

OPTN Liver & Intestinal Transplantation Committee

Descriptive Data Request

**Fifteen-Month Monitoring Report of Liver and Intestine Acuity Circle Allocation
Removal of DSA and Region as Units of Allocation**

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Purpose

The purpose of this report is to provide look at high-level metrics revealing the performance of the system and any potential consequences that may require changes to policy, programming, or clinical practice. This report, performed on behalf of the Organ Procurement and Transplantation Network (OPTN) Liver and Intestinal Transplantation Committee, will be followed by further reports 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, waitlist 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 and utilization rates
- 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 waitlist 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
- Waitlist drop out rates by exception status
- Changes in deceased donor liver transplant recipients by exception status, and associated allocation scores

Data and Methods

Data Sources:

These analyses use data from the OPTN waitlist, Potential Transplant Recipient (PTR) data, as well as the Transplant Candidate Registration (TCR), Transplant Recipient Registration (TRR), Transplant Recipient Followup (TRF), and Deceased Donor Registration (DDR) forms. Analyses are based on OPTN data as of August 06, 2021 and is subject to change based on any future data submission or correction.

Cohorts: The cohorts examined contain periods of 455 days, or approximately one year and three months of data before and after the liver policy change.

In the *Liver Waitlist* section, new registrations added to the liver waitlist are used. The pre- and post-policy eras are defined as 11/05/2018 - 02/03/2020 and 02/04/2020 - 05/04/2021, respectively. Adult (age 18 or older at listing) and pediatric (age < 18 at listing) sections are included.

The *Deceased Donor Liver Transplants* section includes cohorts of deceased donor, liver-alone transplant recipients as well as deceased donor, liver multi-organ transplant recipients, labeled accordingly. Deceased donor liver-alone transplants are further broken into adult (age 18 or older at transplant) and pediatric (age < 18 at transplant) sections, to elicit differences in patterns for these two groups. Cohorts of transplants are defined during 11/05/2018 - 02/03/2020 and 02/04/2020 - 05/04/2021 pre- and post-policy.

A number of data sets are used to provide the metrics in the *Liver Utilization* section. Data on all deceased organ donors from which at least one organ was recovered for the purpose of transplantation was used for liver utilization rates, while the subset of these donors that had a liver recovered were used for liver discard rates as well as volume of deceased liver donors procured. The pre- and post-policy eras were defined as 11/05/2018 - 02/03/2020 and 02/04/2020 - 05/04/2021, respectively.

The *Intestine* section reviews new registrations added to the intestine waitlist, registrations removed from the intestine waitlist due to reasons of death or too sick to transplant, deceased intestine donors recovered, and deceased donor intestine transplants. The time periods defined for each data set are the same as for the above-described liver sections. This section includes both intestine-alone and intestine multi-organ transplants.

Additional information is provided in the *Appendix*, including data on liver-alone registrations ever waiting and liver-alone registrations removed from the waitlist due to death or too sick to transplant during the pre- and post-policy periods.

A Note About COVID-19

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 U.S. on March 13, 2020. Based on the WHO's declaration of the pandemic and the national state of emergency, the post-implementation monitoring for this report contains roughly 14 months of COVID-19 Era data (03/11/2020 - 05/04/2021). Given the impact that has been seen on the U.S. transplant and donation community (unos.org/covid) the true impact of this policy change is very challenging to determine.

Metrics presented in figures and tables are presented by overall pre- and post-policy era as well as **multiple COVID-19 eras**, where appropriate. The multiple COVID eras represent the time prior to COVID-19 emergency declaration until March 12, 2020 (**Pre-COVID Era**), the heaviest-impacted period of time from March 13, 2020 to May 09, 2020 (**COVID Onset Era**) and the additional period of time with continual, albeit less-dramatic, impact from May 10, 2020 to the end of the post-policy cohort (**COVID Stabilization Era**) are labeled.

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 temporarily suspended 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 forms expected between March 13, 2020 and March 31, 2021. It did not suspend the requirement to report recipient death or graft failure, but extended the time frame for reporting that information for transplant recipients from 14 days to 30 days of knowledge of the event.

Methods

Counts and percentages are used to summarize categorical variables or characteristics, while density curves and distribution summaries (minimum, maximum, mean, median, percentiles) are provided for continuous characteristics. If statistical tests of comparison were performed, Chi-Square tests were used for categorical comparisons pre- vs. post-policy. Non-parametric Kruskal-Wallis and Mann-Whitney rank sum tests were used for comparisons in mean and median values pre- vs. post-policy, respectively, when the assumption of normality of the distribution may not hold. The Kolmogorov-Smirnov test was used to compare full distributions of continuous variables pre- vs. post-policy. The Fligner-Killeen test compared the variance in median MELD at transplant (MMaT) pre- vs. post-policy, as it is a robust non-parametric test against departures from normality.

Executive Summary

This report provides a review at 15 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 evaluate 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.

Even with roughly 14 of the 15 months of the post-policy period during the COVID-19 pandemic, many of the results in this report continue to 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:

- Coinciding with the COVID-19 global pandemic, nationally, there were:
 - **197** more adult (age 18+ at listing) and **81** less pediatric (age < 18 at listing) registrations added to the liver waitlist post-policy
 - **223** more adult (age 18+ at transplant) and **5** less pediatric (age < 18 at transplant) deceased donor, liver-alone transplant recipients post-policy
 - **60** more simultaneous liver-kidney transplant recipients post-policy
 - **278** more deceased liver donors recovered post-policy
- The national median transplant score (MTS) for adults remained unchanged at 28, and decreased from 35 to 30 for pediatric transplant recipients
 - There was a decreasing trend in the variance in MTS for adults by State, DSA, and OPTN Region
- Distances between donor hospital and transplant program increased for deceased donor, liver-alone recipients
 - Increased distances occurred most often for adult recipients with MELD scores 29 and higher or Status 1A
 - Increased distances occurred across all allocation score groups for pediatric recipients
 - Median cold ischemia time increased by 13 minutes for adult and 34 minutes for pediatric recipients
- Both the liver discard rate and liver utilization rate decreased nationally
- Nationally, there were:
 - **50** more intestine registrations added to the intestine waitlist post-policy
 - **10** more deceased donor intestine transplants post-policy
 - **2** more deceased intestine donors recovered post-policy

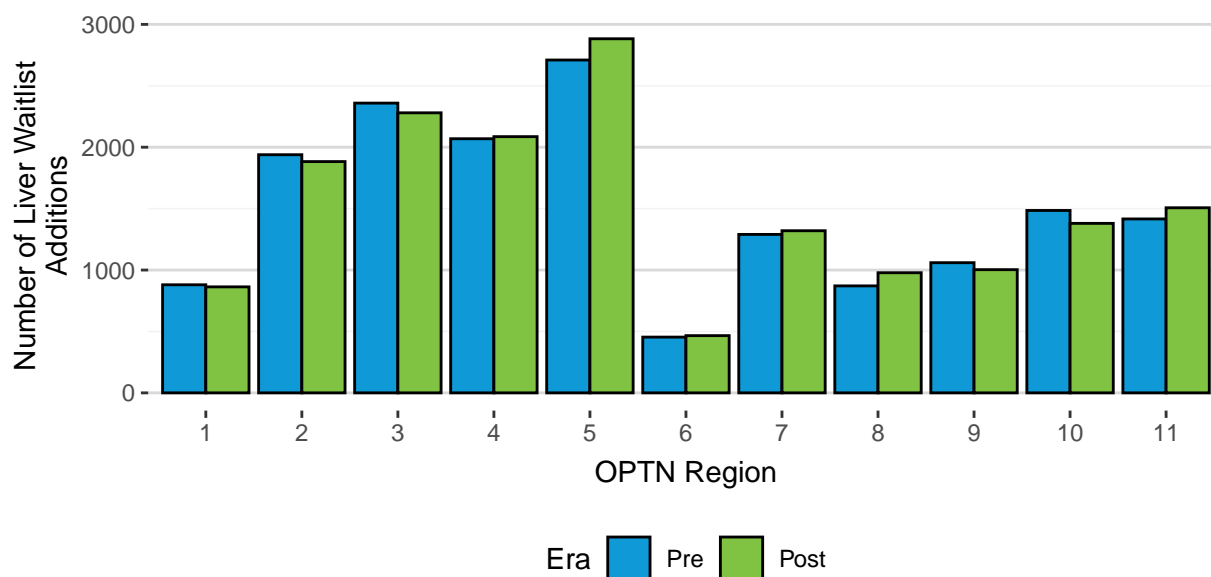
Results

Section I. Liver Waitlist

Overall

There were slightly more new liver waitlist registrations overall post-policy (percent change 0.7%). Regions 5, 8, and 11 experienced the largest increases in waitlist registrations; however, the proportions of waitlist additions among regions were fairly consistent.

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

OPTN Region	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
1	880	5.3%	78	5.0%	71	3.8%	714	5.4%	863	5.2%
2	1939	11.7%	189	12.1%	210	11.2%	1484	11.2%	1883	11.3%
3	2359	14.3%	191	12.2%	258	13.7%	1831	13.9%	2280	13.7%
4	2069	12.5%	191	12.2%	234	12.4%	1661	12.6%	2086	12.5%
5	2710	16.4%	271	17.4%	355	18.9%	2257	17.1%	2883	17.3%
6	454	2.7%	41	2.6%	42	2.2%	383	2.9%	466	2.8%
7	1290	7.8%	154	9.9%	146	7.8%	1020	7.7%	1320	7.9%
8	871	5.3%	87	5.6%	122	6.5%	769	5.8%	978	5.9%
9	1060	6.4%	92	5.9%	84	4.5%	827	6.3%	1003	6.0%
10	1485	9.0%	134	8.6%	159	8.4%	1087	8.2%	1380	8.3%
11	1416	8.6%	132	8.5%	202	10.7%	1173	8.9%	1507	9.1%
National	16533	100.0%	1560	100.0%	1883	100.0%	13206	100.0%	16649	100.0%

The proportions of waitlist additions among diagnosis groups were fairly consistent except for Alcoholic Liver Disease with an increase in registrations post-policy (percent change 14.5%) and Cirrhosis with a decrease in registrations post-policy (percent change -18.6%).

Figure 2. Registrations Added to Liver Waitlist by Diagnosis Group and Era

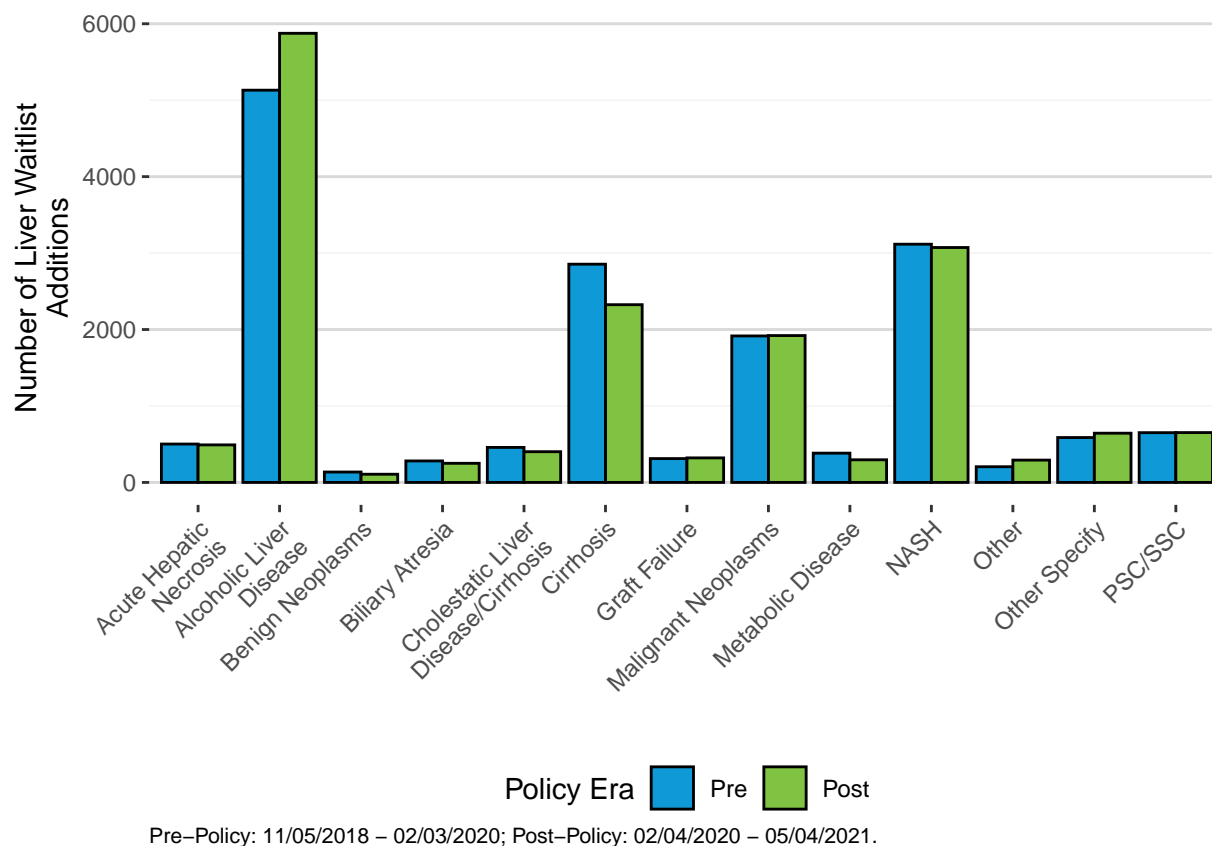
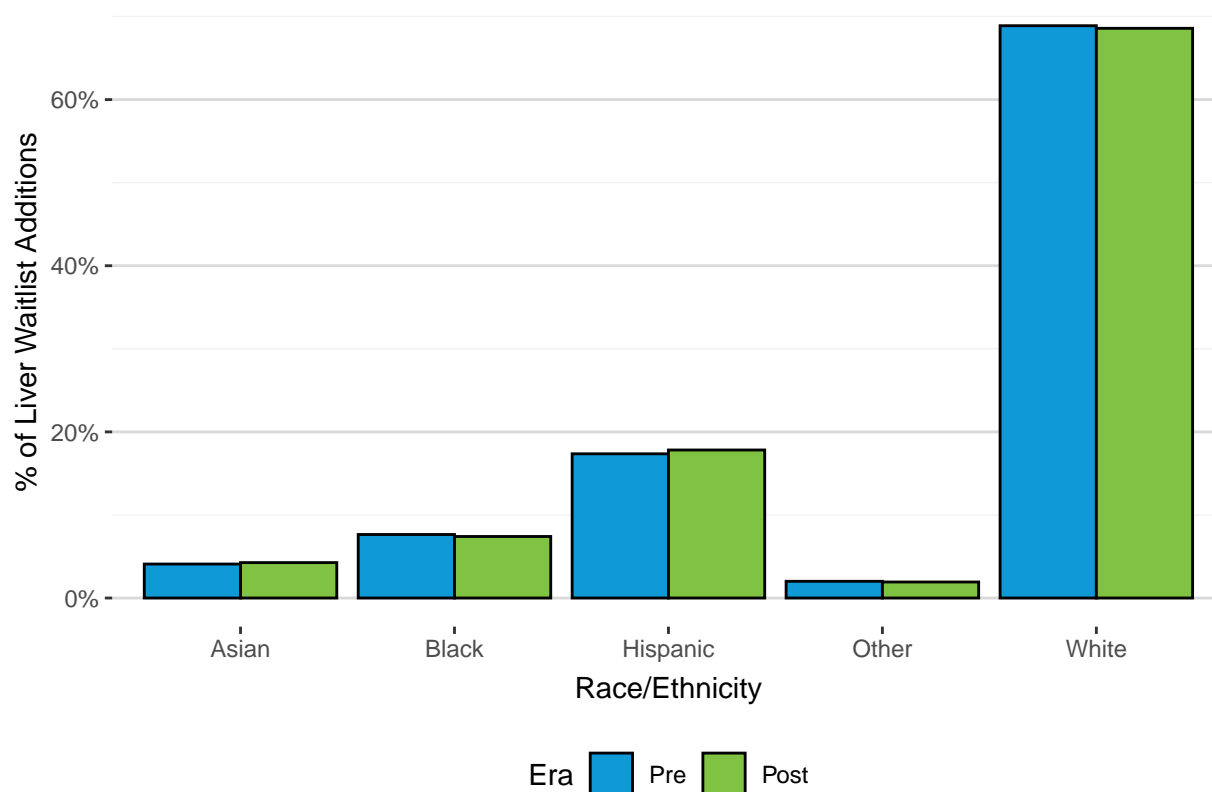


Table 2. Number and Percent of Registrations Added to Liver Waitlist by Diagnosis Group and Era

Diagnosis Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
Acute Hepatic Necrosis	502	3.0%	44	2.8%	48	2.5%	399	3.0%	491	2.9%
Alcoholic Liver Disease	5131	31.0%	530	34.0%	619	32.9%	4726	35.8%	5875	35.3%
Benign Neoplasms	136	0.8%	15	1.0%	9	0.5%	83	0.6%	107	0.6%
Biliary Atresia	281	1.7%	23	1.5%	29	1.5%	198	1.5%	250	1.5%
Cholestatic Liver Disease/Cirrhosis	458	2.8%	37	2.4%	49	2.6%	316	2.4%	402	2.4%
Cirrhosis	2855	17.3%	221	14.2%	318	16.9%	1786	13.5%	2325	14.0%
Graft Failure	312	1.9%	30	1.9%	32	1.7%	259	2.0%	321	1.9%
Malignant Neoplasms	1916	11.6%	189	12.1%	223	11.8%	1509	11.4%	1921	11.5%
Metabolic Disease	383	2.3%	33	2.1%	25	1.3%	238	1.8%	296	1.8%
NASH	3116	18.8%	293	18.8%	360	19.1%	2420	18.3%	3073	18.5%
Other	205	1.2%	20	1.3%	30	1.6%	242	1.8%	292	1.8%
Other Specify	587	3.6%	66	4.2%	81	4.3%	497	3.8%	644	3.9%
PSC/SSC	651	3.9%	59	3.8%	60	3.2%	533	4.0%	652	3.9%

The proportions of new registrations by race/ethnicity remained stable from the pre- to post-policy implementation eras.

Figure 3. Registrations Added to Liver Waitlist by Race/Ethnicity and Era



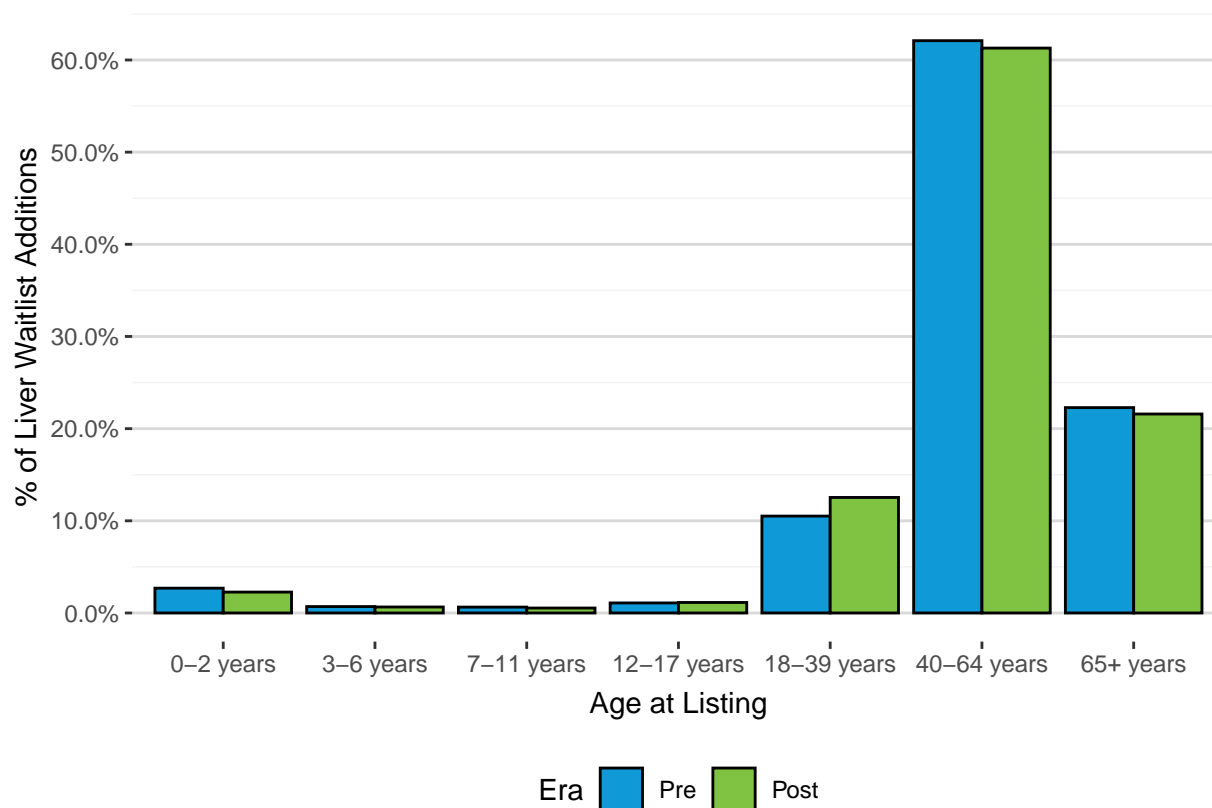
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.

