

OPTN Data Advisory Committee

Descriptive Data Request

Externally Verified Deaths with New Process Change and Description of All Deaths by Source

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Executive Summary

The following report provides an extensive descriptive analysis of deaths from two time periods, as well as an overview of the external deaths verification process UNOS employs to supplement OPTN member-reported deaths information in the OPTN database. Characteristics reviewed included age, race/ethnicity, education level, insurance type, sex, state and center, among some enumerations of time to death from transplant or waitlist removal. First, deaths added to the OPTN database during the February and March 2022 external deaths verification process are characterized. During this time frame, enhancements to the external deaths verification process occurred that allowed for the automation of what was a previously manual review of obituary data. This led to a bolus of deaths verified and thus added to OPTN data. Deaths for transplant recipients as well as waitlist registrations (not removed for transplant) were characterized.

Most deaths were transplant recipients that received transplant around 2006, and 90% of these transplant recipient deaths occurred between 5 to 25 years post-transplant. Across organs, the majority of these deaths for transplant recipients occurred after lost to follow-up; however, over half of pancreas and close to one-third of kidney transplant recipient deaths occurred after graft failure. OPTN policy currently requires reporting of follow-up or patient events until either death or graft failure occurs. Overall, 21% of these transplant recipient deaths were Black, Non-Hispanic and 12% were Hispanic/Latino. When waitlist registrations (not removed for transplant) were reviewed, most deaths had removal dates around 2015, with 59% of waitlist registration deaths occurring over 5 years after removal. Of these waitlist registration deaths, 27% were Black, Non-Hispanic while 14% were Hispanic/Latino.

The second set of deaths to be characterized were those deaths that occurred between January 1, 2005 through December 31, 2021 to look at longer term descriptive patterns across sources of death information. Sources of death information were categorized as “Member Reported” (coming from OPTN members and included in OPTN database), “External Verification” (verified through external sources of death and included in OPTN database), or “Unverified” (from external sources of death that were unable to be verified and not included in OPTN database). Deaths for transplant recipients as well as waitlist registrations (not removed for transplant) were characterized.

Again for this larger cohort of deaths, most deaths were transplant recipients that received transplant around 2006. These deaths occurred most often between 5 to 20 years post transplant (57% member reported, 74% external verification, 72% unverified). While the majority of member reported deaths were reported during follow-ups with no graft failure events (64%), external verification deaths occurred after lost to follow-up (58 - 67% per organ) or graft failure (kidney, kidney-pancreas, and pancreas organs, 42 - 61%). The largest proportion of unverified deaths occurred after lost to follow-up (42%). The largest proportion of transplant recipient deaths for Black, Non-Hispanics and Hispanic/Latinos per organ was for kidney. Overall, the proportions of member reported, external verification, and unverified deaths that were Black, Non-Hispanic were 18%, 24%, and 22%, while the proportions that were Hispanic/Latino were 10%, 12%, and 21%, respectively.

Lastly, for the larger cohort of waitlist registration deaths, there were increased volumes of deaths removed from the waitlist after 2005, which aligns with the defined cohort of interest. There was a more gradual increase in the number of externally verified deaths removed from 2012 on, aligning with the introduction of the external verification process in 2012. By organ, the percentage of waitlist registration deaths within unverified death sources was larger than external verification and member reported death sources for Hispanic/Latinos. Again, kidney waitlist registration deaths has the highest proportions of Black, Non-Hispanics across death sources. Overall, the proportions of member reported, external verification, and unverified deaths that were Black, Non-Hispanic were 24%, 25%, and 26%, while the proportions that were Hispanic/Latino were 15%, 15%, and 25%, respectively.

This report does not investigate the impact to further metrics, such as post-transplant survival rate calculations or waitlist mortality rates. Further review of the distributions and key subgroups presented here that may be most impacted by the enhancements to the external verification process and potential biases in source of death information will provide guidance for further evaluation of metric impacts from this data.

Background/Purpose

During the full committee teleconference on May 9, 2022, a brief presentation was provided on the background of the OPTN external verification of deaths history and the recent announcement of the enhancements made to this process. Following this presentation, concerns and additional questions were raised regarding the bolus of roughly 35,000 deaths added to the OPTN data and characteristics of these data, as well as the remaining impact of additional unverified deaths and implications for OPTN data quality.

Strategic Plan Goal or Committee Project Addressed

Provide equity in access to transplants – continually increase the quality of OPTN data collected and explore the use of external data source to supplement policy-making and research.

