puerto Rico, and Nationally by Donor ABO and Era

		Policy Era		
Recovering OPO	Donor ABO	Pre	Post	Difference (Post-Pre)
HIOP-OP1	A	0	0	0
	AB	0	-	-
	B	-	0	-
	O	16.67	12.5	-4.17
	Total	11.11	10	-1.11
PRLL-OP1	A	0	5.88	5.88
	B	0	0	0
	O	11.11	0	-11.11
	Total	6.67	2.63	-4.04
National	A	8.63	9.6	0.97
	AB	7.52	9.63	2.11
	B	7.57	11.47	3.9
	O	9.09	8.67	-0.42
	Total	8.69	9.38	0.69

The majority of recipients of deceased liver donors recovered in Hawaii were at the transplant program in Hawaii. Blood type O donors recovered in Hawaii went to A, B, and O recipients post-policy, possibly reflecting this variance at work rather than those O donors being offered elsewhere to blood type identical candidates before coming back to Hawaii blood type compatible candidates.

Table 59. Transplant Center of Recipients of Liver Donors Recovered in Hawaii by Donor ABO, Recipient ABO, and Era

				Policy Era	
Recovering OPO	Transplant Center	Donor ABO	Recipient ABO	Pre	Post
HIOP-OP1	CASU-TX1	A	A	1	1
	HIQM-TX1	A	A	1	0
		O	A	0	2
		O	AB	1	0
		O	B	0	2
		O	O	3	2
	WAUW-TX1	B	B	0	1

The majority of transplant recipients of deceased liver donors recovered in Puerto Rico are at programs outside of Puerto Rico, both pre- and post-policy. In most cases, both for transplant recipients at the program in Puerto Rico and programs elsewhere, the donor-recipient blood types are identical. Due to the small sample size, more data and time is needed to determine if the variance is providing the intended benefit for Puerto Rico.

Table 60. Transplant Center of Recipients of Liver Donors Recovered in Puerto Rico by Donor ABO, Recipient ABO, and Era

				Policy Era	
Recovering OPO	Transplant Center	Donor ABO	Recipient ABO	Pre	Post
PRLL-OP1	ALUA-TX1	A	A	1	0
		O	O	1	0
	FLCC-TX1	A	A	1	0
		O	O	2	0
	FLJM-TX1	A	A	4	5
		A	O	1	1
		B	B	2	0
		O	O	5	2
	FLLM-TX1	A	A	0	1
		O	O	1	0
	FLSL-TX1	A	A	2	0
		O	O	1	2
	FLUF-TX1	O	B	0	1
	GAEM-TX1	A	A	0	1
	GAPH-TX1	B	AB	0	1
	MAUM-TX1	A	A	0	1
	NYNY-TX1	A	A	0	1
		O	O	0	3
	PAUP-TX1	B	B	0	1
		O	O	0	1
	PRSJ-TX1	A	A	3	1
		B	B	1	0
		O	O	8	5
	TXMH-TX1	O	O	0	1

Most transplant recipients at the program in Hawaii received a liver recovered in Hawaii. Post-policy, there was one transplant recipient for which the donor was recovered by WALC.

Table 61. Recovery OPO of Deceased Donor Liver Transplants in Hawaii by Donor ABO, Recipient ABO, and Era

				Policy Era	
Transplant Center	Recovering OPO	Donor ABO	Recipient ABO	Pre	Post
HIQM-TX1	HIOP-OP1	A	A	1	0
		O	A	0	2
		O	AB	1	0
		O	B	0	2
		O	O	3	2
	WALC-OP1	O	O	0	1

All transplant recipients at the program in Puerto Rico received a liver recovered in Puerto Rico post-policy.

Table 62. Recovery OPO of Deceased Donor Liver Transplants in Puerto Rico by Donor ABO, Recipient ABO, and Era

				Policy Era	
Transplant Center	Recovering OPO	Donor ABO	Recipient ABO	Pre	Post
PRSJ-TX1	LAOP-OP1	A	A	1	0
	PRLL-OP1	A	A	3	1
		B	B	1	0
		O	O	8	5

Section VIII. National Liver Review Board

Liver MELD and PELD exception score request forms are submitted for a candidate and must be renewed, or extended, every 90 days in order to keep the exception score if they have not yet received a transplant. A candidate may have multiple forms submitted during each of the pre- and post-policy eras.

Figure 70. Exception Request Forms Submitted by Specialty Review Board, Application Type, and Era

Comparisons pre- and post-policy with respect to review boards and distribution of exception request forms submitted should be viewed with the understanding that the first implementation of the National Liver Review Board (NLRB) occurred on May 14, 2019, approximately half-way through the pre-policy era.

Overall, there were fewer exception request forms submitted by application type post-policy compared to pre-policy. There were 148 total ART appeal forms submitted, 81 pre- and 67 post-policy. Again, ART Appeal forms were implemented with the NLRB and were thus only submitted since May 14, 2019. There were 8 total Committee Appeal forms submitted, 6 pre- and 2 policy. Committee Appeal forms were implemented with the NLRB and were thus only submitted since May 14, 2019.

Table 63. Exception Request Forms Submitted by Specialty Review Board, Application Type, and Era

		Policy Era	
Application Type	Review Board	Pre	Post
Initial	Auto Approved	741 (24.3%)	853 (33.1%)
	Withdrawn prior to Review Board Assignment	21 (0.7%)	16 (0.6%)
	Review Board - Pediatrics	161 (5.3%)	222 (8.6%)
	Review Board - Adult Other Diagnosis	388 (12.7%)	391 (15.2%)
	Review Board - Adult HCC	539 (17.7%)	1093 (42.4%)
	Regional Review Boards	1199 (39.3%)	–
	Total	3049 (100%)	2575 (100%)
Extension	Auto Approved	1105 (30.3%)	1261 (40.1%)
	Withdrawn prior to Review Board Assignment	12 (0.3%)	4 (0.1%)
	Review Board - Pediatrics	56 (1.5%)	111 (3.5%)
	Review Board - Adult Other Diagnosis	382 (10.5%)	333 (10.6%)
	Review Board - Adult HCC	676 (18.6%)	1436 (45.7%)
	Regional Review Boards	1410 (38.7%)	–
	Total	3641 (100%)	3145 (100%)
Appeal	Withdrawn prior to Review Board Assignment	6 (1.6%)	1 (0.4%)
	Review Board - Pediatrics	32 (8.6%)	36 (13.2%)
	Review Board - Adult Other Diagnosis	152 (40.6%)	110 (40.3%)
	Review Board - Adult HCC	132 (35.3%)	126 (46.2%)
	Regional Review Boards	52 (13.9%)	–
	Total	374 (100%)	273 (100%)

The following data points review only **initial** and **extension** exception requests submitted, in order to provide a better comparison of trends. This also ensures that each form is unique, rather than similar information being counted multiple times as a initial/extension form, associated appeals form, ART appeals form, and/or Committee appeals form.

Figure 71. Initial and Extension Request Forms Submitted by Diagnosis and Era

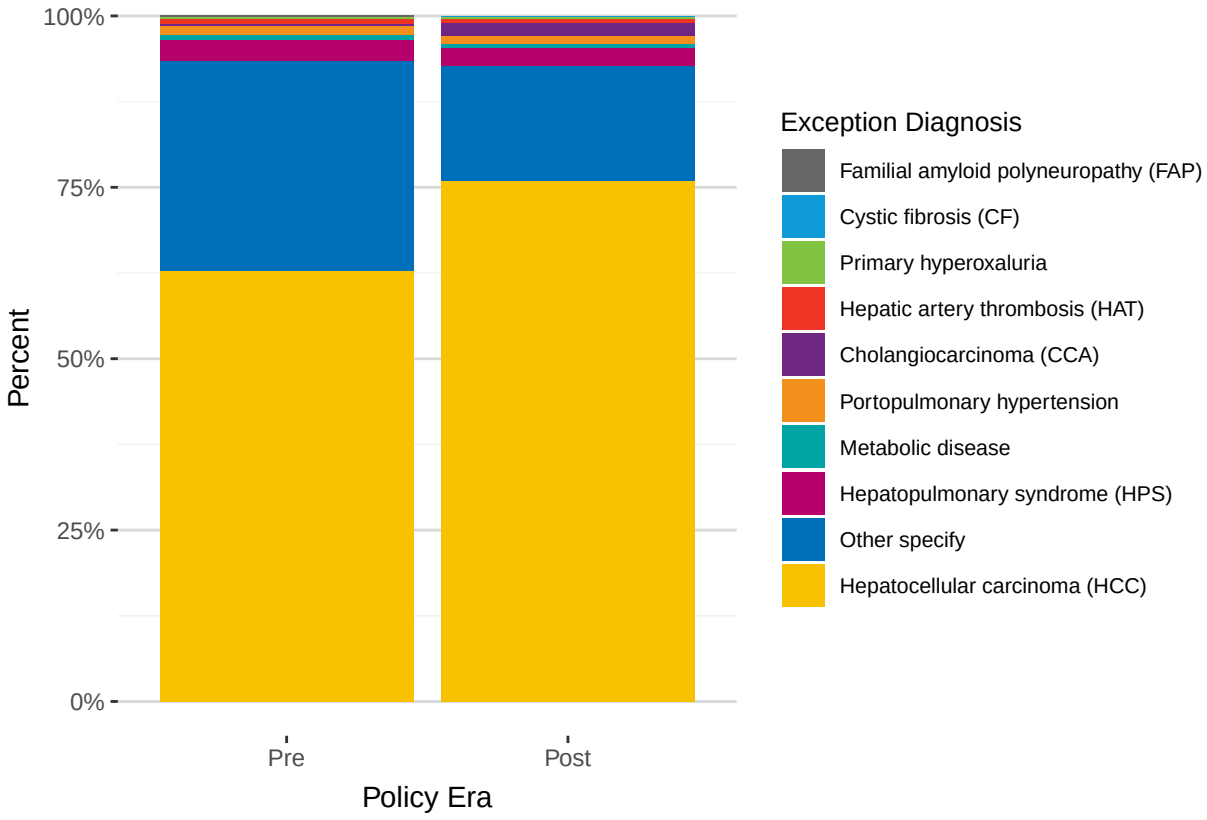


Table 64. Initial and Extension Request Forms Submitted by Diagnosis and Era

	Policy Era	
Exception Diagnosis	Pre	Post
Hepatocellular carcinoma (HCC)	4205 (62.9%)	4340 (75.9%)
Other specify	2044 (30.6%)	959 (16.8%)
Hepatopulmonary syndrome (HPS)	199 (3.0%)	150 (2.6%)
Metabolic disease	55 (0.8%)	38 (0.7%)
Portopulmonary hypertension	83 (1.2%)	65 (1.1%)
Cholangiocarcinoma (CCA)	29 (0.4%)	103 (1.8%)
Hepatic artery thrombosis (HAT)	39 (0.6%)	38 (0.7%)
Primary hyperoxaluria	23 (0.3%)	14 (0.2%)
Cystic fibrosis (CF)	3 (0.0%)	9 (0.2%)
Familial amyloid polyneuropathy (FAP)	10 (0.1%)	4 (0.1%)
Total	6690 (100.0%)	5720 (100.0%)

* Cystic fibrosis (CF) and Cholangiocarcinoma (CCA) were submitted under 'Other specify' with Regional Review Boards and were counted as such in the pre-policy era.

The increase in percentage of initial and extension request forms for HCC and decrease in percentage for Other specify post-policy is most likely due to enhancements to the diagnosis selection process, allowing submitters to

still choose HCC as the correct diagnosis even if it is not a typical initial request. That is, pre-policy many forms for HCC that did not meet criteria or were submitted to skip the 6-month delay for administrative reasons of missing the extension deadline were required to be submitted as Other specify. This practice has been substantially reduced with the implementation of the NLRB. Changes in the volume of CCA and CF extension request forms is also likely due to enhancements with the implementation of the NLRB, allowing for these diagnoses to be chosen appropriately rather than submitted under Other specify.

Figure 72. Initial and Extension Request Forms Submitted by OPTN Region and Era

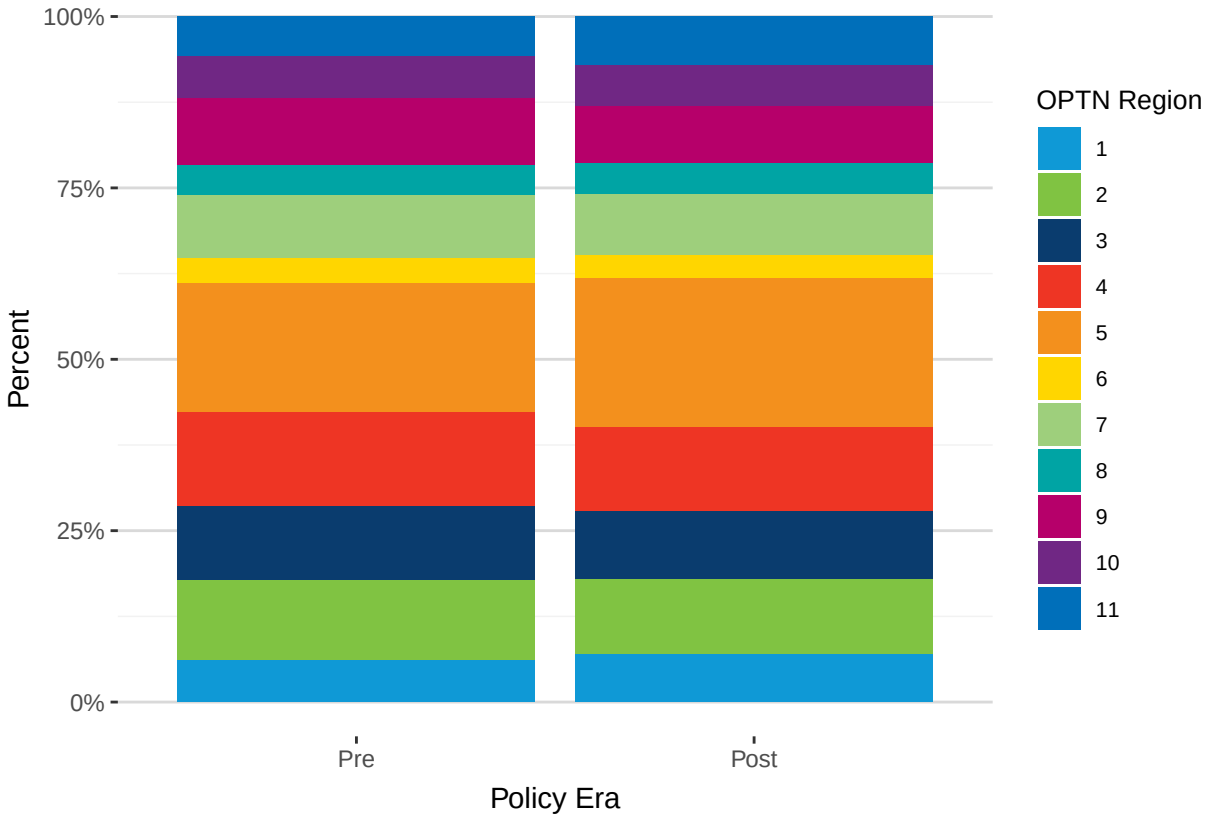


Table 65. Initial and Extension Request Forms Submitted by OPTN Region and Era

	Policy Era	
OPTN Region	Pre	Post
1	408 (6.1%)	403 (7.0%)
2	789 (11.8%)	620 (10.8%)
3	715 (10.7%)	575 (10.1%)
4	922 (13.8%)	697 (12.2%)
5	1257 (18.8%)	1251 (21.9%)
6	242 (3.6%)	185 (3.2%)
7	623 (9.3%)	513 (9.0%)
8	294 (4.4%)	252 (4.4%)
9	645 (9.6%)	481 (8.4%)
10	414 (6.2%)	342 (6.0%)
11	381 (5.7%)	401 (7.0%)

There was not a substantial change in the volume of initial and extension request forms submitted by OPTN region pre- to post-policy.

Figure 73. Initial and Extension Request Forms Submitted by Case Outcome and Era

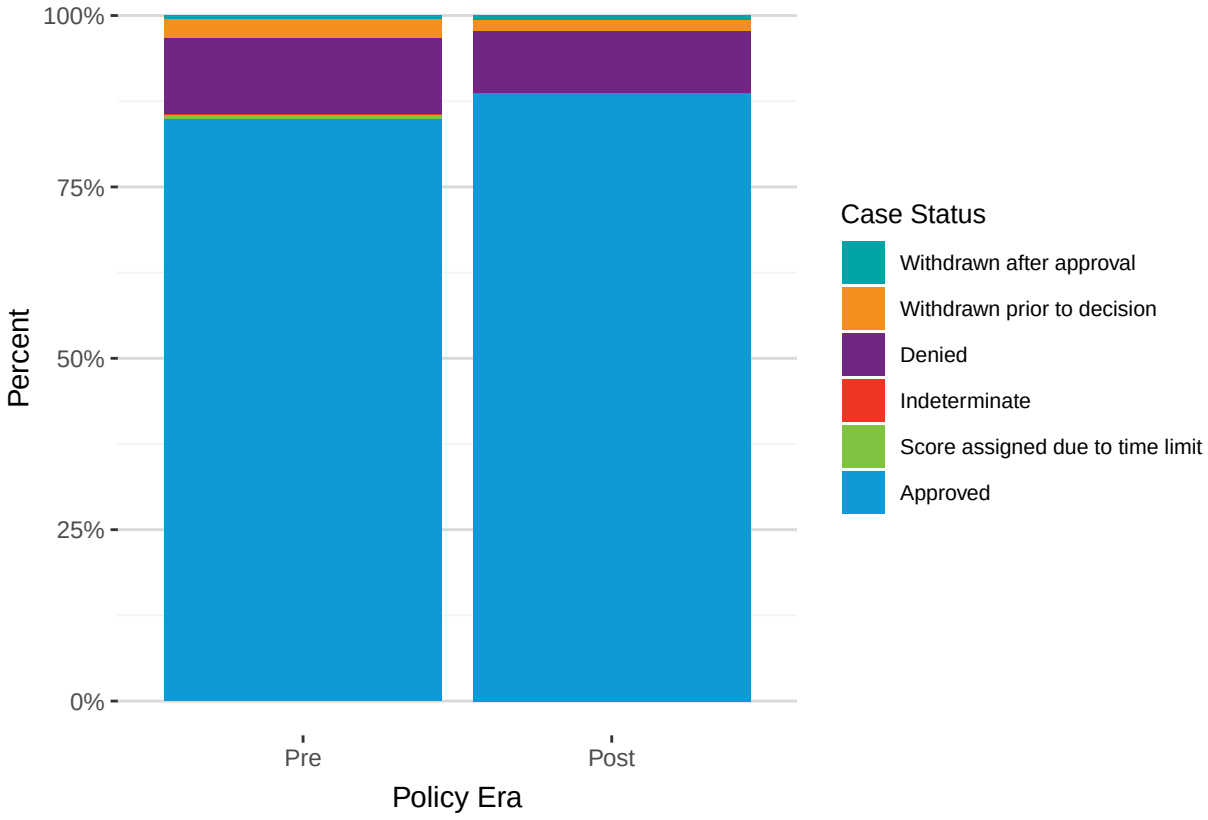


Table 66. Initial and Extension Request Forms Submitted by Case Outcome and Era

	Policy Era	
Case Status	Pre	Post
Approved	5683 (84.9%)	5073 (88.7%)
Score assigned due to time limit	40 (0.6%)	4 (0.1%)
Indeterminate	4 (0.1%)	0 (0.0%)
Submitted to Review Board	0 (0.0%)	0 (0.0%)
Pending	0 (0.0%)	0 (0.0%)
Denied	746 (11.2%)	520 (9.1%)
Withdrawn prior to decision	179 (2.7%)	84 (1.5%)
Withdrawn after approval	38 (0.6%)	39 (0.7%)

A small percentage of forms both pre- and post-policy were withdrawn. The volume of initial and extension request forms that had the requested score assigned due to exceeding the time limit for reviewers to adjudicate substantially decreased post-policy. While the rate of approval for initial and extension request forms appears to have increased post-policy, the pre-policy period contains the implementation of the NLRB on May 14, 2019 and **previous reports** have shown the differential outcomes over time since that implementation. Both reviewers and submitters of exception request forms have had a period of adjustment to the new system and guidelines.

Figure 74. Initial and Extension Request Forms Submitted by Application Type, Case Outcome, and Era

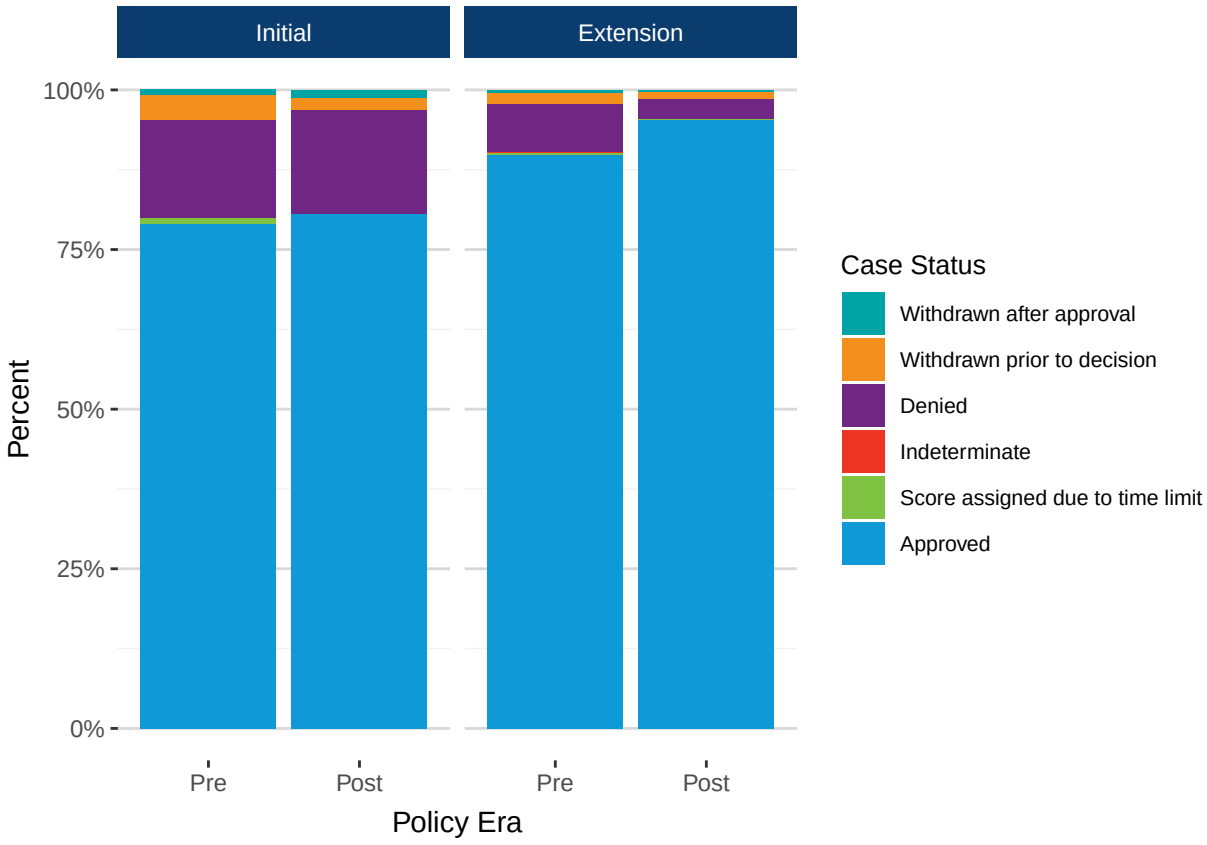


Table 67. Initial and Extension Request Forms Submitted by Application Type, Case Outcome, and Era

Application Type	Case Outcome	Policy Era	
		Pre	Post
Initial	Approved	2412 (79.1%)	2075 (80.6%)
	Score assigned due to time limit	26 (0.9%)	2 (0.1%)
	Indeterminate	3 (0.1%)	0 (0.0%)
	Denied	468 (15.3%)	417 (16.2%)
	Withdrawn prior to decision	116 (3.8%)	51 (2%)
	Withdrawn after approval	24 (0.8%)	30 (1.2%)
Extension	Approved	3271 (89.8%)	2998 (95.3%)
	Score assigned due to time limit	14 (0.4%)	2 (0.1%)
	Indeterminate	1 (0%)	0 (0.0%)
	Denied	278 (7.6%)	103 (3.3%)
	Withdrawn prior to decision	63 (1.7%)	33 (1%)
	Withdrawn after approval	14 (0.4%)	9 (0.3%)

During both policy eras, extension request forms have a higher approval rate than initial request forms. Approval rates are only slightly higher post-policy for initial request forms, but there is a more substantial increase in the approval rates of extension request forms pre- to post-policy. This may indicate that both reviewers and submitters are becoming more familiar with the new NLRB guidelines and appropriate exception diagnoses.