Table 3. Number and Percent of Registrations Added to Liver Waitlist by Race/Ethnicity and Era

Race/Ethnicity	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
Asian	676	4.1%	53	3.4%	76	4.0%	581	4.4%	710	4.3%
Black	1264	7.6%	106	6.8%	112	5.9%	1015	7.7%	1233	7.4%
Hispanic	2870	17.4%	270	17.3%	330	17.5%	2367	17.9%	2967	17.8%
Other	333	2.0%	29	1.9%	38	2.0%	254	1.9%	321	1.9%
White	11390	68.9%	1102	70.6%	1327	70.5%	8989	68.1%	11418	68.6%

New liver waitlist registrations remained similar across most age groups. However, the number of new waitlist registrations in the 18-39 year old age group increased substantially post-policy (percent change 20.1%). Conversely, the number of new waitlist registrations in the 0-2 year old and 7-11 year old age groups decreased substantially post-policy (percent change -15.3% and -15.2%, respectively).

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



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

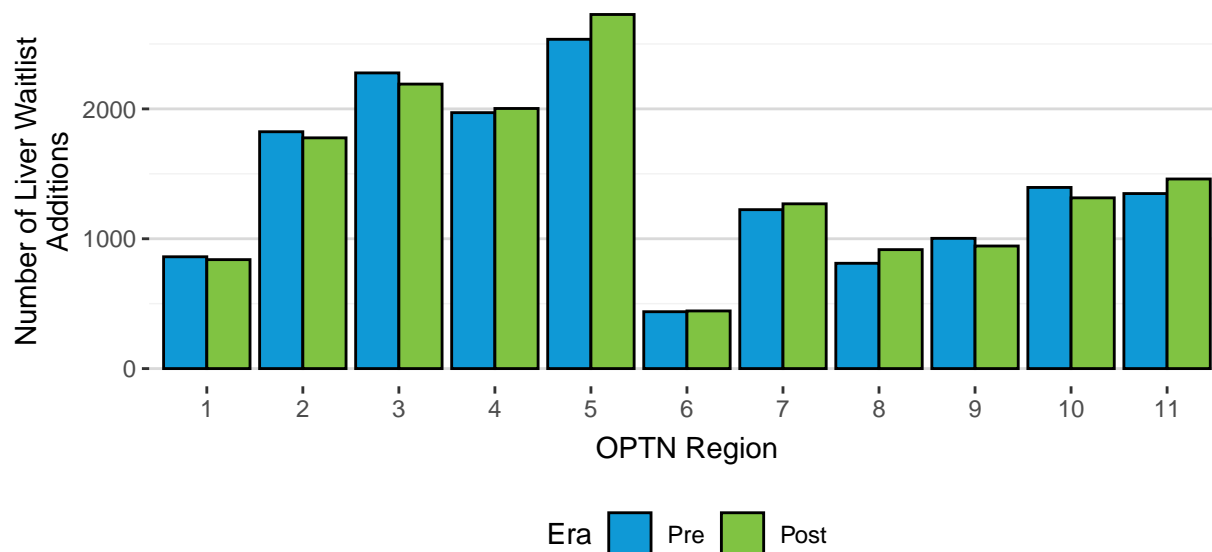
Table 4. Number and Percent of Registrations Added to Liver Waitlist by Age Group and Era

Age at Listing	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
0-2 years	445	2.7%	33	2.1%	46	2.4%	298	2.3%	377	2.3%
3-6 years	115	0.7%	10	0.6%	12	0.6%	86	0.7%	108	0.6%
7-11 years	105	0.6%	14	0.9%	10	0.5%	65	0.5%	89	0.5%
12-17 years	180	1.1%	10	0.6%	19	1.0%	161	1.2%	190	1.1%
18-39 years	1738	10.5%	173	11.1%	208	11.0%	1706	12.9%	2087	12.5%
40-64 years	10266	62.1%	947	60.7%	1180	62.7%	8077	61.2%	10204	61.3%
65+ years	3684	22.3%	373	23.9%	408	21.7%	2813	21.3%	3594	21.6%

Adult Registration Additions

A registration was considered adult if the candidate was 18 years or older at listing. There were slightly more new adult liver waitlist registrations overall post-policy (percent change 1.3%). Regions 5, 8, and 11 experienced the largest increases; however, the proportions of waitlist additions among regions were fairly consistent.

Figure 5. Adult Registrations Added to Liver Waitlist by OPTN Region of Listing Center and Era



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

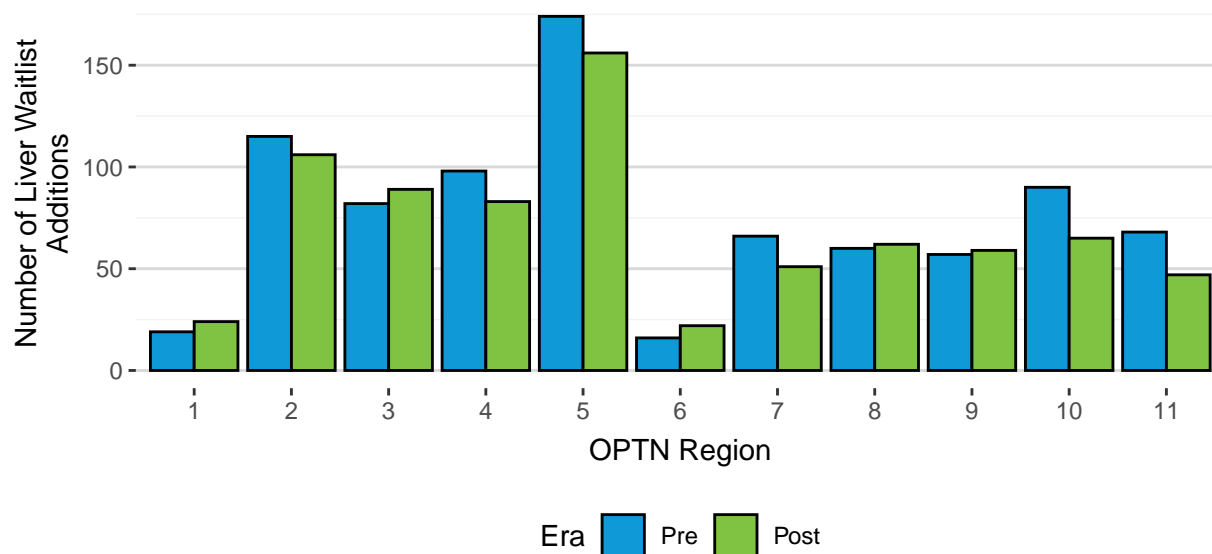
Table 5. Number and Percent of Adult Registrations Added to Liver Waitlist by OPTN Region of Listing Center and Era

OPTN Region	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
1	861	5.5%	73	4.9%	69	3.8%	697	5.5%	839	5.3%
2	1824	11.6%	176	11.8%	201	11.2%	1400	11.1%	1777	11.2%
3	2277	14.5%	184	12.3%	245	13.6%	1762	14.0%	2191	13.8%
4	1971	12.6%	185	12.4%	231	12.9%	1587	12.6%	2003	12.6%
5	2536	16.2%	258	17.3%	333	18.5%	2136	17.0%	2727	17.2%
6	438	2.8%	41	2.7%	42	2.3%	361	2.9%	444	2.8%
7	1224	7.8%	148	9.9%	142	7.9%	979	7.8%	1269	8.0%
8	811	5.2%	81	5.4%	117	6.5%	718	5.7%	916	5.8%
9	1003	6.4%	87	5.8%	79	4.4%	778	6.2%	944	5.9%
10	1395	8.9%	131	8.8%	143	8.0%	1041	8.3%	1315	8.3%
11	1348	8.6%	129	8.6%	194	10.8%	1137	9.0%	1460	9.2%
National	15688	100.0%	1493	100.0%	1796	100.0%	12596	100.0%	15885	100.0%

Pediatric Registration Additions

A registration was considered pediatric if the candidate was less than 18 years old at listing. There were fewer pediatric liver waitlist registrations added post-policy (percent change -9.6%). Regions 2, 4, 5, 7, 10, and 11 experienced decreases in pediatric liver waitlist registrations added post-policy, whereas Regions 1, 3, 6, 8, and 9 experienced increases. There was some variability in proportions by region pre- to post-policy.

Figure 6. Pediatric Registrations Added to Liver Waitlist 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 6. Number and Percent of Pediatric Registrations Added to Liver Waitlist by OPTN Region of Listing Center and Era

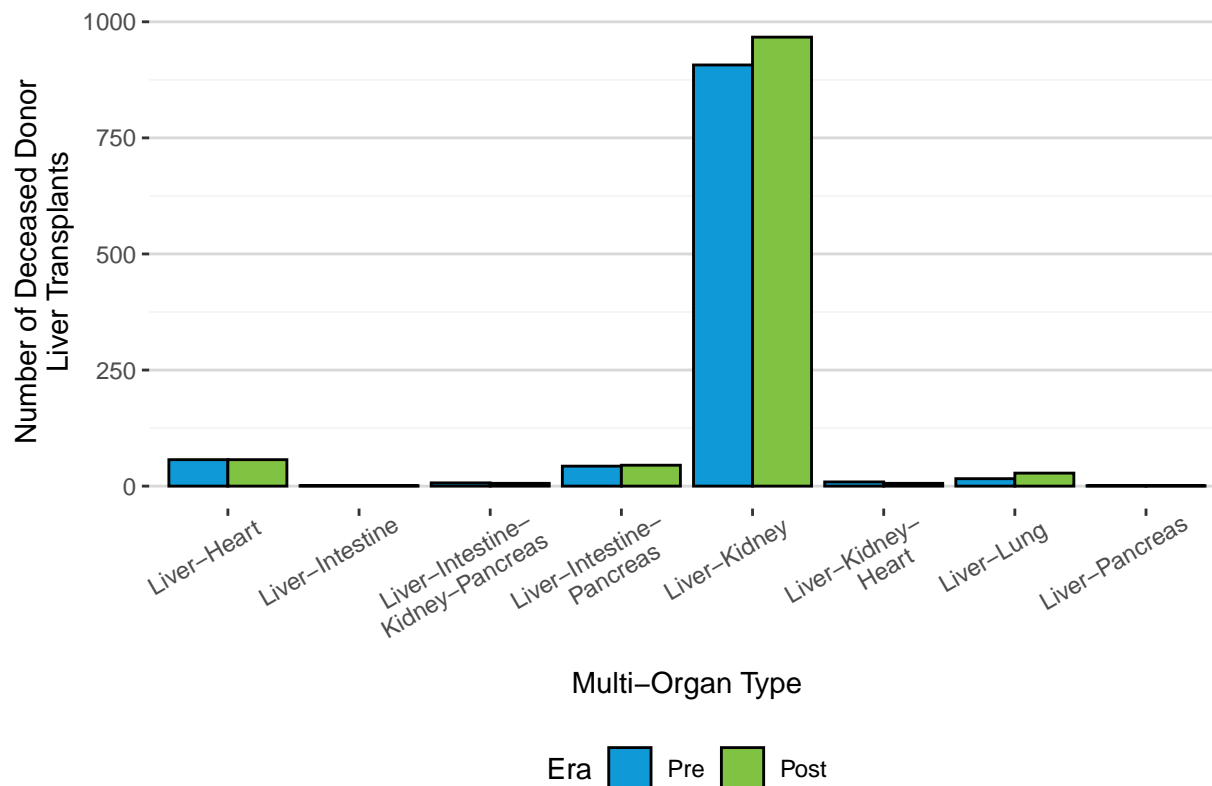
OPTN Region	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
1	19	2.2%	5	7.5%	2	2.3%	17	2.8%	24	3.1%
2	115	13.6%	13	19.4%	9	10.3%	84	13.8%	106	13.9%
3	82	9.7%	7	10.4%	13	14.9%	69	11.3%	89	11.6%
4	98	11.6%	6	9.0%	3	3.4%	74	12.1%	83	10.9%
5	174	20.6%	13	19.4%	22	25.3%	121	19.8%	156	20.4%
6	16	1.9%	0	0.0%	0	0.0%	22	3.6%	22	2.9%
7	66	7.8%	6	9.0%	4	4.6%	41	6.7%	51	6.7%
8	60	7.1%	6	9.0%	5	5.7%	51	8.4%	62	8.1%
9	57	6.7%	5	7.5%	5	5.7%	49	8.0%	59	7.7%
10	90	10.7%	3	4.5%	16	18.4%	46	7.5%	65	8.5%
11	68	8.0%	3	4.5%	8	9.2%	36	5.9%	47	6.2%
National	845	100.0%	67	100.0%	87	100.0%	610	100.0%	764	100.0%

Section II. Deceased Donor Liver Transplants

Overall Liver Transplants

There were a greater number of deceased donor transplants post-policy (10643) compared to pre-policy (10356). While liver-alone transplants made up the vast majority of deceased donor liver transplants, about 10% were liver multi-organ transplants. The largest liver multi-organ category was liver-kidney (SLK) transplants, which saw an increase in volume and percentage of liver transplants post-policy implementation (percent change 6.6%). Any other multi-organ combinations accounted for less than 2% of deceased donor liver transplants during all policy eras.

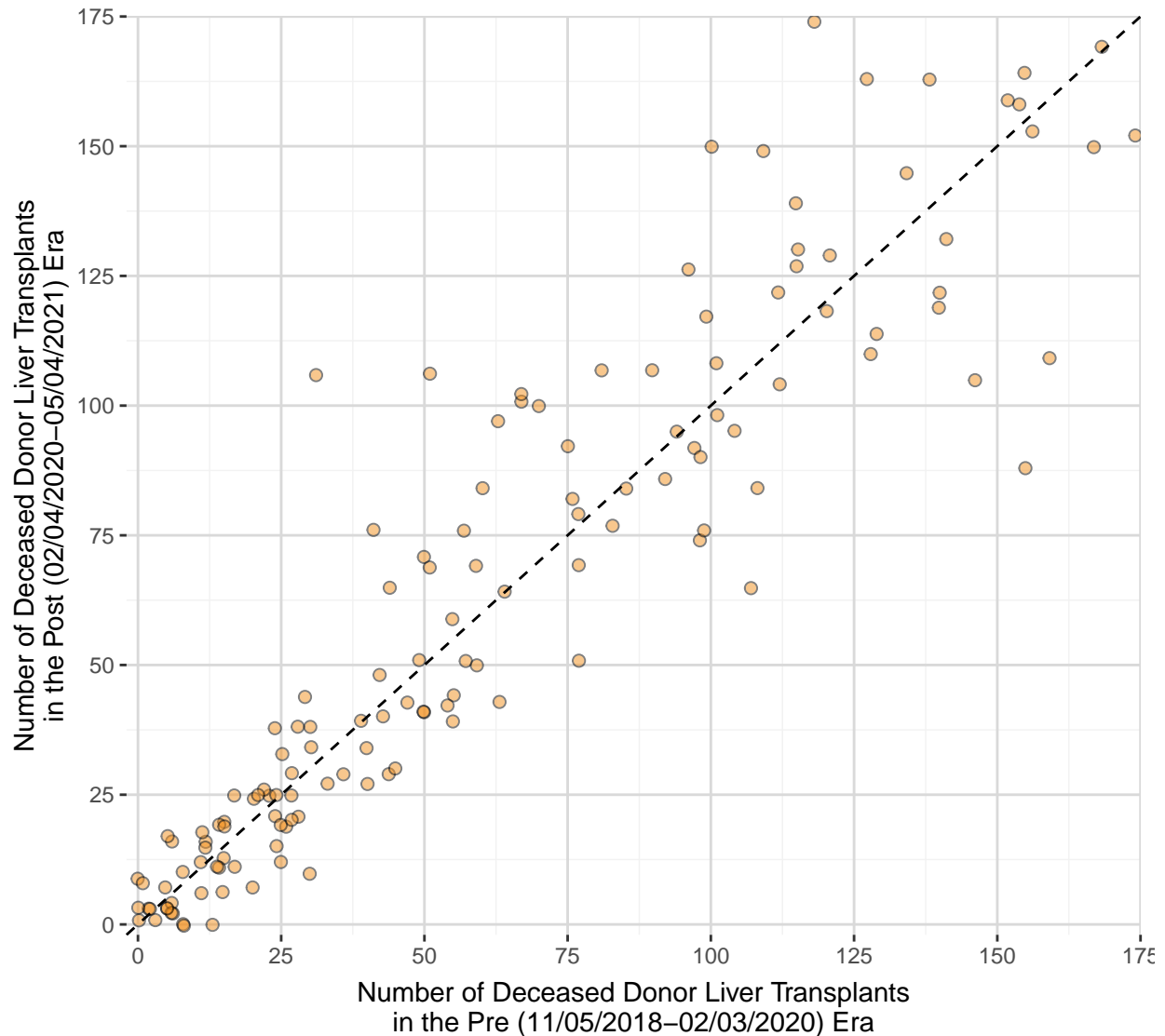
Figure 7. Deceased Donor Liver Transplants by Multi-Organ Type and Era



National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 7. Number and Percent of Deceased Donor Liver Transplants by Multi-Organ Type and Era

Multi-Organ Type	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
Liver Only	9315	89.9%	870	90.4%	1008	88.8%	7655	89.6%	9533	89.6%
Liver-Heart	57	0.6%	6	0.6%	7	0.6%	44	0.5%	57	0.5%
Liver-Intestine	1	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Liver-Intestine-Kidney-Pancreas	7	0.1%	1	0.1%	0	0.0%	5	0.1%	6	0.1%
Liver-Intestine-Pancreas	43	0.4%	0	0.0%	7	0.6%	38	0.4%	45	0.4%
Liver-Kidney	907	8.8%	82	8.5%	111	9.8%	774	9.1%	967	9.1%
Liver-Kidney-Heart	9	0.1%	0	0.0%	0	0.0%	6	0.1%	6	0.1%
Liver-Lung	16	0.2%	3	0.3%	2	0.2%	23	0.3%	28	0.3%
Liver-Pancreas	1	0.0%	0	0.0%	0	0.0%	1	0.0%	1	0.0%
Total	10356	100.0%	962	100.0%	1135	100.0%	8546	100.0%	10643	100.0%

Figure 8. Scatter Plot of Transplant Center Deceased Donor Liver-Alone Transplant Volume

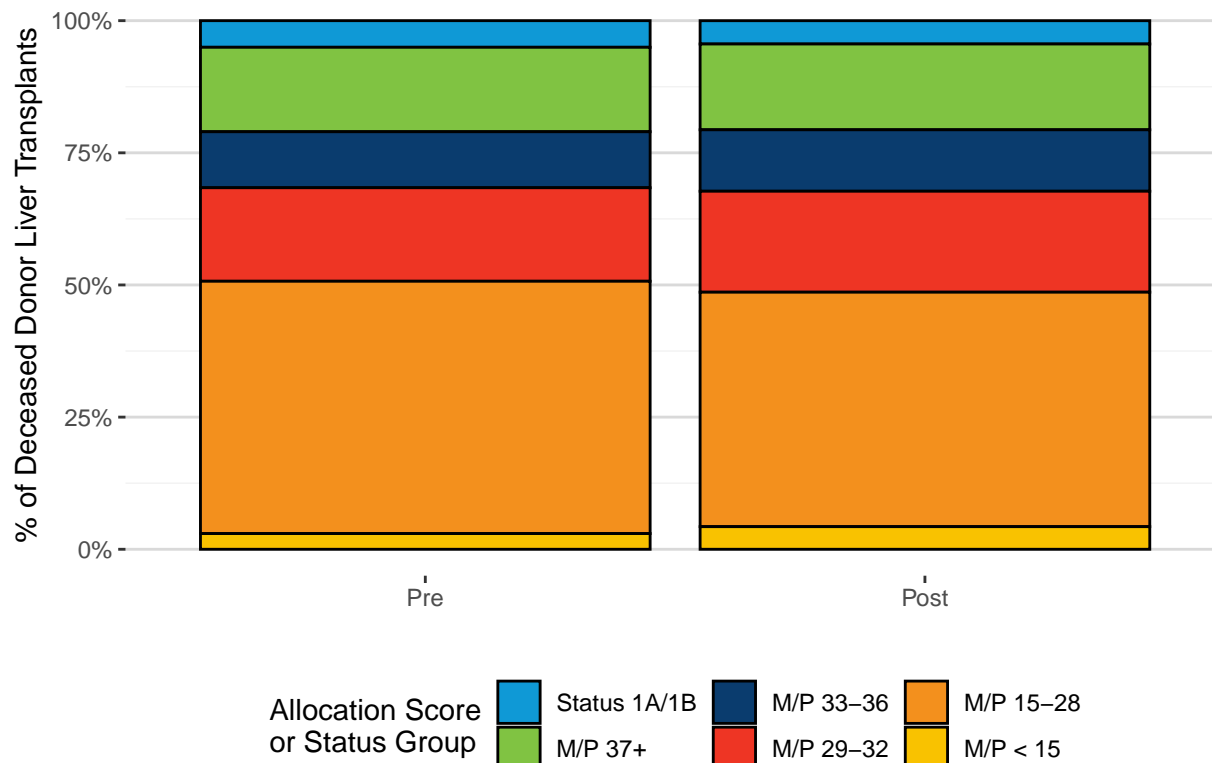
* There was 1 program that is not included due to new activation after the pre era.
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.