Committee Request

1. Using the cohort of approximately 35,000 deaths recently added to OPTN data in February and March 2022 through the external verification process, provide counts and percentages of deaths by:
 - Type of death - waitlist registrations not removed for transplant (deceased or living donor) and transplant recipients (deceased or living donor), overall and by organ
 - Year of death, overall and by organ
 - Type and year of death, overall and by organ
 - For transplant recipients,
 - Year of transplant, overall and by organ
 - Years from transplant to death ([0, 1), [1, 3), [3, 5), [5, 10), [10, 15), [15, 20), [20, 25), [25, 30), [30, Inf]), overall and by organ
 - Death after graft failure, death after recipient reported lost to follow-up, other; overall and by organ
 - Age at transplant (<1, 1-5, 6-10, 11-17, 18-34, 35-49, 50-64, 65+), overall and by organ
 - Race/Ethnicity (Asian, Non-Hispanic; Black, Non-Hispanic; Hispanic/Latino; Multiracial, Non-Hispanic; Other, Non-Hispanic; White, Non-Hispanic), overall and by organ
 - Sex (male, female), overall and by organ
 - Education level (less than college or GED, college or GED and higher), overall and by organ
 - Primary source of payment (public, private), overall and by organ
 - State of transplant program where transplant was received, overall and by organ
 - De-identified transplant program, overall and by organ
 - For waitlist registrations not removed for transplant,
 - Year of removal, overall and by organ
 - Time from removal to death (While Waiting, 1-7 days, 8-14 days, 15-30 days, 31-60 days, 61-90 days, 91-180 days, 181 days – 1 year, 1-3 years, 3-5 years, > 5 years), overall and by organ
 - Removal reason (Still Waiting, Too Sick to Transplant, Condition Improved, Unable to Contact, Refused Transplant, Death, Other), overall and by organ
 - Age at removal, overall and by organ
 - Race/Ethnicity, overall and by organ
 - Sex, overall and by organ
 - Education level, overall and by organ
 - Primary source of payment, overall and by organ
 - State of listing transplant program, overall and by organ
 - De-identified transplant program, overall and by organ
 - For the subset of waitlist registrations removed for death on the waitlist list, status at time of removal, overall and by organ
2. Using the cohort of all deaths that occurred during January 1, 2005 through December 31, 2021, provide counts and percentages of deaths stratified by generic source of death (reported by OPTN member, OPTN data; externally verified source, OPTN data; and unverified, not OPTN data):

- Type of death - waitlist registrations not removed for transplant (deceased or living donor) and transplant recipients (deceased or living donor), overall and by organ
- Year of death, overall and by organ
- Type and year of death, overall and by organ
- For transplant recipients,
 - Year of transplant, overall and by organ
 - Years from transplant to death, overall and by organ
 - Death after graft failure, death after recipient reported lost to follow-up, death after not seen, other; overall and by organ
 - Age at transplant, overall and by organ
 - Race/Ethnicity, overall and by organ
 - Sex, overall and by organ
 - Education level, overall and by organ
 - Primary source of payment, overall and by organ
 - State of listing transplant program, overall and by organ
 - De-identified transplant program, overall and by organ
- For waitlist registrations not removed for transplant,
 - Year of removal, overall and by organ
 - Time from removal to death, overall and by organ
 - Removal reason, overall and by organ
 - Age at removal, overall and by organ
 - Race/Ethnicity, overall and by organ
 - Sex, overall and by organ
 - Education level, overall and by organ
 - Primary source of payment, overall and by organ
 - State of listing transplant program, overall and by organ
 - De-identified transplant program, overall and by organ
- For all waitlist registrations (any removal reason),
 - Year of removal, overall and by organ
 - Time from removal to death (While Waiting, 1-7 days, 8-14 days, 15-30 days, 31-60 days, 61-90 days, 91-180 days, 181 days – 1 year, 1-3 years, 3-5 years, > 5 years), overall and by organ
 - Removal reason (Still Waiting, Too Sick to Transplant, Condition Improved, Unable to Contact, Refused Transplant, Death, Other), overall and by organ
 - State of listing transplant program, overall and by organ
 - De-identified transplant program, overall and by organ

3. In addition to the above data distributions, the following informational items will be provided:

- Mapping of OPTN death data source types and relationships, and any changes in this mapping or linkages that have occurred over time
- Current sources of supplemental data included in OPTN data files and fields impacted (e.g., death, but also graft failure, etc)
- Update and impact of additional living donor deaths to OPTN data
- Outline of differences and data sets used by UNOS for OPTN-related work and those made available in the public OPTN STAR file
- Confirmation of which data files (OPTN STAR and/or SRTR SAF) included unverified deaths prior to their removal
- Differences in death verification processes employed by UNOS and SRTR and drivers of potential discrepancies in OPTN STAR file and SRTR SAF file death counts
- Confirmation of whether CMS data on deaths post-graft failure for kidney patients is being used, similar to dialysis dates data from CMS crown data
- Explanation of extent verification of deaths is reliant upon transplant center reporting of deaths to the OPTN

Data and Methods

Data Sources:

OPTN data on transplant candidate and recipient deaths reported to the OPTN by OPTN members, identified through external data sources and verified for inclusion with OPTN data, and non-OPTN data on transplant candidate and recipient deaths from external data sources that were not verified and not included in OPTN data.

Cohort:

Externally verified deaths data from obituary and LexisNexis data sources included in the OPTN database during March 2022.

Deaths data (OPTN and non-OPTN) with death dates during January 1, 2005 through December 31, 2021.