Figure 75. Initial and Extension Request Forms Submitted by Specialty Review Board, Case Outcome, and Era

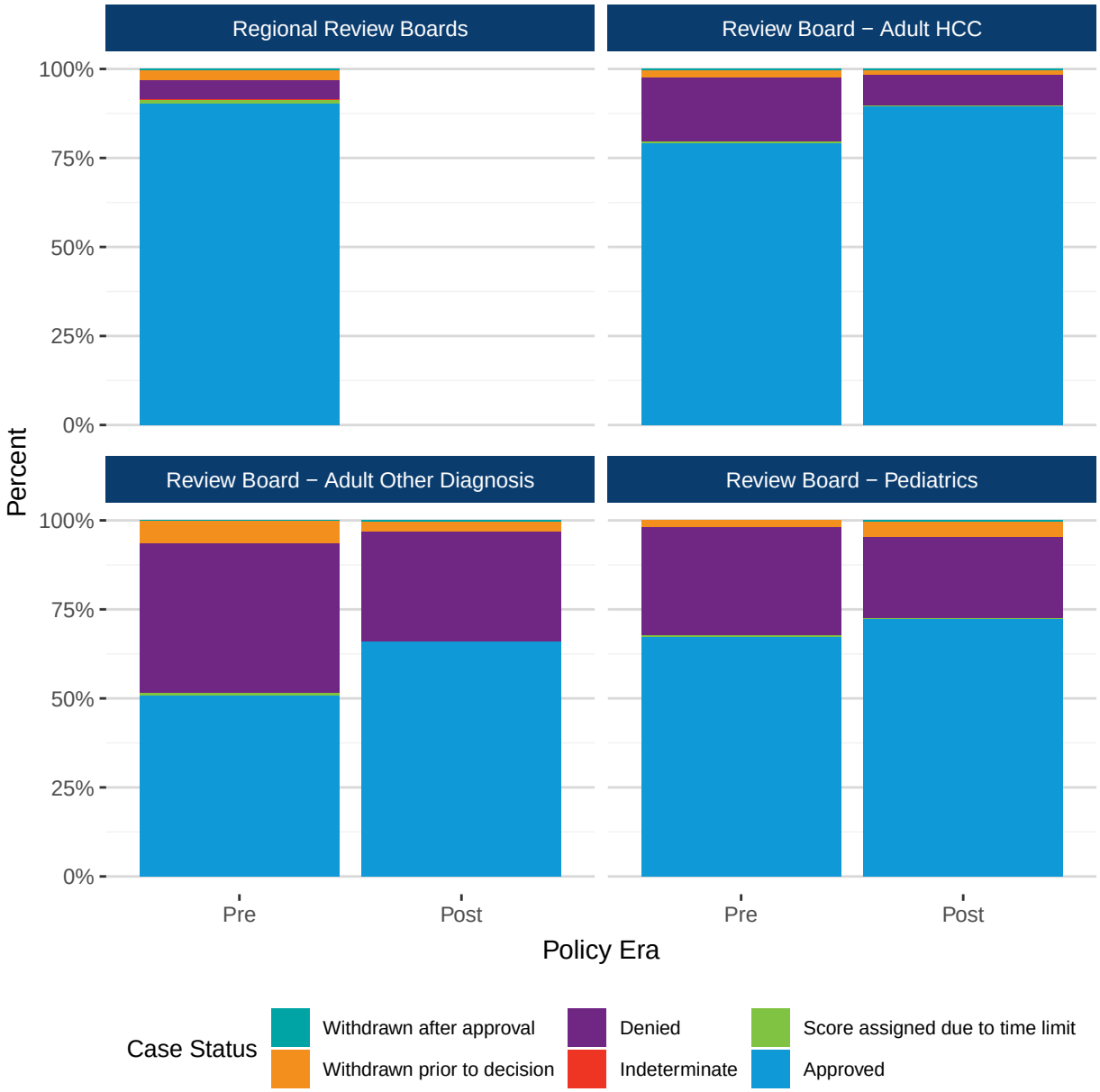
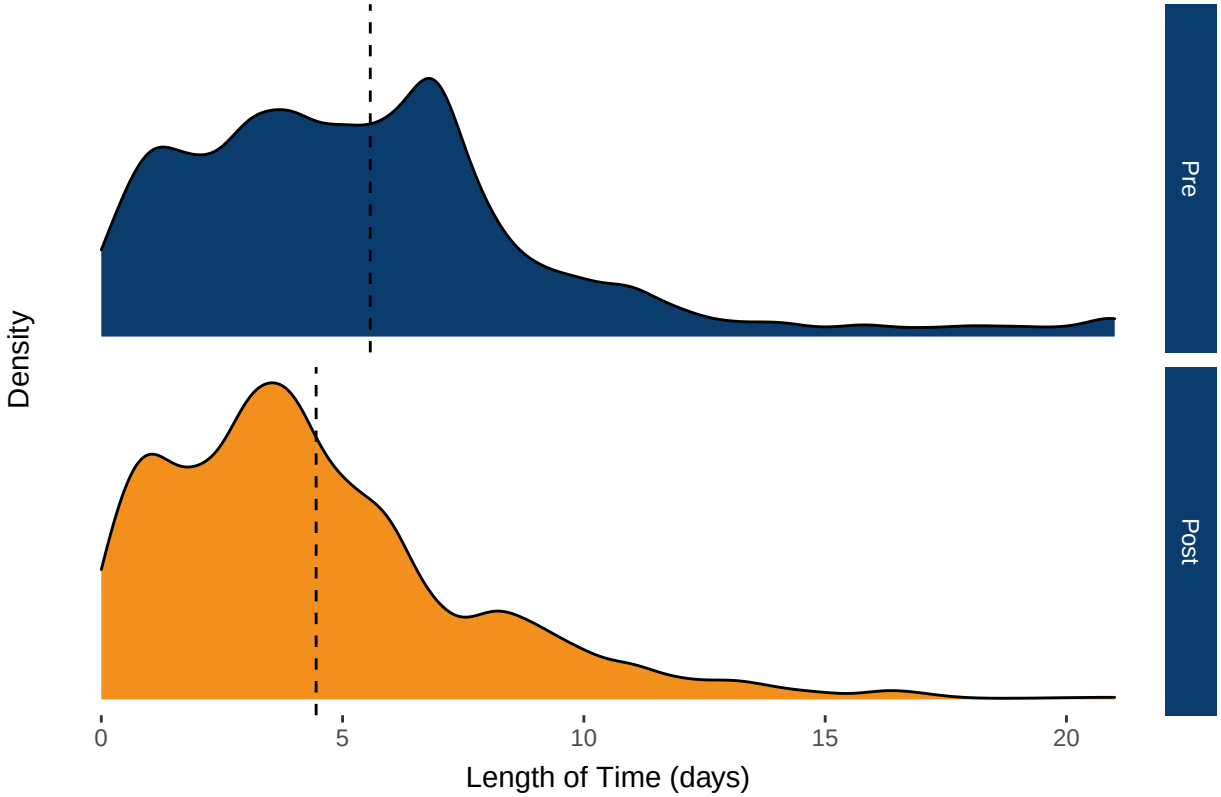


Table 68. Initial and Extension Request Forms Submitted by Specialty Review Board, Case Outcome, and Era

Review Board	Case Outcome	Policy Era	
		Pre	Post
Regional Review Boards	Approved	2356 (90.3%)	0 (0.0%)
	Score assigned due to time limit	30 (1.1%)	0 (0.0%)
	Indeterminate	4 (0.2%)	0 (0.0%)
	Denied	136 (5.2%)	0 (0.0%)
	Withdrawn prior to decision	72 (2.8%)	0 (0.0%)
	Withdrawn after approval	11 (0.4%)	0 (0.0%)
Review Board - Adult HCC	Approved	963 (79.3%)	2267 (89.6%)
	Score assigned due to time limit	4 (0.3%)	2 (0.1%)
	Denied	220 (18.1%)	222 (8.8%)
	Withdrawn prior to decision	22 (1.8%)	30 (1.2%)
	Withdrawn after approval	6 (0.5%)	8 (0.3%)
Review Board - Adult Other Diagnosis	Approved	392 (50.9%)	478 (66%)
	Score assigned due to time limit	5 (0.6%)	1 (0.1%)
	Denied	324 (42.1%)	222 (30.7%)
	Withdrawn prior to decision	48 (6.2%)	20 (2.8%)
	Withdrawn after approval	1 (0.1%)	3 (0.4%)
Review Board - Pediatrics	Approved	146 (67.3%)	241 (72.4%)
	Score assigned due to time limit	1 (0.5%)	1 (0.3%)
	Denied	66 (30.4%)	76 (22.8%)
	Withdrawn prior to decision	4 (1.8%)	14 (4.2%)
	Withdrawn after approval	0 (0.0%)	1 (0.3%)
Withdrawn prior to Review Board Assignment	Withdrawn prior to decision	33 (100%)	20 (100%)
Auto Approved	Approved	1826 (98.9%)	2087 (98.7%)
	Withdrawn after approval	20 (1.1%)	27 (1.3%)

Comparisons between specialty review boards of the NLRB pre- and post-policy should be interpreted with caution, as the NLRB was implemented half-way through the pre-policy era on May 14, 2019. However, for all specialty review boards an increase in the approval rates was seen.

Figure 76. Total Process Time (Application Date to Decision Date) for Initial and Extension Exception Forms by Era



** There were N=209 forms removed for missing process time, due to being withdrawn prior to decision.*
*** The dotted vertical lines represent mean days in each era.*

Table 69. Total Process Time (Application Date to Decision Date) for Initial and Extension Exception Forms by Era

	Policy Era	
Time (Days)	Pre	Post
N Forms	4811.0	3586.0
Minimum	0.0	0.0
25th Percentile	2.9	2.0
Median	5.1	3.9
Mean	5.6	4.5
75th Percentile	7.1	5.9
Maximum	21.6	21.5

The average time for an initial or extension request form to be adjudicated by an NLRB specialty review board post-policy decreased from the average time for an initial or extension request for to be adjudicated by the RRB or NLRB pre-policy. This decrease was statistically significant ($t = 13.88$, p-value < 0.001). Half of all initial and extension request forms post-policy were adjudicated in under 4 days, and 75% of these forms were adjudicated within 6 days.

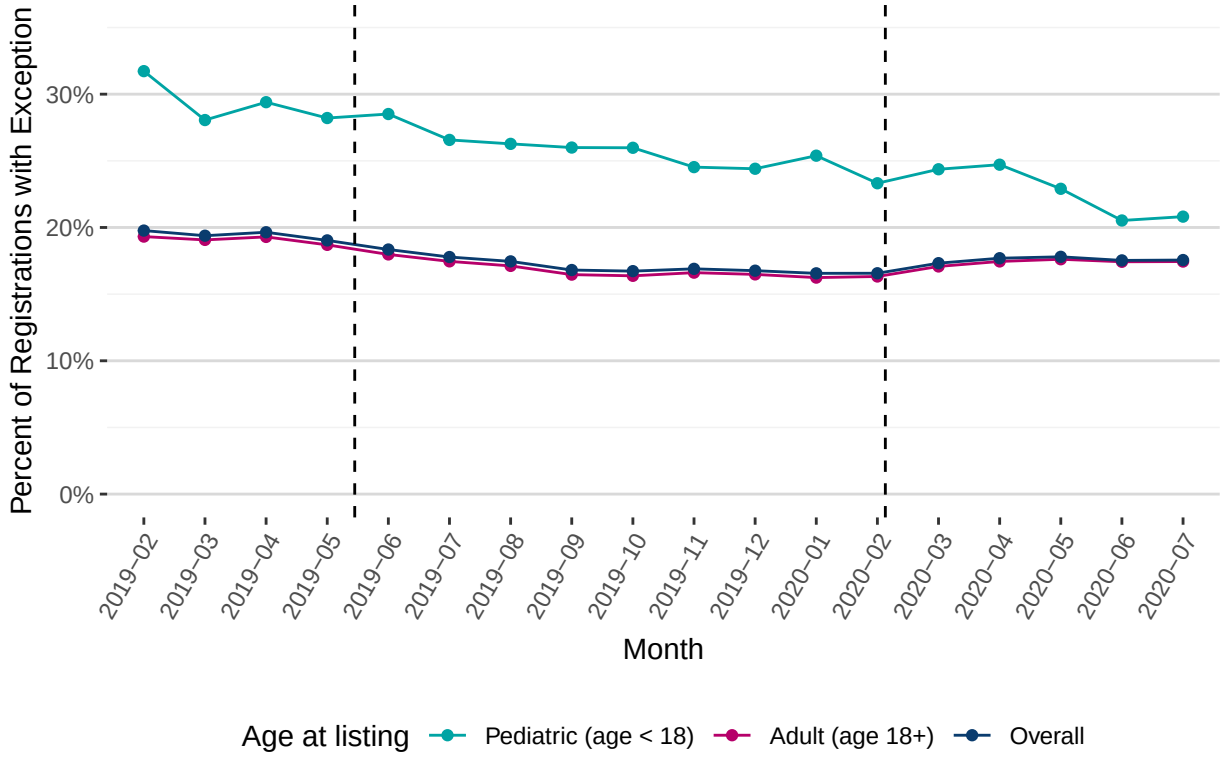
It was also of interest to determine how often exception cases reviewed and denied by the NLRB were resulting in a new initial request form being submitted, rather than an appeal of that particular exception request. To reduce added burden on reviewers, submitting an appeal of a denied exception request is more appropriate than completing a new initial exception request.

There were fewer new, initial request forms submitted post-policy compared to pre-policy; however, the rate of approval was higher post-policy. This should be interpreted keeping in mind the first NLRB implementation date on May 14, 2019 - roughly half-way into the pre-policy period.

Table 70: Number and percent of exception cases reviewed by the NLRB with a new initial form submitted after previously denied initial or extension form, by new initial form status/outcome type

	Policy Era	
Case Status	Pre	Post
Approved	59 (45.0%)	62 (53.0%)
Denied	66 (50.4%)	52 (44.4%)
Withdrawn after approval	0 (0.0%)	1 (0.9%)
Withdrawn prior to decision	6 (4.6%)	2 (1.7%)
Total	131 (100.0%)	117 (100.0%)

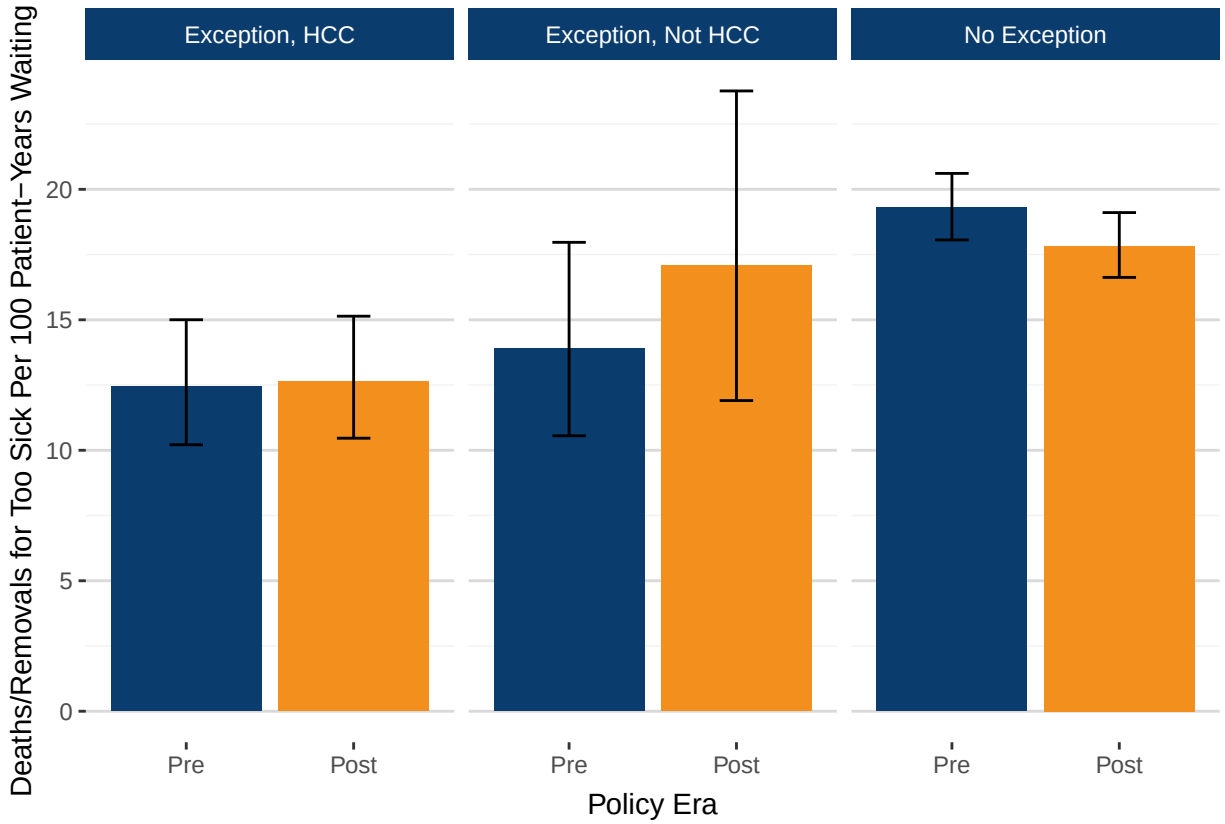
Figure 77. Percentage of Liver Waiting List Registrations with Exception by Month, Age at Listing, and Exception Type



** National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.*
*** The left−hand vertical dotted line represents the initial implemention of the NLRB on 5/14/2019.*
**** The right−hand vertical dotted line represents the implementation of acuity circles and NLRB changes on 2/4/2020.*

There was a dip in the percentage of registrants on the waiting list at any end of each month with an exception score following the implementation of NLRB on May 14, 2019. This was more pronounced for pediatric candidates than adults. While this decreasing trend in the percentage of the waiting list with an exception score continued for pediatric candidates post-policy implementation on February 4, 2020, there was a slight increase for adults. Note that for each month, all listings are counted not just new additions to the waiting list.

Figure 78. Waiting List Deaths or Removals for Too Sick Per 100 Patient-Years Waiting by Exception Type and Era



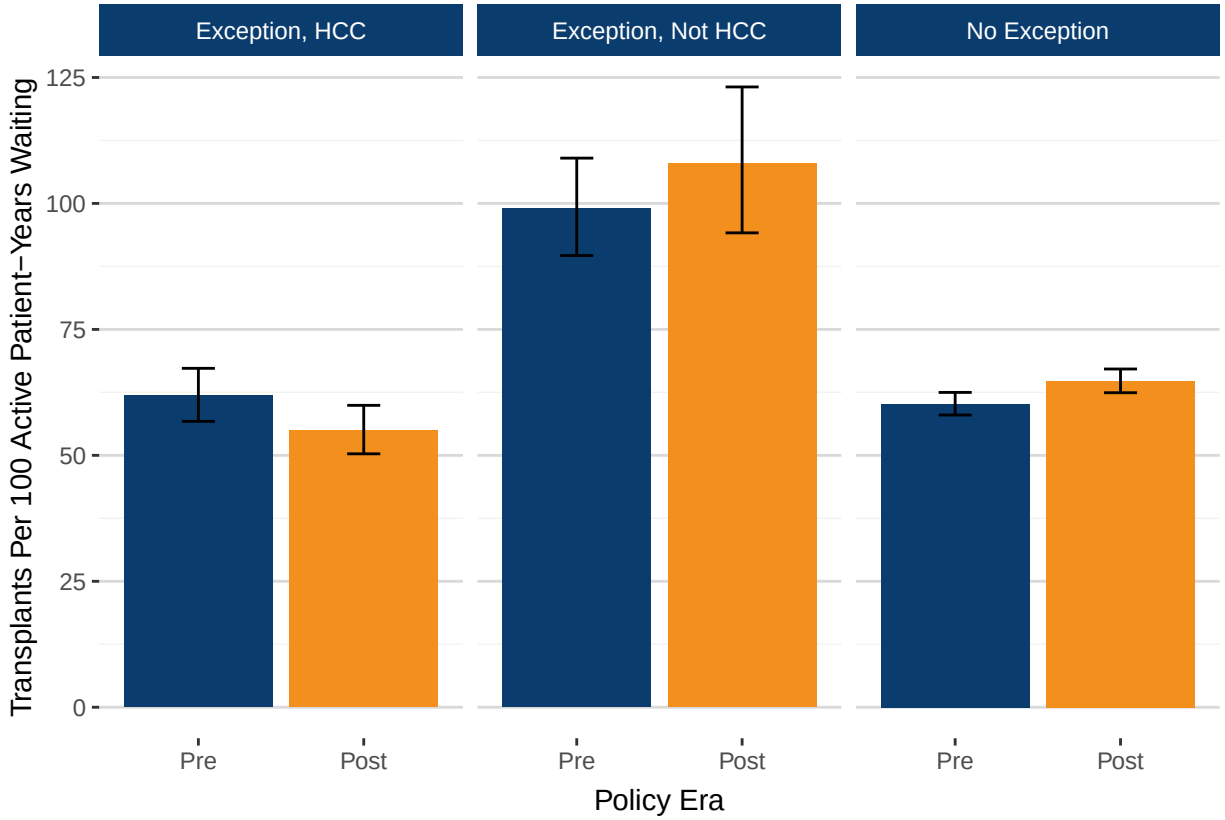
** National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.*

Table 71. Waiting List Deaths or Removals for Too Sick Per 100 Patient-Years Waiting by Exception Type and Era

Exception Status	Policy Era	N Ever Waiting	N Removals	PY	Removals per 100 PY	95% CI
Exception, HCC	Pre	2503	109	876.48	12.44	[10.21, 15.00]
	Post	2540	118	933.50	12.64	[10.46, 15.14]
Exception, Not HCC	Pre	1217	58	417.28	13.90	[10.55, 17.97]
	Post	642	35	204.79	17.09	[11.90, 23.77]
No Exception	Pre	14072	896	4641.68	19.30	[18.06, 20.61]
	Post	13699	807	4524.99	17.83	[16.62, 19.11]

The estimates for the waiting list death rate for non-HCC exception candidates decreased pre-to post-policy and increased for non-exception candidates. Since the confidence intervals pre- and post-policy for the rates for each group overlap, the changes are not statistically significant. While the findings are not statistically significant, the death rate will continue to be closely monitored in future reports, particularly as this does not take into consideration different MELD/PELD scores given small sample sizes at this time.

Figure 79. Transplants Per 100 Active Patient-Years Waiting by MELD or PELD Score/Status, Exception Type, and Era



** National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.*

Table 72. Transplants Per 100 Active Patient-Years Waiting by MELD or PELD Score/Status, Exception Type, and Era

Exception Status	Policy Era	N Ever Waiting	N Transplants	Active PY	Transplants per 100 Active PY	95% CI
Exception, HCC	Pre	2503	542	876.48	61.84	[56.74, 67.27]
	Post	2540	513	933.50	54.95	[50.30, 59.92]
Exception, Not HCC	Pre	1217	413	417.28	98.97	[89.66, 109.00]
	Post	642	221	204.79	107.92	[94.16, 123.12]
No Exception	Pre	14072	2795	4641.68	60.22	[58.00, 62.49]
	Post	13699	2930	4524.99	64.75	[62.43, 67.14]

The estimates for the waiting list transplant rate for HCC exception candidates decreased pre-to post-policy and increased for non-HCC exception and non-exception candidates. Since the confidence intervals pre- and post-policy for the rates for each group overlap, the changes are not statistically significant. While the findings are not statistically significant, the transplant rate will continue to be closely monitored in future reports, particularly as this does not take into consideration different MELD/PELD scores given small sample sizes at this time.