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

The majority of programs performed similar numbers of deceased donor liver-alone transplants pre- (11/05/2018–02/03/2020) and post- (02/04/2020–05/04/2021) policy, overall. A Spearman's rank correlation of $\rho = 0.952$ indicated a strong positive, monotonic relationship between these two measures. The Kruskal-Wallis test indicated that there was not a statistically significant change pre- to post-policy in the number of deceased donor, liver-alone transplants performed per transplant program ($\chi^2_1 = 0.0114$, $p = 0.915$).

Similar percentages of transplants occurred within each score group pre- and post-policy era, with a decrease in the proportion of transplant recipients with Status 1A/1B and MELD or PELD scores of 15-28 post-policy. Changes pre- to overall post-policy were statistically significant ($\chi^2=47.37$, $p<0.001$).

Figure 9. Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status and Era



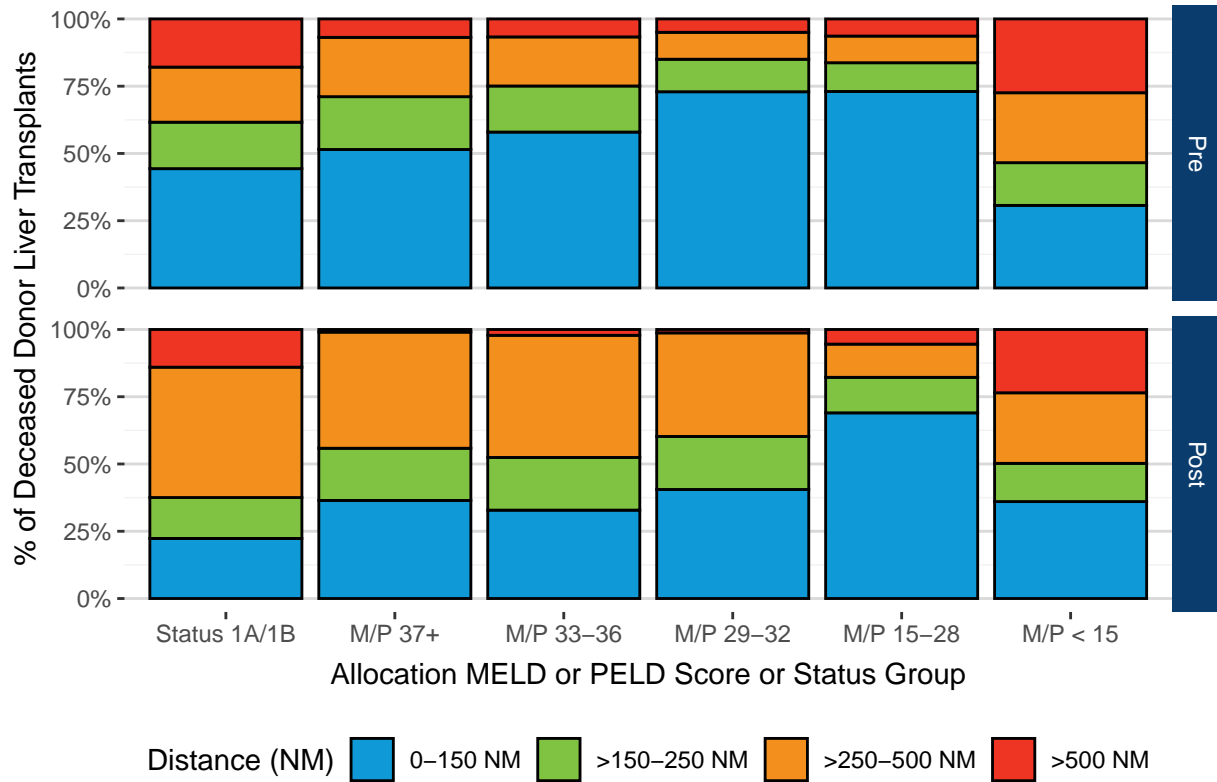
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 8. Number and Percent of Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status and Era

Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
Status 1A/1B	469	5.0%	37	4.3%	46	4.6%	338	4.4%	421	4.4%
M/P 37+	1488	16.0%	148	17.0%	145	14.4%	1254	16.4%	1547	16.2%
M/P 33-36	987	10.6%	100	11.5%	125	12.4%	883	11.5%	1108	11.6%
M/P 29-32	1648	17.7%	200	23.0%	203	20.1%	1418	18.5%	1821	19.1%
M/P 15-28	4446	47.7%	346	39.8%	464	46.0%	3418	44.7%	4228	44.4%
M/P < 15	277	3.0%	39	4.5%	25	2.5%	344	4.5%	408	4.3%
Total	9315	100.0%	870	100.0%	1008	100.0%	7655	100.0%	9533	100.0%

There was a substantial change in the distribution of distance between donor hospital and transplant program by score group. Notably in the post-policy era, higher allocation status and score groups had larger proportions of livers coming from further away, while the distribution of distance for recipients with MELD or PELD scores of 15-28 and <15 remained similar to pre-policy distributions. Although livers traveled further in the post-policy era for higher allocation status and score groups, the increases were in the >250-500 nautical mile group.

Figure 10. Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status, Classification Distance, and Era



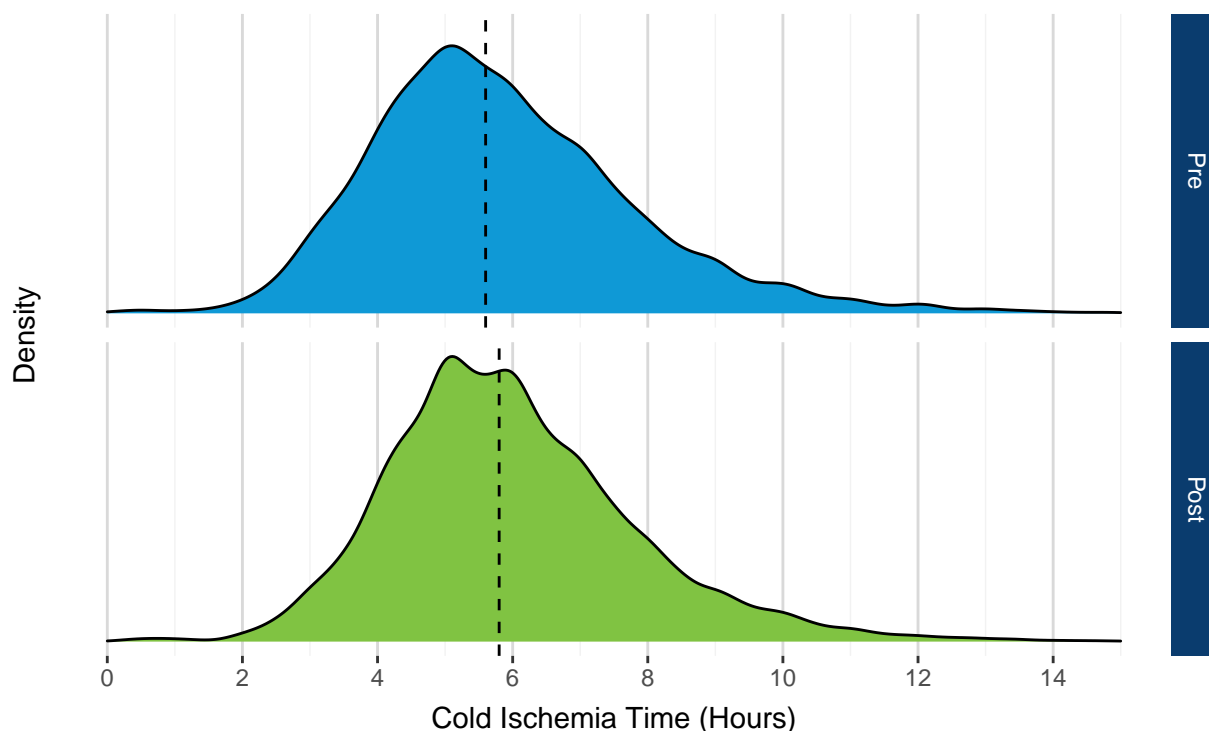
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
 Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 9. Number and Percent of Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status, Classification Distance, and Era

Classification Distance	Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
		N	%	N	%	N	%	N	%	N	%
0-150 NM	Status 1A/1B	208	3.4%	10	2.3%	13	2.5%	71	1.8%	94	1.9%
	M/P 37+	766	12.6%	53	12.1%	56	10.8%	455	11.8%	564	11.7%
	M/P 33-36	572	9.4%	32	7.3%	45	8.7%	287	7.4%	364	7.5%
	M/P 29-32	1202	19.8%	96	21.9%	76	14.7%	566	14.6%	738	15.3%
	M/P 15-28	3247	53.4%	239	54.4%	321	62.1%	2358	60.9%	2918	60.5%
	M/P < 15	85	1.4%	9	2.1%	6	1.2%	132	3.4%	147	3.0%
>150-250 NM	Status 1A/1B	81	6.4%	6	4.0%	8	4.6%	50	4.1%	64	4.1%
	M/P 37+	292	23.2%	32	21.2%	33	19.0%	235	19.1%	300	19.3%
	M/P 33-36	169	13.4%	18	11.9%	26	14.9%	173	14.1%	217	13.9%
	M/P 29-32	199	15.8%	38	25.2%	49	28.2%	272	22.1%	359	23.1%
	M/P 15-28	475	37.7%	48	31.8%	55	31.6%	455	37.0%	558	35.9%
	M/P < 15	44	3.5%	9	6.0%	3	1.7%	46	3.7%	58	3.7%
>250-500 NM	Status 1A/1B	96	7.5%	18	7.4%	17	6.3%	169	7.7%	204	7.5%
	M/P 37+	328	25.6%	60	24.8%	53	19.6%	555	25.3%	668	24.7%
	M/P 33-36	180	14.0%	46	19.0%	52	19.3%	405	18.5%	503	18.6%
	M/P 29-32	165	12.9%	62	25.6%	76	28.1%	563	25.7%	701	25.9%
	M/P 15-28	441	34.4%	39	16.1%	65	24.1%	418	19.1%	522	19.3%
	M/P < 15	72	5.6%	17	7.0%	7	2.6%	83	3.8%	107	4.0%
>500 NM	Status 1A/1B	84	12.1%	3	7.9%	8	17.0%	48	13.3%	59	13.2%
	M/P 37+	102	14.7%	3	7.9%	3	6.4%	9	2.5%	15	3.4%
	M/P 33-36	66	9.5%	4	10.5%	2	4.3%	18	5.0%	24	5.4%
	M/P 29-32	82	11.8%	4	10.5%	2	4.3%	17	4.7%	23	5.1%
	M/P 15-28	283	40.8%	20	52.6%	23	48.9%	187	51.7%	230	51.5%
	M/P < 15	76	11.0%	4	10.5%	9	19.1%	83	22.9%	96	21.5%

The median cold ischemia time increased by roughly 12 minutes post-policy compared to pre-policy; however, the change in average cold ischemia time was statistically significant pre- versus post-policy overall ($t=-5.40$, $p<0.001$). Changes in cold ischemia time post-policy should take into consideration the missingness of this measurement for approximately 2.0% of transplants post-policy (versus 0.5% pre-policy) as well as the COVID-19 emergency declaration.

Figure 11. Distribution of Cold Ischemia Time for Deceased Donor Liver-Alone Transplants by Era



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

Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

** Dotted lines indicate median cold ischemia time within each era.

*** There were 51 pre-policy and 189 post-policy transplant recipients with missing cold ischemia time that are not included.

^ There were 18 pre-policy and 32 post-policy transplant recipients with cold ischemia time > 15 hours not included.

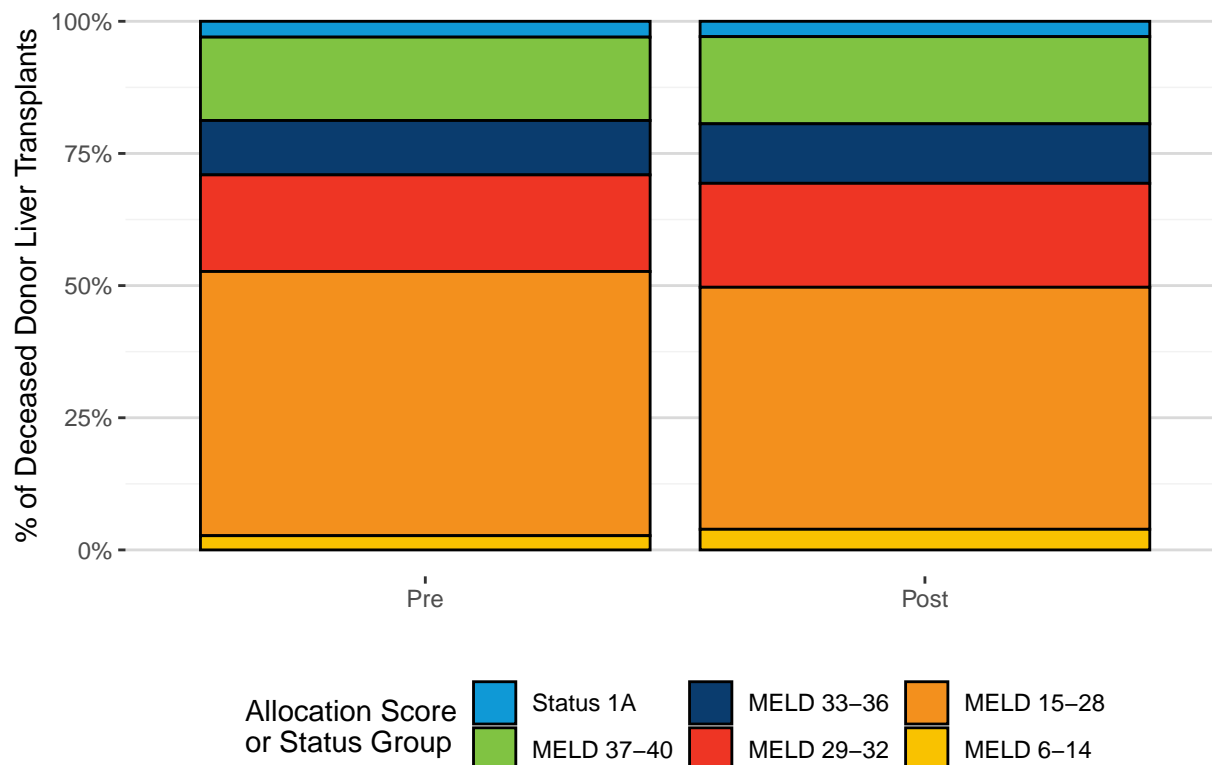
Table 10. Distribution of Cold Ischemia Time for Deceased Donor Liver-Alone Transplants by Era

Policy Era	N	N Missing	Time (hours)					
			Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
Pre-Policy	9315	51	0.00	4.50	5.60	5.88	7	33.20
Post-Policy, Pre-COVID	870	10	0.42	4.75	5.70	6.01	7	43.00
Post-Policy, COVID Onset	1008	16	0.83	4.70	5.63	6.02	7	17.63
Post-Policy, COVID Stabilization	7655	163	0.07	4.80	5.83	6.05	7	33.50
Post-Policy (overall)	9533	189	0.07	4.78	5.80	6.04	7	43.00

Adult Liver-Alone Transplants

A transplant was considered adult if the recipient was 18 years or older at transplant. Similar percentages of transplants occurred within each score group pre- and post-policy, with a post-policy decrease in the proportion of adult transplant recipients with MELD scores of 15-28. Changes pre- to overall post-policy were statistically significant ($\chi^2_5=46.05$, $p<0.001$). The national median allocation MELD score at transplant for adults was 28 pre-policy and 28 overall post-policy.

Figure 12. Adult Deceased Donor Liver-Alone Transplants by Allocation MELD Score or Status and Era



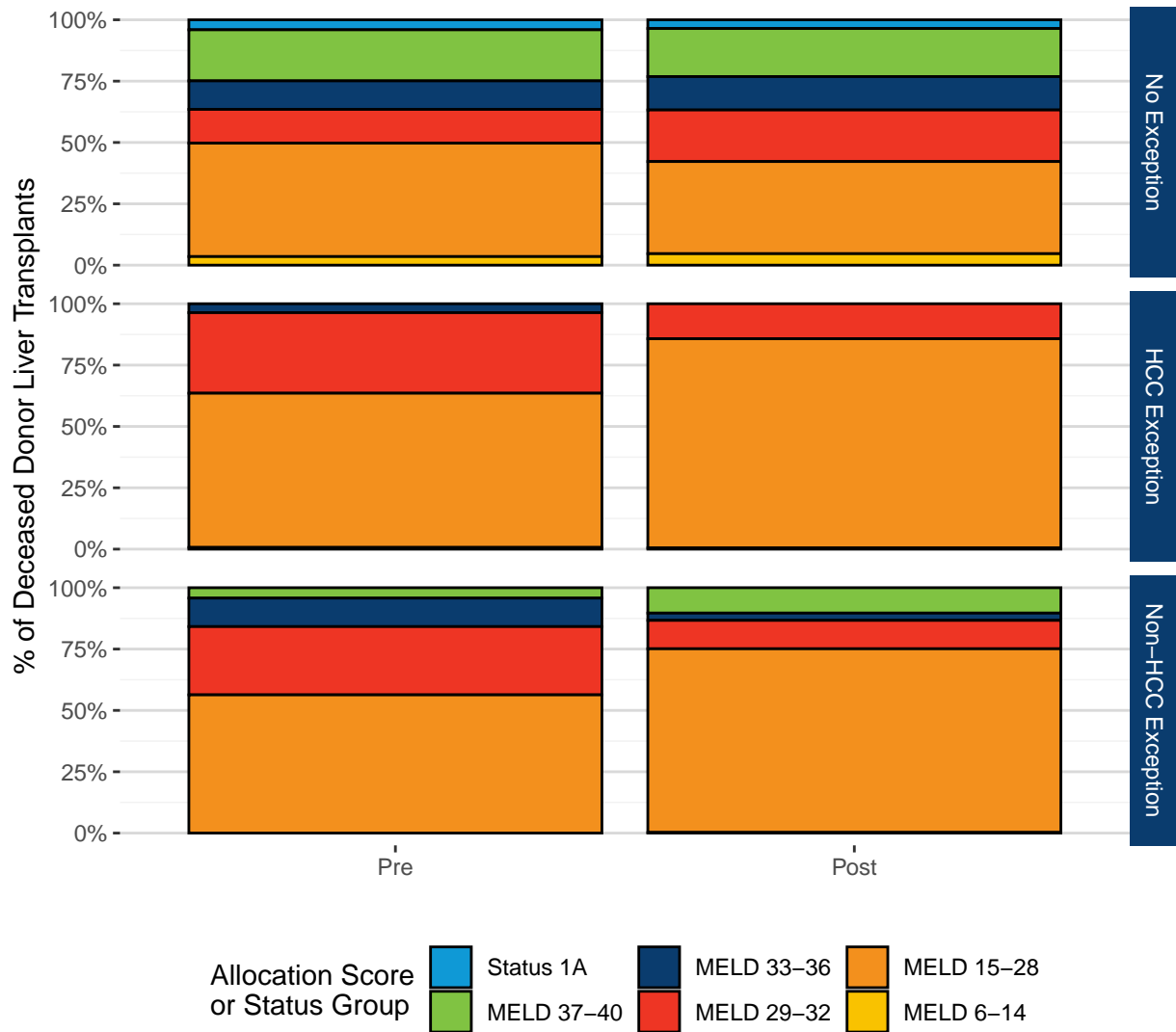
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 11. Number and Percent of Adult Deceased Donor Liver-Alone Transplants by Allocation MELD Score or Status and Era

Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
Status 1A	264	3.0%	25	3.0%	26	2.7%	211	2.9%	262	2.9%
MELD 37-40	1389	15.8%	140	17.0%	140	14.6%	1209	16.7%	1489	16.5%
MELD 33-36	906	10.3%	90	10.9%	120	12.5%	807	11.1%	1017	11.3%
MELD 29-32	1610	18.3%	196	23.8%	198	20.7%	1382	19.1%	1776	19.7%
MELD 15-28	4402	50.0%	338	41.1%	454	47.4%	3343	46.1%	4135	45.8%
MELD 6-14	237	2.7%	33	4.0%	20	2.1%	299	4.1%	352	3.9%
Total	8808	100.0%	822	100.0%	958	100.0%	7251	100.0%	9031	100.0%

The distributions of allocation MELD scores or status at transplant for adult recipients changed for all exception groups. The large majority of both HCC and non-HCC exception transplant recipients had scores of 15-28 post-policy. There was an increase in non-HCC exception recipients with high MELD scores of 37-40 and fewer with scores of 29-36. Non-exception transplant recipients experienced a large increase in the proportion of MELD 29-32 recipients and a subsequent decrease in MELD 15-28 recipients post-policy.