For the subset of waitlist registrations not removed for transplant, registrations for patients with the following removal reasons were **excluded**:

- Deceased donor transplant, removed by transplanting center
- Transplant at another center (multi-listed)
- Living donor transplant, removed by transplanting center
- Deceased donor emergency transplant
- Deceased donor multi-organ transplant
- Patient died during transplant procedure
- Transplanted in another country
- Patient died during living donor transplant procedure

Results

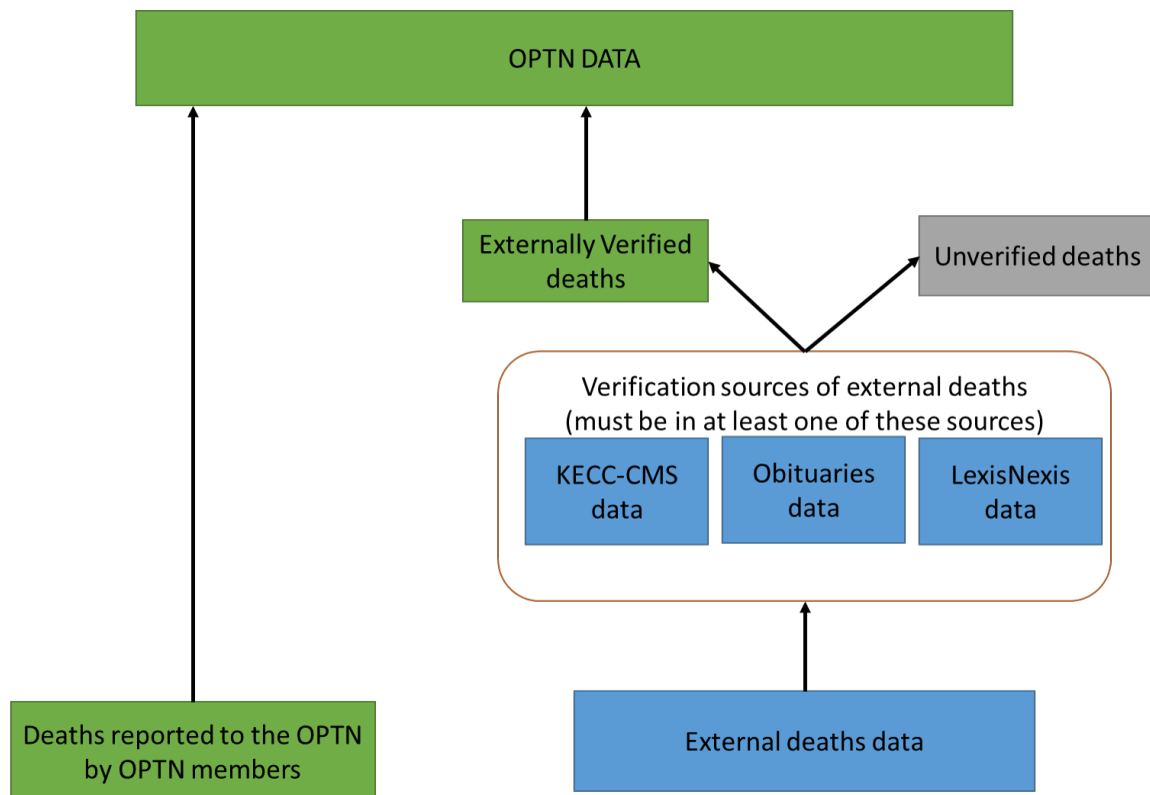
A timeline of the data collection process with respect to deaths information that was provided during the May 9, 2022 meeting is also provided here again.

- **1988**: OPTN data collection begins
- **2004**: OPTN database supplemented with external sources of death
- **2011**: Broad access to external sources of death was greatly restricted outside of federal agency usage (<https://ladmf.ntis.gov/docs/import-change-dmf.pdf>)
- **2013**: OPTN establishes death verification process (<https://unos.org/news/optn-to-implement-new-process-for-patient-status-verification/>)
 - A manual, labor-intensive process of independently verifying some external deaths by a secondary source in order to augment OPTN data
 - Due to the time-consuming nature of this task, OPTN had to prioritize efforts to focus on deaths relevant to SRTR's PSR cohorts for one- and three-year survival rates
- **2017**: OPTN publishes sensitivity analysis on impact of external sources of death versus OPTN member-reported deaths (Wilk, Amber R., Leah B. Edwards, and Erick B. Edwards. "The effect of augmenting OPTN data with external death data on calculating patient survival rates after organ transplantation." *Transplantation* 101.4 (2017): 836.)
- **2022**: OPTN adopts a new, more automated death verification process (<https://optn.transplant.hrsa.gov/news/optn-death-verification-process-improvements-will-yield-updated-numbers-beginning-in-april-2022/>)
 - Reduced the resource-intensive manual process
 - Now attempts to verify all externally sourced deaths, not just deaths affecting PSR cohorts

Below is a high-level flow diagram of how deaths information is included in the OPTN database. Per signed Data Use Agreements (DUAs) and Non-Disclosure Agreements (NDAs), we cannot disclose the external deaths data source(s), but can share the current verification process for incorporating this information into the OPTN database. All recipient, candidate, and living donor deaths that are reported by OPTN members are included in the OPTN database without further verification required. External data on deaths is obtained on all transplant candidates and recipients in the OPTN database that do not have a death event reported to the OPTN by the member. This

is then processed through the three listed verification sources and must be identified in at least one of the three sources to be included in the OPTN database.