Figure 80. Percentage of Deceased Donor Liver Transplants by Exception Type, Age at Transplant, and Era

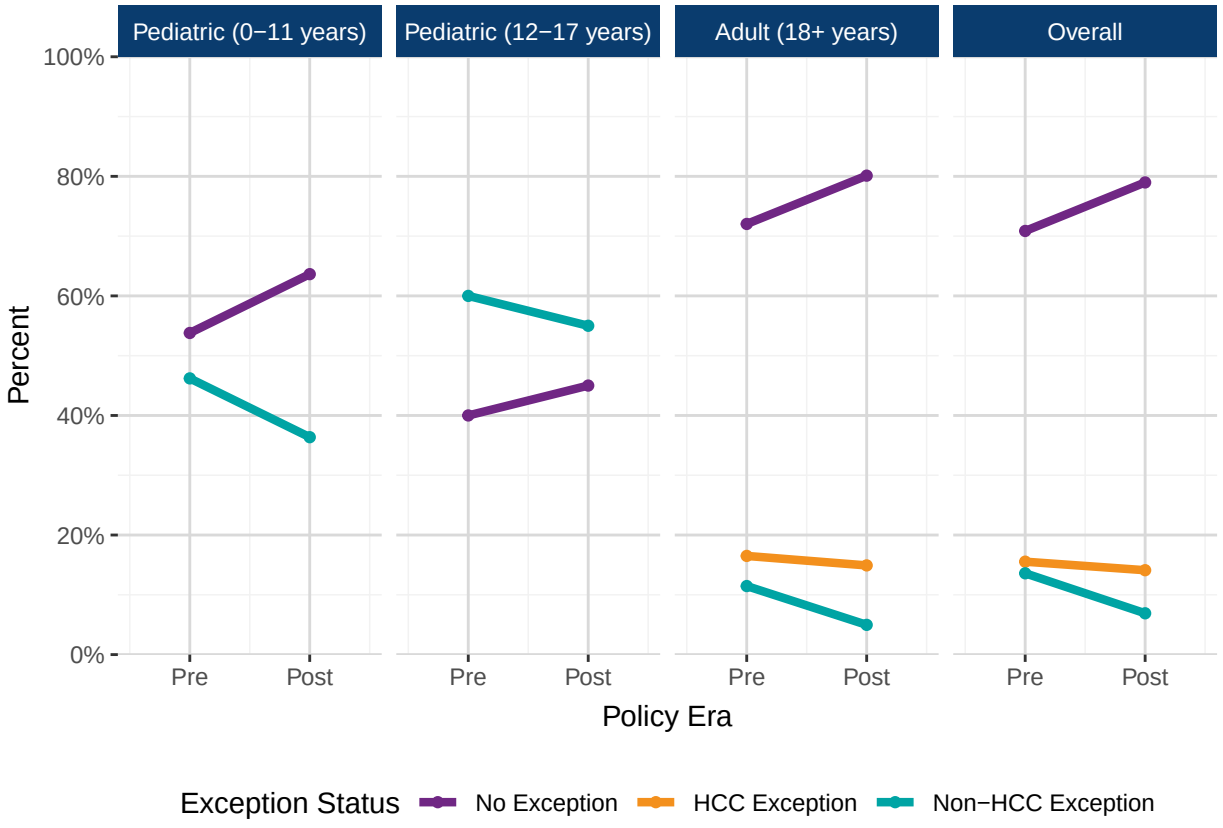


Table 81. Deceased Donor Liver Transplants by Exception Type, Age at Transplant, and Era

		Policy Era	
Recipient Age	Exception Type	Pre	Post
Pediatric (0-11 years)	No Exception	85 (53.8%)	77 (63.6%)
	Non-HCC Exception	73 (46.2%)	44 (36.4%)
Pediatric (12-17 years)	No Exception	10 (40%)	18 (45%)
	Non-HCC Exception	15 (60%)	22 (55%)
Adult (18+ years)	No Exception	2130 (72%)	2272 (80.1%)
	HCC Exception	488 (16.5%)	423 (14.9%)
	Non-HCC Exception	339 (11.5%)	141 (5%)
Overall	No Exception	2225 (70.9%)	2367 (79%)
	HCC Exception	488 (15.5%)	423 (14.1%)
	Non-HCC Exception	427 (13.6%)	207 (6.9%)

The percentage of deceased donor, liver-alone transplants for non-exception recipients increased overall by roughly 8% pre- to post-policy era. This increased percentage of non-exception transplants was highest for pediatric (0-11 years) recipients (+9.8%), followed by adult (18+ years) recipients (+8.1%) and pediatric (12-17 years) recipients (+6.3%). Adult recipients experienced the largest decrease for non-HCC exception transplants, while HCC exception transplants remained fairly similar pre- to post-policy. This will continue to be monitored in future reports, to determine whether this decrease is an appropriate result of the standardization of exceptions with the NLRB or an unintended consequence of changes to the exception scoring changes.

As seen previously in the report, the volume of deceased donor liver recipients aged 0-11 years is lower in the post-policy era.

Figure 81. Percentage of Deceased Donor Liver Transplants by Exception Type, OPTN Region and Era

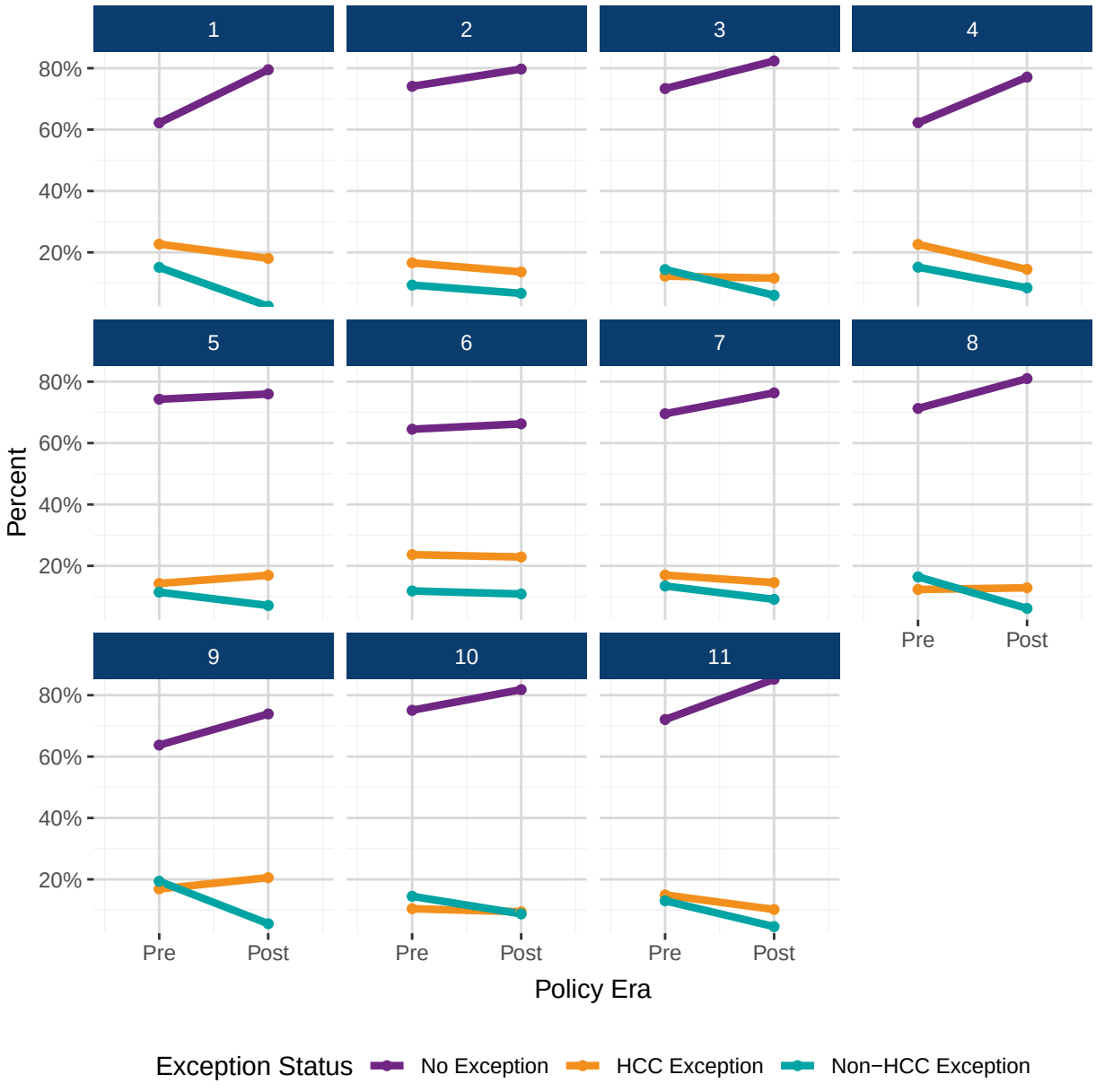


Table 82. Deceased Donor Liver Transplants by Exception Type, OPTN Region, and Era

		Policy Era	
OPTN Region	Exception Type	Pre	Post
1	No Exception	74 (62.2%)	97 (79.5%)
	HCC Exception	27 (22.7%)	22 (18%)
	Non-HCC Exception	18 (15.1%)	3 (2.5%)
2	No Exception	246 (74.1%)	228 (79.7%)
	HCC Exception	55 (16.6%)	39 (13.6%)
	Non-HCC Exception	31 (9.3%)	19 (6.6%)
3	No Exception	413 (73.4%)	355 (82.4%)
	HCC Exception	69 (12.3%)	50 (11.6%)
	Non-HCC Exception	81 (14.4%)	26 (6%)
4	No Exception	201 (62.2%)	256 (77.1%)
	HCC Exception	73 (22.6%)	48 (14.5%)
	Non-HCC Exception	49 (15.2%)	28 (8.4%)
5	No Exception	364 (74.3%)	386 (76%)
	HCC Exception	70 (14.3%)	86 (16.9%)
	Non-HCC Exception	56 (11.4%)	36 (7.1%)
6	No Exception	60 (64.5%)	55 (66.3%)
	HCC Exception	22 (23.7%)	19 (22.9%)
	Non-HCC Exception	11 (11.8%)	9 (10.8%)
7	No Exception	176 (69.6%)	210 (76.4%)
	HCC Exception	43 (17%)	40 (14.5%)
	Non-HCC Exception	34 (13.4%)	25 (9.1%)
8	No Exception	139 (71.3%)	145 (81%)
	HCC Exception	24 (12.3%)	23 (12.8%)
	Non-HCC Exception	32 (16.4%)	11 (6.1%)
9	No Exception	102 (63.7%)	133 (73.9%)
	HCC Exception	27 (16.9%)	37 (20.6%)
	Non-HCC Exception	31 (19.4%)	10 (5.6%)
10	No Exception	223 (75.1%)	243 (81.8%)
	HCC Exception	31 (10.4%)	28 (9.4%)
	Non-HCC Exception	43 (14.5%)	26 (8.8%)
11	No Exception	227 (72.1%)	259 (85.2%)
	HCC Exception	47 (14.9%)	31 (10.2%)
	Non-HCC Exception	41 (13%)	14 (4.6%)

The changes in distribution of non-exception, HCC exception, and non-HCC exception transplant recipients differs by OPTN region, pre- to post-policy. The percentage of non-exception transplant recipients increased in all OPTN regions pre- to post-policy. The largest increase was in region 1, and the smallest increase was in region 5.

OPTN regions 5, 8, and 9 experienced increased percentages of HCC exception transplant recipients post-policy, while all other regions experienced decreases. region 4 experienced the largest decrease pre- to post-policy. In all OPTN Regions, the percentage of non-HCC exception transplant recipients fell from double to single digits pre- to post-policy.

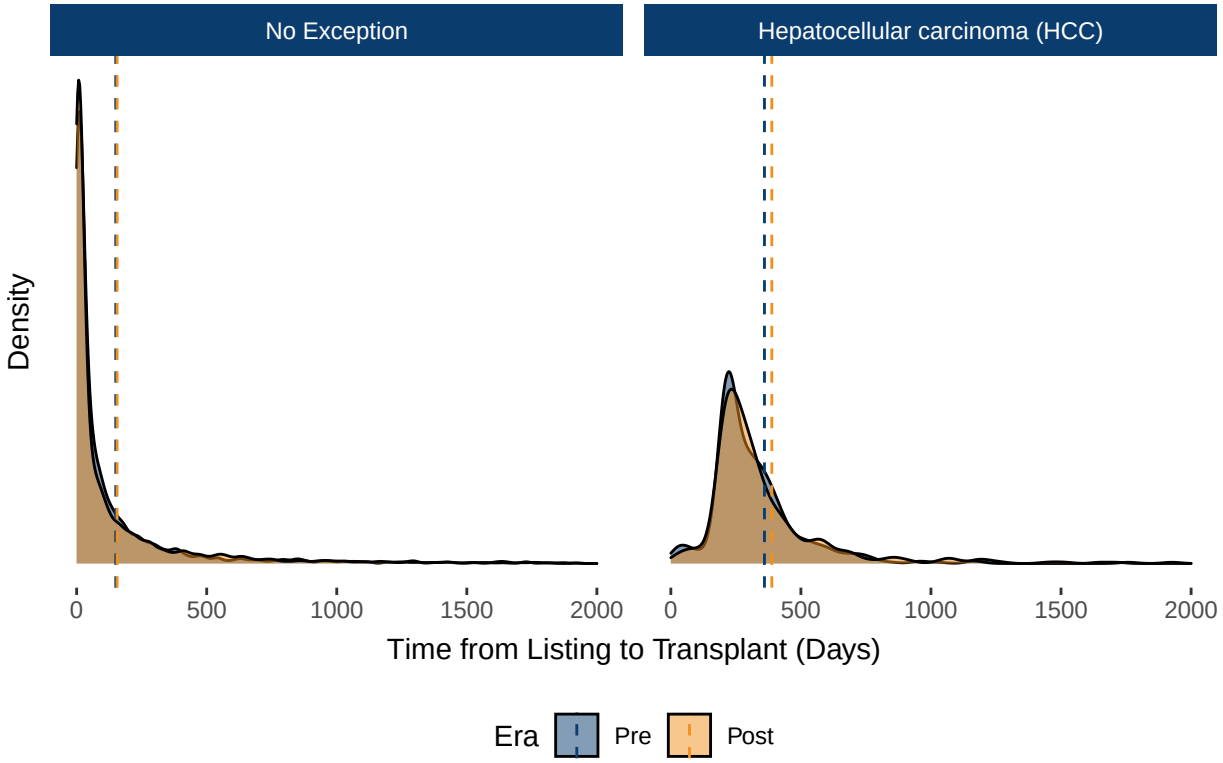
A breakdown by diagnosis is provided for deceased donor liver transplants, particularly for those non-HCC exception recipients.

Table 82. Deceased Donor Liver Transplants by Exception Diagnosis and Era

	Policy Era	
Exception Diagnosis	Pre	Post
No Exception	2225 (70.9%)	2367 (79.0%)
Hepatocellular carcinoma (HCC)	488 (15.5%)	423 (14.1%)
Other specify	321 (10.2%)	119 (4.0%)
Hepatopulmonary syndrome (HPS)	51 (1.6%)	33 (1.1%)
Cholangiocarcinoma (CCA)	18 (0.6%)	25 (0.8%)
Portopulmonary hypertension	18 (0.6%)	10 (0.3%)
Metabolic disease	3 (0.1%)	3 (0.1%)
Cystic fibrosis (CF)	3 (0.1%)	3 (0.1%)
Familial amyloid polyneuropathy (FAP)	1 (0.0%)	0 (0.0%)
Hepatic artery thrombosis (HAT)	12 (0.4%)	14 (0.5%)
Total	3140 (100.0%)	2997 (100.0%)

* Cystic fibrosis (CF) and Cholangiocarcinoma (CCA) were submitted under 'Other specify' with Regional Review Boards and were counted as such in the pre-policy era.

Figure 82. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant, Non-Exception and HCC Exception Diagnosis, by Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate average time waiting within each era.
*** There were 28 pre−policy and 29 post−policy transplant recipients with > 2000 days that are not included.

Table 76. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant, Non-Exception and HCC Exception Diagnosis, by Era

			Time (Days)					
Exception Diagnosis	Policy Era	N	Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
No Exception	Pre	2225	0	7.0	33.0	150.4	135.0	3391
	Post	2367	0	5.0	24.0	155.7	137.5	6987
Hepatocellular carcinoma (HCC)	Pre	488	10	217.0	283.5	360.0	382.5	5104
	Post	423	21	220.5	282.0	388.1	398.5	5612

The distribution of days from listing to deceased donor transplant for non-exception recipients remained similar pre- and post-policy, with some shifts at each of the ends of extremes. The median decreased by 9 days, while the average increased by 5.3 days pre- to post-policy. This may be due to a number of individuals with much longer wait times being transplanted in the post-policy era.

The distribution of days from listing to deceased donor transplant for HCC exception recipients also remained similar pre- and post-policy. The median decreased by 1.5 days, while the average increased by 28.2 days pre- to post-policy.

Table 77. Waiting List Removals Due to Death or Too Sick to Transplant by Exception Diagnosis and Era

	Policy Era	
Exception diagnosis	Pre	Post
No Exception	1071 (84.5%)	935 (78.2%)
Hepatocellular carcinoma (HCC)	120 (9.5%)	190 (15.9%)
Other specify	62 (4.9%)	46 (3.8%)
Hepatopulmonary syndrome (HPS)	9 (0.7%)	9 (0.8%)
Cholangiocarcinoma (CCA)	1 (0.1%)	9 (0.8%)
Portopulmonary hypertension	4 (0.3%)	4 (0.3%)
Hepatic artery thrombosis (HAT)	0 (0.0%)	3 (0.3%)
Metabolic disease	1 (0.1%)	0 (0.0%)
Total	1268 (100.0%)	1196 (100.0%)

* Cystic fibrosis (CF) and Cholangiocarcinoma (CCA) were submitted under 'Other specify' with Regional Review Boards and may be counted as such in the pre-policy era.

There were fewer removals from the liver waiting list due to death or too sick to transplant post-policy compared to pre-policy. In both eras, the majority of removals were non-exception candidates. However, the percentage of removals with HCC exceptions increased, accounting for almost 16% of all removals post-policy, compared to 9.5% pre-policy. Changes in remvals from the waiting list post-policy must be considered in light of the COVID emergency declaration.

Conclusion

This report provides a review of the first six months under acuity circle allocation changes, both for allocation and the National Liver Review Board. A national state of emergency was declared due to COVID-19 on March 13, 2020, making the true impact of this policy change challenging to determine. While changes pre- to post-policy must be considered in light of this national emergency, many of the results thus far are supported by the predictions of the SRTR modeling prior to implementation of the acuity circle allocation policy. Some of the main findings from this report include:

- Decreased variance in median allocation MELD or PELD score at transplant when examined by different geographies, including state, DSA and by OPTN region
- Increased median allocation MELD or PELD score at transplant for DSAs with previously lower medians under previous policy
- Increased median allocation MELD or PELD score at transplant for deceased donor, non-exception, liver transplant recipients
- Increased percentage of non-exception transplant recipients, similar percentage of HCC exception transplant recipients, and decreased percentage of non-HCC exception transplant recipients
- Increased distance from donor hospital to transplant program of recipient
- No changes in liver waiting list transplant rates, by candidate exception status
- Decreased liver waiting list mortality rates for non-exception transplant candidates
- Increased national liver discard rate and decreased national utilization rate
- Decreased removals from the liver waiting list due to death or too sick to transplant

Regarding the impact of the NLRB, trends continued in similar directions as to what was seen in the first nine months of this policy change under DSAs and OPTN regions for allocation as well as the first three months post-acuity circles allocation. Here, comparisons pre- and post- implementation on February 4, 2020 must keep in mind the prior changes from regional review boards to the NLRB on May 14, 2019 in the pre-policy era. However, notable highlights include:

- Increased percentages of initial and extension request forms automatically approved, decreasing the forms requiring additional review
- Increased approval rates of initial and extension request forms
- Decreased time from exception request form submission to adjudication
- Decreased non-HCC exception, deceased donor, liver-alone transplant recipients
- Similar waiting list mortality (removals for death or too sick to transplant) and waiting list transplant rates, by exception status

The COVID-19 crisis has created challenges in many sectors, but particularly the medical field. Specific to transplantation, changes in potential patient evaluation, organ procurement, and transplant recipient selection process, as well as acceptance behaviors and routine outpatient activities, including clinical testing, have interrupted the ability to fully realize and understand any policy changes during this time. The confounding effects of COVID-19 cannot be parsed out from potential policy effects, and continued data accumulation and monitoring of the system will be needed to determine when the effects of this crisis may no longer be an influential factor.

Appendix

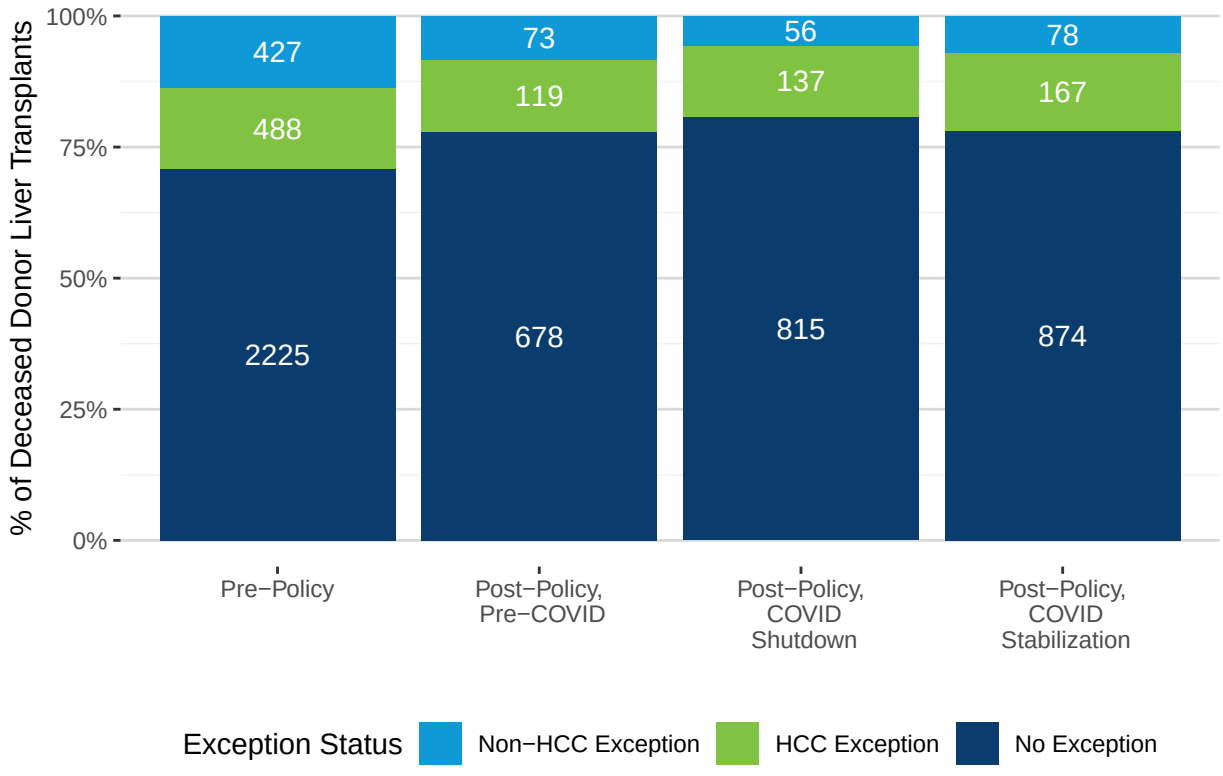
COVID-19 Breakdowns

This section provides additional figures breaking the post-policy era into smaller periods of time to explore whether differences occurred during various periods of the COVID crisis. Acuity circles allocation policy was implemented on February 4, 2020. Post-implementation monitoring with additional COVID-19 eras are defined as follows:

1. Pre-Policy (transplants: February 5 - July 2, 2019; all else: February 5 - August 6, 2019)
2. Post-Policy, Pre-COVID (February 4 - March 12, 2020)
3. Post-Policy, COVID Shutdown (March 13 - May 9, 2020)
4. Post-Policy, COVID Stabilization (transplants: May 10 - June 30, 2020; all else: May 10 - August 4, 2020)

For further information and data supporting these cutoffs, see the **COVID-19 and solid organ transplant dashboard** (https://unos.org/covid/).