Figure 13. Adult Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status, Exception Status and Era



National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
 Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 12. Number and Percent of Adult Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score at Transplant, Exception Status and Era

Exception Status	Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
		N	%	N	%	N	%	N	%	N	%
No Exception	Status 1A	264	4.1%	25	3.8%	26	3.3%	211	3.5%	262	3.5%
	MELD 37-40	1353	20.8%	137	20.9%	138	17.7%	1172	19.7%	1447	19.6%
	MELD 33-36	754	11.6%	86	13.1%	119	15.3%	800	13.4%	1005	13.6%
	MELD 29-32	893	13.8%	157	24.0%	170	21.8%	1225	20.6%	1552	21.0%
	MELD 15-28	3003	46.2%	217	33.1%	306	39.3%	2250	37.8%	2773	37.6%
	MELD 6-14	227	3.5%	33	5.0%	20	2.6%	292	4.9%	345	4.7%
HCC Exception	MELD 33-36	53	3.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	MELD 29-32	480	32.8%	27	22.7%	24	17.5%	126	12.8%	177	14.3%
	MELD 15-28	919	62.9%	92	77.3%	113	82.5%	853	86.6%	1058	85.3%
	MELD 6-14	10	0.7%	0	0.0%	0	0.0%	6	0.6%	6	0.5%
Non-HCC Exception	MELD 37-40	36	4.2%	3	6.2%	2	4.8%	37	11.7%	42	10.3%
	MELD 33-36	99	11.6%	4	8.3%	1	2.4%	7	2.2%	12	3.0%
	MELD 29-32	237	27.8%	12	25.0%	4	9.5%	31	9.8%	47	11.6%
	MELD 15-28	480	56.3%	29	60.4%	35	83.3%	240	75.9%	304	74.9%
	MELD 6-14	0	0.0%	0	0.0%	0	0.0%	1	0.3%	1	0.2%

The range of adult median transplant scores (MTS) by DSA was 18 to 36 in the pre-policy era and 18 to 33 in the post-policy era. However, the overall post-policy map illustrates an attenuation of MTS from the extremes. The national MTS was 28 pre- and 28 post-policy.

Figure 14. Median Adult Deceased Donor Liver-Alone Recipient Allocation MELD Score at Transplant by DSA of Transplant Center and Era

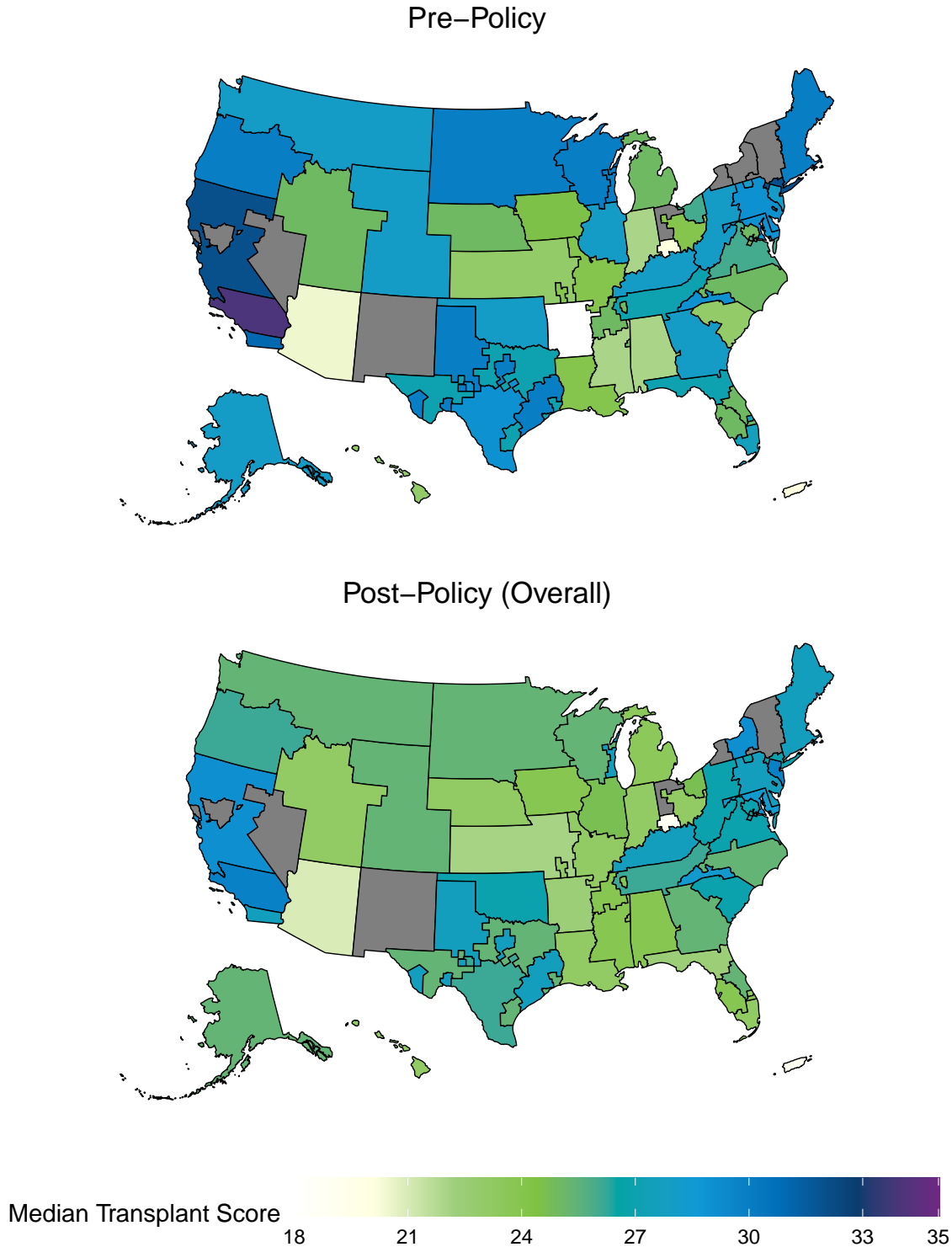


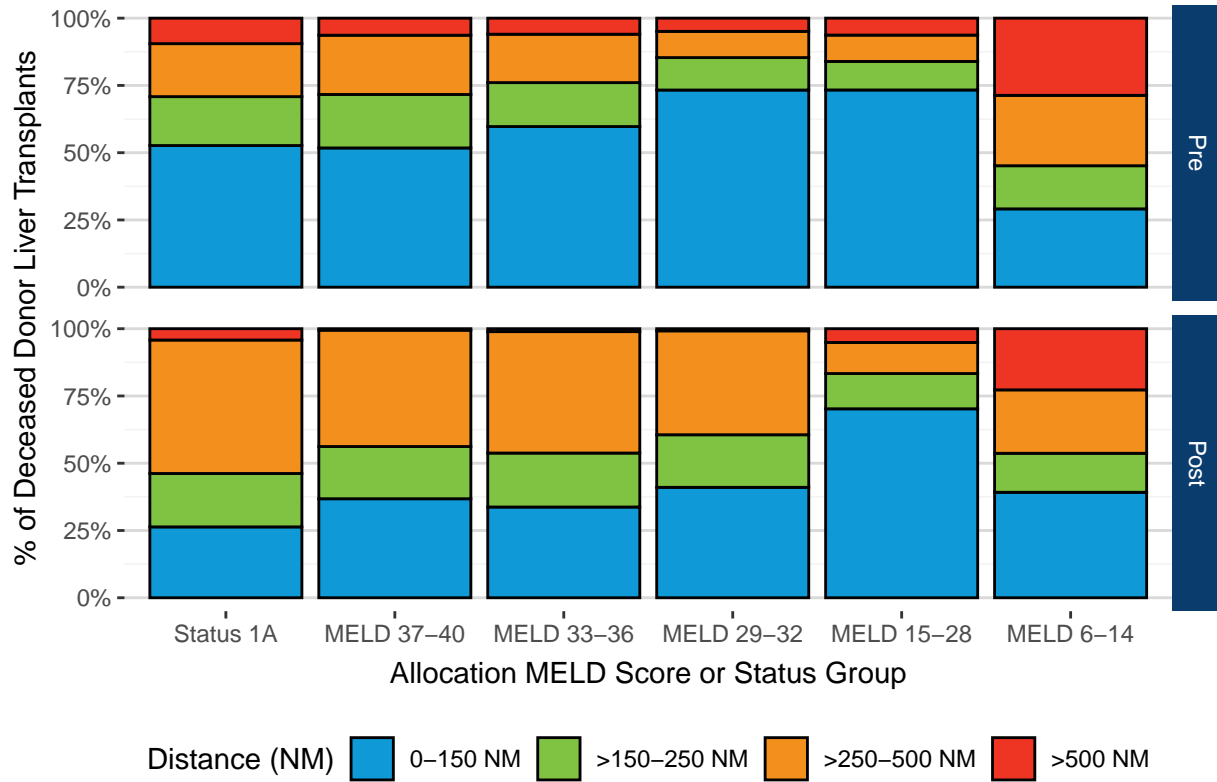
Table 13. Variance and Standard Deviation of Median Adult Deceased Donor Liver-Along Recipient Allocation MELD Score at Transplant By Era

While patterns of decreasing variation of median allocation score at transplant emerged, these changes should be interpreted with caution in light of the COVID-19 emergency declaration, particularly in these smaller post-policy implementation time periods and as the sample size per geographic unit gets smaller. Overall pre- versus post-policy comparisons show that there were no statistically significant differences in variance at this time (OPTN Region $\chi^2=0.05$, $p=0.827$, DSA $\chi^2=0.20$, $p=0.651$, state $\chi^2=0.36$, $p=0.547$, transplant program $\chi^2=0.42$, $p=0.517$).

Unit of Median Transplant Score	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	Variance	(SD)	Variance	(SD)	Variance	(SD)	Variance	(SD)	Variance	(SD)
OPTN Region	7.69	2.77	4.42	2.10	4.36	2.09	6.02	2.45	5.30	2.30
DSA	13.53	3.68	14.97	3.87	17.90	4.23	12.23	3.50	11.65	3.41
State	12.23	3.50	16.06	4.01	19.09	4.37	10.11	3.18	10.10	3.18
Transplant Center	18.55	4.31	26.38	5.14	21.77	4.67	29.17	5.40	28.55	5.34

In the post-policy era, higher allocation score groups had larger proportions of livers coming from further away, while the distribution of distance for recipients with MELD scores of 15-28 and <15 remained similar to pre-policy distributions.

Figure 15. Adult Deceased Donor Liver-Alone Transplants by Allocation MELD Score or Status, Classification Distance, and Era



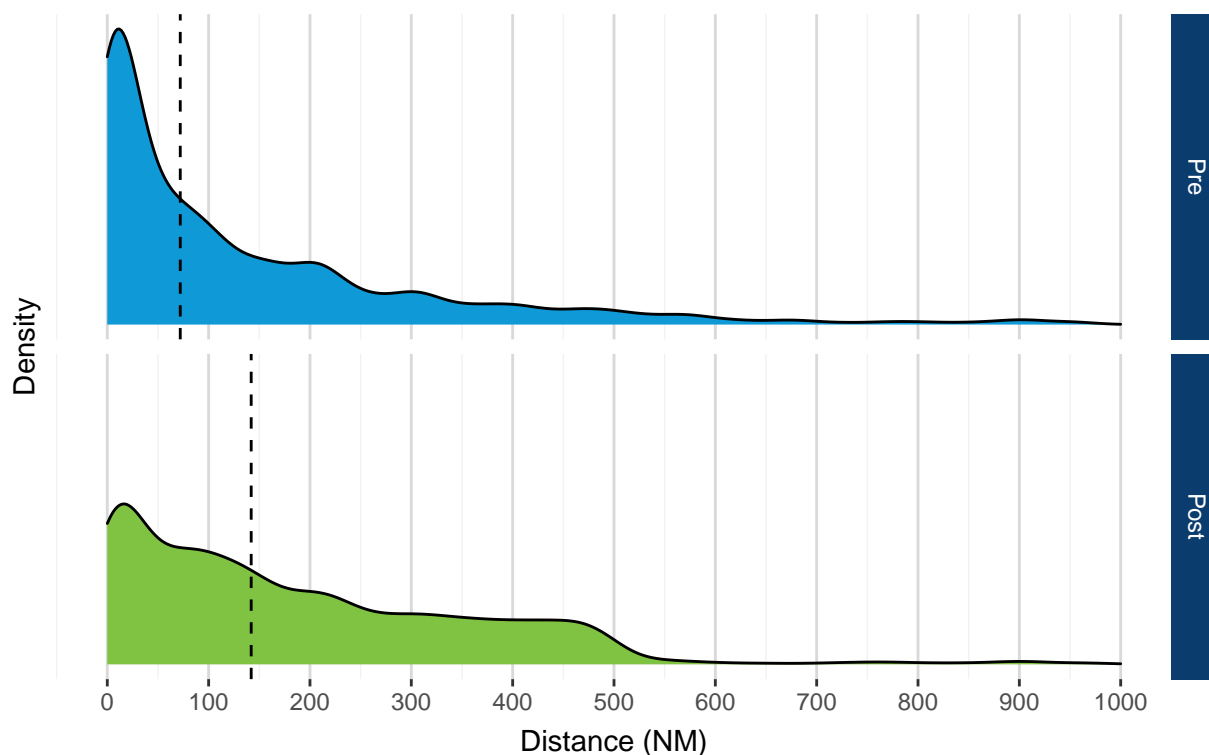
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
 Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 14. Number and Percent of Adult Deceased Donor Liver-Alone Transplants by Allocation MELD Score or Status, Classification Distance, and Era

Classification Distance	Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
		N	%	N	%	N	%	N	%	N	%
0-150 NM	Status 1A	139	2.4%	9	2.1%	10	1.9%	50	1.3%	69	1.5%
	MELD 37-40	719	12.2%	49	11.4%	56	10.9%	443	11.7%	548	11.6%
	MELD 33-36	541	9.2%	31	7.2%	44	8.6%	268	7.1%	343	7.3%
	MELD 29-32	1180	20.1%	96	22.3%	76	14.8%	557	14.7%	729	15.4%
	MELD 15-28	3227	54.9%	238	55.2%	321	62.6%	2345	61.9%	2904	61.4%
	MELD 6-14	69	1.2%	8	1.9%	6	1.2%	124	3.3%	138	2.9%
>150-250 NM	Status 1A	48	4.1%	6	4.2%	7	4.2%	39	3.3%	52	3.5%
	MELD 37-40	276	23.6%	32	22.2%	32	19.3%	225	19.1%	289	19.5%
	MELD 33-36	148	12.6%	15	10.4%	26	15.7%	163	13.9%	204	13.7%
	MELD 29-32	194	16.6%	37	25.7%	47	28.3%	263	22.4%	347	23.4%
	MELD 15-28	467	39.9%	46	31.9%	53	31.9%	443	37.7%	542	36.5%
	MELD 6-14	38	3.2%	8	5.6%	1	0.6%	42	3.6%	51	3.4%
>250-500 NM	Status 1A	52	4.4%	9	4.2%	8	3.3%	113	5.6%	130	5.2%
	MELD 37-40	306	26.1%	57	26.4%	51	20.8%	536	26.5%	644	26.0%
	MELD 33-36	163	13.9%	42	19.4%	50	20.4%	367	18.2%	459	18.5%
	MELD 29-32	157	13.4%	59	27.3%	73	29.8%	554	27.4%	686	27.7%
	MELD 15-28	431	36.8%	35	16.2%	57	23.3%	386	19.1%	478	19.3%
	MELD 6-14	62	5.3%	14	6.5%	6	2.4%	63	3.1%	83	3.3%
>500 NM	Status 1A	25	4.2%	1	3.2%	1	2.9%	9	3.3%	11	3.3%
	MELD 37-40	88	14.9%	2	6.5%	1	2.9%	5	1.9%	8	2.4%
	MELD 33-36	54	9.1%	2	6.5%	0	0.0%	9	3.3%	11	3.3%
	MELD 29-32	79	13.4%	4	12.9%	2	5.9%	8	3.0%	14	4.2%
	MELD 15-28	277	46.9%	19	61.3%	23	67.6%	169	62.6%	211	63.0%
	MELD 6-14	68	11.5%	3	9.7%	7	20.6%	70	25.9%	80	23.9%

There was a shift towards longer distances in the post-policy periods, which was more evenly distributed across distances from about 150 to 500 nautical miles indicated by the more gradual slopes of the densities.

Figure 16. Distribution of Distance from Donor Hospital to Transplant Center for Adult Deceased Donor Liver-Alone Transplants by Era



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

Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

** Dotted lines indicate median distance within each era.

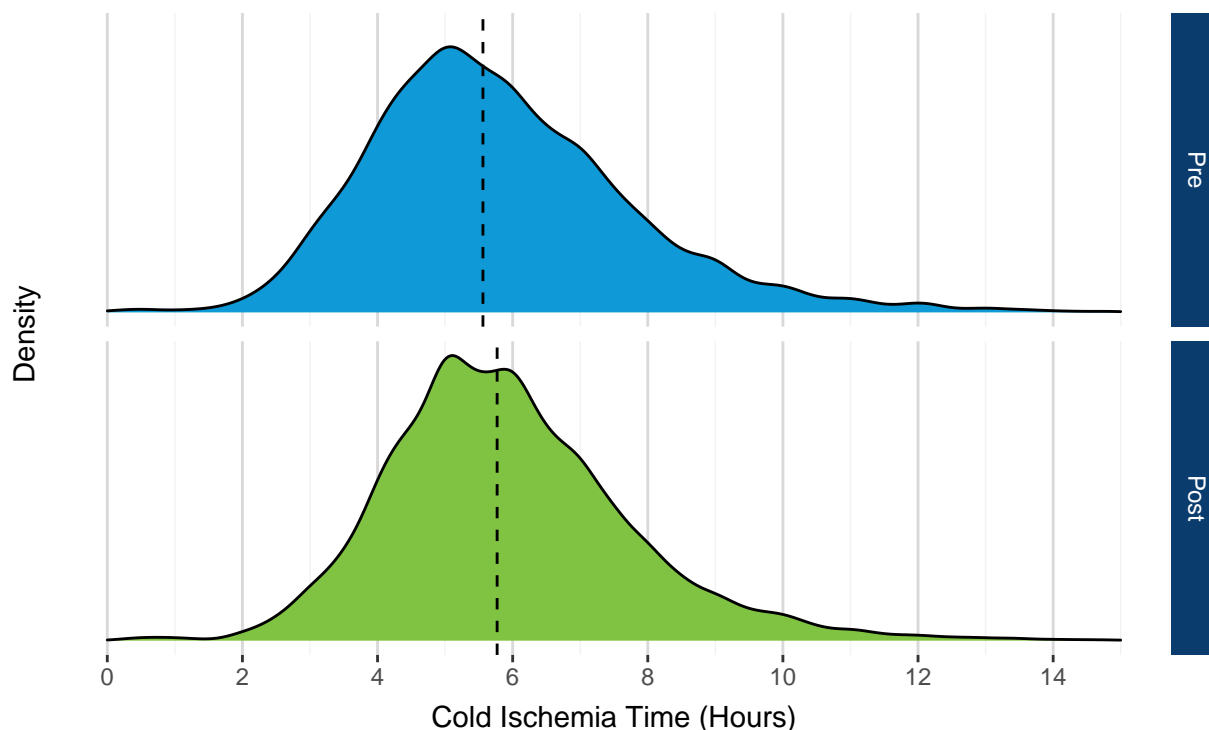
*** There were 107 pre-policy and 111 post-policy transplants > 1000 NM that were excluded.

Table 15. Summary of Distance from Donor Hospital to Transplant Center for Adult Deceased Donor Liver-Alone Transplants by Era

Policy Era	Distance (NM)					
	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Pre-Policy	0	11	155.1	72.0	207.0	2331
Post-Policy, Pre-COVID	0	41	193.1	139.5	292.0	1461
Post-Policy, COVID Onset	0	39	191.8	138.0	277.8	1736
Post-Policy, COVID Stabilization	0	48	201.8	142.0	307.5	2529
Post-Policy (overall)	0	47	200.0	142.0	305.0	2529

The median cold ischemia time increased by roughly 13 minutes post-policy compared to pre-policy; however, the change in average cold ischemia time was statistically significant pre- versus post-policy overall ($t=-4.69$, $p<0.001$).