Figure 1: A high-level overview of how deaths data is incorporated into the OPTN database.



In this diagram, KECC-CMS (University of Michigan Kidney Epidemiology Cost Center) data includes information from a combination of CMS (Centers for Medicare & Medicaid Services) data sources, such as CROWNWeb, CMS Medical Evidence Form (Form CMS-2728), Medicare, and ESRD (End Stage Renal Disease) data. LexisNexis data is from an enterprise data analytics company providing information from various public claims records. Lastly, obituary data includes information from the previously manual process to identify and verify obituaries as well as from the new, automated process as of early 2022, allowing UNOS to expand to checking all recipient, candidate, and living donor deaths in the database rather than those in the most recent PSR cohort time period. This is largely the basis of the data presented in the section “New Deaths Externally Verified in February/March 2022” below.

The death status and date from external verification source(s) does not override anything already recorded by OPTN members. If an external data death cannot be verified within at least one of the three listed verification sources, it is not included in the OPTN database and is not considered a death event. In many cases, externally verified deaths eventually become member-reported deaths as follow-up visits by members with their patients occur.

Per current OPTN Policy *18.1 Data Submission Requirements*, transplant hospitals are required to submit organ-specific transplant recipient follow-up forms (TRF) within *either* of the following:

- 30 days* after the six-month and annual anniversary of the transplant date until the recipient’s death or graft failure
- 14 days from notification of the recipient’s death or graft failure

** note that this time frame will be changed to 90 days, effective with the implementation of the Modified Data Submission and Data Lock policy.

Member-reported deaths are not impacted by externally verified death data, as this information takes priority. Due to the temporal sequencing of the process and when TIEDI forms are required to be submitted, it may be the case that information on a death is found via externally verified sources and included in OPTN data but later added and confirmed by the member as well. The information provided by the OPTN member, which includes additional items such as cause of death, trumps the externally verified source information. Calculated fields in the OPTN STAR files may use externally verified death data under some circumstances. For example, “Composite Death Date” includes member-reported deaths as well as externally verified deaths, and other fields such as “PSTATUS” and “PTIME”, for patient survival status and patient survival time, are calculated based on this.

Currently there are no other data fields included in the OPTN STAR file that are supplemented by external data sources in a similar manner. The OPTN STAR file has not ever included unverified deaths information. The documentation for the OPTN STAR file includes information on where each variable originates from in the system (TIEDI form, Waitlist, DonorNet, etc) or whether it is a calculated variable.

UNOS did not begin receiving externally verified deaths for living donors until early 2022 and is continuing to work on incorporating these into the OPTN STAR file. Only those living donor deaths reported by OPTN members are currently included in the OPTN database. Additional updates and communications will be forthcoming on this effort.

While the OPTN cannot speak to SRTR practices for internal and SAF file analyses, we can outline the data UNOS analyzes in various situations. When UNOS performs analyses for or on behalf of the OPTN, we typically use a more recent, but similar, data set to that which is publicly available as the OPTN STAR file. We use a cut of the data from the OPTN database as of the previous Friday. This includes information on deaths reported by OPTN members as well as from externally verified sources. The OPTN has access to, and it is permissible to use, all deaths in aggregate including those that remain unverified from external sources; however, this is not often done. If such an analysis is performed, the methods and titles of all data and information clearly denote this.

The semi-annual “Patient Status Confirmation Link” process in the Data Services Portal allows members to report patients we have identified as experiencing a death as actually alive; however, if at some later date than a member’s confirmation the patient is verified dead in the external data sources, this verified death will override the previous “alive” status as they could have died more recently than what the member was just reported. UNOS is working on the best approach to identify how often false positives from externally verified sources have been included in the OPTN database historically.