Figure 83. Deceased Donor Liver Transplants by Exception Status and Era



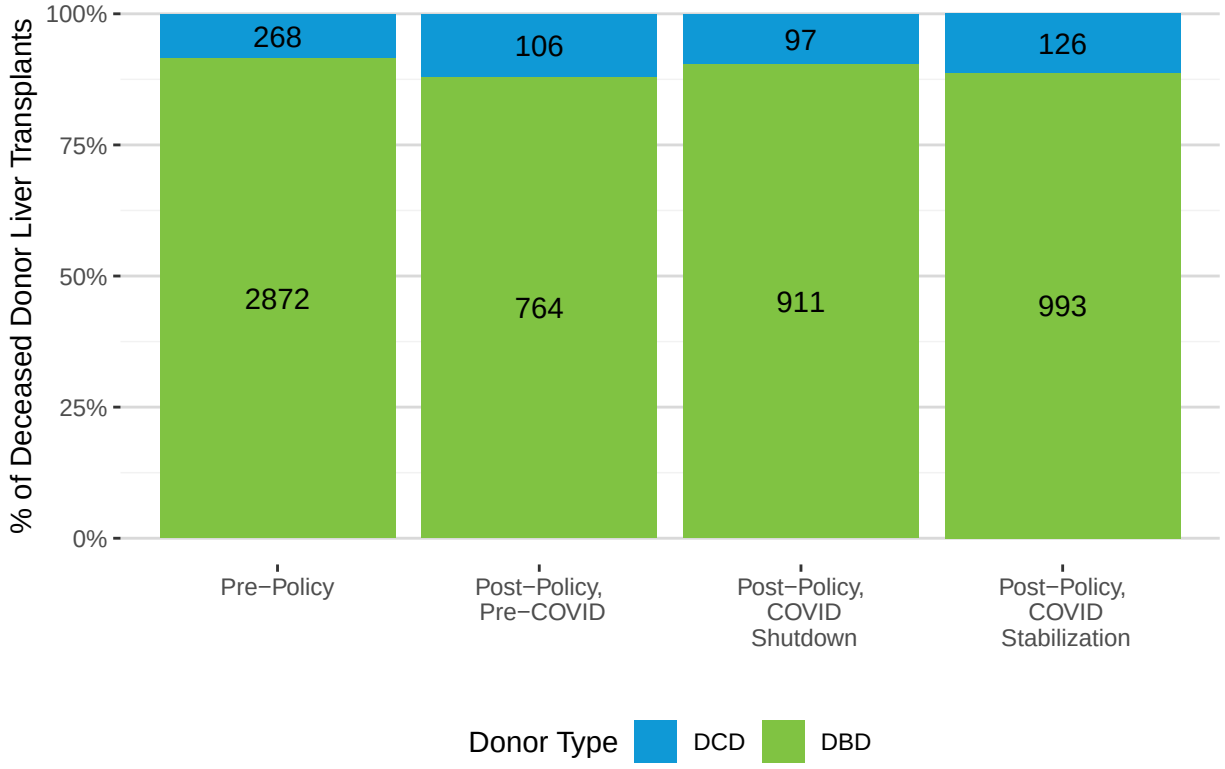
Pre−Policy: February 5 − July 2, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020;
Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − June 30, 2020

Table 78. Number and Percent of Deceased Donor Liver Transplants by Exception Status and Era

	Policy Era			
Exception Status	Pre-Policy	Post-Policy, Pre-COVID	Post-Policy, COVID Shutdown	Post-Policy, COVID Stabilization
No Exception	2225 (70.9%)	678 (77.9%)	815 (80.9%)	874 (78.1%)
HCC Exception	488 (15.5%)	119 (13.7%)	137 (13.6%)	167 (14.9%)
Non-HCC Exception	427 (13.6%)	73 (8.4%)	56 (5.6%)	78 (7.0%)
Total	3140 (100.0%)	870 (100.0%)	1008 (100.0%)	1119 (100.0%)

* Pre-Policy: February 5 - July 2, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - June 30, 2020

Figure 84. Deceased Donor Liver Transplants by Donor Type and Era



Pre−Policy: February 5 − July 2, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020;
Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − June 30, 2020

Table 79. Number and Percent of Deceased Donor Liver Transplants by Donor Type and Era

	Policy Era			
Donor Type	Pre-Policy	Post-Policy, Pre-COVID	Post-Policy, COVID Shutdown	Post-Policy, COVID Stabilization
DCD	268 (8.5%)	106 (12.2%)	97 (9.6%)	126 (11.3%)
DBD	2872 (91.5%)	764 (87.8%)	911 (90.4%)	993 (88.7%)
Total	3140 (100.0%)	870 (100.0%)	1008 (100.0%)	1119 (100.0%)

* Pre-Policy: February 5 - July 2, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - June 30, 2020

Figure 85. Deceased Donor Liver Transplants by OPTN Region and Era

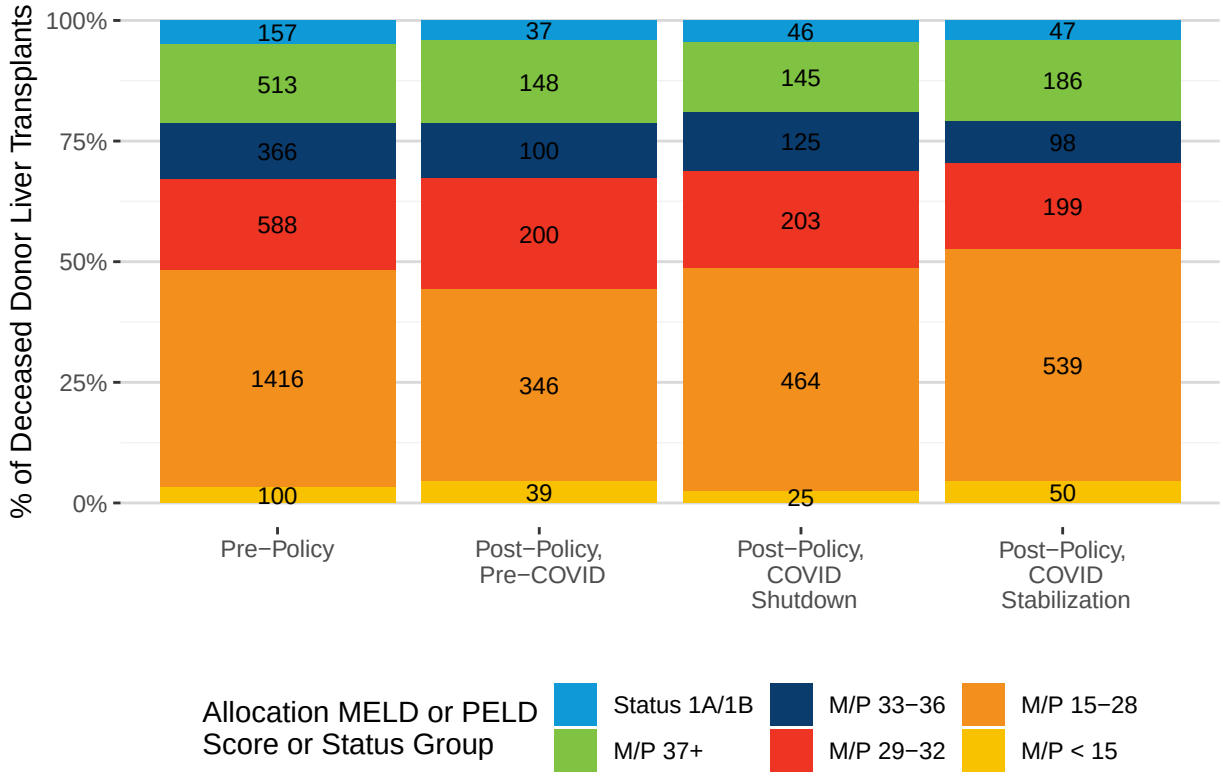
Pre−Policy: February 5 − July 2, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020;
Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − June 30, 2020

Table 80. Number and Percent of Deceased Donor Liver Transplants by OPTN Region and Era

	Policy Era			
OPTN Region	Pre-Policy	Post-Policy, Pre-COVID	Post-Policy, COVID Shutdown	Post-Policy, COVID Stabilization
1	119 (3.8%)	52 (6.0%)	36 (3.6%)	34 (3.0%)
2	332 (10.6%)	76 (8.7%)	104 (10.3%)	106 (9.5%)
3	563 (17.9%)	110 (12.6%)	146 (14.5%)	175 (15.6%)
4	323 (10.3%)	99 (11.4%)	114 (11.3%)	119 (10.6%)
5	490 (15.6%)	154 (17.7%)	180 (17.9%)	174 (15.5%)
6	93 (3.0%)	25 (2.9%)	26 (2.6%)	32 (2.9%)
7	253 (8.1%)	94 (10.8%)	85 (8.4%)	96 (8.6%)
8	195 (6.2%)	51 (5.9%)	57 (5.7%)	71 (6.3%)
9	160 (5.1%)	49 (5.6%)	55 (5.5%)	76 (6.8%)
10	297 (9.5%)	84 (9.7%)	94 (9.3%)	119 (10.6%)
11	315 (10.0%)	76 (8.7%)	111 (11.0%)	117 (10.5%)
Total	3140 (100.0%)	870 (100.0%)	1008 (100.0%)	1119 (100.0%)

* Pre-Policy: February 5 - July 2, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - June 30, 2020

Figure 86. Deceased Donor Liver Transplants by Allocation MELD or PELD Score or Status and Era



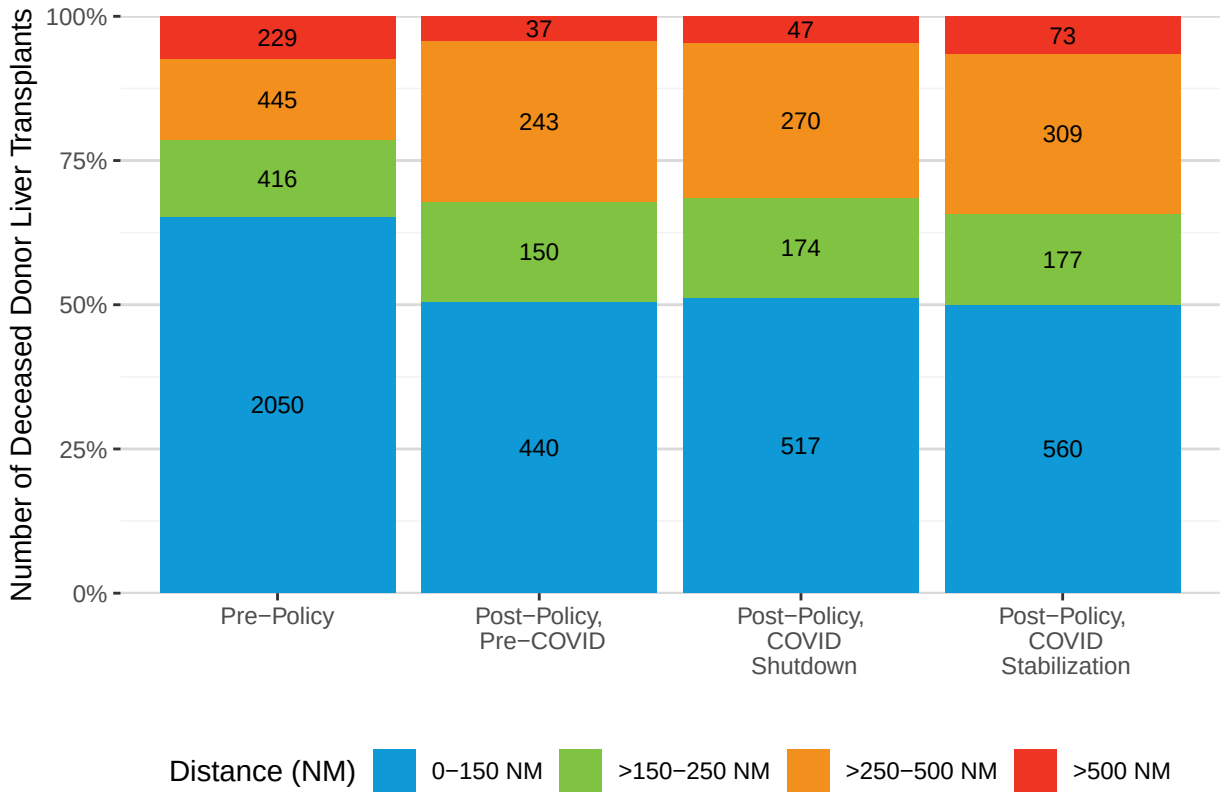
Pre−Policy: February 5 − July 2, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020;
Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − June 30, 2020

Table 80. Number of Deceased Donor Liver Transplants by Allocation MELD or PELD Score/Status Group and Era

	Policy Era			
Score or Status Group	Pre-Policy	Post-Policy, Pre-COVID	Post-Policy, COVID Shutdown	Post-Policy, COVID Stabilization
Status 1A/1B	157 (5.0%)	37 (4.3%)	46 (4.6%)	47 (4.2%)
M/P 37+	513 (16.3%)	148 (17.0%)	145 (14.4%)	186 (16.6%)
M/P 33-36	366 (11.7%)	100 (11.5%)	125 (12.4%)	98 (8.8%)
M/P 29-32	588 (18.7%)	200 (23.0%)	203 (20.1%)	199 (17.8%)
M/P 15-28	1416 (45.1%)	346 (39.8%)	464 (46.0%)	539 (48.2%)
M/P < 15	100 (3.2%)	39 (4.5%)	25 (2.5%)	50 (4.5%)
Temporarily Inactive	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total	3140 (100.0%)	870 (100.0%)	1008 (100.0%)	1119 (100.0%)

* Pre-Policy: February 5 - July 2, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - June 30, 2020

Figure 87. Deceased Donor Liver Transplants by Classification Distance and Era



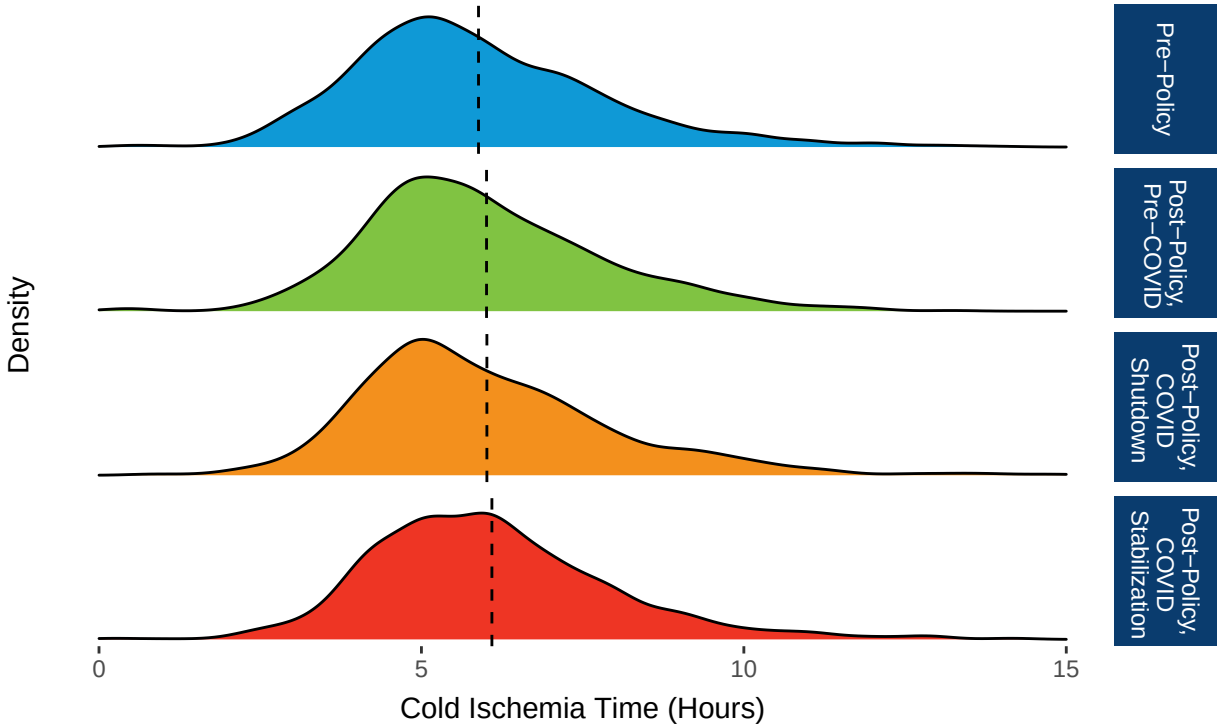
Pre−Policy: February 5 − July 2, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020;
Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − June 30, 2020

Table 81. Number of Deceased Donor Liver Transplants by Distance and Era

	Policy Era			
Score or Status Group	Pre-Policy	Post-Policy, Pre-COVID	Post-Policy, COVID Shutdown	Post-Policy, COVID Stabilization
0-150 NM	2050 (65.3%)	440 (50.6%)	517 (51.3%)	560 (50.0%)
>150-250 NM	416 (13.2%)	150 (17.2%)	174 (17.3%)	177 (15.8%)
>250-500 NM	445 (14.2%)	243 (27.9%)	270 (26.8%)	309 (27.6%)
>500 NM	229 (7.3%)	37 (4.3%)	47 (4.7%)	73 (6.5%)
Total	3140 (100.0%)	870 (100.0%)	1008 (100.0%)	1119 (100.0%)

* Pre-Policy: February 5 - July 2, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - June 30, 2020

Figure 88. Distribution of Cold Ischemia Time by Era



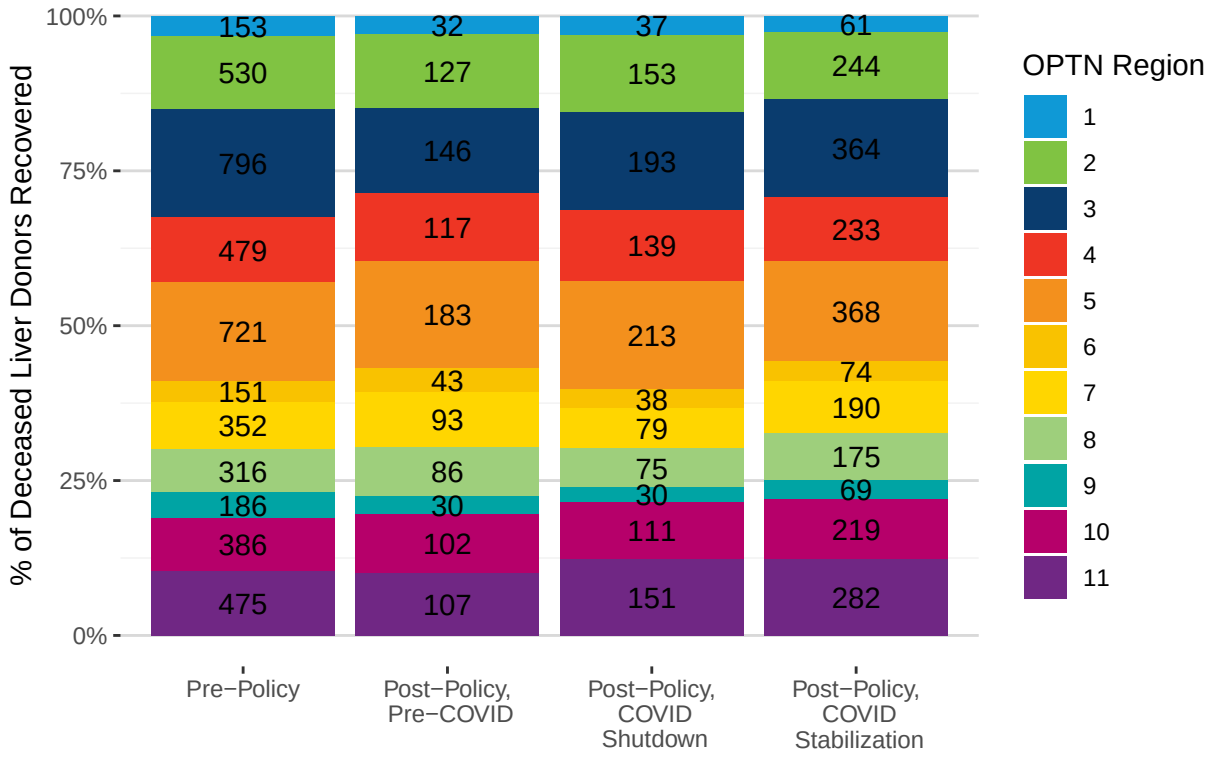
Pre−Policy: February 5 − July 2, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020;
Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − June 30, 2020
** Dotted lines indicate average cold ischemia time within each era.
*** There were 15 pre−policy; 15 post−policy, pre−COVID; 30 post−policy, COVID shutdown; 70 post−policy, COVID stabilizati
^ There were 5 pre−policy and 4 post−policy transplant recipients with cold ischemia time > 15 hours not included.

Table 82. Distribution of Cold Ischemia Time and Era

		Time (hours)					
Policy Era	N	Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
Pre-Policy	3125	0.28	4.52	5.57	5.89	7.00	34.67
Post-Policy, Pre-COVID	855	0.42	4.74	5.70	6.01	7.00	43.00
Post-Policy, COVID Shutdown	978	0.83	4.68	5.63	6.02	7.00	17.63
Post-Policy, COVID Stabilization	1049	0.07	4.85	5.92	6.09	7.06	17.43

* Pre-Policy: February 5 - July 2, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - June 30, 2020

Figure 89. Deceased Liver Donors Recovered by OPTN Region and Era



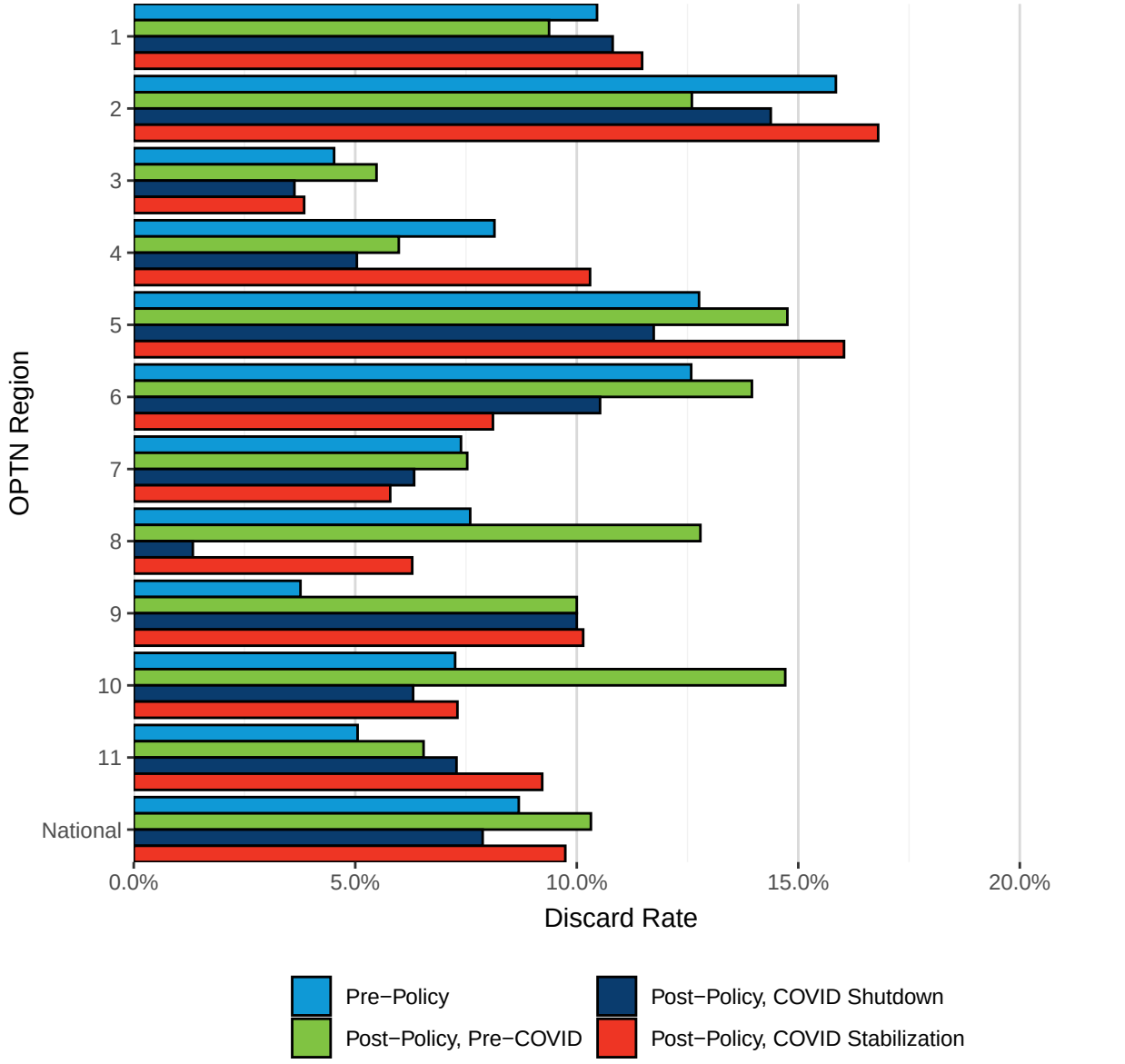
Pre−Policy: February 5 − August 6, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020; Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − August 4, 2020