Figure 17. Distribution of Cold Ischemia Time for Adult Deceased Donor Liver-Alone Transplants by Era



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

Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

** Dotted lines indicate median cold ischemia time within each era.

*** There were 47 pre-policy and 187 post-policy transplant recipients with missing cold ischemia time that are not included.

^ There were 17 pre-policy and 31 post-policy transplant recipients with cold ischemia time > 15 hours not included.

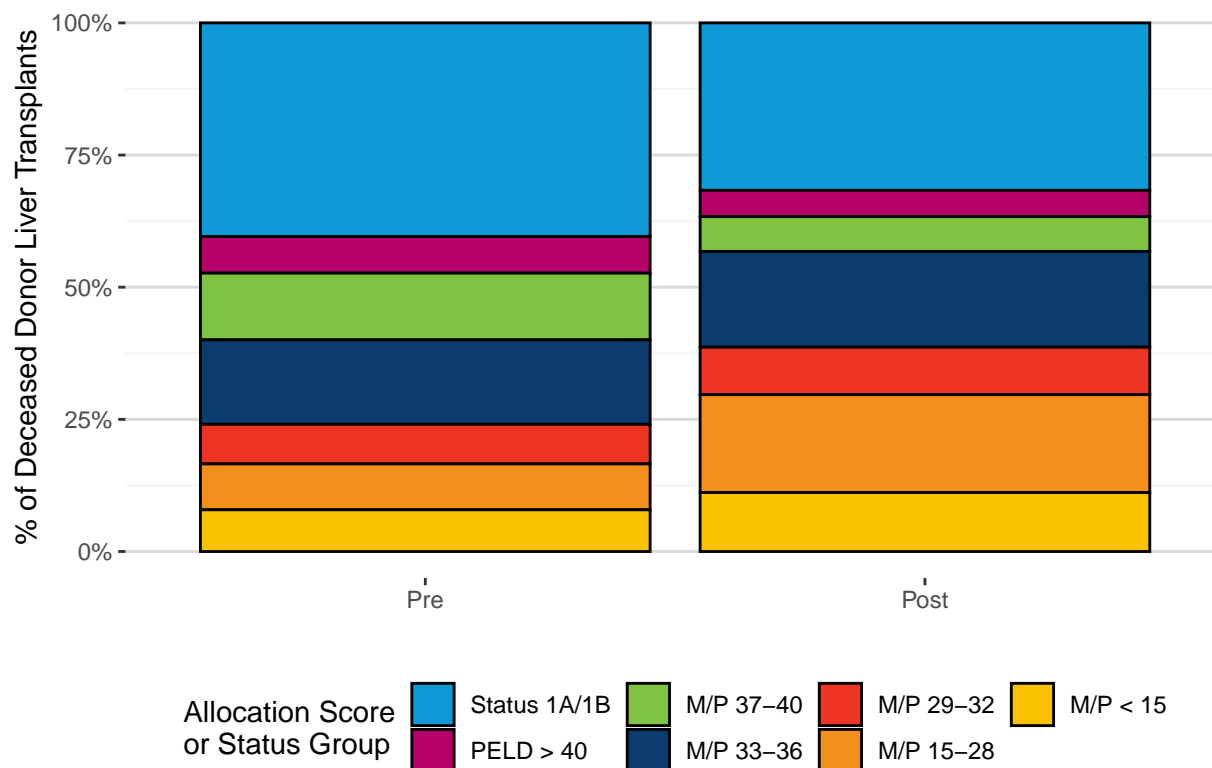
Table 16. Distribution of Cold Ischemia Time for Adult Deceased Donor Liver-Alone Transplants by Era

Policy Era	N	N Missing	Time (hours)					
			Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
Pre-Policy	8808	47	0.00	4.50	5.56	5.85	6.96	33.20
Post-Policy, Pre-COVID	822	10	0.42	4.72	5.70	5.98	7.00	43.00
Post-Policy, COVID Onset	958	16	0.83	4.68	5.60	5.95	6.98	17.63
Post-Policy, COVID Stabilization	7251	161	0.07	4.78	5.80	6.00	7.00	33.50
Post-Policy (overall)	9031	187	0.07	4.76	5.77	5.99	7.00	43.00

Pediatric Liver-Alone Transplants

A transplant was considered pediatric if the recipient was less than 18 years old at transplant. Proportions of pediatric deceased donor, liver-alone transplants varied by allocation score or status pre- compared to post-policy. Decreases in Status 1A/1B and MELD or PELD 37-40 transplants occurred post-policy, with substantial variation across COVID-19 eras. There were increased volumes of transplants with MELD or PELD scores of 28 and lower post-policy. Changes pre- to overall post-policy were statistically significant ($\chi^2=38.73$, $p<0.001$). The national median allocation MELD or PELD score at transplant was 35 pre-policy and 30 overall post-policy.

Figure 18. Pediatric Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status and Era



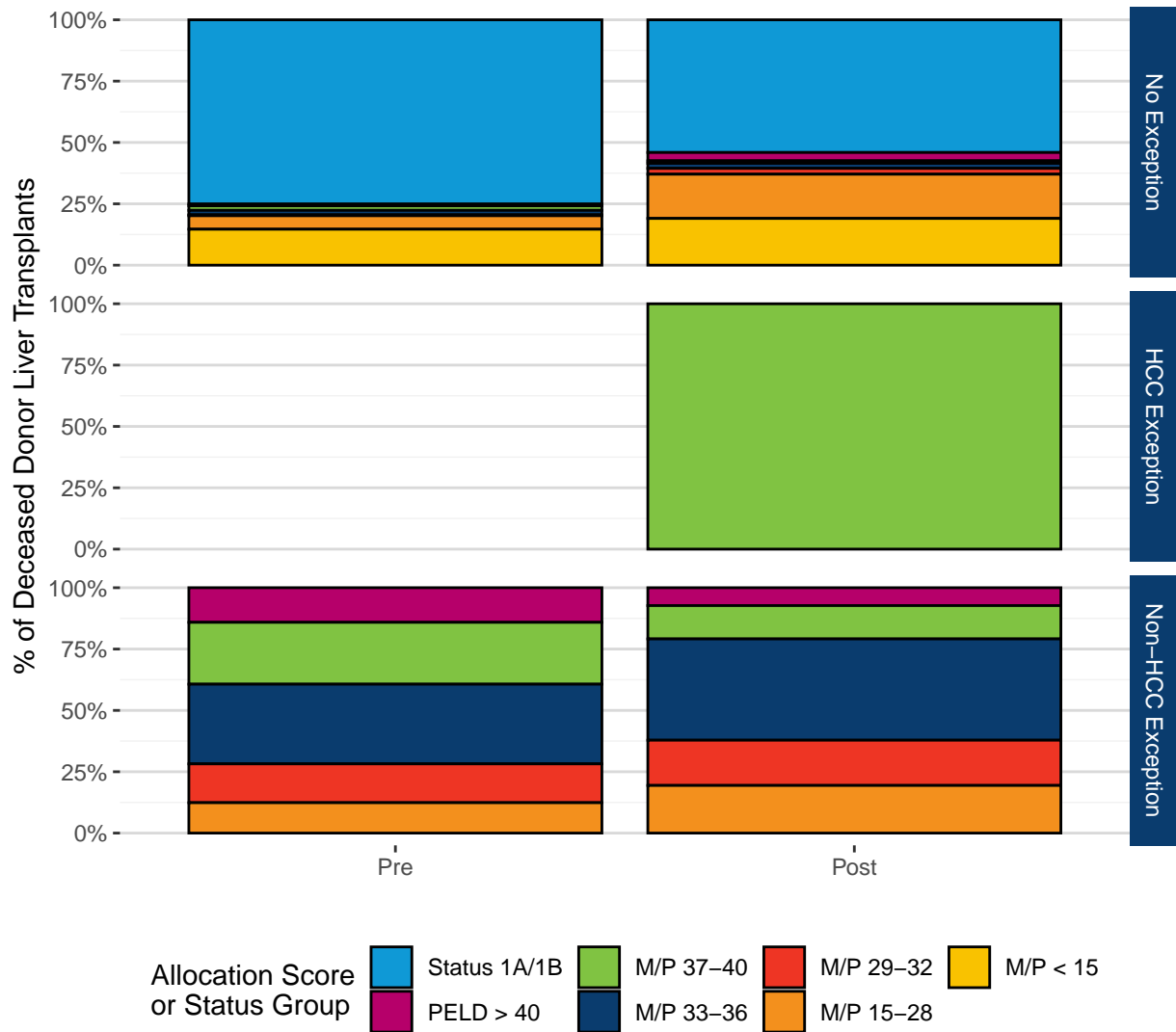
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 17. Number and Percent of Pediatric Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status Group and Era

Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
Status 1A/1B	205	40.4%	12	25.0%	20	40.0%	127	31.4%	159	31.7%
PELD > 40	35	6.9%	2	4.2%	3	6.0%	20	5.0%	25	5.0%
M/P 37-40	64	12.6%	6	12.5%	2	4.0%	25	6.2%	33	6.6%
M/P 33-36	81	16.0%	10	20.8%	5	10.0%	76	18.8%	91	18.1%
M/P 29-32	38	7.5%	4	8.3%	5	10.0%	36	8.9%	45	9.0%
M/P 15-28	44	8.7%	8	16.7%	10	20.0%	75	18.6%	93	18.5%
M/P < 15	40	7.9%	6	12.5%	5	10.0%	45	11.1%	56	11.2%
Total	507	100.0%	48	100.0%	50	100.0%	404	100.0%	502	100.0%

There were changes in the distribution of scores for pediatric recipients by exception status. There was a shift in many of the high scores for exceptions over 35 towards the median PELD at transplant (exception scoring MPaT = 35 as of the time of this report) post-policy as well as an increase in exceptions with a score between 15-28. There was also a decrease in Status 1A/1B transplants, though this still makes up the majority of non-exception transplants post-policy.

Figure 19. Pediatric Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status, Exception Status and Era



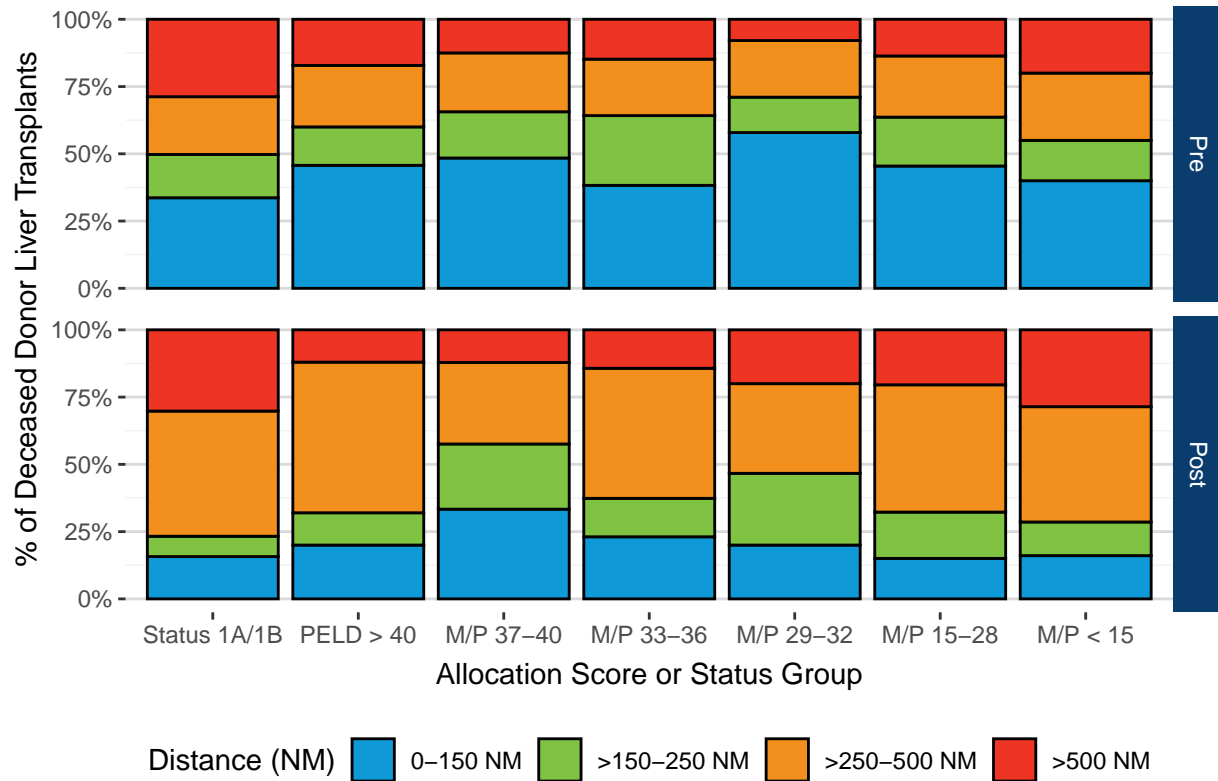
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
 Pre-Policy: 11/05/2018 - 02/03/2020; Post-Policy: 02/04/2020 - 05/04/2021.

Table 18. Number and Percent of Pediatric Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status, Exception Status, and Era

Exception Status	Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
		N	%	N	%	N	%	N	%	N	%
No Exception	Status 1A/1B	205	75.1%	12	52.2%	20	55.6%	127	54.0%	159	54.1%
	PELD > 40	2	0.7%	0	0.0%	1	2.8%	9	3.8%	10	3.4%
	M/P 37-40	5	1.8%	1	4.3%	0	0.0%	2	0.9%	3	1.0%
	M/P 33-36	5	1.8%	0	0.0%	1	2.8%	5	2.1%	6	2.0%
	M/P 29-32	1	0.4%	1	4.3%	0	0.0%	6	2.6%	7	2.4%
	M/P 15-28	15	5.5%	3	13.0%	9	25.0%	41	17.4%	53	18.0%
	M/P < 15	40	14.7%	6	26.1%	5	13.9%	45	19.1%	56	19.0%
HCC Exception	M/P 37-40	0	0.0%	0	0.0%	0	0.0%	2	100.0%	2	100.0%
Non-HCC Exception	PELD > 40	33	14.1%	2	8.0%	2	14.3%	11	6.6%	15	7.3%
	M/P 37-40	59	25.2%	5	20.0%	2	14.3%	21	12.6%	28	13.6%
	M/P 33-36	76	32.5%	10	40.0%	4	28.6%	71	42.5%	85	41.3%
	M/P 29-32	37	15.8%	3	12.0%	5	35.7%	30	18.0%	38	18.4%
	M/P 15-28	29	12.4%	5	20.0%	1	7.1%	34	20.4%	40	19.4%

In the post-policy era, all pediatric allocation score groups had larger proportions of livers coming from further away. There were smaller proportions of livers traveling within 0-150 nautical miles.

Figure 20. Pediatric Deceased Donor Liver-Alone Transplants by Allocation MELD Score or Status, Classification Distance, and Era



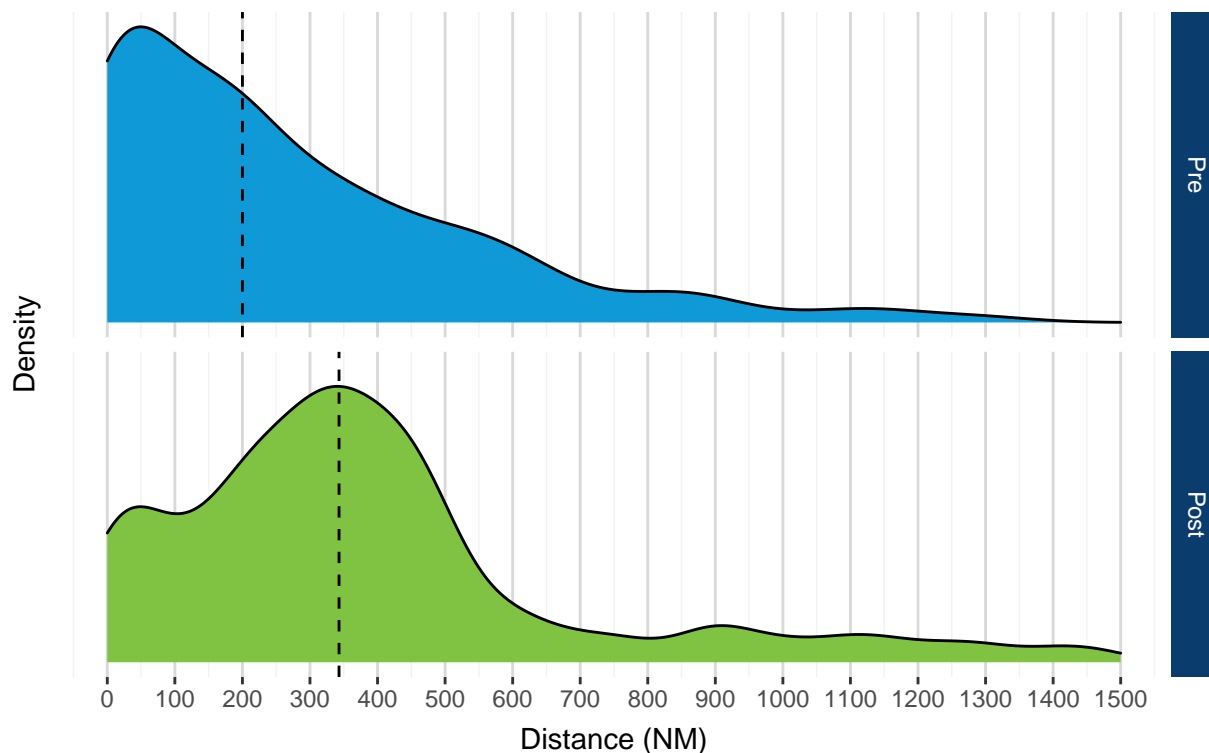
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
 Pre-Policy: 11/05/2018 - 02/03/2020; Post-Policy: 02/04/2020 - 05/04/2021.

Table 19. Number and Percent of Pediatric Deceased Donor Liver-Alone Transplants by Allocation MELD Score or Status, Classification Distance, and Era

Classification Distance	Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
		N	%	N	%	N	%	N	%	N	%
0-150 NM	Status 1A/1B	69	33.7%	1	12.5%	3	75.0%	21	25.6%	25	26.6%
	PELD > 40	16	7.8%	1	12.5%	0	0.0%	4	4.9%	5	5.3%
	M/P 37-40	31	15.1%	3	37.5%	0	0.0%	8	9.8%	11	11.7%
	M/P 33-36	31	15.1%	1	12.5%	1	25.0%	19	23.2%	21	22.3%
	M/P 29-32	22	10.7%	0	0.0%	0	0.0%	9	11.0%	9	9.6%
	M/P 15-28	20	9.8%	1	12.5%	0	0.0%	13	15.9%	14	14.9%
M/P < 15	16	7.8%	1	12.5%	0	0.0%	8	9.8%	9	9.6%	
>150-250 NM	Status 1A/1B	33	37.1%	0	0.0%	1	12.5%	11	19.6%	12	16.9%
	PELD > 40	5	5.6%	0	0.0%	0	0.0%	3	5.4%	3	4.2%
	M/P 37-40	11	12.4%	0	0.0%	1	12.5%	7	12.5%	8	11.3%
	M/P 33-36	21	23.6%	3	42.9%	0	0.0%	10	17.9%	13	18.3%
	M/P 29-32	5	5.6%	1	14.3%	2	25.0%	9	16.1%	12	16.9%
	M/P 15-28	8	9.0%	2	28.6%	2	25.0%	12	21.4%	16	22.5%
M/P < 15	6	6.7%	1	14.3%	2	25.0%	4	7.1%	7	9.9%	
>250-500 NM	Status 1A/1B	44	39.6%	9	34.6%	9	36.0%	56	32.2%	74	32.9%
	PELD > 40	8	7.2%	1	3.8%	2	8.0%	11	6.3%	14	6.2%
	M/P 37-40	14	12.6%	2	7.7%	0	0.0%	8	4.6%	10	4.4%
	M/P 33-36	17	15.3%	4	15.4%	2	8.0%	38	21.8%	44	19.6%
	M/P 29-32	8	7.2%	3	11.5%	3	12.0%	9	5.2%	15	6.7%
	M/P 15-28	10	9.0%	4	15.4%	8	32.0%	32	18.4%	44	19.6%
M/P < 15	10	9.0%	3	11.5%	1	4.0%	20	11.5%	24	10.7%	
>500 NM	Status 1A/1B	59	57.8%	2	28.6%	7	53.8%	39	42.4%	48	42.9%
	PELD > 40	6	5.9%	0	0.0%	1	7.7%	2	2.2%	3	2.7%
	M/P 37-40	8	7.8%	1	14.3%	1	7.7%	2	2.2%	4	3.6%
	M/P 33-36	12	11.8%	2	28.6%	2	15.4%	9	9.8%	13	11.6%
	M/P 29-32	3	2.9%	0	0.0%	0	0.0%	9	9.8%	9	8.0%
	M/P 15-28	6	5.9%	1	14.3%	0	0.0%	18	19.6%	19	17.0%
M/P < 15	8	7.8%	1	14.3%	2	15.4%	13	14.1%	16	14.3%	

Distributions of distance from donor hospital to transplant program appear much differently for pediatric transplant recipients than for adult transplant recipients. Post-policy, there was a substantial decrease in the number of transplants within 150 nautical miles and an increase in the number of transplants within 250-500 nautical miles.