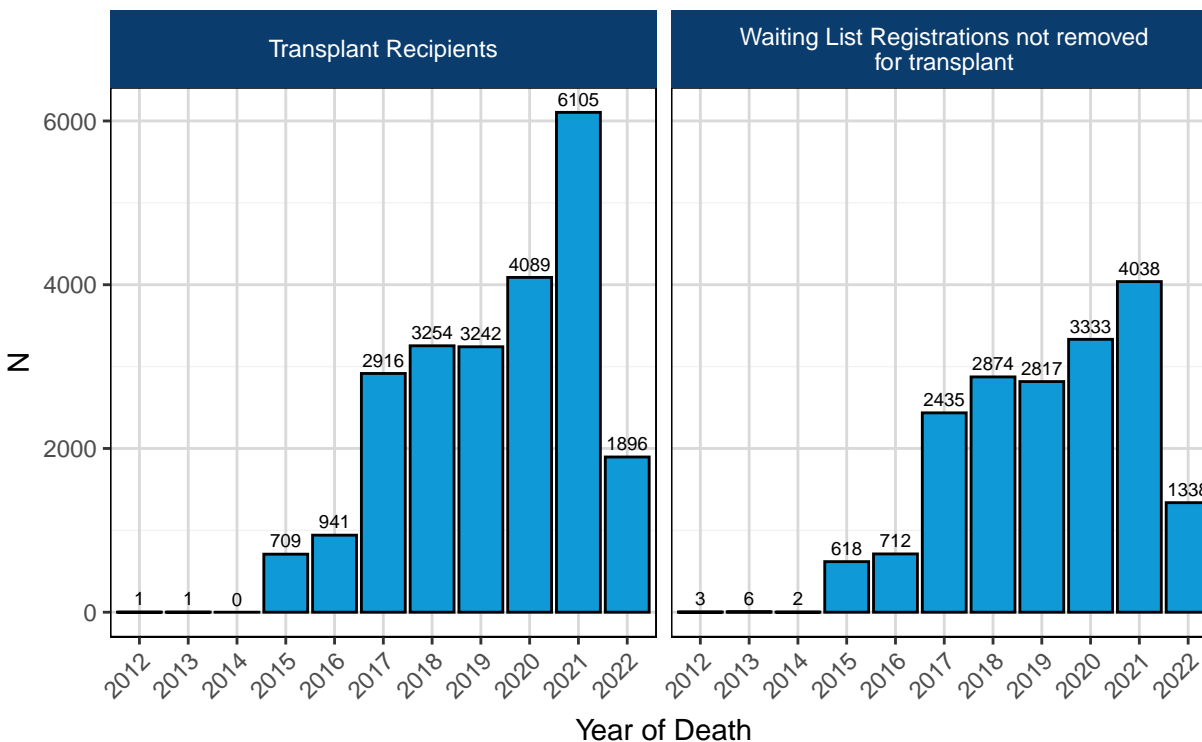
UNOS and SRTR are reviewing current processes for death verification to ensure alignment of data and information available moving forward. Additional discussions on this point will be ongoing to review current discrepancies and a unified approach for consistency.

The remainder of the report is set up as follows - the Results Section entitled “New Deaths Externally Verified in February/March 2022” enumerates the bolus of deaths added to the OPTN data with the early 2022 enhancements to the obituary verification process. This is further broken up to characterize transplant recipients separately from waitlist registrations (not removed for transplant). As outlined above in the Data and Methods Section, if a waitlist registration has a removal associated with transplant they were excluded in this subgroup, with the assumption that they will be captured in the transplant recipients subgroup to avoid multiplicity. The Results Section entitled “Deaths with Death Date between 1/1/2005 - 12/31/2021” is also broken up into transplant recipients, waitlist registrations (not removed for transplant), as well as an additional all waitlist registrations group. These subsections characterize deaths with death dates between 2005 and 2021 by the source of death information in addition to other characteristics.

New Deaths Externally Verified in February/March 2022

Figure 2 illustrates the distribution of the externally verified deaths from changes to the external verification process as of March 2022 by patient type and year of death. These deaths occurred during 2015 through 2022 for both transplant recipients and waitlist registrations (not removed for transplant).

Figure 2: External validation deaths from March 2022 by patient type and year of death.



Transplant Recipients

Because there were very few deaths for heart-lung and intestine transplant recipients with the updated external verification process, these organs will be excluded in the graphics and tables in the rest of this section.

Table 1: External validation deaths for transplant recipients from March 2022 by organ.

Organ	N
Heart	1070
Heart-Lung	4
Intestine	15
Kidney	17744
Kidney-Pancreas	969
Liver	2782
Lung	291
Pancreas	279
TOTAL	23154

The order of magnitude is much larger for kidney and overall deaths each year, so the bottom panel of Figure 3 excludes these lines to provide a closer look at trends in other organs by year transplanted. There is a larger proportion of deaths that were capture from transplants around 2006, which aligns with the following figure illustrating time from transplant to death (Figure 4). The earliest Spring 2022 Program Specific Report (PSR) cohort began January 1, 2016 and the latest ended December 31, 2021. There were 3% (705) of these externally verified deaths from the enhanced process that had transplant dates from 2016 - 2021.

Figure 3: External validation deaths for transplant recipients from March 2022 by organ and year of transplant. Top panel contains all organs and total, bottom panel excludes kidney and total trends.