Table 83. Number of Deceased Liver Donors Recovered by OPTN Region and Era

	Policy Era			
OPTN Region	Pre-Policy	Post-Policy, Pre-COVID	Post-Policy, COVID Shutdown	Post-Policy, COVID Stabilization
1	153 (3.4%)	32 (3.0%)	37 (3.0%)	61 (2.7%)
2	530 (11.7%)	127 (11.9%)	153 (12.6%)	244 (10.7%)
3	796 (17.5%)	146 (13.7%)	193 (15.8%)	364 (16.0%)
4	479 (10.5%)	117 (11.0%)	139 (11.4%)	233 (10.2%)
5	721 (15.9%)	183 (17.2%)	213 (17.5%)	368 (16.1%)
6	151 (3.3%)	43 (4.0%)	38 (3.1%)	74 (3.2%)
7	352 (7.7%)	93 (8.7%)	79 (6.5%)	190 (8.3%)
8	316 (7.0%)	86 (8.1%)	75 (6.2%)	175 (7.7%)
9	186 (4.1%)	30 (2.8%)	30 (2.5%)	69 (3.0%)
10	386 (8.5%)	102 (9.6%)	111 (9.1%)	219 (9.6%)
11	475 (10.5%)	107 (10.0%)	151 (12.4%)	282 (12.4%)
Total	4545 (100.0%)	1066 (100.0%)	1219 (100.0%)	2279 (100.0%)

* Pre-Policy: February 5 - August 6, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - August 4, 2020

Figure 90. Liver Discard Rate by OPTN Region and Era



Pre−Policy: February 5 − August 6, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020;
Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − August 4, 202(

Table 83. Liver Discard Rate by OPTN Region and Era

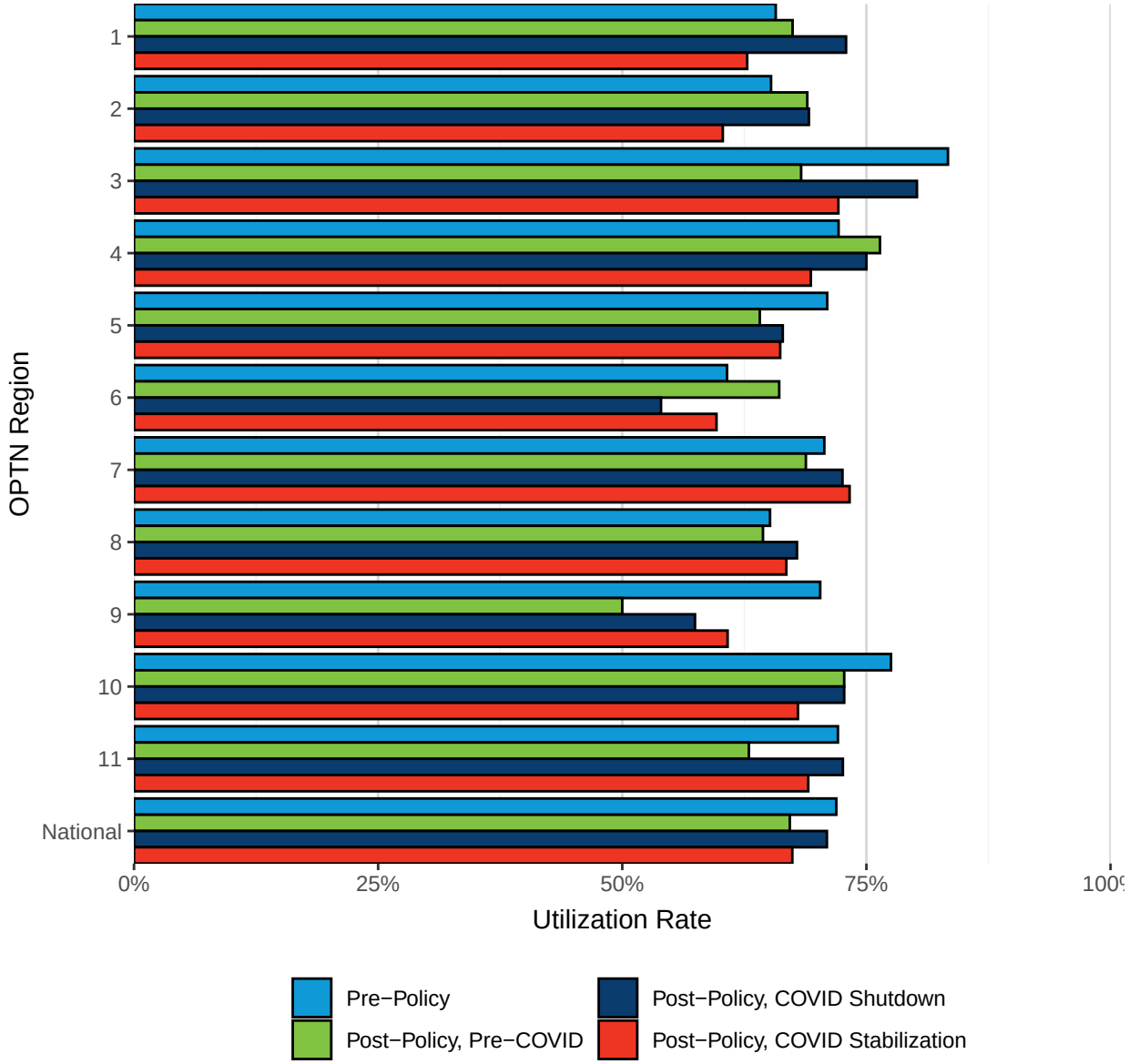
OPTN Region	Policy Era	N Recovered	N Not Transplanted	Discard Rate
National	Pre-Policy	4545	395	8.69
	Post-Policy, Pre-COVID	1066	110	10.32
	Post-Policy, COVID Shutdown	1219	96	7.88
	Post-Policy, COVID Stabilization	2279	222	9.74

* Pre-Policy: February 5 - August 6, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - August 4, 2020

OPTN Region	Policy Era	N Recovered	N Not Transplanted	Discard Rate
1	Pre-Policy	153	16	10.46
	Post-Policy, Pre-COVID	32	3	9.38
	Post-Policy, COVID Shutdown	37	4	10.81
	Post-Policy, COVID Stabilization	61	7	11.48
2	Pre-Policy	530	84	15.85
	Post-Policy, Pre-COVID	127	16	12.60
	Post-Policy, COVID Shutdown	153	22	14.38
	Post-Policy, COVID Stabilization	244	41	16.80
3	Pre-Policy	796	36	4.52
	Post-Policy, Pre-COVID	146	8	5.48
	Post-Policy, COVID Shutdown	193	7	3.63
	Post-Policy, COVID Stabilization	364	14	3.85
4	Pre-Policy	479	39	8.14
	Post-Policy, Pre-COVID	117	7	5.98
	Post-Policy, COVID Shutdown	139	7	5.04
	Post-Policy, COVID Stabilization	233	24	10.30
5	Pre-Policy	721	92	12.76
	Post-Policy, Pre-COVID	183	27	14.75
	Post-Policy, COVID Shutdown	213	25	11.74
	Post-Policy, COVID Stabilization	368	59	16.03
6	Pre-Policy	151	19	12.58
	Post-Policy, Pre-COVID	43	6	13.95
	Post-Policy, COVID Shutdown	38	4	10.53
	Post-Policy, COVID Stabilization	74	6	8.11
7	Pre-Policy	352	26	7.39
	Post-Policy, Pre-COVID	93	7	7.53
	Post-Policy, COVID Shutdown	79	5	6.33
	Post-Policy, COVID Stabilization	190	11	5.79
8	Pre-Policy	316	24	7.59
	Post-Policy, Pre-COVID	86	11	12.79
	Post-Policy, COVID Shutdown	75	1	1.33
	Post-Policy, COVID Stabilization	175	11	6.29
9	Pre-Policy	186	7	3.76
	Post-Policy, Pre-COVID	30	3	10.00
	Post-Policy, COVID Shutdown	30	3	10.00
	Post-Policy, COVID Stabilization	69	7	10.14
10	Pre-Policy	386	28	7.25
	Post-Policy, Pre-COVID	102	15	14.71
	Post-Policy, COVID Shutdown	111	7	6.31
	Post-Policy, COVID Stabilization	219	16	7.31
11	Pre-Policy	475	24	5.05
	Post-Policy, Pre-COVID	107	7	6.54
	Post-Policy, COVID Shutdown	151	11	7.28
	Post-Policy, COVID Stabilization	282	26	9.22

* Pre-Policy: February 5 - August 6, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - August 4, 2020

Figure 91. Liver Utilization Rate by OPTN Region and Era



Pre−Policy: February 5 − August 6, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020;
Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − August 4, 202(

Table 84. Liver Utilization Rate by OPTN Region and Era

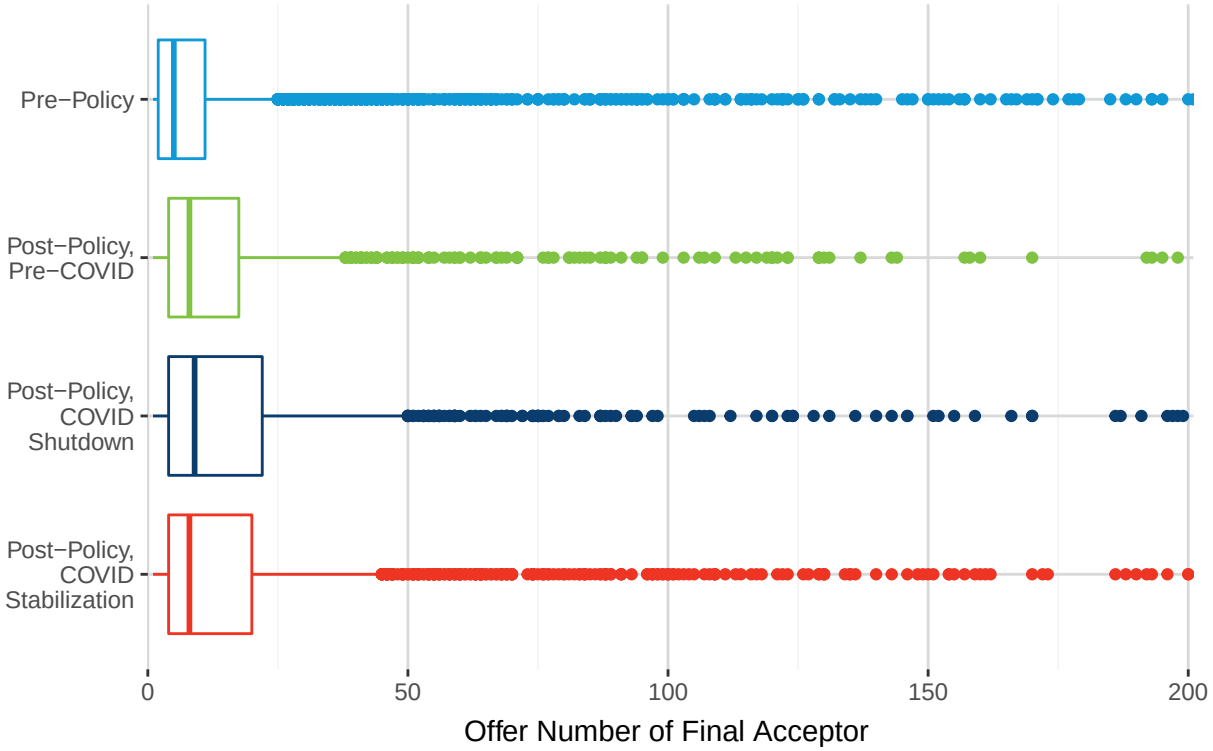
OPTN Region	Policy Era	N Organ Donors	N Livers Transplanted	Utilization Rate
National	Pre-Policy	5847	4205	71.92
	Post-Policy, Pre-COVID	1431	961	67.16
	Post-Policy, COVID Shutdown	1594	1131	70.95
	Post-Policy, COVID Stabilization	3081	2077	67.41

* Pre-Policy: February 5 - August 6, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - August 4, 2020

OPTN Region	Policy Era	N Organ Donors	N Livers Transplanted	Utilization Rate
1	Pre-Policy	210	138	65.71
	Post-Policy, Pre-COVID	43	29	67.44
	Post-Policy, COVID Shutdown	48	35	72.92
	Post-Policy, COVID Stabilization	86	54	62.79
2	Pre-Policy	699	456	65.24
	Post-Policy, Pre-COVID	161	111	68.94
	Post-Policy, COVID Shutdown	191	132	69.11
	Post-Policy, COVID Stabilization	340	205	60.29
3	Pre-Policy	913	761	83.35
	Post-Policy, Pre-COVID	202	138	68.32
	Post-Policy, COVID Shutdown	232	186	80.17
	Post-Policy, COVID Stabilization	488	352	72.13
4	Pre-Policy	614	443	72.15
	Post-Policy, Pre-COVID	144	110	76.39
	Post-Policy, COVID Shutdown	176	132	75.00
	Post-Policy, COVID Stabilization	303	210	69.31
5	Pre-Policy	903	641	70.99
	Post-Policy, Pre-COVID	245	157	64.08
	Post-Policy, COVID Shutdown	286	190	66.43
	Post-Policy, COVID Stabilization	473	313	66.17
6	Pre-Policy	219	133	60.73
	Post-Policy, Pre-COVID	56	37	66.07
	Post-Policy, COVID Shutdown	63	34	53.97
	Post-Policy, COVID Stabilization	114	68	59.65
7	Pre-Policy	464	328	70.69
	Post-Policy, Pre-COVID	125	86	68.80
	Post-Policy, COVID Shutdown	102	74	72.55
	Post-Policy, COVID Stabilization	247	181	73.28
8	Pre-Policy	456	297	65.13
	Post-Policy, Pre-COVID	118	76	64.41
	Post-Policy, COVID Shutdown	109	74	67.89
	Post-Policy, COVID Stabilization	247	165	66.80
9	Pre-Policy	259	182	70.27
	Post-Policy, Pre-COVID	54	27	50.00
	Post-Policy, COVID Shutdown	47	27	57.45
	Post-Policy, COVID Stabilization	102	62	60.78
10	Pre-Policy	476	369	77.52
	Post-Policy, Pre-COVID	121	88	72.73
	Post-Policy, COVID Shutdown	143	104	72.73
	Post-Policy, COVID Stabilization	303	206	67.99
11	Pre-Policy	634	457	72.08
	Post-Policy, Pre-COVID	162	102	62.96
	Post-Policy, COVID Shutdown	197	143	72.59
	Post-Policy, COVID Stabilization	378	261	69.05

* Pre-Policy: February 5 - August 6, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - August 4, 2020

Figure 92. Distribution of Sequence Number of Final Acceptor on Liver Match Run by Era



Pre−Policy: February 5 − August 6, 2019; Post−Policy, Pre−COVID: February 4 − March 12, 2020; Post−Policy, COVID Shutdown: March 13 − May 9, 2020; Post−Policy, COVID Stabilization: May 10 − August 4, 2
** There were 196 final acceptances in pre−policy; 58 post−policy, pre−COVID; 46 post−policy, COVID shutdown and 125 post−policy, COVID stabilization, respectively, with an offer number over 200.

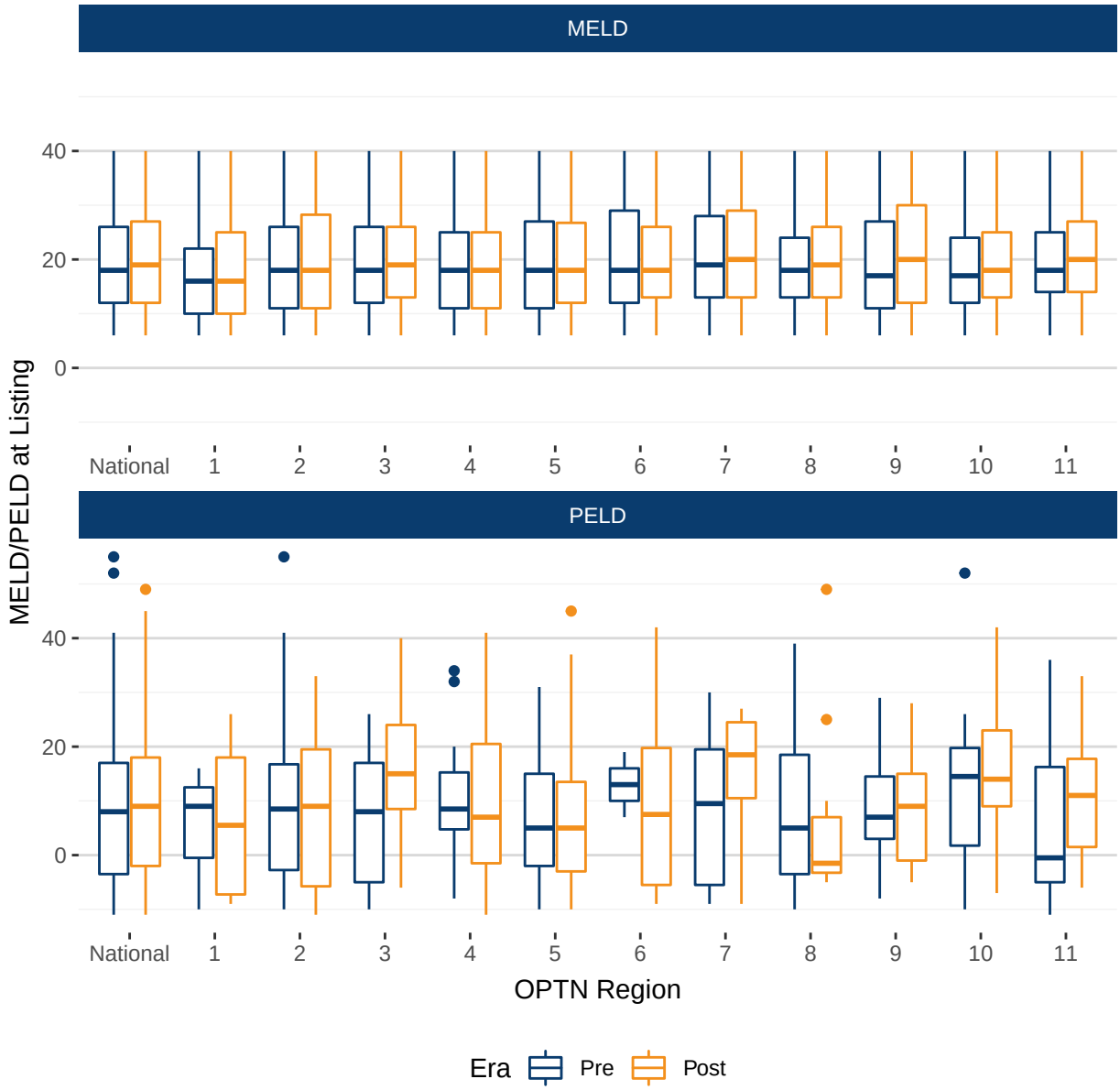
Table 85. Distribution of Sequence Number of Final Acceptor on Liver Match Run by Era

	Policy Era			
Final Acceptor Sequence Number	Pre-Policy	Post-Policy, Pre-COVID	Post-Policy, COVID Shutdown	Post-Policy, COVID Stabilization
N Matches	4227	989	1138	2098
Minimum	1	1	1	1
25th Percentile	2	4	4	4
Median	5	9	10	9
Mean	80	96	85	107
75th Percentile	14	22	25	25
90th Percentile	46	84	68	84
Maximum	7079	7517	7128	7555

* Pre-Policy: February 5 - August 6, 2019; Post-Policy, Pre-COVID: February 4 - March 12, 2020; Post-Policy, COVID Shutdown: March 13 - May 9, 2020; Post-Policy, COVID Stabilization: May 10 - August 4, 2020

Additional Waitlist Information

Figure 93. Median and Interquartile Range of MELD/PELD Score at Listing by Era, Age Group and OPTN Region



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

By OPTN region, some shifts in MELD and PELD at listing are evident. These are more pronounced for PELD scores, given the smaller volume of pediatric PELD candidates. Summary data supporting this figure is included below.

Table 86. Distribution Statistics for MELD Score at Listing by OPTN Region and Era

OPTN Region	Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum
1	Pre	351	6	10	16	22.00	40
	Post	304	6	10	16	25.00	40
2	Pre	695	6	11	18	26.00	40
	Post	668	6	11	18	28.25	40
3	Pre	897	6	12	18	26.00	40
	Post	828	6	13	19	26.00	40
4	Pre	820	6	11	18	25.00	40
	Post	776	6	11	18	25.00	40
5	Pre	962	6	11	18	27.00	40
	Post	1026	6	12	18	26.75	40
6	Pre	169	6	12	18	29.00	40
	Post	152	6	13	18	26.00	40
7	Pre	504	6	13	19	28.00	40
	Post	468	6	13	20	29.00	40
8	Pre	326	6	13	18	24.00	40
	Post	345	6	13	19	26.00	40
9	Pre	398	6	11	17	27.00	40
	Post	316	6	12	20	30.00	40
10	Pre	569	6	12	17	24.00	40
	Post	501	6	13	18	25.00	40
11	Pre	557	6	14	18	25.00	40
	Post	567	6	14	20	27.00	40

Table 87. Distribution Statistics for PELD Score at Listing by OPTN Region and Era

OPTN Region	Era	N	Minimum	25th Percentile	Median	75th Percentile	Maximum
1	Pre	3	-10	-0.50	9.0	12.50	16
	Post	8	-9	-7.25	5.5	18.00	26
2	Pre	34	-10	-2.75	8.5	16.75	55
	Post	26	-11	-5.75	9.0	19.50	33
3	Pre	21	-10	-5.00	8.0	17.00	26
	Post	24	-6	8.50	15.0	24.00	40
4	Pre	24	-8	4.75	8.5	15.25	34
	Post	15	-11	-1.50	7.0	20.50	41
5	Pre	41	-10	-2.00	5.0	15.00	31
	Post	47	-10	-3.00	5.0	13.50	45
6	Pre	2	7	10.00	13.0	16.00	19
	Post	6	-9	-5.50	7.5	19.75	42
7	Pre	18	-9	-5.50	9.5	19.50	30
	Post	8	-9	10.50	18.5	24.50	27
8	Pre	19	-10	-3.50	5.0	18.50	39
	Post	12	-5	-3.25	-1.5	7.00	49
9	Pre	19	-8	3.00	7.0	14.50	29
	Post	13	-5	-1.00	9.0	15.00	28
10	Pre	22	-10	1.75	14.5	19.75	52
	Post	15	-7	9.00	14.0	23.00	42
11	Pre	20	-11	-5.00	-0.5	16.25	36
	Post	10	-6	1.50	11.0	17.75	33

Table 88. Liver Waitlist Rates of Removal Due to Death or Too Sick to Transplant by Age Group and Era

Age Group	Policy Era	N Ever Waiting	N Removals	Patient-Years	Removals per 100 PY	95% CI
Pediatric (0-11 years)	Pre	523	15	133.92	11.20	6.27, 18.47
	Post	431	11	116.69	9.43	4.71, 16.87
Pediatric (12-17 years)	Pre	192	9	64.17	14.02	6.41, 26.62
	Post	184	2	56.56	3.54	0.43, 12.77
Adult (18+ years)	Pre	16973	1037	5728.87	18.10	17.02, 19.24
	Post	16201	946	5483.69	17.25	16.17, 18.39

Table 89. Liver Waitlist Rates of Removal Due to Death or Too Sick to Transplant by Sex and Era

Sex	Policy Era	N Ever Waiting	N Removals	Patient-Years	Removals per 100 PY	95% CI
Female	Pre	6889	425	2343.88	18.13	16.45, 19.94
	Post	6550	360	2240.80	16.07	14.45, 17.81
Male	Pre	10799	636	3583.08	17.75	16.4, 19.18
	Post	10263	599	3415.92	17.54	16.16, 19

Table 91. Liver Waitlist Rates of Transplant by Age Group and Era

Age Group	Policy Era	N Ever Waiting	N Transplants	Patient-Years	Transplants per 100 Active PY	95% CI
Pediatric (0-11 years)	Pre	523	190	133.92	141.88	122.42, 163.55
	Post	431	160	116.69	137.12	116.69, 160.09
Pediatric (12-17 years)	Pre	192	32	64.17	49.87	34.11, 70.4
	Post	184	56	56.56	99.02	74.8, 128.58
Adult (18+ years)	Pre	16973	3507	5728.87	61.22	59.21, 63.28
	Post	16201	3427	5483.69	62.49	60.42, 64.62