Figure 21. Distribution of Distance from Donor Hospital to Transplant Center for Pediatric Deceased Donor Liver-Alone Transplants by Era



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

Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

** Dotted lines indicate median distance within each era.

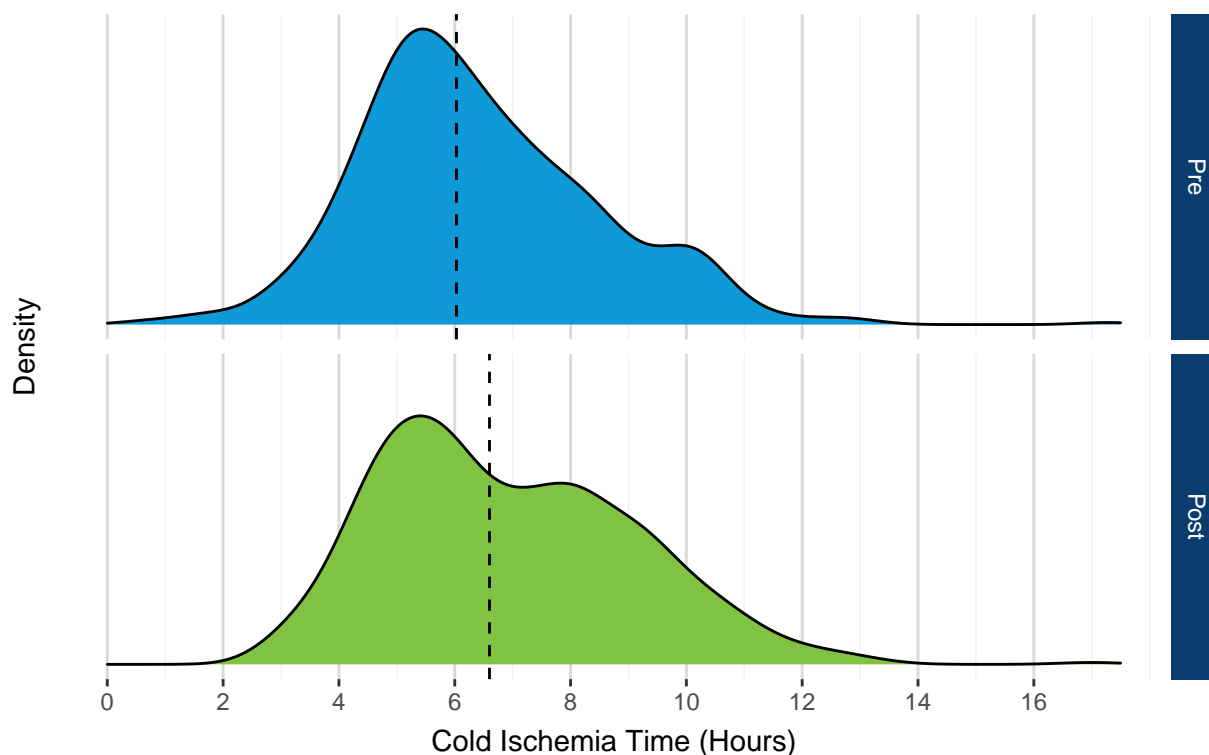
*** There were 10 pre-policy and 12 post-policy transplants > 1500 NM that were excluded.

Table 20. Summary of Distance from Donor Hospital to Transplant Center for Pediatric Deceased Donor Liver-Alone Transplants by Era

Policy Era	Distance (NM)					
	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Pre-Policy	0	45.5	300.8	200	417.0	2218
Post-Policy, Pre-COVID	0	220.5	369.9	338	409.5	1592
Post-Policy, COVID Onset	0	263.8	515.4	349	507.5	2108
Post-Policy, COVID Stabilization	0	187.5	423.4	346	487.3	2205
Post-Policy (overall)	0	204.0	427.5	343	484.8	2205

The median cold ischemia time increased by 34 minutes pre- to post-policy. The change in average cold ischemia time was statistically significant pre- versus post-policy overall ($t=-3.69$, $p<0.001$).

Figure 22. Distribution of Cold Ischemia Time for Pediatric Deceased Donor Liver-Alone Transplants by Era



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

Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

** Dotted lines indicate median cold ischemia time within each era.

*** There were 4 pre-policy and 2 post-policy transplant recipients with missing cold ischemia time that are not included.

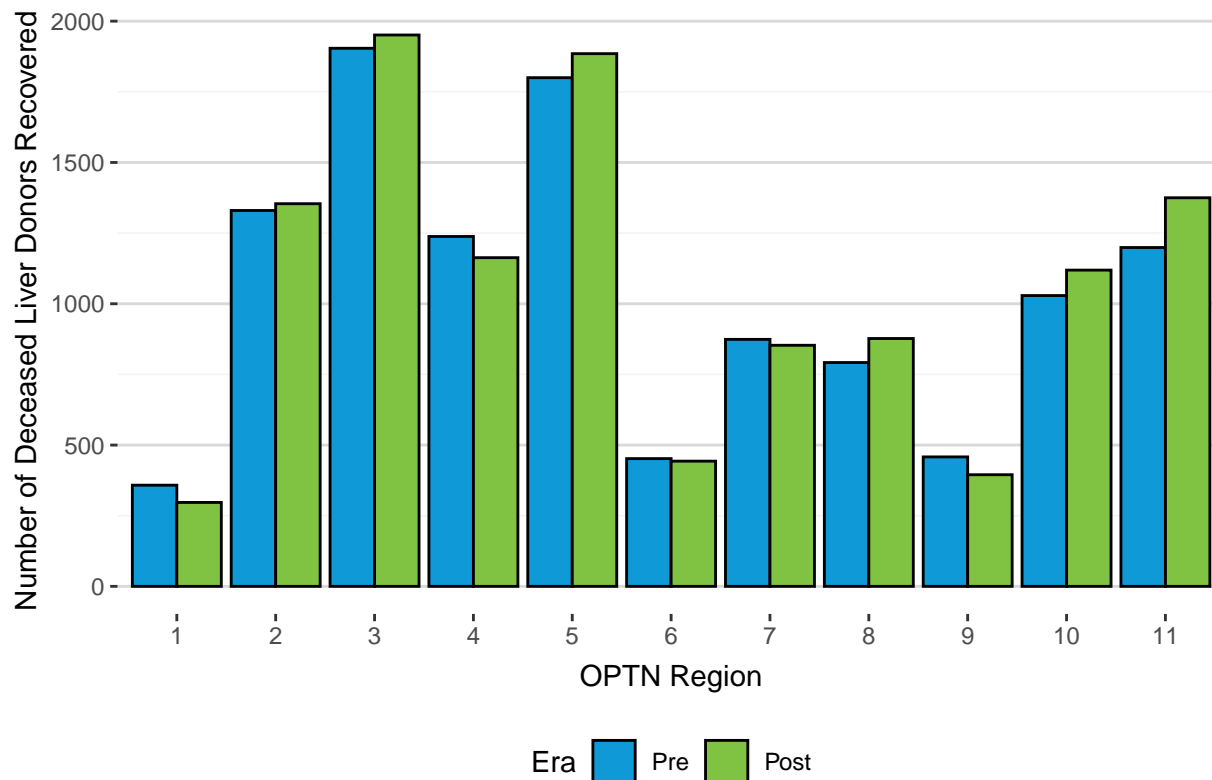
Table 21. Distribution of Cold Ischemia Time for Pediatric Deceased Donor Liver-Alone Transplants by Era

Policy Era	N	N Missing	Time (hours)					
			Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum
Pre-Policy	507	4	0.57	5.03	6.03	6.43	7.67	17.28
Post-Policy, Pre-COVID	48	0	3.35	4.97	5.90	6.56	8.23	11.90
Post-Policy, COVID Onset	50	0	3.95	5.64	7.38	7.39	9.00	12.50
Post-Policy, COVID Stabilization	404	2	2.92	5.20	6.64	6.91	8.32	17.00
Post-Policy (overall)	502	2	2.92	5.20	6.60	6.92	8.40	17.00

Section III. Liver Utilization

Overall, there were more deceased liver donors recovered in the nation post-policy (percent change 2.4%). However, volumes were variable across the country. Below illustrates this by OPTN region. The **Appendix** highlights these trends by OPO as well.

Figure 23. Deceased Liver Donors Recovered by OPTN Region and Era



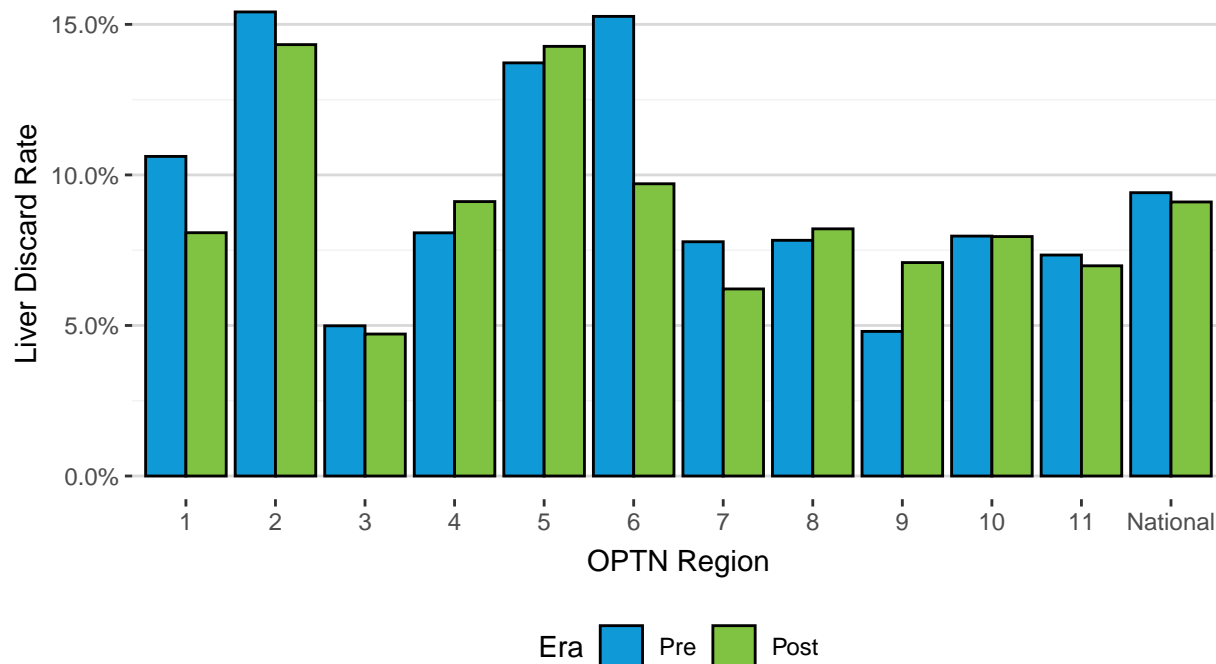
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 22. Number of Deceased Liver Donors Recovered by OPTN Region and Era

OPTN Region	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Shutdown		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
1	358	3.1%	33	3.1%	39	3.2%	225	2.4%	297	2.5%
2	1330	11.6%	128	11.9%	154	12.6%	1072	11.4%	1354	11.6%
3	1904	16.7%	146	13.6%	193	15.7%	1612	17.1%	1951	16.7%
4	1238	10.8%	117	10.9%	139	11.3%	907	9.6%	1163	9.9%
5	1800	15.7%	184	17.2%	215	17.5%	1486	15.8%	1885	16.1%
6	452	4.0%	43	4.0%	38	3.1%	362	3.8%	443	3.8%
7	874	7.6%	93	8.7%	79	6.4%	681	7.2%	853	7.3%
8	792	6.9%	87	8.1%	75	6.1%	715	7.6%	877	7.5%
9	458	4.0%	30	2.8%	30	2.4%	335	3.6%	395	3.4%
10	1029	9.0%	102	9.5%	111	9.1%	906	9.6%	1119	9.6%
11	1199	10.5%	109	10.2%	153	12.5%	1113	11.8%	1375	11.7%
National	11434	100.0%	1072	100.0%	1226	100.0%	9414	100.0%	11712	100.0%

We defined discard rate as the number of livers not transplanted over the number of deceased liver donors recovered, multiplied by 100 to get a percentage. Nationally the liver discard rate fluctuated over the COVID-19 eras post-policy; however, the National discard rate was lower overall post-policy compared to pre-policy. This change was not statistically significant ($\chi^2_1=0.62$, $p=0.431$).

Figure 24. Liver Discard Rate by OPTN Region and Era



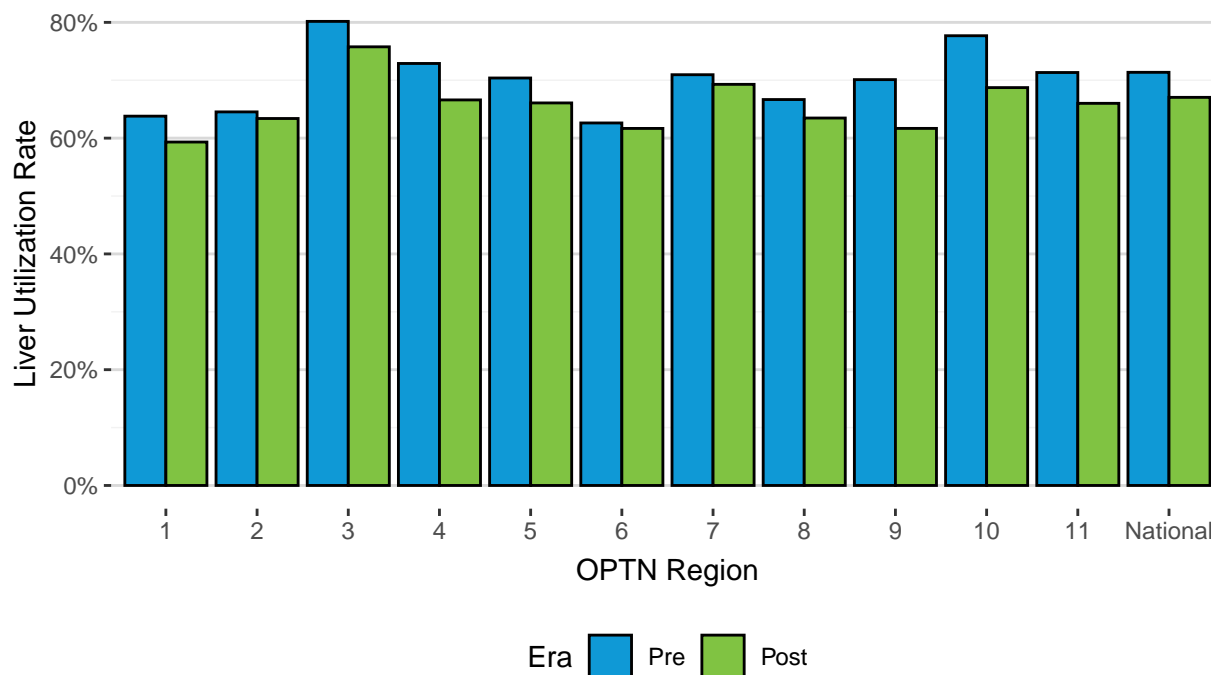
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 22. Liver Discard Rate by OPTN Region and Era

OPTN Region	Pre-Policy			Post-Policy, Pre-COVID			Post-Policy, COVID Shutdown			Post-Policy, COVID Stabilization			Post-Policy (overall)		
	Recovered	Discarded	%	Recovered	Discarded	%	Recovered	Discarded	%	Recovered	Discarded	%	Recovered	Discarded	%
1	358	38	10.61	33	4	12.12	39	4	10.26	225	16	7.11	297	24	8.08
2	1330	205	15.41	128	17	13.28	154	22	14.29	1072	155	14.46	1354	194	14.33
3	1904	95	4.99	146	8	5.48	193	7	3.63	1612	77	4.78	1951	92	4.72
4	1238	100	8.08	117	7	5.98	139	7	5.04	907	92	10.14	1163	106	9.11
5	1800	247	13.72	184	27	14.67	215	25	11.63	1486	217	14.60	1885	269	14.27
6	452	69	15.27	43	6	13.95	38	4	10.53	362	33	9.12	443	43	9.71
7	874	68	7.78	93	7	7.53	79	5	6.33	681	41	6.02	853	53	6.21
8	792	62	7.83	87	11	12.64	75	1	1.33	715	60	8.39	877	72	8.21
9	458	22	4.80	30	3	10.00	30	3	10.00	335	22	6.57	395	28	7.09
10	1029	82	7.97	102	14	13.73	111	7	6.31	906	68	7.51	1119	89	7.95
11	1199	88	7.34	109	7	6.42	153	10	6.54	1113	79	7.10	1375	96	6.98
National	11434	1076	9.41	1072	111	10.35	1226	95	7.75	9414	860	9.14	11712	1066	9.10

We defined liver utilization rate 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. This change was statistically significant ($\chi^2_1=67.58$, $p<0.001$).

Figure 25. Liver Utilization Rate by OPTN Region and Era



National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 23. Liver Utilization Rate by OPTN Region and Era

OPTN Region	Pre-Policy	Post-Policy, Pre-COVID	Post-Policy, COVID Shutdown	Post-Policy, COVID Stabilization	Post-Policy (overall)
	%	%	%	%	%
1	63.80	67.44	78.00	55.99	59.33
2	64.53	68.94	69.79	61.97	63.39
3	80.17	68.32	80.17	76.01	75.77
4	72.90	76.39	75.00	64.34	66.60
5	70.39	64.63	67.36	66.07	66.08
6	62.62	66.07	53.97	62.13	61.68
7	70.96	68.80	72.55	69.00	69.29
8	66.67	65.55	67.89	62.78	63.47
9	70.11	50.00	57.45	63.36	61.68
10	77.69	73.77	72.73	67.78	68.73
11	71.34	64.63	74.50	65.11	66.01
National	71.37	67.62	71.60	66.42	67.04

Section IV. Intestine

There were 131 intestine candidates added to the waitlist pre-policy and 181 post-policy. Few intestine registrations were removed in the pre-policy era (6) or post-policy era (1) due to death or too sick to transplant.

A total of 113 deceased intestine donors were recovered pre-policy and 115 were recovered post-policy. More deceased donor intestine transplants occurred post-policy (102 pre- and 112 post-policy). Note that this includes all deceased donor intestine recipients - intestine-alone as well as intestine multi-organ. The following table illustrates the distribution of intestine-alone versus intestine multi-organ transplants in each policy era.

Table 24. Number of Deceased Donor Intestine Transplants by Multi-Organ Type and Era

Multi-Organ Type	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
Intestine Only	42	41.2%	4	50.0%	2	22.2%	43	45.3%	49	43.8%
Intestine-Kidney	4	3.9%	0	0.0%	0	0.0%	2	2.1%	2	1.8%
Intestine-Kidney-Pancreas	0	0.0%	0	0.0%	0	0.0%	1	1.1%	1	0.9%
Intestine-Liver	1	1.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Intestine-Liver-Kidney	7	6.9%	1	12.5%	0	0.0%	5	5.3%	6	5.4%
Intestine-Liver-Pancreas	43	42.2%	0	0.0%	7	77.8%	38	40.0%	45	40.2%
Intestine-Pancreas	5	4.9%	3	37.5%	0	0.0%	6	6.3%	9	8.0%
Total	102	100.0%	8	100.0%	9	100.0%	95	100.0%	112	100.0%

The distribution of intestine transplants by classification distance groups were similar between the policy eras.

Table 25. Number of Deceased Donor Intestine Transplants by Classification Distance and Era

Classification Distance	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
0-150 NM	21	20.6%	2	25.0%	1	11.1%	24	25.3%	27	24.1%
>150-250 NM	8	7.8%	0	0.0%	2	22.2%	8	8.4%	10	8.9%
>250-500 NM	23	22.5%	2	25.0%	1	11.1%	26	27.4%	29	25.9%
>500 NM	50	49.0%	4	50.0%	5	55.6%	37	38.9%	46	41.1%

Conclusion

This report provides a review of the first fifteen months under acuity circle allocation changes. 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. Takeaways at a national-level of these policy changes are as follows.

Generally the waitlist has remained consistent with regards to characteristics of new additions pre- to post-policy. Of note, there was an increase in registrations with a diagnosis of alcoholic liver disease post-policy. As was the case with all organ waitlists, the effects of COVID-19 were seen in the volumes of new waitlist additions (OPTN COVID-19 dashboard).

The median MELD at transplant (MMaT) for adult liver-alone deceased donor transplant recipients has shifted post-policy by various geographic areas, and there have been decreases in the variance of MMaT by OPTN Region, DSA, and state, though these were not statistically significant. The increased distances from donor hospital to transplant program that were immediate with this policy change have been consistent, with broader sharing across DSA and OPTN regional boundaries. Interestingly, this has increased the proportion of transplants within 150 – 500 nautical miles, and decreased transplants further than 500 nautical miles for adults, compared to pre-policy. However, cold ischemia time only increased slightly (median increased by 13 minutes for adult recipients) despite the increase in distance.