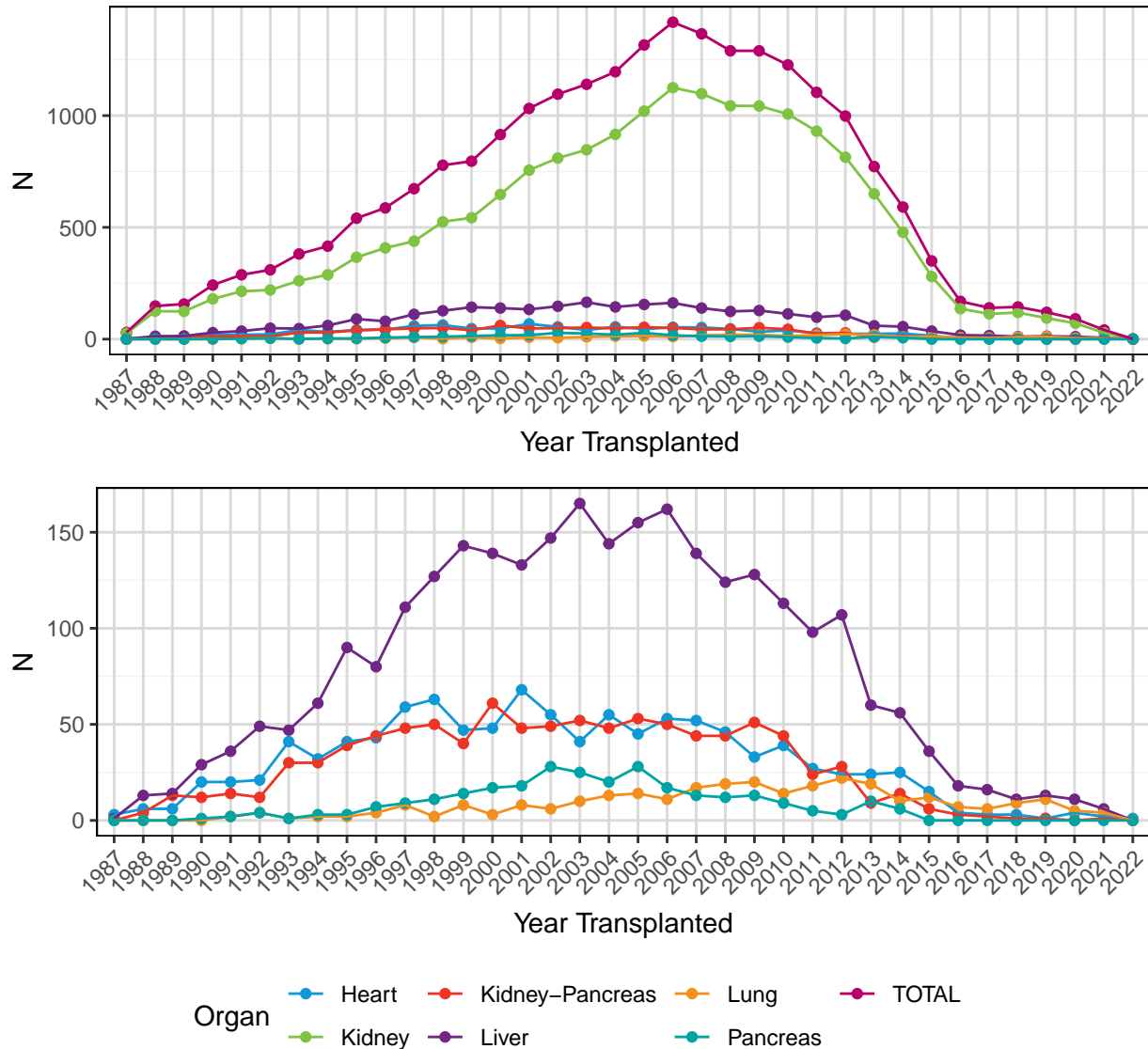


Table 2: External validation deaths for transplant recipients from March 2022 by organ and year of transplant.

Year Transplanted	Heart	Kidney	Kidney-Pancreas	Liver	Lung	Pancreas	TOTAL
1987	*	26	*	*	*	*	30
1988	*	125	*	13	*	*	148
1989	*	124	13	14	*	*	157
1990	20	180	12	29	*	*	242
1991	20	214	14	36	*	*	288
1992	21	220	12	49	*	*	310
1993	41	261	30	47	*	*	381
1994	32	288	30	61	*	*	416
1995	41	366	39	90	*	*	541
1996	43	408	44	80	*	*	587
1997	59	438	48	111	*	*	673
1998	63	525	50	127	*	11	778
1999	47	543	40	143	*	14	796
2000	48	647	61	139	*	17	915
2001	68	756	48	133	*	18	1032
2002	55	810	49	147	*	28	1096
2003	41	847	52	165	10	25	1140
2004	55	916	48	144	13	20	1196
2005	45	1020	53	155	14	28	1316
2006	53	1125	50	162	11	17	1418
2007	52	1098	44	139	17	13	1366
2008	46	1044	44	124	19	12	1290
2009	33	1043	51	128	20	13	1290
2010	39	1007	44	113	14	*	1227
2011	27	930	24	98	18	*	1104
2012	24	814	28	107	22	*	998
2013	24	650	*	60	19	10	772
2014	25	478	14	56	10	*	591
2015	15	280	*	36	12	*	350
2016	*	136	*	18	*	*	169
2017	*	113	*	16	*	*	140
2018	*	119	*	11	*	*	144
2019	*	94	*	13	11	*	120
2020	*	71	*	11	*	*	91
2021	*	28	*	*	*	*	41
2022	*	*	*	*	*	*	*

* Counts less than 10 not shown.

Again, given that the order of magnitude is much larger for kidney and overall deaths each year, the bottom panel of Figure 4 excludes these lines to provide a closer look at trends in other organs. Most deaths that were captured were for recipients 5-25 years post-transplant across organs.

Figure 4: External validation deaths for transplant recipients from March 2022 by organ and time from transplant to death. Top panel contains all organs and total, bottom panel excludes kidney and total trends.