Table 92. Liver Waitlist Rates of Transplant by Sex and Era

Sex	Policy Era	N Ever Waiting	N Transplants	Patient-Years	Transplants per 100 Active PY	95% CI
Female	Pre	6889	1333	2343.88	56.87	53.86, 60.01
	Post	6550	1315	2240.80	58.68	55.56, 61.94
Male	Pre	10799	2396	3583.08	66.87	64.22, 69.6
	Post	10263	2328	3415.92	68.15	65.41, 70.98

Additional Deceased Donor Liver Transplant Information

Table 94. Number of Deceased Donor Liver Transplants by Allocation MELD or PELD Score/Status Group, OPTN Region of Transplant Center, and Era

		Policy Era		
OPTN Region	Score or Status Group	Pre	Post	Difference (Post-Pre)
1	Status 1A/1B	4 (3.4%)	5 (4.1%)	1
	M/P 37+	17 (14.3%)	24 (19.7%)	7
	M/P 33-36	19 (16.0%)	13 (10.7%)	-6
	M/P 29-32	41 (34.5%)	35 (28.7%)	-6
	M/P 15-28	32 (26.9%)	43 (35.2%)	11
	M/P < 15	6 (5.0%)	2 (1.6%)	-4
2	Status 1A/1B	24 (7.2%)	18 (6.3%)	-6
	M/P 37+	78 (23.5%)	57 (19.9%)	-21
	M/P 33-36	32 (9.6%)	42 (14.7%)	10
	M/P 29-32	68 (20.5%)	56 (19.6%)	-12
	M/P 15-28	121 (36.4%)	105 (36.7%)	-16
	M/P < 15	9 (2.7%)	8 (2.8%)	-1

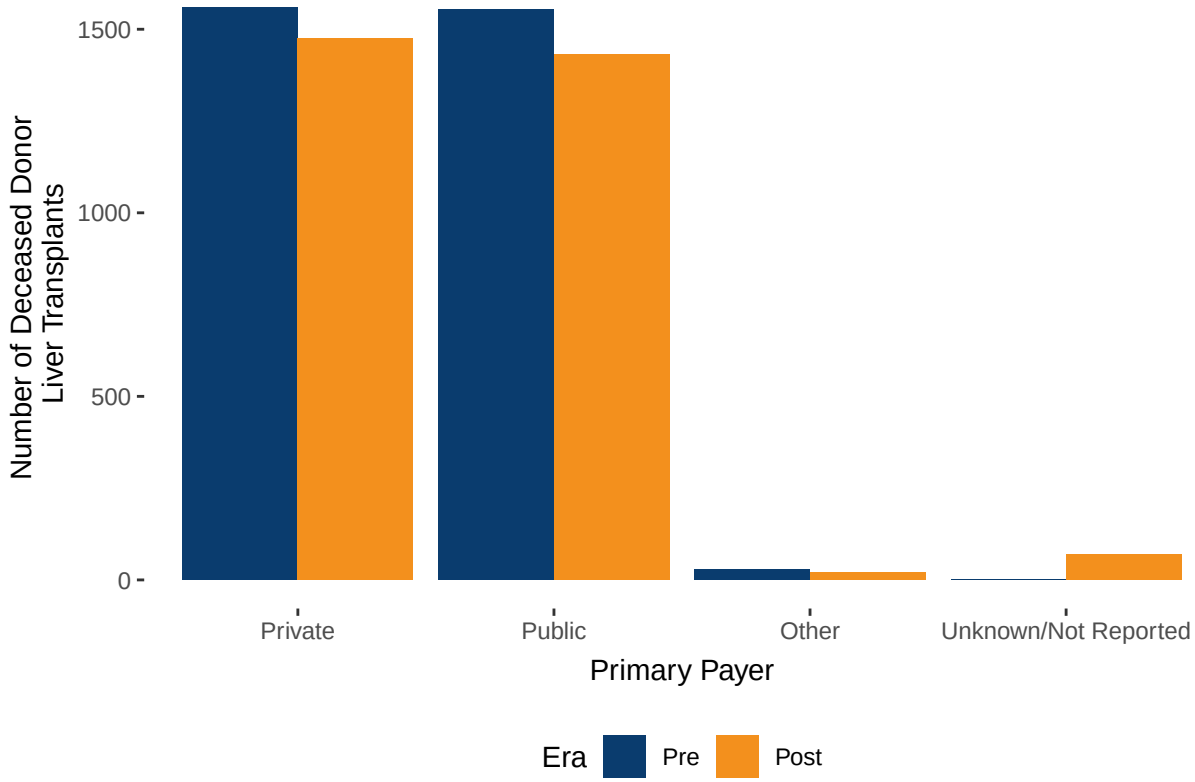
(continued)

OPTN Region	Score or Status Group	Pre	Post	Difference (Post-Pre)
3	Status 1A/1B	14 (2.5%)	10 (2.3%)	-4
	M/P 37+	70 (12.4%)	60 (13.9%)	-10
	M/P 33-36	48 (8.5%)	42 (9.7%)	-6
	M/P 29-32	73 (13.0%)	60 (13.9%)	-13
	M/P 15-28	341 (60.6%)	245 (56.8%)	-96
	M/P < 15	17 (3.0%)	14 (3.2%)	-3
4	Status 1A/1B	9 (2.8%)	10 (3.0%)	1
	M/P 37+	52 (16.1%)	69 (20.8%)	17
	M/P 33-36	37 (11.5%)	43 (13.0%)	6
	M/P 29-32	79 (24.5%)	59 (17.8%)	-20
	M/P 15-28	135 (41.8%)	135 (40.7%)	0
	M/P < 15	11 (3.4%)	16 (4.8%)	5
5	Status 1A/1B	39 (8.0%)	21 (4.1%)	-18
	M/P 37+	117 (23.9%)	121 (23.8%)	4
	M/P 33-36	76 (15.5%)	58 (11.4%)	-18
	M/P 29-32	86 (17.6%)	131 (25.8%)	45
	M/P 15-28	139 (28.4%)	149 (29.3%)	10
	M/P < 15	33 (6.7%)	28 (5.5%)	-5
6	Status 1A/1B	6 (6.5%)	3 (3.6%)	-3
	M/P 37+	13 (14.0%)	11 (13.3%)	-2
	M/P 33-36	18 (19.4%)	6 (7.2%)	-12
	M/P 29-32	23 (24.7%)	16 (19.3%)	-7
	M/P 15-28	33 (35.5%)	47 (56.6%)	14
7	Status 1A/1B	14 (5.5%)	16 (5.8%)	2
	M/P 37+	39 (15.4%)	35 (12.7%)	-4
	M/P 33-36	43 (17.0%)	33 (12.0%)	-10
	M/P 29-32	73 (28.9%)	67 (24.4%)	-6
	M/P 15-28	81 (32.0%)	121 (44.0%)	40
	M/P < 15	3 (1.2%)	3 (1.1%)	0
8	Status 1A/1B	9 (4.6%)	8 (4.5%)	-1
	M/P 37+	19 (9.7%)	14 (7.8%)	-5
	M/P 33-36	14 (7.2%)	9 (5.0%)	-5
	M/P 29-32	26 (13.3%)	34 (19.0%)	8
	M/P 15-28	125 (64.1%)	110 (61.5%)	-15
	M/P < 15	2 (1.0%)	4 (2.2%)	2
9	Status 1A/1B	12 (7.5%)	18 (10.0%)	6
	M/P 37+	50 (31.2%)	21 (11.7%)	-29
	M/P 33-36	36 (22.5%)	21 (11.7%)	-15
	M/P 29-32	33 (20.6%)	39 (21.7%)	6
	M/P 15-28	26 (16.2%)	75 (41.7%)	49
	M/P < 15	3 (1.9%)	6 (3.3%)	3
10	Status 1A/1B	14 (4.7%)	11 (3.7%)	-3
	M/P 37+	23 (7.7%)	23 (7.7%)	0
	M/P 33-36	19 (6.4%)	28 (9.4%)	9
	M/P 29-32	41 (13.8%)	33 (11.1%)	-8
	M/P 15-28	186 (62.6%)	175 (58.9%)	-11
	M/P < 15	14 (4.7%)	27 (9.1%)	13

(continued)

OPTN Region	Score or Status Group	Pre	Post	Difference (Post-Pre)
11	Status 1A/1B	12 (3.8%)	10 (3.3%)	-2
	M/P 37+	35 (11.1%)	44 (14.5%)	9
	M/P 33-36	24 (7.6%)	28 (9.2%)	4
	M/P 29-32	45 (14.3%)	72 (23.7%)	27
	M/P 15-28	197 (62.5%)	144 (47.4%)	-53
	M/P < 15	2 (0.6%)	6 (2.0%)	4

Figure 94. Deceased Donor Liver Transplant by Primary Payer and Era



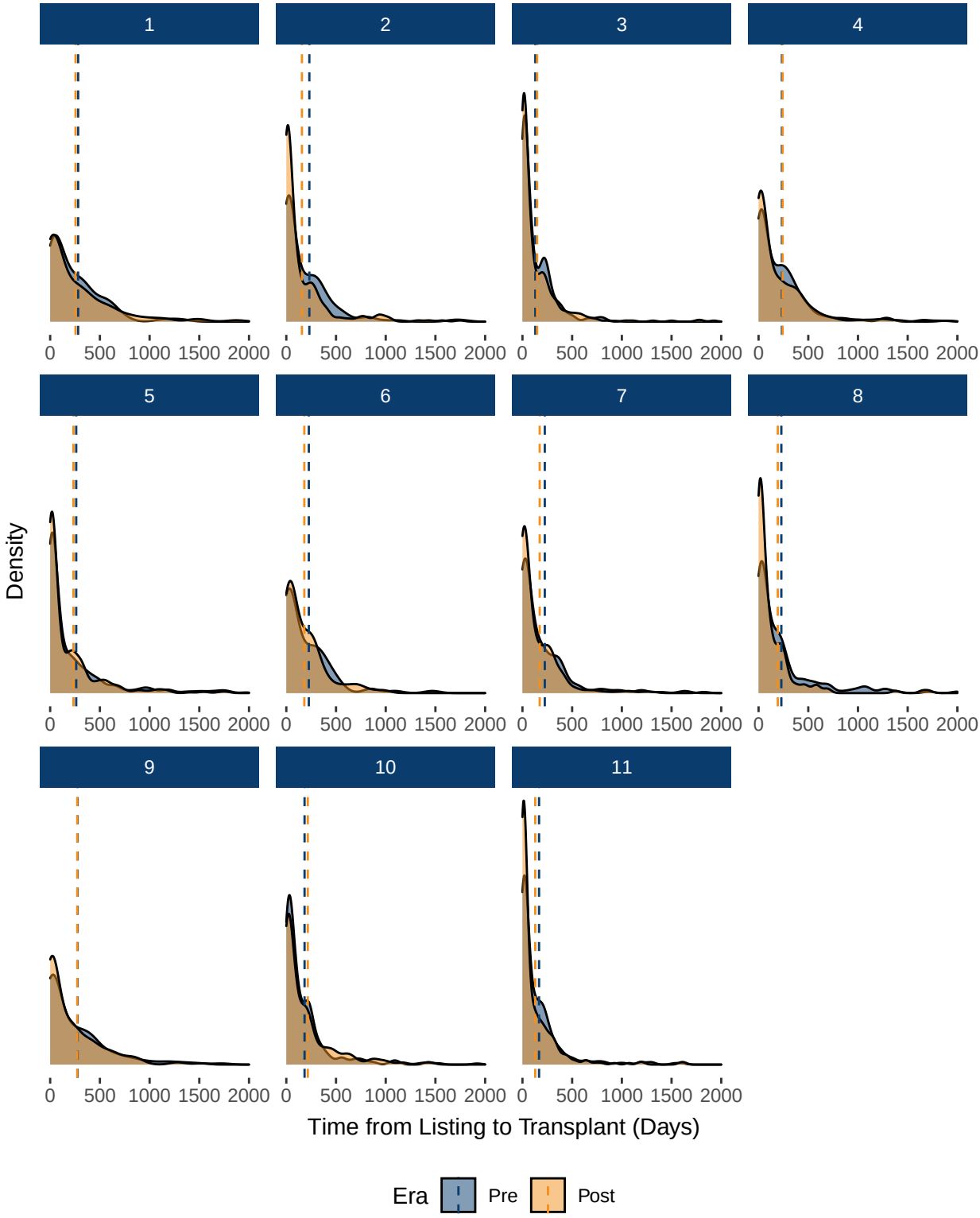
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 95. Number and Percent of Deceased Donor Liver Transplants by Primary Payer and Era

	Policy Era		
Primary Payer Type	Pre	Post	Difference (Post-Pre)
Private	1559 (49.6%)	1476 (49.2%)	-83
Public	1553 (49.5%)	1432 (47.8%)	-121
Other	28 (0.9%)	20 (0.7%)	-8
Unknown/Not Reported	0 (0.0%)	69 (2.3%)	69
Total	3140 (100.0%)	2997 (100.0%)	-143

There was an increase for those with unknown or not reported primary payer in the post-policy era; however, this may be due to data accumulation and may change over time as this field is not required to run a match.

Figure 95. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant by OPTN Region and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate average time waiting within each era.
*** There were 28 pre−policy and 29 post−policy transplant recipients with > 2000 days that are not included.

The median days waiting decreased in almost every region, staying the same in region 6. The average time from listing to deceased donor transplant, for those transplanted pre- and post-policy, increased in regions 3, 4, 9 and 10 and decreased in regions 1, 2, 6, 7, 8, and 11.

Table 96. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant by OPTN Region and Era

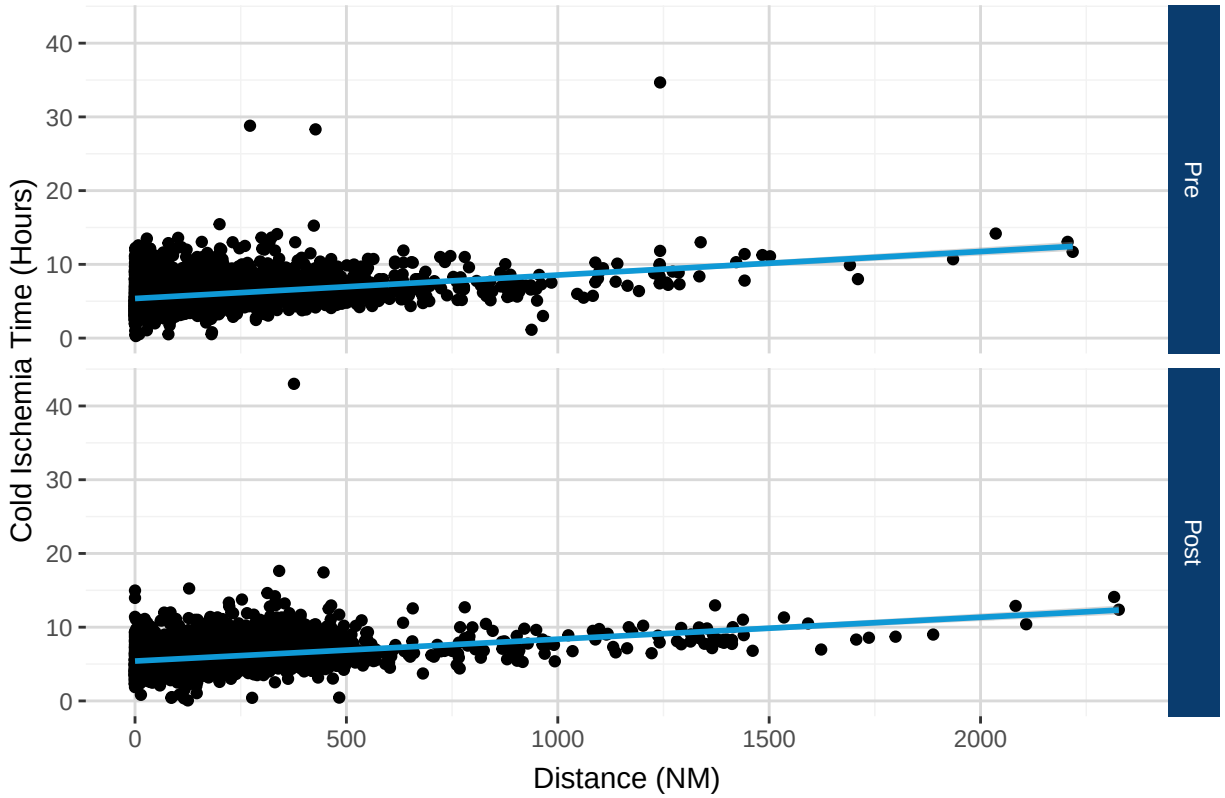
			Time (Days)					
OPTN Region	Policy Era	N	Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
1	Pre	119	2	31.0	155.0	281.4	363.5	2986
	Post	122	1	9.3	109.0	255.2	372.3	1872
2	Pre	332	0	10.0	94.0	231.8	302.0	3356
	Post	286	0	5.0	35.0	156.9	211.0	1746
3	Pre	563	1	10.0	59.0	129.5	207.0	2534
	Post	431	1	7.0	44.0	147.4	192.0	2567
4	Pre	323	2	17.0	138.0	235.1	309.0	2447
	Post	332	0	9.0	89.5	242.5	320.8	3551
5	Pre	490	0	9.0	60.5	262.0	293.5	5104
	Post	508	1	7.0	49.5	234.0	261.8	5612
6	Pre	93	1	19.0	113.0	226.4	316.0	3391
	Post	83	1	22.0	107.0	181.2	271.0	978
7	Pre	253	1	13.0	78.0	224.8	300.0	3490
	Post	275	0	6.5	47.0	173.6	239.0	6987
8	Pre	195	1	22.0	100.0	229.1	257.5	1998
	Post	179	1	8.0	47.0	193.3	185.5	4753
9	Pre	160	1	9.0	120.0	276.0	384.5	2961
	Post	180	1	6.0	94.0	272.1	353.3	5886
10	Pre	297	1	23.0	83.0	183.5	225.0	2750
	Post	297	1	7.0	82.0	216.1	240.0	2508
11	Pre	315	1	11.0	55.0	167.2	208.5	2711
	Post	304	1	5.0	27.0	128.9	165.3	2595

As expected given the higher priority afforded higher acuity candidates, time from listing to transplant is lower in general for higher MELD/PELD scores and statuses. Of note, the median and mean days for transplant recipients with a MELD or PELD score 29 or higher, or in Status 1, decreased post-policy. The most substantial decrease was seen for transplant recipients with MELD or PELD scores 29-32.

Table 97. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant by Allocation MELD or PELD Score or Status and Era

			Time (Days)					
MELD or PELD Score/Status	Policy Era	N	Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
Status 1A/1B	Pre	157	0	2.00	4.0	78.22	23.00	2258
	Post	130	0	2.00	3.0	40.80	19.75	1020
M/P 37+	Pre	513	1	4.00	8.0	94.50	40.00	2961
	Post	479	1	3.00	5.0	84.05	16.50	6987
M/P 33-36	Pre	366	1	7.00	38.5	256.25	380.50	3490
	Post	323	1	3.00	12.0	119.33	87.00	2563
M/P 29-32	Pre	588	1	35.75	251.5	308.62	390.00	5104
	Post	602	1	7.00	44.5	223.53	260.25	5612
M/P 15-28	Pre	1416	1	38.00	132.5	217.98	241.00	3391
	Post	1349	1	35.00	147.0	250.11	296.00	4869
M/P < 15	Pre	100	2	26.00	71.5	169.24	181.25	2034
	Post	114	4	43.75	121.0	285.87	338.00	5886

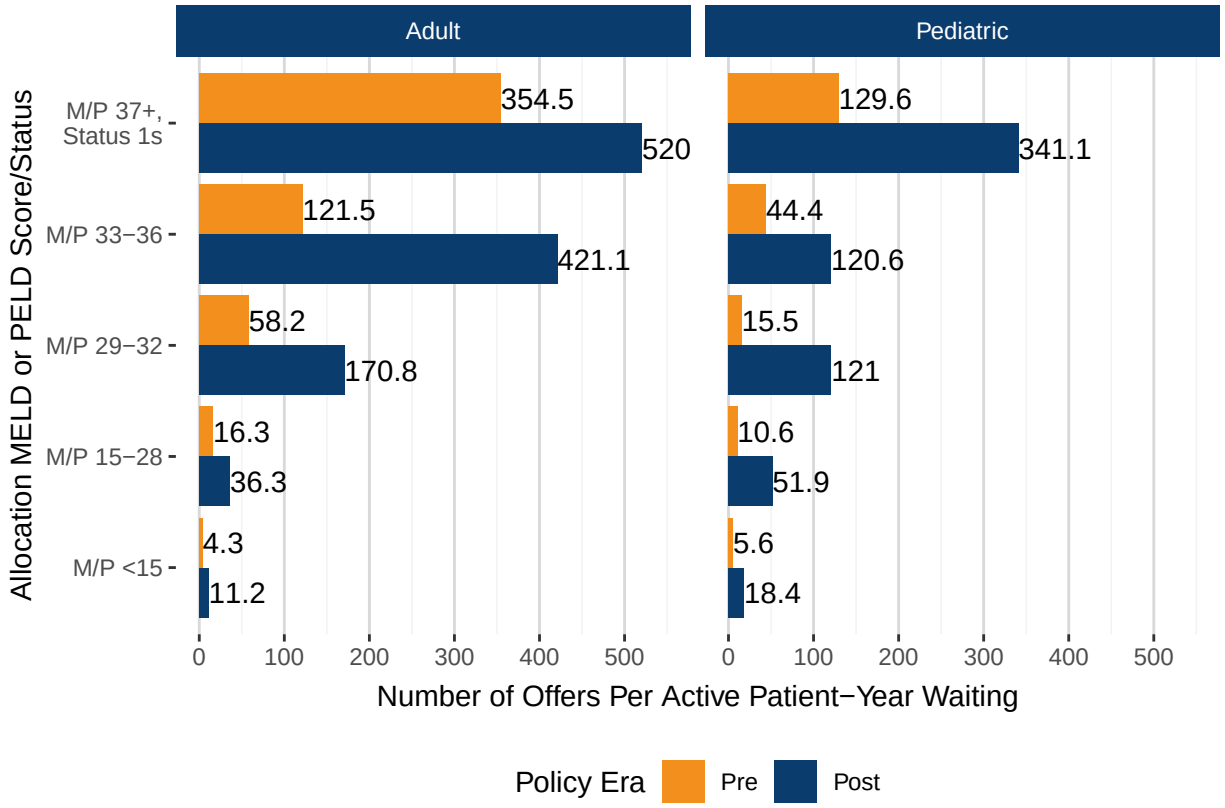
Figure 97. Scatter Plot of Cold Ischemia Time and Distance from Donor Hospital to Transplant Center by Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** There were 15 pre−policy and 115 post−policy transplant recipients with missing data that are not included.