For pediatric (age < 18 years) liver-alone deceased donor transplant, there was an increase in non-exception recipients post-policy; however, there was also a substantial decrease in the proportion and volume of Status 1A and 1B transplants, which are considered non-exception. The national median allocation MELD or PELD score at transplant for pediatric recipients decreased from 35 pre-policy to 30 post-policy. Increased distances from donor hospital to transplant program also occurred for pediatric transplants across all allocation groups with a substantial in the number of transplants within 150 nautical miles. Median cold ischemia time increased by 34 minutes pre- to post-policy.

Additionally, there was a 6.6% increase in simultaneous liver-kidney multi-organ transplants post-policy. There was variation in the changes in discard and utilization rates within OPTN Regions, though both decreased nationally. While there were fewer deceased donors with a liver recovered (decreased utilization rate), more often those that did have a liver recovered resulted in transplant (decreased discard rate).

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 the COVID-19 onset period.

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.

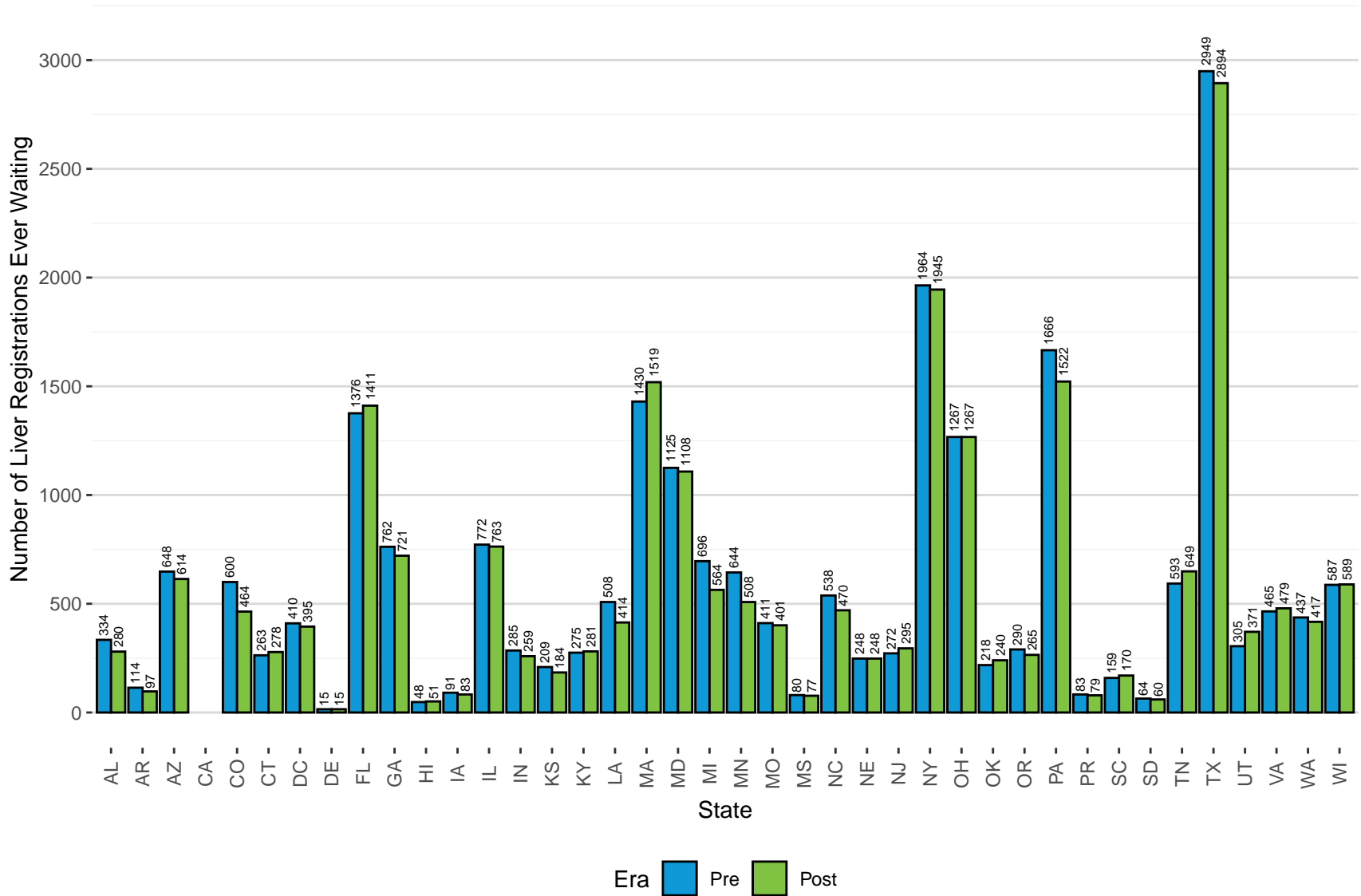
Appendix

Additional Waiting List Registration Additions Information

Table 26. Number of Liver-Alone Waiting List Registrations Ever Waiting by State and Era

State	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
AL	334	1.2%	127	1.0%	137	1.0%	253	1.1%	280	1.1%
AR	114	0.4%	48	0.4%	53	0.4%	85	0.4%	97	0.4%
AZ	648	2.4%	214	1.7%	215	1.6%	517	2.2%	614	2.3%
CA	3960	14.6%	2244	17.4%	2282	17.3%	3497	15.0%	3902	14.8%
CO	600	2.2%	227	1.8%	221	1.7%	409	1.8%	464	1.8%
CT	263	1.0%	161	1.2%	168	1.3%	258	1.1%	278	1.1%
DC	410	1.5%	217	1.7%	230	1.7%	364	1.6%	395	1.5%
DE	15	0.1%	6	0.0%	3	0.0%	11	0.0%	15	0.1%
FL	1376	5.1%	505	3.9%	541	4.1%	1241	5.3%	1411	5.4%
GA	762	2.8%	350	2.7%	373	2.8%	647	2.8%	721	2.7%
HI	48	0.2%	24	0.2%	26	0.2%	47	0.2%	51	0.2%
IA	91	0.3%	26	0.2%	33	0.3%	75	0.3%	83	0.3%
IL	772	2.8%	326	2.5%	329	2.5%	651	2.8%	763	2.9%
IN	285	1.0%	96	0.7%	104	0.8%	230	1.0%	259	1.0%
KS	209	0.8%	100	0.8%	104	0.8%	167	0.7%	184	0.7%
KY	275	1.0%	143	1.1%	152	1.2%	243	1.0%	281	1.1%
LA	508	1.9%	171	1.3%	176	1.3%	356	1.5%	414	1.6%
MA	1430	5.3%	905	7.0%	886	6.7%	1398	6.0%	1519	5.8%
MD	1125	4.1%	731	5.7%	745	5.7%	1016	4.4%	1108	4.2%
MI	696	2.6%	304	2.4%	294	2.2%	501	2.1%	564	2.1%
MN	644	2.4%	229	1.8%	222	1.7%	437	1.9%	508	1.9%
MO	411	1.5%	123	1.0%	132	1.0%	355	1.5%	401	1.5%
MS	80	0.3%	25	0.2%	25	0.2%	66	0.3%	77	0.3%
NC	538	2.0%	190	1.5%	198	1.5%	405	1.7%	470	1.8%
NE	248	0.9%	118	0.9%	133	1.0%	209	0.9%	248	0.9%
NJ	272	1.0%	160	1.2%	163	1.2%	275	1.2%	295	1.1%
NY	1964	7.2%	1115	8.6%	1087	8.3%	1719	7.4%	1945	7.4%
OH	1267	4.7%	619	4.8%	620	4.7%	1087	4.7%	1267	4.8%
OK	218	0.8%	105	0.8%	110	0.8%	219	0.9%	240	0.9%
OR	290	1.1%	123	1.0%	119	0.9%	230	1.0%	265	1.0%
PA	1666	6.1%	665	5.2%	677	5.1%	1307	5.6%	1522	5.8%
PR	83	0.3%	18	0.1%	18	0.1%	75	0.3%	79	0.3%
SC	159	0.6%	54	0.4%	65	0.5%	155	0.7%	170	0.6%
SD	64	0.2%	35	0.3%	38	0.3%	59	0.3%	60	0.2%
TN	593	2.2%	245	1.9%	276	2.1%	570	2.4%	649	2.5%
TX	2949	10.9%	1339	10.4%	1366	10.4%	2545	10.9%	2894	11.0%
UT	305	1.1%	162	1.3%	169	1.3%	336	1.4%	371	1.4%
VA	465	1.7%	163	1.3%	177	1.3%	405	1.7%	479	1.8%
WA	437	1.6%	192	1.5%	198	1.5%	382	1.6%	417	1.6%
WI	587	2.2%	293	2.3%	296	2.2%	506	2.2%	589	2.2%

Figure 26. Number of Liver-Alone Waiting List Registrations Ever Waiting by State and Era



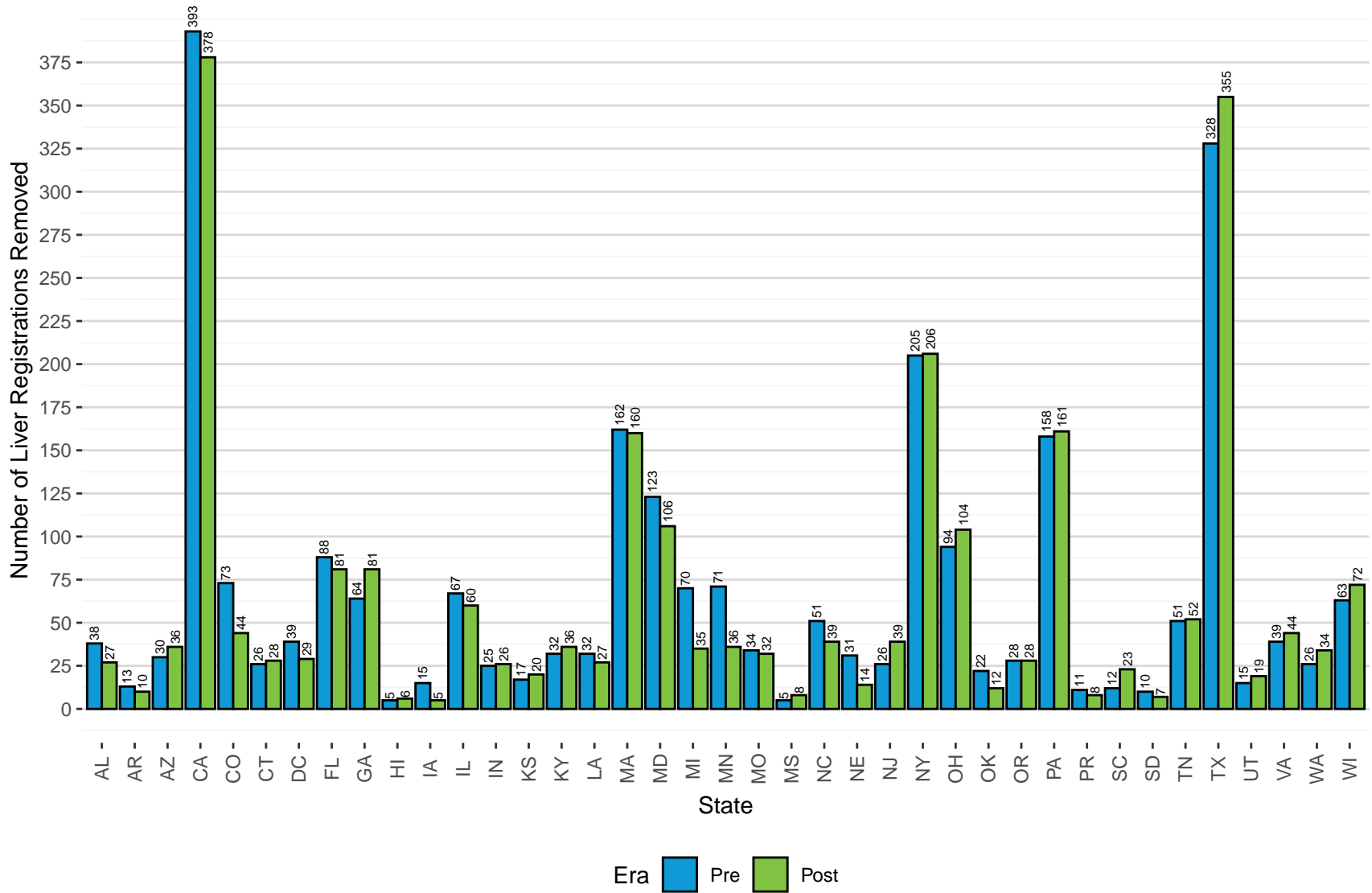
National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Additional Waiting List Removals Information

Table 26. Number of Liver-Along Waiting List Registrations Removed for Death or Too Sick to Transplant by State and Era

State	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
AL	38	1.5%	0	0.0%	3	1.0%	24	1.2%	27	1.1%
AR	13	0.5%	1	0.4%	3	1.0%	6	0.3%	10	0.4%
AZ	30	1.2%	5	2.2%	5	1.7%	26	1.3%	36	1.4%
CA	393	15.2%	37	16.2%	52	17.4%	289	14.7%	378	15.2%
CO	73	2.8%	8	3.5%	3	1.0%	33	1.7%	44	1.8%
CT	26	1.0%	1	0.4%	4	1.3%	23	1.2%	28	1.1%
DC	39	1.5%	1	0.4%	3	1.0%	25	1.3%	29	1.2%
FL	88	3.4%	6	2.6%	9	3.0%	66	3.4%	81	3.3%
GA	64	2.5%	11	4.8%	8	2.7%	62	3.2%	81	3.3%
HI	5	0.2%	0	0.0%	0	0.0%	6	0.3%	6	0.2%
IA	15	0.6%	1	0.4%	1	0.3%	3	0.2%	5	0.2%
IL	67	2.6%	6	2.6%	11	3.7%	43	2.2%	60	2.4%
IN	25	1.0%	1	0.4%	1	0.3%	24	1.2%	26	1.0%
KS	17	0.7%	1	0.4%	3	1.0%	16	0.8%	20	0.8%
KY	32	1.2%	4	1.7%	5	1.7%	27	1.4%	36	1.4%
LA	32	1.2%	2	0.9%	3	1.0%	22	1.1%	27	1.1%
MA	162	6.2%	13	5.7%	11	3.7%	136	6.9%	160	6.4%
MD	123	4.7%	7	3.1%	20	6.7%	79	4.0%	106	4.3%
MI	70	2.7%	6	2.6%	6	2.0%	23	1.2%	35	1.4%
MN	71	2.7%	4	1.7%	5	1.7%	27	1.4%	36	1.4%
MO	34	1.3%	1	0.4%	1	0.3%	30	1.5%	32	1.3%
MS	5	0.2%	1	0.4%	1	0.3%	6	0.3%	8	0.3%
NC	51	2.0%	5	2.2%	1	0.3%	33	1.7%	39	1.6%
NE	31	1.2%	0	0.0%	5	1.7%	9	0.5%	14	0.6%
NJ	26	1.0%	4	1.7%	2	0.7%	33	1.7%	39	1.6%
NY	205	7.9%	23	10.0%	41	13.8%	142	7.2%	206	8.3%
OH	94	3.6%	13	5.7%	13	4.4%	78	4.0%	104	4.2%
OK	22	0.8%	0	0.0%	2	0.7%	10	0.5%	12	0.5%
OR	28	1.1%	4	1.7%	3	1.0%	21	1.1%	28	1.1%
PA	158	6.1%	11	4.8%	13	4.4%	137	7.0%	161	6.5%
PR	11	0.4%	0	0.0%	0	0.0%	8	0.4%	8	0.3%
SC	12	0.5%	2	0.9%	1	0.3%	20	1.0%	23	0.9%
SD	10	0.4%	0	0.0%	1	0.3%	6	0.3%	7	0.3%
TN	51	2.0%	3	1.3%	4	1.3%	45	2.3%	52	2.1%
TX	328	12.7%	35	15.3%	34	11.4%	286	14.6%	355	14.3%
UT	15	0.6%	0	0.0%	0	0.0%	19	1.0%	19	0.8%
VA	39	1.5%	4	1.7%	8	2.7%	32	1.6%	44	1.8%
WA	26	1.0%	0	0.0%	3	1.0%	31	1.6%	34	1.4%
WI	63	2.4%	8	3.5%	9	3.0%	55	2.8%	72	2.9%

Figure 27. Number of Liver-Alone Waiting List Registrations Removed for Death or Too Sick to Transplant by State and Era

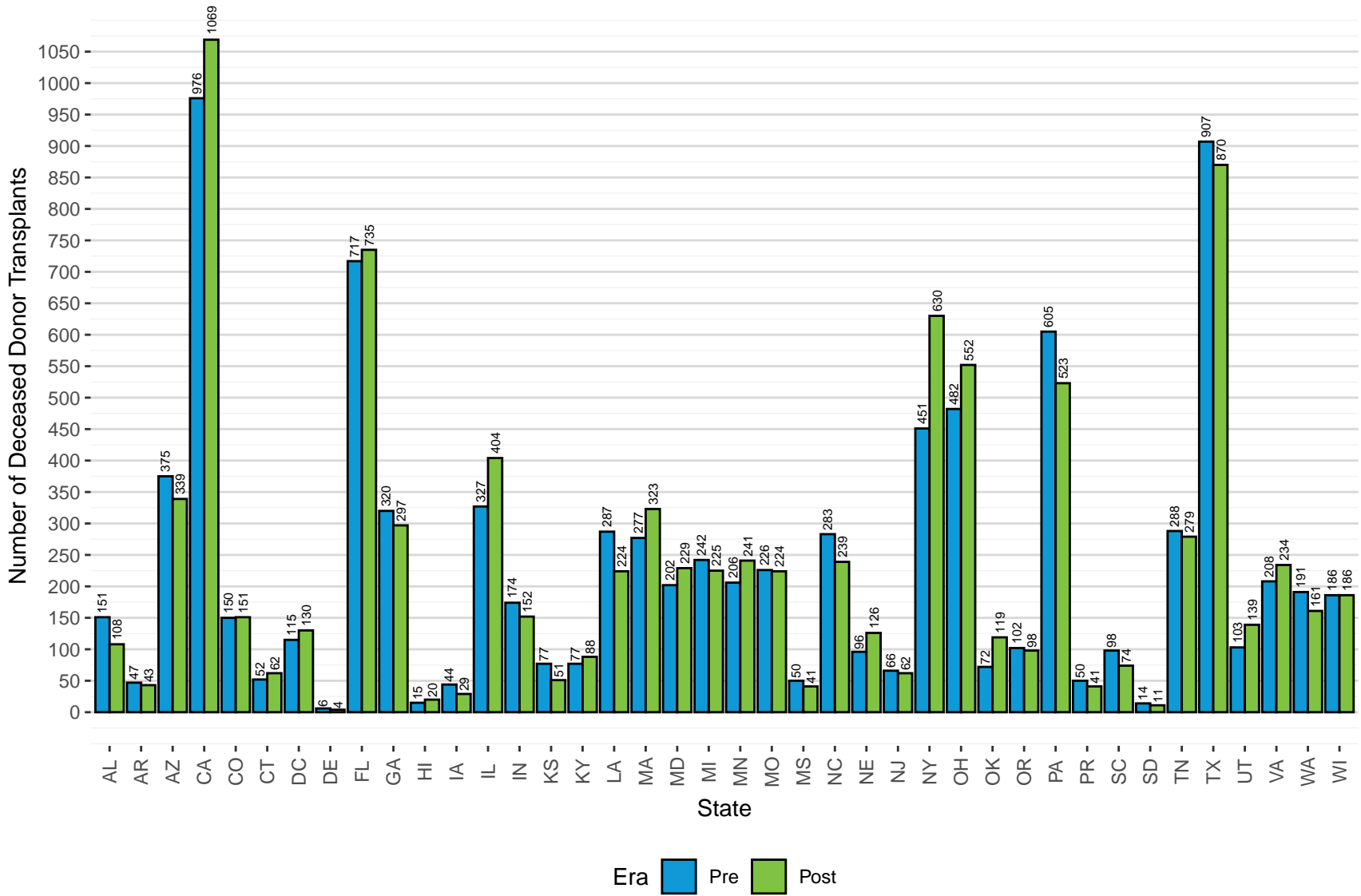


National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Additional Deceased Donor Liver Transplant Information**Table 26. Number of Deceased Donor Liver-Alone Transplants by State and Era**