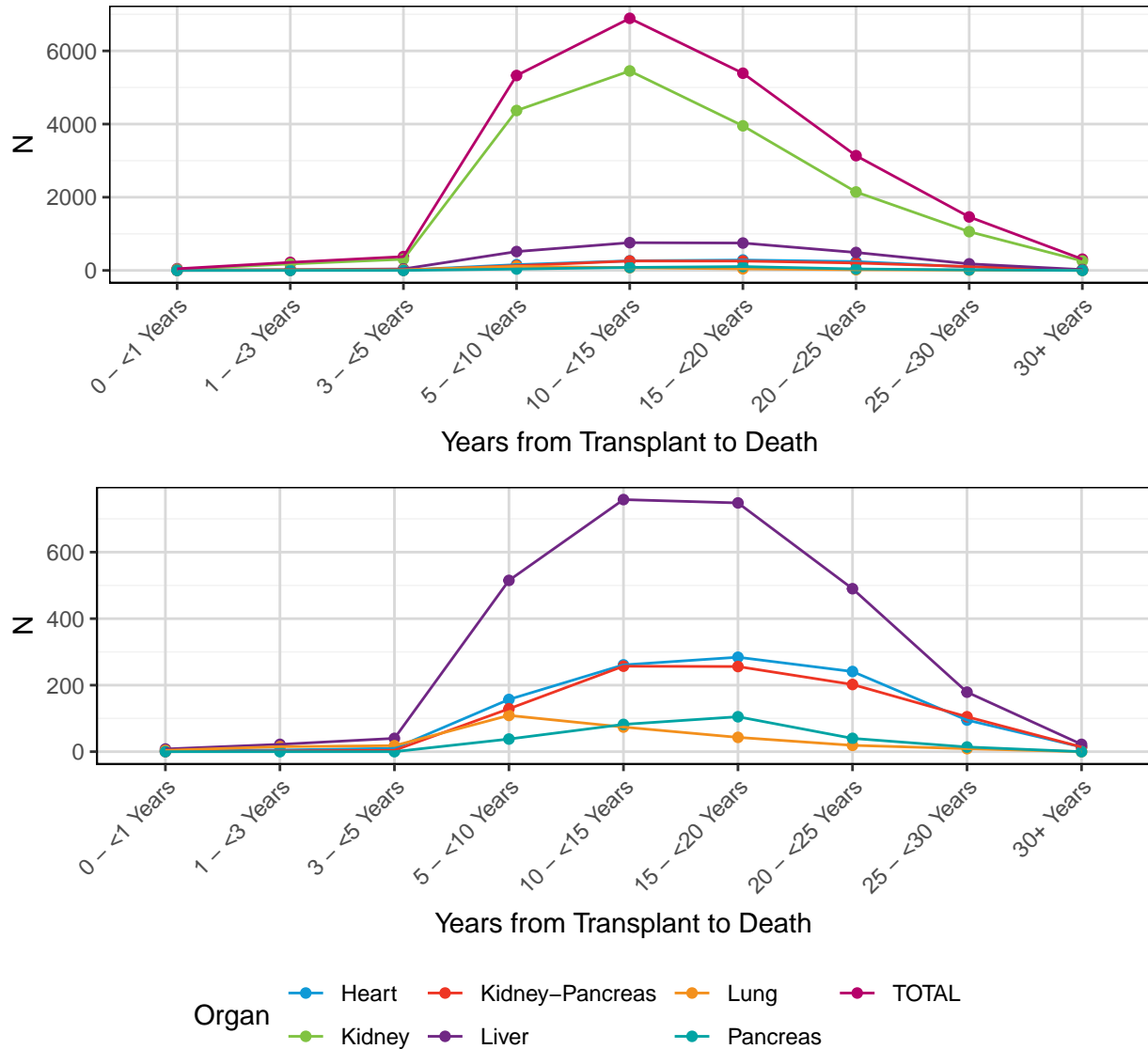


Table 3: External validation deaths for transplant recipients from March 2022 by organ and time from transplant to death.

Years from Transplant to Death	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
0 - <1 Years	*	*	30	0.2%	*	*	*	*	*	*	*	*	45	0.2%
1 - <3 Years	*	*	176	1.0%	*	*	22	0.8%	15	5.2%	*	*	220	1.0%
3 - <5 Years	10	0.9%	304	1.7%	*	*	40	1.4%	18	6.2%	*	*	377	1.6%
5 - <10 Years	157	14.7%	4370	24.6%	129	13.3%	515	18.5%	109	37.5%	38	13.6%	5327	23.0%
10 - <15 Years	261	24.4%	5452	30.7%	257	26.5%	758	27.2%	74	25.4%	82	29.4%	6890	29.8%
15 - <20 Years	284	26.5%	3952	22.3%	256	26.4%	748	26.9%	43	14.8%	105	37.6%	5390	23.3%
20 - <25 Years	241	22.5%	2144	12.1%	202	20.8%	490	17.6%	19	6.5%	40	14.3%	3136	13.5%
25 - <30 Years	95	8.9%	1059	6.0%	105	10.8%	179	6.4%	*	*	14	5.0%	1462	6.3%
30+ Years	14	1.3%	257	1.4%	14	1.4%	22	0.8%	*	*	*	*	307	1.3%

* Counts less than 10 not shown.

Across organs, the majority of transplant recipients in the externally validated deaths occurred as deaths after lost to follow-up. Over half of pancreas and close to one third of kidney transplant recipient externally validated deaths occurred as deaths after graft failure.