Additional Offer and Acceptance Rates Information

Figure 99. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status, Age at Listing, and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 98. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status, Age at Listing, and Era

Age Group	Score Group	Policy Era	N Ever Waiting	Offers	Person-Years	Offers per Active PY	95% CI
Adult	M/P <15	Pre	9712	11290	2640.62	4.28	(4.2, 4.36)
Adult	M/P <15	Post	9115	28434	2533.70	11.22	(11.09, 11.35)
Adult	M/P 15-28	Pre	8130	26751	1643.87	16.27	(16.08, 16.47)
Adult	M/P 15-28	Post	7647	58397	1606.75	36.34	(36.05, 36.64)
Adult	M/P 29-32	Pre	2308	12409	213.29	58.18	(57.16, 59.21)
Adult	M/P 29-32	Post	1490	12484	73.10	170.79	(167.81, 173.81)
Adult	M/P 33-36	Pre	960	4006	32.98	121.45	(117.72, 125.27)
Adult	M/P 33-36	Post	716	3985	9.46	421.11	(408.14, 434.4)
Adult	M/P 37+, Status 1s	Pre	973	5817	16.41	354.52	(345.46, 363.75)
Adult	M/P 37+, Status 1s	Post	918	6759	12.98	520.58	(508.24, 533.14)
Pediatric	M/P <15	Pre	299	314	55.74	5.63	(5.03, 6.29)
Pediatric	M/P <15	Post	250	829	45.02	18.41	(17.18, 19.71)
Pediatric	M/P 15-28	Pre	204	291	27.41	10.62	(9.43, 11.91)
Pediatric	M/P 15-28	Post	169	1155	22.27	51.85	(48.91, 54.93)
Pediatric	M/P 29-32	Pre	113	172	11.08	15.53	(13.29, 18.03)
Pediatric	M/P 29-32	Post	67	784	6.48	121.00	(112.68, 129.77)
Pediatric	M/P 33-36	Pre	143	661	14.89	44.39	(41.07, 47.91)
Pediatric	M/P 33-36	Post	104	1365	11.32	120.64	(114.32, 127.21)
Pediatric	M/P 37+, Status 1s	Pre	239	3027	23.36	129.57	(125, 134.27)
Pediatric	M/P 37+, Status 1s	Post	155	4817	14.12	341.07	(331.5, 350.84)

Figure 101. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status, Blood Type, and Era

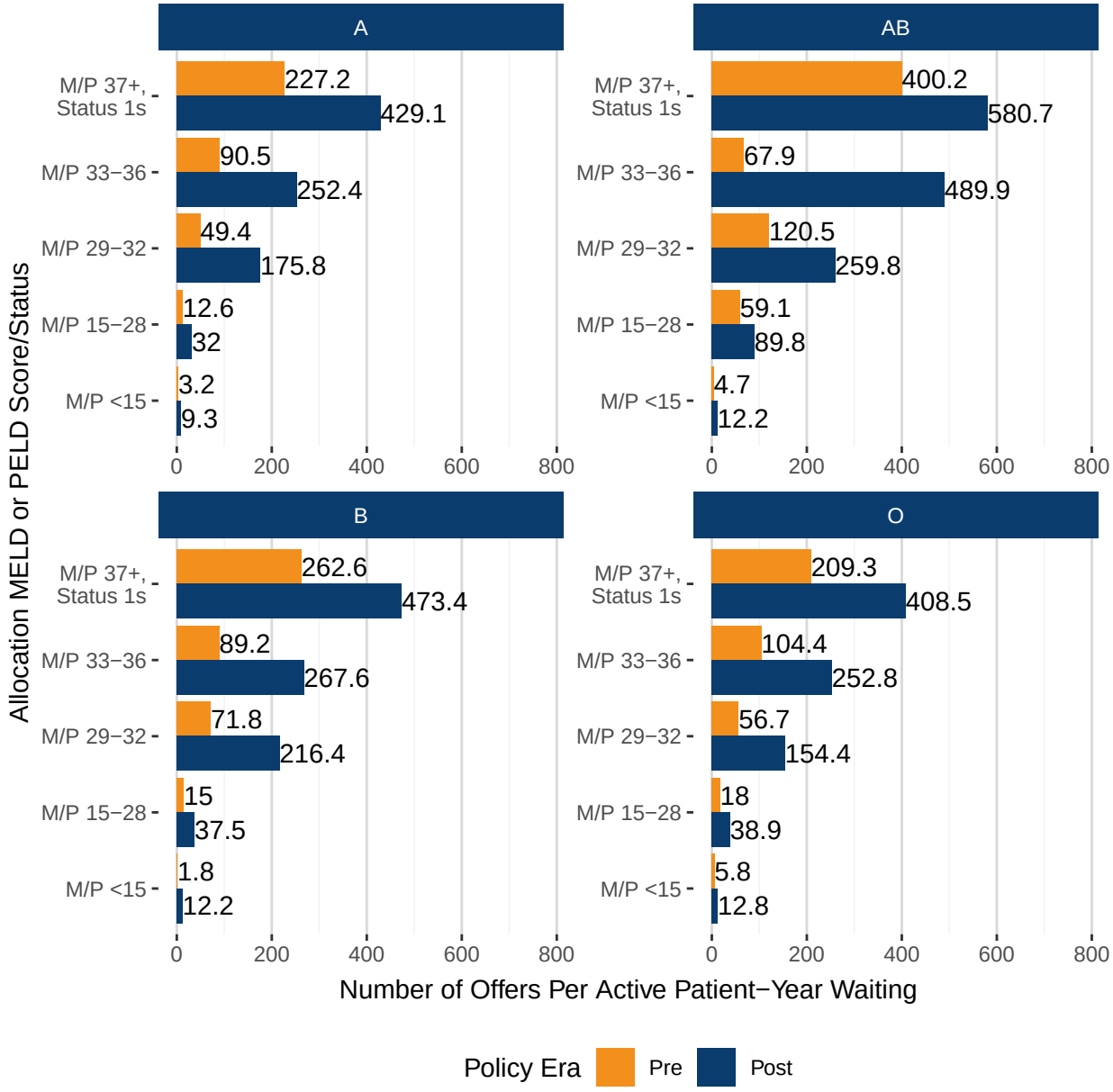
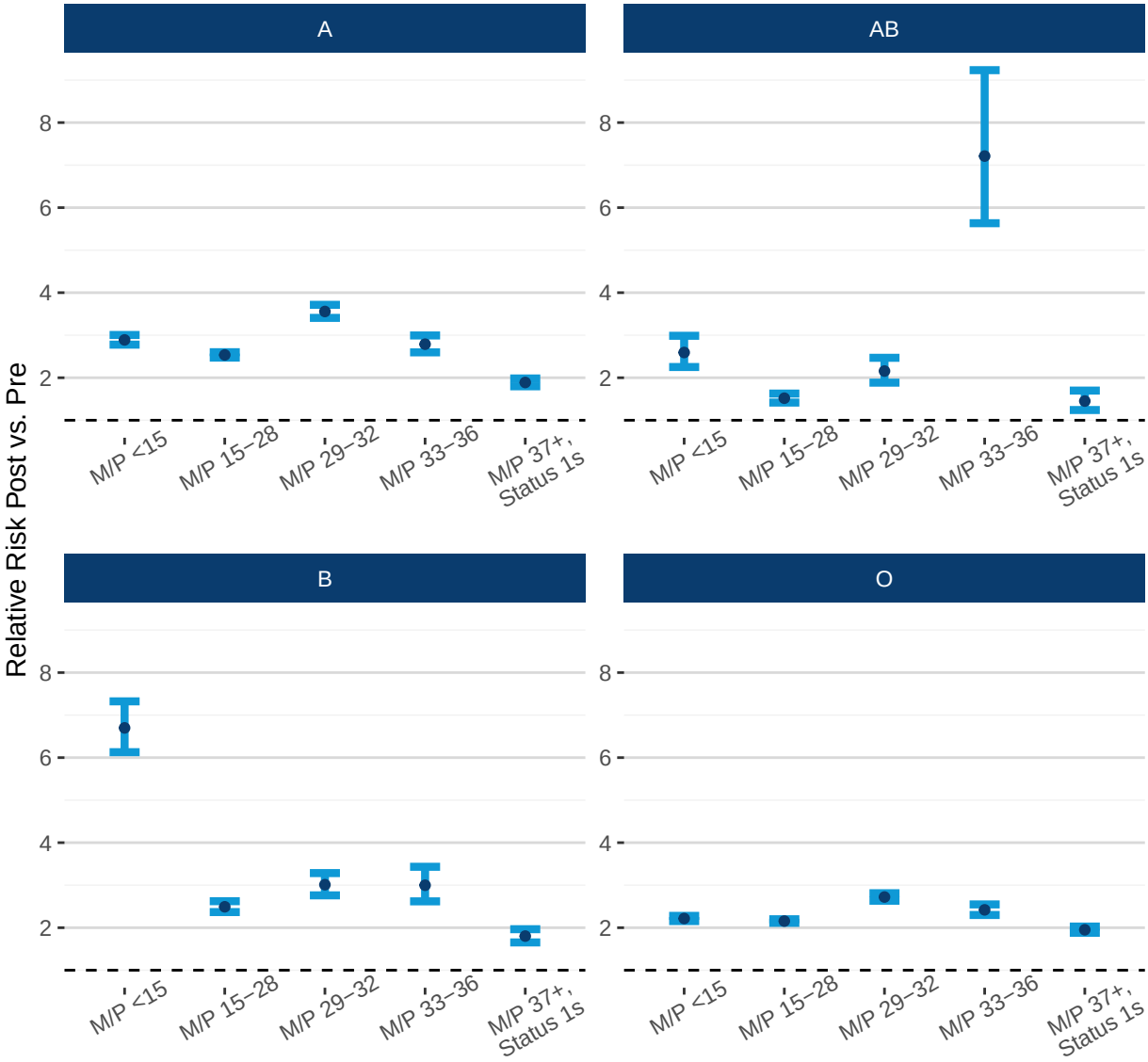


Table 99. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status, Blood Type, and Era

Blood Type	Score Group	Policy Era	N Ever Waiting	Offers	Person-Years	Offers per Active PY	95% CI
A	M/P <15	Pre	3857	3377	1044.86	3.23	(3.12, 3.34)
A	M/P <15	Post	3682	9402	1006.76	9.34	(9.15, 9.53)
A	M/P 15-28	Pre	3286	8626	682.66	12.64	(12.37, 12.91)
A	M/P 15-28	Post	3125	21458	669.65	32.04	(31.62, 32.48)
A	M/P 29-32	Pre	920	3966	80.24	49.43	(47.9, 50.99)
A	M/P 29-32	Post	589	4278	24.33	175.84	(170.61, 181.19)
A	M/P 33-36	Pre	406	1374	15.18	90.51	(85.79, 95.42)
A	M/P 33-36	Post	302	1694	6.71	252.37	(240.5, 264.68)
A	M/P 37+, Status 1s	Pre	451	2828	12.45	227.21	(218.91, 235.74)
A	M/P 37+, Status 1s	Post	409	3757	8.76	429.07	(415.46, 443.01)
AB	M/P <15	Pre	248	278	59.07	4.71	(4.17, 5.29)
AB	M/P <15	Post	208	630	51.62	12.21	(11.27, 13.2)
AB	M/P 15-28	Pre	212	1473	24.90	59.15	(56.16, 62.25)
AB	M/P 15-28	Post	195	1730	19.27	89.78	(85.6, 94.12)
AB	M/P 29-32	Pre	47	363	3.01	120.45	(108.38, 133.5)
AB	M/P 29-32	Post	47	501	1.93	259.75	(237.5, 283.52)
AB	M/P 33-36	Pre	35	107	1.58	67.92	(55.66, 82.08)
AB	M/P 33-36	Post	18	153	0.31	489.87	(415.32, 573.93)
AB	M/P 37+, Status 1s	Pre	34	216	0.54	400.20	(348.61, 457.28)
AB	M/P 37+, Status 1s	Post	33	568	0.98	580.73	(533.95, 630.51)
B	M/P <15	Pre	1115	562	309.02	1.82	(1.67, 1.98)
B	M/P <15	Post	997	3504	287.61	12.18	(11.78, 12.59)
B	M/P 15-28	Pre	857	2157	143.48	15.03	(14.41, 15.68)
B	M/P 15-28	Post	710	4483	119.66	37.47	(36.38, 38.58)
B	M/P 29-32	Pre	229	1174	16.34	71.85	(67.8, 76.08)
B	M/P 29-32	Post	133	901	4.16	216.36	(202.46, 230.96)
B	M/P 33-36	Pre	104	376	4.21	89.23	(80.44, 98.72)
B	M/P 33-36	Post	84	478	1.79	267.59	(244.14, 292.69)
B	M/P 37+, Status 1s	Pre	134	959	3.65	262.59	(246.23, 279.75)
B	M/P 37+, Status 1s	Post	120	1118	2.36	473.40	(446.05, 501.98)
O	M/P <15	Pre	4790	7387	1283.42	5.76	(5.63, 5.89)
O	M/P <15	Post	4478	15727	1232.74	12.76	(12.56, 12.96)
O	M/P 15-28	Pre	3980	14786	820.23	18.03	(17.74, 18.32)
O	M/P 15-28	Post	3784	31881	820.27	38.87	(38.44, 39.3)
O	M/P 29-32	Pre	1225	7078	124.78	56.73	(55.41, 58.06)
O	M/P 29-32	Post	788	7588	49.15	154.37	(150.92, 157.89)
O	M/P 33-36	Pre	558	2810	26.90	104.45	(100.62, 108.38)
O	M/P 33-36	Post	416	3025	11.97	252.78	(243.85, 261.95)
O	M/P 37+, Status 1s	Pre	593	4841	23.13	209.28	(203.43, 215.26)
O	M/P 37+, Status 1s	Post	512	6133	15.01	408.49	(398.33, 418.85)

Figure 102. Relative Risk Post- Versus Pre-Policy of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status and Blood Type

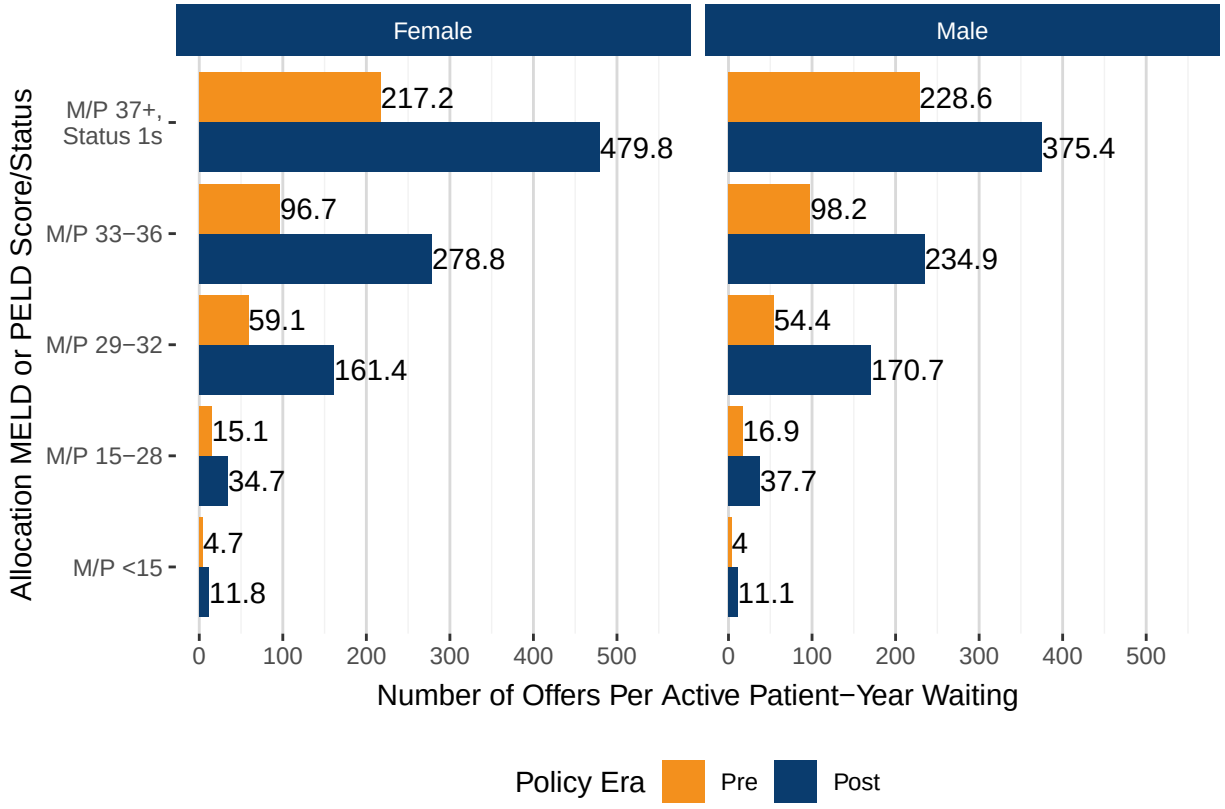


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Figure 103. Percent of Offers Accepted by Allocation MELD or PELD Score or Status, Blood Type, and Era

* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Figure 104. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status, Sex, and Era

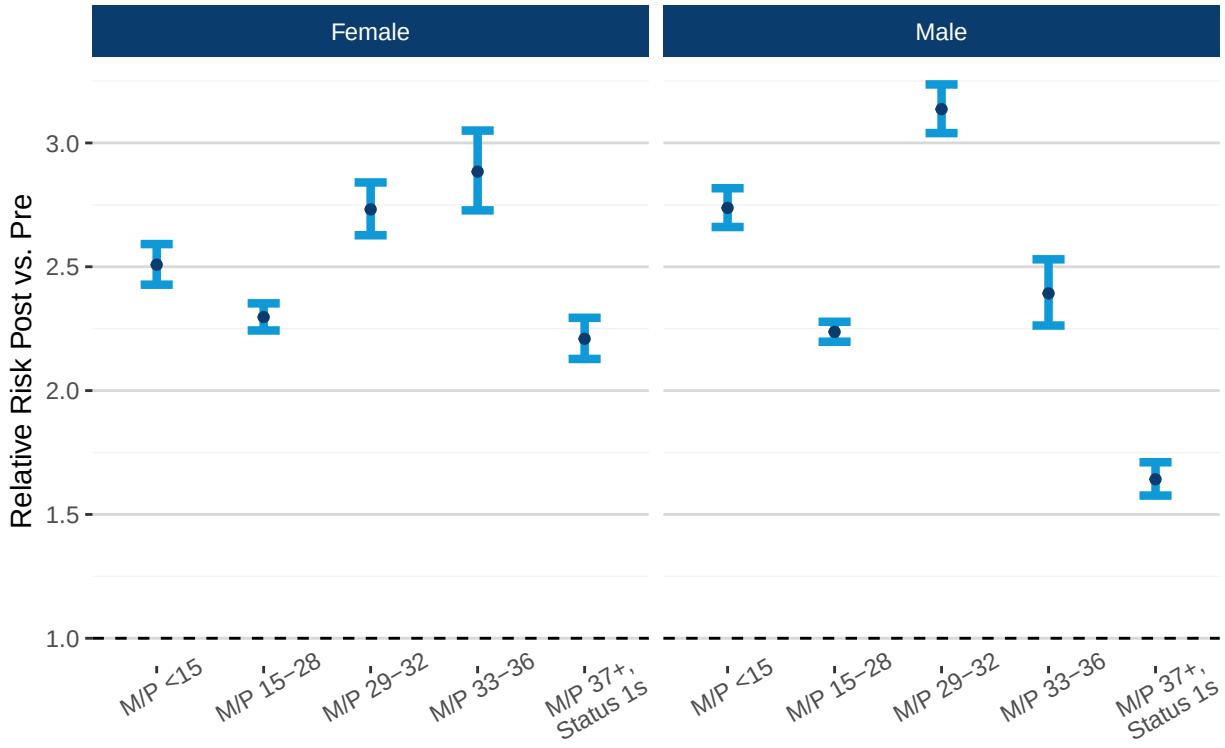


* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 100. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status, Sex, and Era

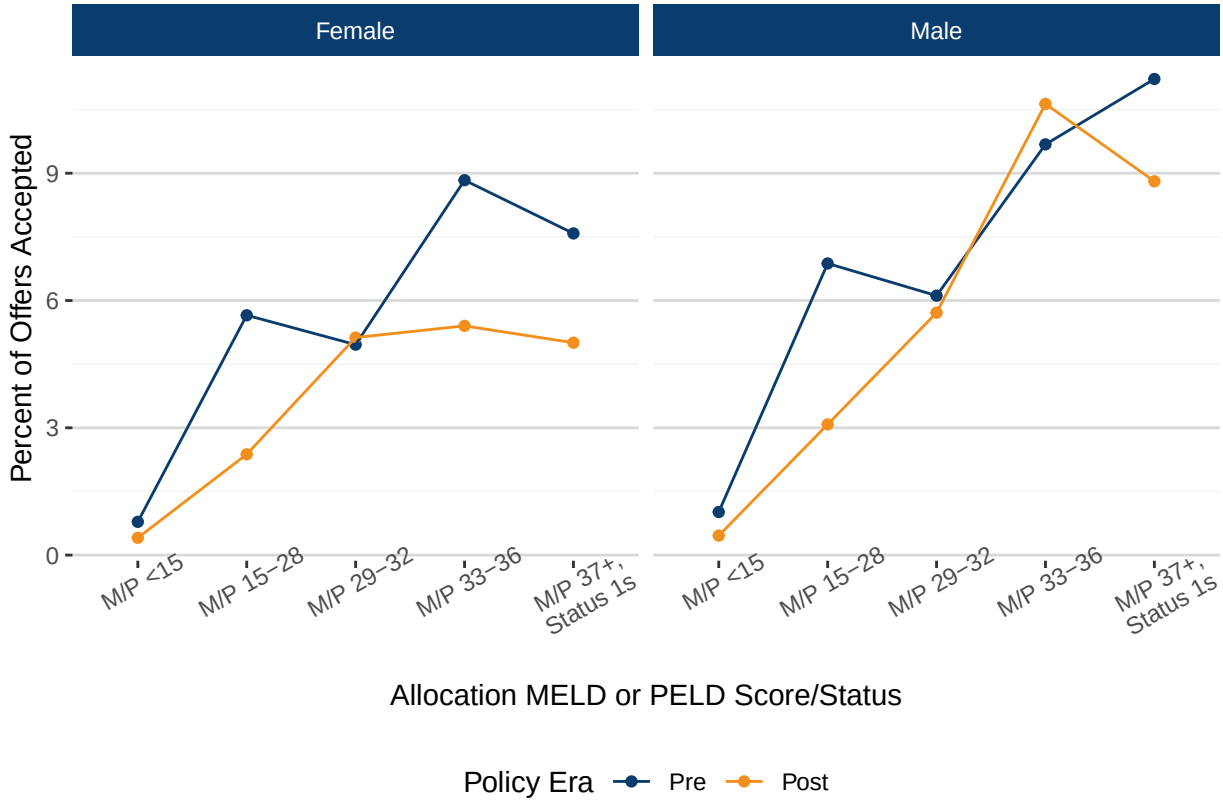
Sex	Score Group	Policy Era	N Ever Waiting	Offers	Person-Years	Offers per Active PY	95% CI
Female	M/P <15	Pre	3903	5104	1086.90	4.70	(4.57, 4.83)
Female	M/P <15	Post	3600	12252	1040.19	11.78	(11.57, 11.99)
Female	M/P 15-28	Pre	3163	9801	649.35	15.09	(14.8, 15.4)
Female	M/P 15-28	Post	2928	21766	627.83	34.67	(34.21, 35.13)
Female	M/P 29-32	Pre	890	4698	79.54	59.07	(57.39, 60.78)
Female	M/P 29-32	Post	634	5461	33.84	161.36	(157.11, 165.7)
Female	M/P 33-36	Pre	483	2105	21.78	96.67	(92.58, 100.89)
Female	M/P 33-36	Post	352	2980	10.69	278.83	(268.9, 289.02)
Female	M/P 37+, Status 1s	Pre	556	4709	21.68	217.16	(211, 223.45)
Female	M/P 37+, Status 1s	Post	467	6434	13.41	479.76	(468.1, 491.63)
Male	M/P <15	Pre	6107	6500	1609.46	4.04	(3.94, 4.14)
Male	M/P <15	Post	5765	17011	1538.53	11.06	(10.89, 11.22)
Male	M/P 15-28	Pre	5171	17241	1021.93	16.87	(16.62, 17.12)
Male	M/P 15-28	Post	4888	37786	1001.08	37.75	(37.37, 38.13)
Male	M/P 29-32	Pre	1531	7883	144.83	54.43	(53.23, 55.64)
Male	M/P 29-32	Post	923	7807	45.73	170.71	(166.95, 174.54)
Male	M/P 33-36	Pre	620	2562	26.10	98.17	(94.4, 102.04)
Male	M/P 33-36	Post	468	2370	10.09	234.88	(225.51, 244.53)
Male	M/P 37+, Status 1s	Pre	656	4135	18.08	228.64	(221.73, 235.72)
Male	M/P 37+, Status 1s	Post	606	5142	13.70	375.44	(365.25, 385.85)

Figure 105. Relative Risk Post- Versus Pre-Policy of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status and Sex



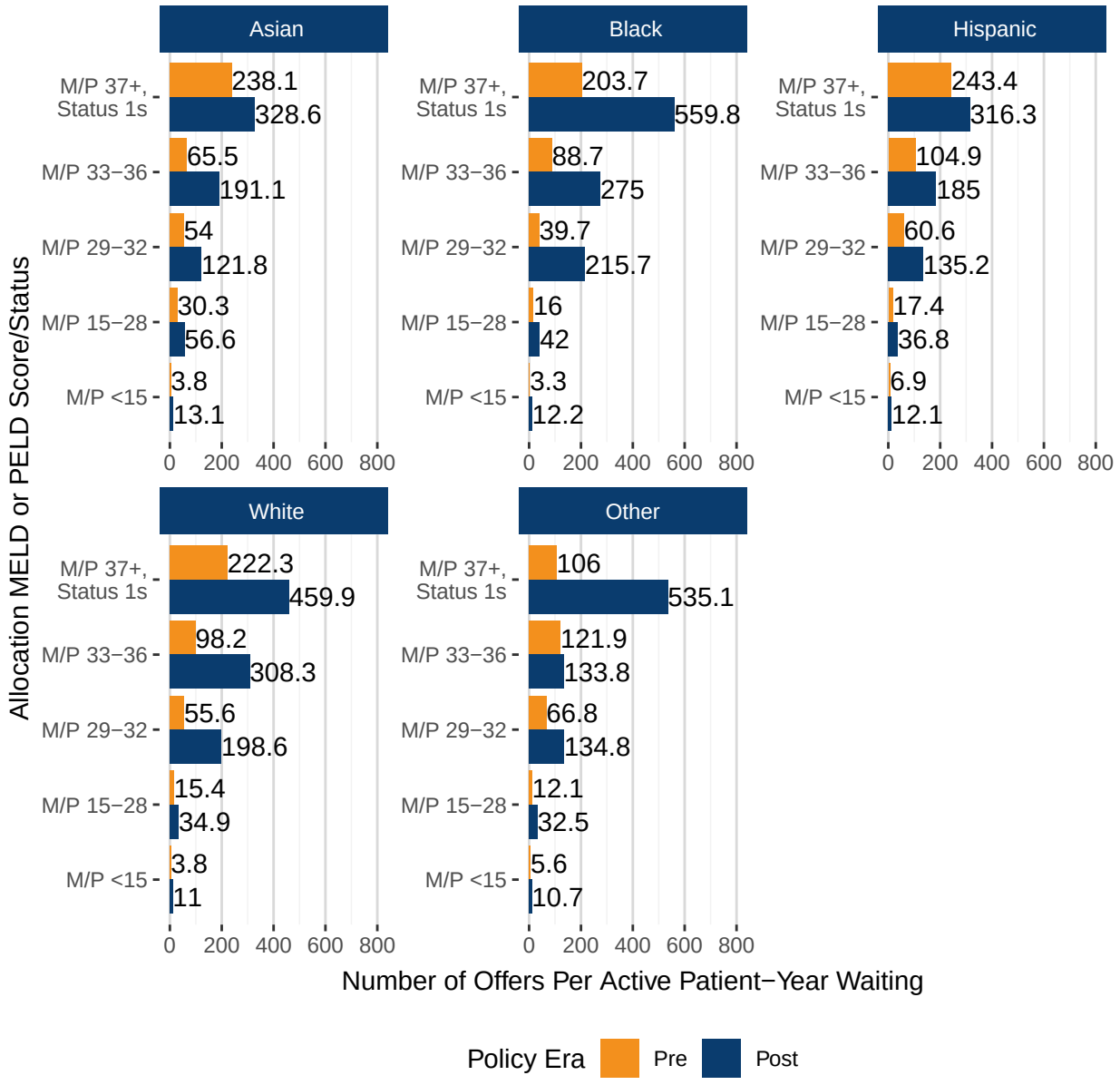
* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Figure 106. Percent of Offers Accepted by Allocation MELD or PELD Score or Status, Sex, and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Figure 107. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status, Race/Ethnicity, and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.