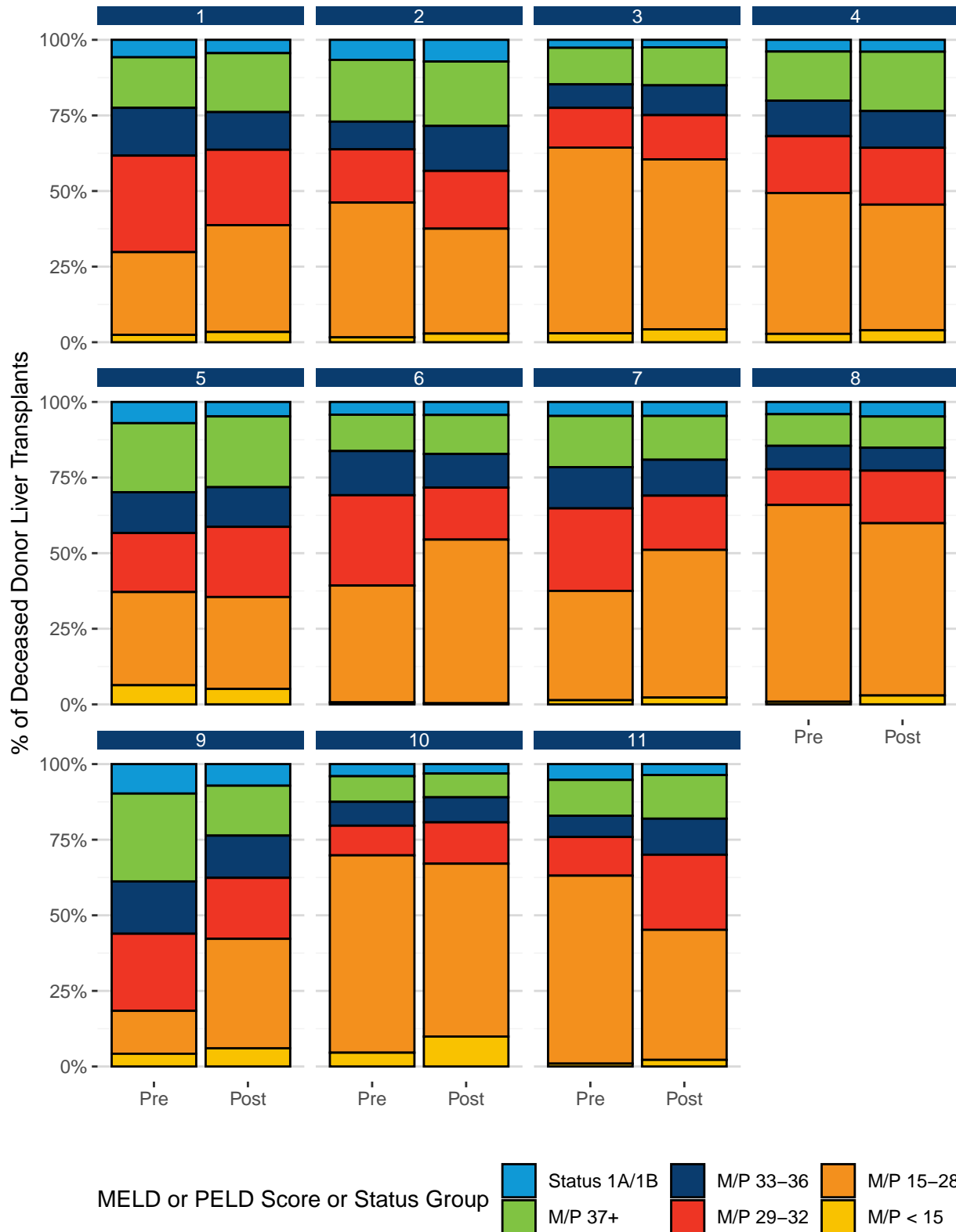
State	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
AL	151	1.6%	10	1.1%	11	1.1%	87	1.1%	108	1.1%
AR	47	0.5%	4	0.5%	4	0.4%	35	0.5%	43	0.5%
AZ	375	4.0%	33	3.8%	36	3.6%	270	3.5%	339	3.6%
CA	976	10.5%	104	12.0%	131	13.0%	834	10.9%	1069	11.2%
CO	150	1.6%	17	2.0%	9	0.9%	125	1.6%	151	1.6%
CT	52	0.6%	4	0.5%	6	0.6%	52	0.7%	62	0.7%
DC	115	1.2%	6	0.7%	14	1.4%	110	1.4%	130	1.4%
DE	6	0.1%	1	0.1%	0	0.0%	3	0.0%	4	0.0%
FL	717	7.7%	45	5.2%	73	7.2%	617	8.1%	735	7.7%
GA	320	3.4%	20	2.3%	32	3.2%	245	3.2%	297	3.1%
HI	15	0.2%	2	0.2%	1	0.1%	17	0.2%	20	0.2%
IA	44	0.5%	3	0.3%	2	0.2%	24	0.3%	29	0.3%
IL	327	3.5%	40	4.6%	42	4.2%	322	4.2%	404	4.2%
IN	174	1.9%	15	1.7%	10	1.0%	127	1.7%	152	1.6%
KS	77	0.8%	4	0.5%	5	0.5%	42	0.5%	51	0.5%
KY	77	0.8%	6	0.7%	12	1.2%	70	0.9%	88	0.9%
LA	287	3.1%	23	2.6%	21	2.1%	180	2.4%	224	2.3%
MA	277	3.0%	48	5.5%	30	3.0%	245	3.2%	323	3.4%
MD	202	2.2%	14	1.6%	22	2.2%	193	2.5%	229	2.4%
MI	242	2.6%	27	3.1%	6	0.6%	192	2.5%	225	2.4%
MN	206	2.2%	23	2.6%	26	2.6%	192	2.5%	241	2.5%
MO	226	2.4%	15	1.7%	21	2.1%	188	2.5%	224	2.3%
MS	50	0.5%	5	0.6%	4	0.4%	32	0.4%	41	0.4%
NC	283	3.0%	25	2.9%	25	2.5%	189	2.5%	239	2.5%
NE	96	1.0%	12	1.4%	20	2.0%	94	1.2%	126	1.3%
NJ	66	0.7%	7	0.8%	3	0.3%	52	0.7%	62	0.7%
NY	451	4.8%	49	5.6%	55	5.5%	526	6.9%	630	6.6%
OH	482	5.2%	42	4.8%	78	7.7%	432	5.6%	552	5.8%
OK	72	0.8%	8	0.9%	8	0.8%	103	1.3%	119	1.2%
OR	102	1.1%	13	1.5%	9	0.9%	76	1.0%	98	1.0%
PA	605	6.5%	48	5.5%	65	6.4%	410	5.4%	523	5.5%
PR	50	0.5%	3	0.3%	1	0.1%	37	0.5%	41	0.4%
SC	98	1.1%	2	0.2%	7	0.7%	65	0.8%	74	0.8%
SD	14	0.2%	0	0.0%	0	0.0%	11	0.1%	11	0.1%
TN	288	3.1%	26	3.0%	35	3.5%	218	2.8%	279	2.9%
TX	907	9.7%	91	10.5%	106	10.5%	673	8.8%	870	9.1%
UT	103	1.1%	17	2.0%	13	1.3%	109	1.4%	139	1.5%
VA	208	2.2%	17	2.0%	32	3.2%	185	2.4%	234	2.5%
WA	191	2.1%	10	1.1%	16	1.6%	135	1.8%	161	1.7%
WI	186	2.0%	31	3.6%	17	1.7%	138	1.8%	186	2.0%

Figure 28. Number of Deceased Donor Liver-Alone Transplants by State and Era



National state of emergency declared in US due to COVID-19 pandemic on March 13, 2020.
Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Figure 29. Deceased Donor Liver-Alone Transplants by MELD or PELD Score or Status, OPTN Region of Transplant Center, and Era



Pre-Policy: 11/05/2018 – 02/03/2020; Post-Policy: 02/04/2020 – 05/04/2021.

Table 26. Number of Deceased Donor Liver-Alone Transplants by Allocation MELD or PELD Score or Status, OPTN Region of Transplant Center, and Era

OPTN Region	Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
		N	%	N	%	N	%	N	%	N	%
1	Status 1A/1B	19	5.8%	4	7.7%	1	2.8%	12	4.0%	17	4.4%
	M/P 37+	55	16.7%	10	19.2%	5	13.9%	60	20.2%	75	19.5%
	M/P 33-36	52	15.8%	5	9.6%	4	11.1%	39	13.1%	48	12.5%
	M/P 29-32	105	31.9%	15	28.8%	10	27.8%	71	23.9%	96	24.9%
	M/P 15-28	90	27.4%	16	30.8%	16	44.4%	104	35.0%	136	35.3%
	M/P < 15	8	2.4%	2	3.8%	0	0.0%	11	3.7%	13	3.4%
2	Status 1A/1B	66	6.6%	6	7.9%	8	7.7%	54	7.0%	68	7.2%
	M/P 37+	203	20.4%	11	14.5%	20	19.2%	171	22.3%	202	21.3%
	M/P 33-36	91	9.2%	13	17.1%	15	14.4%	113	14.7%	141	14.9%
	M/P 29-32	175	17.6%	19	25.0%	18	17.3%	144	18.8%	181	19.1%
	M/P 15-28	443	44.6%	26	34.2%	42	40.4%	261	34.0%	329	34.7%
	M/P < 15	16	1.6%	1	1.3%	1	1.0%	25	3.3%	27	2.8%
3	Status 1A/1B	43	2.7%	1	0.9%	5	3.4%	31	2.5%	37	2.5%
	M/P 37+	196	12.1%	20	18.2%	18	12.3%	149	12.1%	187	12.6%
	M/P 33-36	126	7.8%	11	10.0%	18	12.3%	118	9.6%	147	9.9%
	M/P 29-32	213	13.1%	13	11.8%	23	15.8%	182	14.8%	218	14.6%
	M/P 15-28	996	61.4%	59	53.6%	81	55.5%	697	56.5%	837	56.2%
	M/P < 15	48	3.0%	6	5.5%	1	0.7%	56	4.5%	63	4.2%
4	Status 1A/1B	38	3.9%	3	3.0%	4	3.5%	32	4.1%	39	3.9%
	M/P 37+	159	16.2%	28	28.3%	12	10.5%	154	19.8%	194	19.6%
	M/P 33-36	115	11.7%	12	12.1%	22	19.3%	86	11.1%	120	12.1%
	M/P 29-32	184	18.8%	17	17.2%	19	16.7%	150	19.3%	186	18.8%
	M/P 15-28	456	46.6%	36	36.4%	49	43.0%	326	42.0%	411	41.6%
	M/P < 15	27	2.8%	3	3.0%	8	7.0%	28	3.6%	39	3.9%
5	Status 1A/1B	102	7.0%	2	1.3%	10	5.6%	62	5.1%	74	4.8%
	M/P 37+	332	22.8%	38	24.7%	37	20.6%	287	23.7%	362	23.4%
	M/P 33-36	196	13.5%	26	16.9%	19	10.6%	158	13.0%	203	13.1%
	M/P 29-32	284	19.5%	45	29.2%	49	27.2%	265	21.8%	359	23.2%
	M/P 15-28	448	30.8%	30	19.5%	60	33.3%	380	31.3%	470	30.4%
	M/P < 15	92	6.3%	13	8.4%	5	2.8%	61	5.0%	79	5.1%
6	Status 1A/1B	13	4.2%	2	8.0%	0	0.0%	10	4.4%	12	4.3%
	M/P 37+	37	12.0%	2	8.0%	5	19.2%	29	12.7%	36	12.9%
	M/P 33-36	45	14.6%	1	4.0%	3	11.5%	27	11.8%	31	11.1%
	M/P 29-32	92	29.9%	7	28.0%	3	11.5%	38	16.7%	48	17.2%
	M/P 15-28	119	38.6%	13	52.0%	15	57.7%	123	53.9%	151	54.1%
	M/P < 15	2	0.6%	0	0.0%	0	0.0%	1	0.4%	1	0.4%
7	Status 1A/1B	34	4.6%	7	7.4%	3	3.5%	29	4.4%	39	4.6%
	M/P 37+	124	16.9%	10	10.6%	13	15.3%	99	14.9%	122	14.5%
	M/P 33-36	100	13.6%	9	9.6%	15	17.6%	76	11.5%	100	11.9%
	M/P 29-32	200	27.3%	34	36.2%	18	21.2%	99	14.9%	151	17.9%
	M/P 15-28	265	36.2%	32	34.0%	36	42.4%	343	51.7%	411	48.8%
	M/P < 15	10	1.4%	2	2.1%	0	0.0%	17	2.6%	19	2.3%
8	Status 1A/1B	24	4.0%	6	11.8%	1	1.8%	21	4.4%	28	4.8%
	M/P 37+	62	10.5%	3	5.9%	5	8.8%	52	11.0%	60	10.3%
	M/P 33-36	46	7.8%	3	5.9%	3	5.3%	38	8.0%	44	7.6%
	M/P 29-32	70	11.8%	12	23.5%	12	21.1%	77	16.3%	101	17.4%
	M/P 15-28	386	65.1%	25	49.0%	35	61.4%	271	57.3%	331	57.0%
	M/P < 15	5	0.8%	2	3.9%	1	1.8%	14	3.0%	17	2.9%
9	Status 1A/1B	44	9.8%	2	4.1%	7	12.7%	36	6.8%	45	7.1%
	M/P 37+	131	29.0%	8	16.3%	5	9.1%	91	17.3%	104	16.5%
	M/P 33-36	78	17.3%	4	8.2%	3	5.5%	81	15.4%	88	14.0%
	M/P 29-32	115	25.5%	13	26.5%	13	23.6%	101	19.2%	127	20.2%
	M/P 15-28	64	14.2%	21	42.9%	25	45.5%	182	34.6%	228	36.2%
	M/P < 15	19	4.2%	1	2.0%	2	3.6%	35	6.7%	38	6.0%

(continued)

OPTN Region	Score or Status Group	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
		N	%	N	%	N	%	N	%	N	%
10	Status 1A/1B	36	4.0%	1	1.2%	3	3.2%	25	3.3%	29	3.1%
	M/P 37+	76	8.5%	7	8.3%	9	9.6%	57	7.6%	73	7.9%
	M/P 33-36	71	7.9%	9	10.7%	10	10.6%	58	7.7%	77	8.3%
	M/P 29-32	88	9.8%	10	11.9%	9	9.6%	108	14.4%	127	13.7%
	M/P 15-28	586	65.3%	50	59.5%	57	60.6%	424	56.5%	531	57.2%
	M/P < 15	41	4.6%	7	8.3%	6	6.4%	79	10.5%	92	9.9%
11	Status 1A/1B	50	5.2%	3	3.9%	4	3.6%	26	3.6%	33	3.6%
	M/P 37+	113	11.8%	11	14.5%	16	14.4%	105	14.4%	132	14.4%
	M/P 33-36	67	7.0%	7	9.2%	13	11.7%	89	12.2%	109	11.9%
	M/P 29-32	122	12.8%	15	19.7%	29	26.1%	183	25.2%	227	24.8%
	M/P 15-28	593	62.2%	38	50.0%	48	43.2%	307	42.2%	393	43.0%
	M/P < 15	9	0.9%	2	2.6%	1	0.9%	17	2.3%	20	2.2%

Additional Utilization Information**Table 27. Number of Deceased Liver Donors Recovered by OPO and Era**

OPO Code	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
ALOB	206	1.8%	23	2.1%	22	1.8%	162	1.7%	207	1.8%
AROR	79	0.7%	5	0.5%	5	0.4%	58	0.6%	68	0.6%
AZOB	298	2.6%	34	3.2%	31	2.5%	250	2.7%	315	2.7%
CADN	379	3.3%	32	3.0%	54	4.4%	293	3.1%	379	3.2%
CAGS	77	0.7%	9	0.8%	8	0.7%	116	1.2%	133	1.1%
CAOP	587	5.1%	45	4.2%	69	5.6%	417	4.4%	531	4.5%
CASD	126	1.1%	12	1.1%	15	1.2%	85	0.9%	112	1.0%
CORS	165	1.4%	22	2.1%	13	1.1%	146	1.6%	181	1.5%
CTOP	67	0.6%	3	0.3%	7	0.6%	31	0.3%	41	0.4%
DCTC	141	1.2%	9	0.8%	10	0.8%	110	1.2%	129	1.1%
FLFH	182	1.6%	12	1.1%	13	1.1%	173	1.8%	198	1.7%
FLMP	163	1.4%	14	1.3%	24	2.0%	136	1.4%	174	1.5%
FLUF	203	1.8%	10	0.9%	23	1.9%	188	2.0%	221	1.9%
FLWC	272	2.4%	20	1.9%	29	2.4%	240	2.5%	289	2.5%
GALL	355	3.1%	20	1.9%	34	2.8%	278	3.0%	332	2.8%
HIOP	27	0.2%	2	0.2%	1	0.1%	22	0.2%	25	0.2%
IAOP	89	0.8%	5	0.5%	3	0.2%	79	0.8%	87	0.7%
ILIP	445	3.9%	37	3.5%	42	3.4%	348	3.7%	427	3.6%
INOP	227	2.0%	28	2.6%	19	1.5%	215	2.3%	262	2.2%
KYDA	119	1.0%	15	1.4%	18	1.5%	139	1.5%	172	1.5%
LAOP	239	2.1%	22	2.1%	28	2.3%	196	2.1%	246	2.1%
MAOB	291	2.5%	30	2.8%	32	2.6%	194	2.1%	256	2.2%
MDPC	163	1.4%	15	1.4%	28	2.3%	109	1.2%	152	1.3%
MIOP	332	2.9%	33	3.1%	29	2.4%	246	2.6%	308	2.6%
MNOP	191	1.7%	24	2.2%	11	0.9%	140	1.5%	175	1.5%
MOMA	230	2.0%	18	1.7%	15	1.2%	199	2.1%	232	2.0%
MSOP	87	0.8%	13	1.2%	7	0.6%	82	0.9%	102	0.9%
MWOB	250	2.2%	34	3.2%	31	2.5%	239	2.5%	304	2.6%
NCCM	120	1.0%	10	0.9%	17	1.4%	103	1.1%	130	1.1%
NCNC	227	2.0%	22	2.1%	37	3.0%	190	2.0%	249	2.1%
NEOR	58	0.5%	8	0.7%	13	1.1%	52	0.6%	73	0.6%
NJTO	182	1.6%	23	2.1%	19	1.5%	147	1.6%	189	1.6%
NMOP	49	0.4%	6	0.6%	5	0.4%	58	0.6%	69	0.6%
NVLV	171	1.5%	35	3.3%	19	1.5%	138	1.5%	192	1.6%
NYAP	64	0.6%	6	0.6%	4	0.3%	59	0.6%	69	0.6%
NYFL	55	0.5%	10	0.9%	5	0.4%	33	0.4%	48	0.4%
NYRT	314	2.7%	11	1.0%	19	1.5%	224	2.4%	254	2.2%
NYWN	25	0.2%	3	0.3%	2	0.2%	19	0.2%	24	0.2%
OHLB	151	1.3%	11	1.0%	13	1.1%	134	1.4%	158	1.3%
OHLC	97	0.8%	6	0.6%	24	2.0%	102	1.1%	132	1.1%
OHLP	132	1.2%	14	1.3%	23	1.9%	133	1.4%	170	1.5%
OHOV	90	0.8%	10	0.9%	3	0.2%	76	0.8%	89	0.8%
OKOP	155	1.4%	8	0.7%	14	1.1%	132	1.4%	154	1.3%

(continued)

OPO Code	Pre-Policy		Post-Policy, Pre-COVID		Post-Policy, COVID Onset		Post-Policy, COVID Stabilization		Post-Policy (overall)	
	N	%	N	%	N	%	N	%	N	%
ORUO	121	1.1%	15	1.4%	10	0.8%	120	1.3%	145	1.2%
PADV	633	5.5%	55	5.1%	64	5.2%	482	5.1%	601	5.1%
PATF	211	1.8%	26	2.4%	33	2.7%	224	2.4%	283	2.4%
PRLI	118	1.0%	7	0.7%	8	0.7%	99	1.1%	114	1.0%
SCOP	163	1.4%	15	1.4%	21	1.7%	147	1.6%	183	1.6%
TNDS	320	2.8%	32	3.0%	27	2.2%	310	3.3%	369	3.2%
TNMS	67	0.6%	2	0.2%	10	0.8%	58	0.6%	70	0.6%
TXGC	441	3.9%	53	4.9%	50	4.1%	311	3.3%	414	3.5%
TXSA	199	1.7%	15	1.4%	21	1.7%	164	1.7%	200	1.7%
TXSB	443	3.9%	41	3.8%	54	4.4%	300	3.2%	395	3.4%
UTOP	113	1.0%	11	1.0%	14	1.1%	129	1.4%	154	1.3%
VATB	183	1.6%	13	1.2%	23	1.9%	166	1.8%	202	1.7%
WALC	304	2.7%	26	2.4%	27	2.2%	220	2.3%	273	2.3%
WIDN	105	0.9%	13	1.2%	12	1.0%	76	0.8%	101	0.9%
WIUW	133	1.2%	19	1.8%	14	1.1%	117	1.2%	150	1.3%