Table 101. Number of Offers Per Patient-Year Waiting by Allocation MELD or PELD Score or Status, Race/Ethnicity, and Era

Race/Ethnicity	Score Group	Policy Era	N Ever Waiting	Offers	Person-Years	Offers per Active PY	95% CI
Asian	M/P <15	Pre	503	538	141.85	3.79	(3.48, 4.13)
Asian	M/P <15	Post	435	1493	113.92	13.11	(12.45, 13.79)
Asian	M/P 15-28	Pre	303	1546	51.06	30.28	(28.79, 31.83)
Asian	M/P 15-28	Post	283	3670	64.86	56.58	(54.77, 58.44)
Asian	M/P 29-32	Pre	162	1383	25.61	54.00	(51.19, 56.92)
Asian	M/P 29-32	Post	91	1071	8.79	121.82	(114.63, 129.34)
Asian	M/P 33-36	Pre	56	229	3.50	65.51	(57.3, 74.56)
Asian	M/P 33-36	Post	43	290	1.52	191.06	(169.71, 214.37)
Asian	M/P 37+, Status 1s	Pre	57	422	1.77	238.07	(215.89, 261.9)
Asian	M/P 37+, Status 1s	Post	60	560	1.70	328.62	(301.96, 357)
Black	M/P <15	Pre	667	606	181.72	3.33	(3.07, 3.61)
Black	M/P <15	Post	579	2007	165.06	12.16	(11.63, 12.7)
Black	M/P 15-28	Pre	502	1552	97.11	15.98	(15.2, 16.8)
Black	M/P 15-28	Post	509	4328	103.03	42.01	(40.77, 43.28)
Black	M/P 29-32	Pre	161	554	13.97	39.66	(36.42, 43.1)
Black	M/P 29-32	Post	96	750	3.48	215.72	(200.56, 231.73)
Black	M/P 33-36	Pre	85	360	4.06	88.66	(79.74, 98.31)
Black	M/P 33-36	Post	72	788	2.87	274.97	(256.11, 294.86)
Black	M/P 37+, Status 1s	Pre	114	813	3.99	203.67	(189.91, 218.16)
Black	M/P 37+, Status 1s	Post	124	1497	2.67	559.84	(531.84, 588.94)
Hispanic	M/P <15	Pre	1818	3251	470.98	6.90	(6.67, 7.14)
Hispanic	M/P <15	Post	1741	5422	447.37	12.12	(11.8, 12.45)
Hispanic	M/P 15-28	Pre	1497	5169	297.17	17.39	(16.92, 17.88)
Hispanic	M/P 15-28	Post	1381	10654	289.58	36.79	(36.1, 37.5)
Hispanic	M/P 29-32	Pre	569	3497	57.71	60.59	(58.6, 62.64)
Hispanic	M/P 29-32	Post	387	3931	29.08	135.19	(131, 139.49)
Hispanic	M/P 33-36	Pre	264	1313	12.52	104.91	(99.31, 110.75)
Hispanic	M/P 33-36	Post	168	965	5.22	184.99	(173.5, 197.04)
Hispanic	M/P 37+, Status 1s	Pre	285	2276	9.35	243.40	(233.51, 253.61)
Hispanic	M/P 37+, Status 1s	Post	209	2282	7.21	316.34	(303.5, 329.59)
White	M/P <15	Pre	6879	7002	1865.11	3.75	(3.67, 3.84)
White	M/P <15	Post	6457	19930	1814.85	10.98	(10.83, 11.14)
White	M/P 15-28	Pre	5888	18386	1194.45	15.39	(15.17, 15.62)
White	M/P 15-28	Post	5494	39914	1142.51	34.94	(34.59, 35.28)
White	M/P 29-32	Pre	1466	6685	120.19	55.62	(54.3, 56.97)
White	M/P 29-32	Post	955	7335	36.93	198.61	(194.09, 203.21)
White	M/P 33-36	Pre	670	2590	26.37	98.23	(94.48, 102.09)
White	M/P 33-36	Post	509	3200	10.38	308.34	(297.75, 319.21)
White	M/P 37+, Status 1s	Pre	730	5198	23.38	222.29	(216.29, 228.42)
White	M/P 37+, Status 1s	Post	651	6545	14.23	459.94	(448.86, 471.22)
Other	M/P <15	Pre	144	207	36.94	5.60	(4.87, 6.42)
Other	M/P <15	Post	157	411	38.32	10.73	(9.71, 11.82)
Other	M/P 15-28	Pre	149	389	32.26	12.06	(10.89, 13.32)
Other	M/P 15-28	Post	152	986	30.36	32.48	(30.49, 34.57)
Other	M/P 29-32	Pre	65	462	6.92	66.76	(60.81, 73.13)
Other	M/P 29-32	Post	31	181	1.34	134.83	(115.9, 155.96)
Other	M/P 33-36	Pre	28	175	1.44	121.90	(104.51, 141.36)
Other	M/P 33-36	Post	28	107	0.80	133.75	(109.61, 161.62)
Other	M/P 37+, Status 1s	Pre	28	135	1.27	105.97	(88.85, 125.43)
Other	M/P 37+, Status 1s	Post	30	692	1.29	535.13	(495.99, 576.53)

Additional NLRB Information

For the following figures reviewing the adjustment from the median MELD or PELD at transplant, the pre-policy era begins on May 14, 2019, when the NLRB was first implemented. Thus, the time frames are not the same

pre- and post-policy here.

Figure 108: Distribution of MTS Adjustment for Exception Request Forms Submitted by Application Type and Era

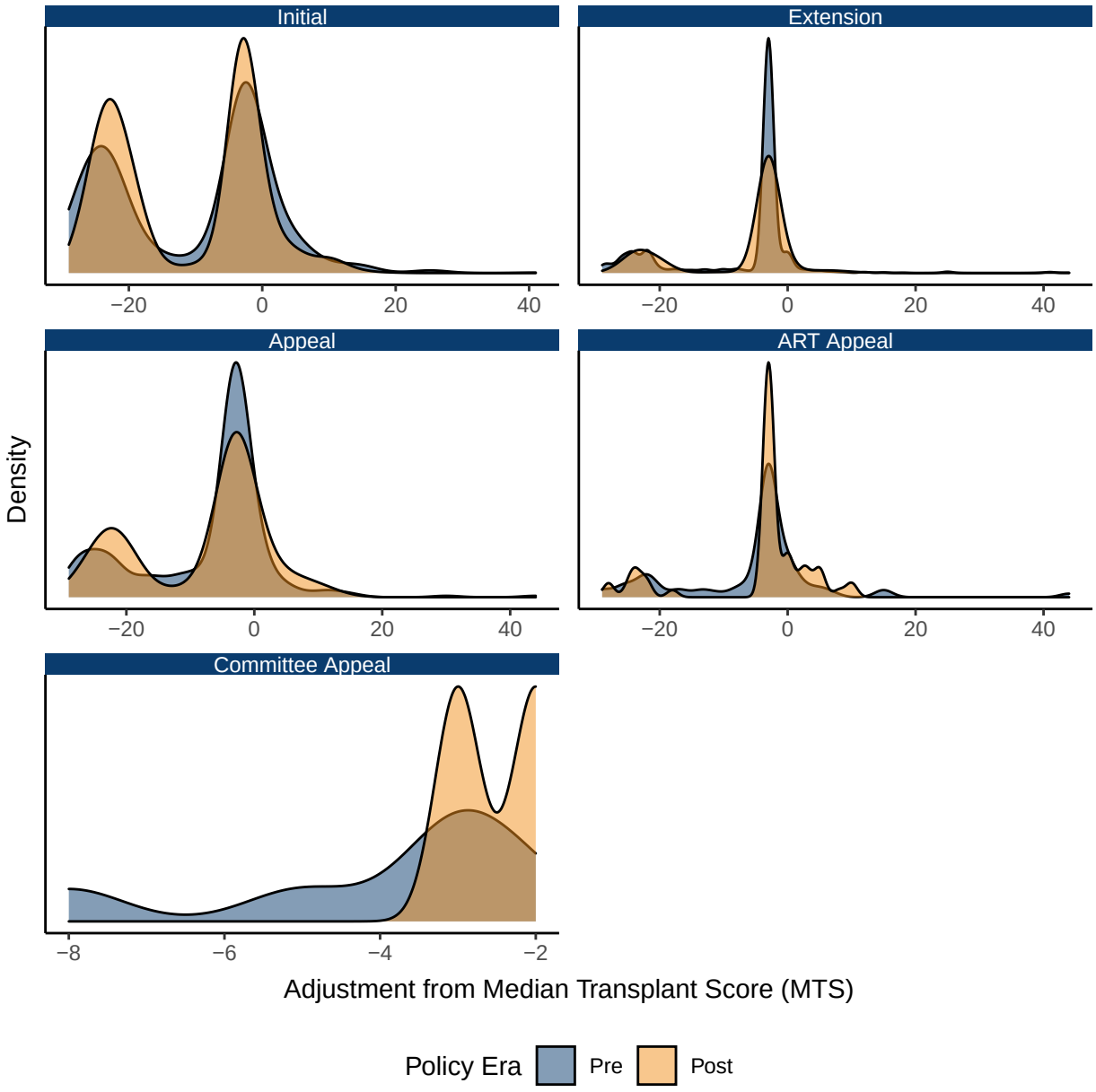


Table 102: Summary of MTS Adjustment for Exception Request Forms Submitted by Application Type and Era

Application Type	Policy Era	N	Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
Initial	Pre	1088	-29	-23.0	-3.0	-10.3	-3.0	41
	Post	1706	-28	-23.0	-3.0	-11.2	-3.0	19
Extension	Pre	1114	-29	-8.0	-3.0	-7.1	-3.0	44
	Post	1880	-28	-3.0	-3.0	-7.0	-3.0	41
Appeal	Pre	316	-29	-13.0	-3.0	-7.4	-3.0	44
	Post	272	-28	-20.0	-3.0	-7.9	-3.0	13
ART Appeal	Pre	77	-29	-8.0	-3.0	-5.6	-3.0	44
	Post	62	-28	-3.0	-3.0	-4.5	0.0	10
Committee Appeal	Pre	6	-8	-4.5	-3.0	-4.0	-3.0	-2
	Post	2	-3	-2.8	-2.5	-2.5	-2.3	-2

Figure 109: Distribution of MTS Adjustment for Initial and Extension Request Forms Submitted by Specialty Review Board and Era

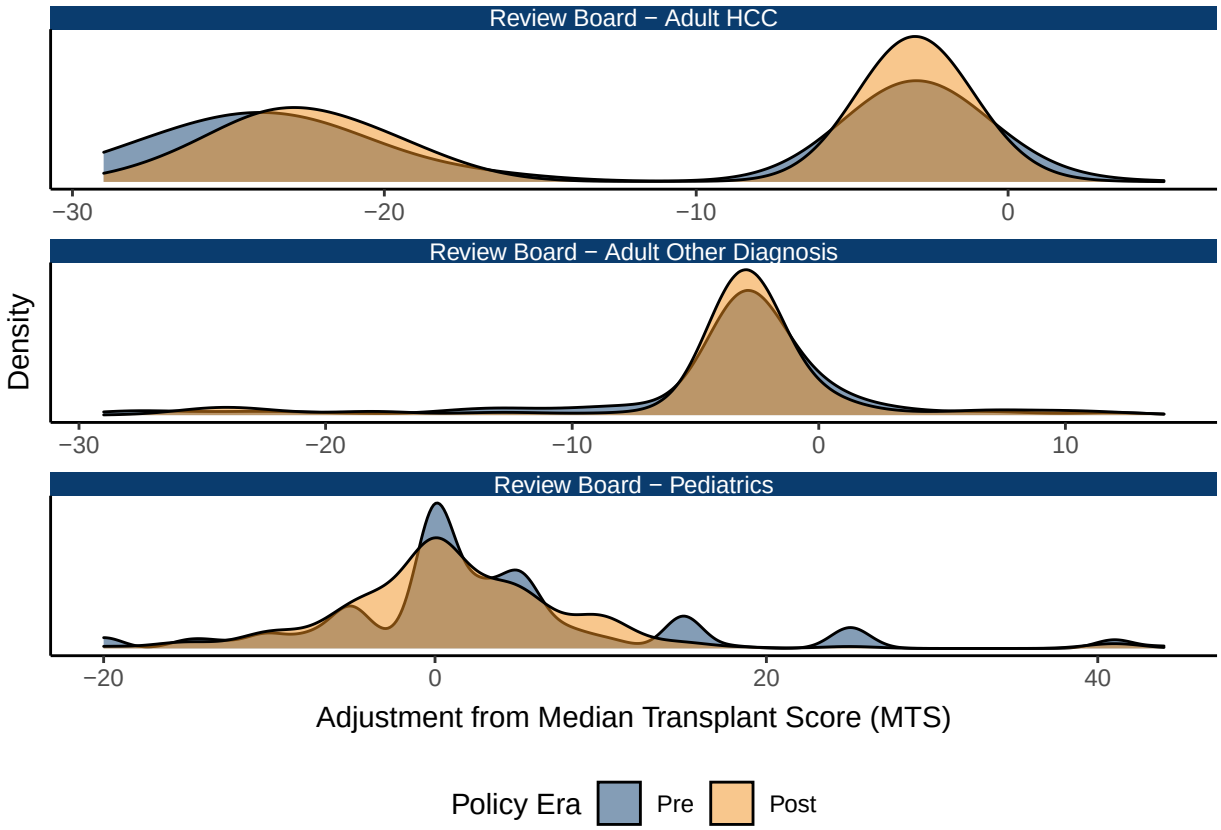


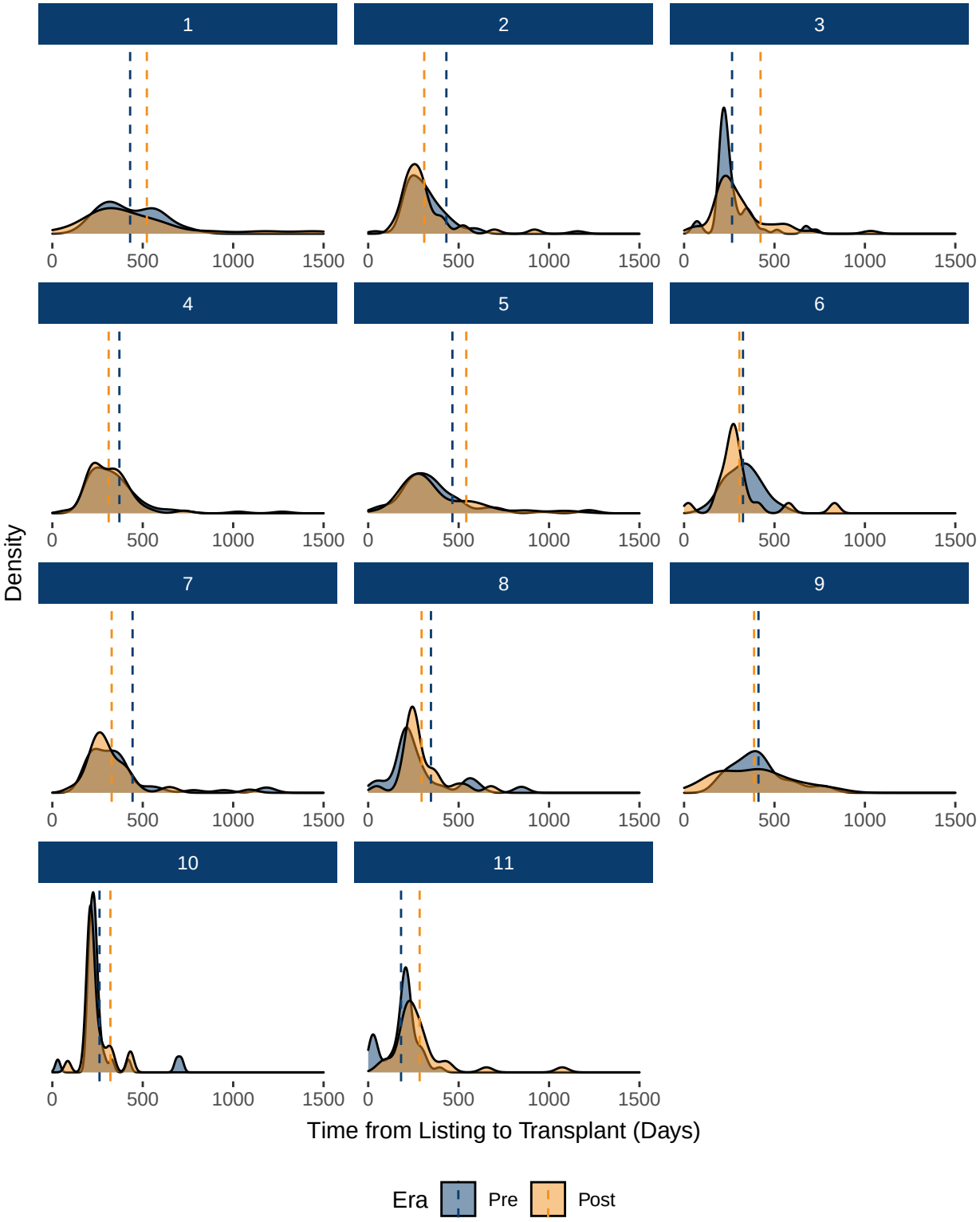
Table 103: Summary of MTS Adjustment for Initial and Extension Request Forms Submitted by Specialty Review Board and Era

Committee	Policy Era	N	Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
Review Board - Adult HCC	Pre	1215	-29	-24	-17	-13.7	-3	5
	Post	2529	-28	-23	-3	-11.9	-3	4
Review Board - Adult Other Diagnosis	Pre	770	-29	-3	-3	-4.1	-3	12
	Post	724	-27	-3	-3	-3.7	-3	14
Review Board - Pediatrics	Pre	217	-20	0	0	3.0	5	44
	Post	333	-20	-3	0	1.5	5	41

Table 104. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant by Exception Diagnosis and Era

			Time (Days)					
Exception Diagnosis	Policy Era	N	Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
No Exception	Pre	2225	0	7.0	33.0	150.4	135.0	3391
	Post	2367	0	5.0	24.0	155.7	137.5	6987
Hepatocellular carcinoma (HCC)	Pre	488	10	217.0	283.5	360.0	382.5	5104
	Post	423	21	220.5	282.0	388.1	398.5	5612
Other specify	Pre	321	7	107.0	246.0	372.7	460.0	2986
	Post	119	5	72.0	148.0	318.7	338.0	3933
Hepatopulmonary syndrome (HPS)	Pre	51	8	83.0	186.0	297.8	339.0	1998
	Post	33	17	55.0	83.0	302.4	310.0	2343
Cholangiocarcinoma (CCA)	Pre	18	13	74.8	247.0	241.1	383.0	573
	Post	25	6	58.0	102.0	141.5	181.0	458
Portopulmonary hypertension	Pre	18	19	140.5	243.0	493.4	503.0	3490
	Post	10	44	74.0	116.5	280.9	334.3	1206
Metabolic disease	Pre	3	103	233.5	364.0	430.3	594.0	824
	Post	3	17	58.5	100.0	154.0	222.5	345
Hepatic artery thrombosis (HAT)	Pre	12	2	3.8	8.0	23.8	17.5	135
	Post	14	2	2.3	12.5	35.6	38.3	225
Cystic fibrosis (CF)	Pre	3	80	137.5	195.0	464.3	656.5	1118
	Post	3	209	211.0	213.0	257.3	281.5	350
Familial amyloid polyneuropathy (FAP)	Pre	1	234	234.0	234.0	234.0	234.0	234

Figure 111. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant, HCC Exception Transplants, by OPTN Region and Era



* National state of emergency declared in US due to COVID−19 pandemic on March 13, 2020.
** Dotted lines indicate average time waiting within each era.
*** There were 55 pre−policy and 50 post−policy transplant recipients with > 2000 days that are not included.

Table 105. Distribution of Days Actively Waiting from Listing Until Deceased Donor Liver Transplant, HCC Exception Transplants, by OPTN Region and Era

			Time (Days)					
OPTN Region	Policy Era	N	Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
1	Pre	27	212	311.0	388.0	430.1	560.0	762
	Post	22	25	277.5	392.5	522.7	592.3	1511
2	Pre	55	40	230.0	301.0	432.2	383.0	3356
	Post	39	142	224.0	276.0	309.7	327.5	920
3	Pre	69	50	209.0	233.0	265.4	278.0	730
	Post	50	26	205.8	259.5	422.9	373.8	2567
4	Pre	73	184	232.0	319.0	370.7	402.0	1648
	Post	48	77	224.3	299.0	311.6	365.8	727
5	Pre	70	23	248.3	337.5	465.6	447.3	5104
	Post	86	21	244.5	320.5	542.3	544.3	5612
6	Pre	22	124	238.3	330.0	325.8	388.8	544
	Post	19	23	240.0	276.0	306.0	315.5	832
7	Pre	43	191	235.5	317.0	443.7	391.0	3094
	Post	40	101	240.8	286.0	328.1	375.3	1092
8	Pre	24	24	196.8	224.0	347.0	349.5	1713
	Post	23	47	237.5	251.0	295.2	338.0	679
9	Pre	27	201	304.0	410.0	411.4	459.0	792
	Post	37	30	202.0	385.0	387.1	506.0	844
10	Pre	31	30	204.0	230.0	260.9	245.0	714
	Post	28	85	203.8	220.0	321.1	268.8	2508
11	Pre	47	10	148.0	200.0	181.6	224.0	395
	Post	31	61	197.0	240.0	284.5	302.0	1073
National	Pre	488	10	217.0	283.5	360.0	382.5	5104
	Post	423	21	220.5	282.0	388.1	398.5	5612