Figure 5: External validation deaths for transplant recipients from March 2022 by organ and follow-up status at death.

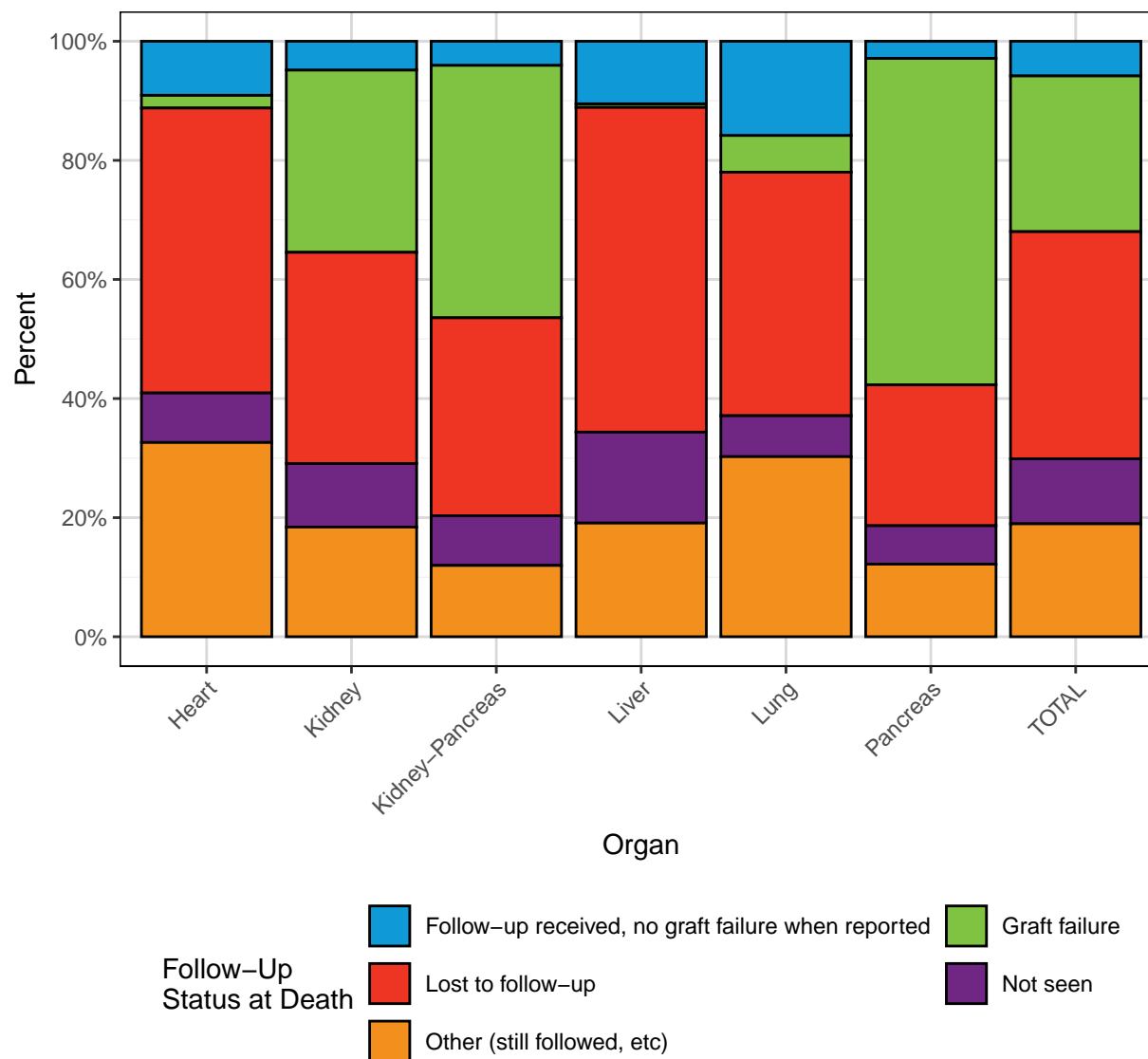


Table 4: External validation deaths for transplant recipients from March 2022 by organ and follow-up status at death.

Follow-Up Status at Death	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Graft failure	23	2.1%	5434	30.6%	411	42.4%	17	0.6%	18	6.2%	153	54.8%	6062	26.2%
Lost to follow-up	512	47.9%	6292	35.5%	322	33.2%	1517	54.5%	119	40.9%	66	23.7%	8833	38.1%
Not seen	89	8.3%	1894	10.7%	81	8.4%	425	15.3%	20	6.9%	18	6.5%	2527	10.9%
Follow-up received, no graft failure when reported	97	9.1%	856	4.8%	39	4.0%	292	10.5%	46	15.8%	*	*	1341	5.8%
Other (still followed, etc)	349	32.6%	3268	18.4%	116	12.0%	531	19.1%	88	30.2%	34	12.2%	4391	19.0%

* Counts less than 10 not shown.

While 60% of pancreas and kidney-pancreas transplant recipients in the externally validated deaths were between ages 35-49 at time of transplant, the majority were a bit older for all other organs, with ages 50-64 at time of transplant.

Figure 6: External validation deaths for transplant recipients from March 2022 by organ and recipient age at transplant.

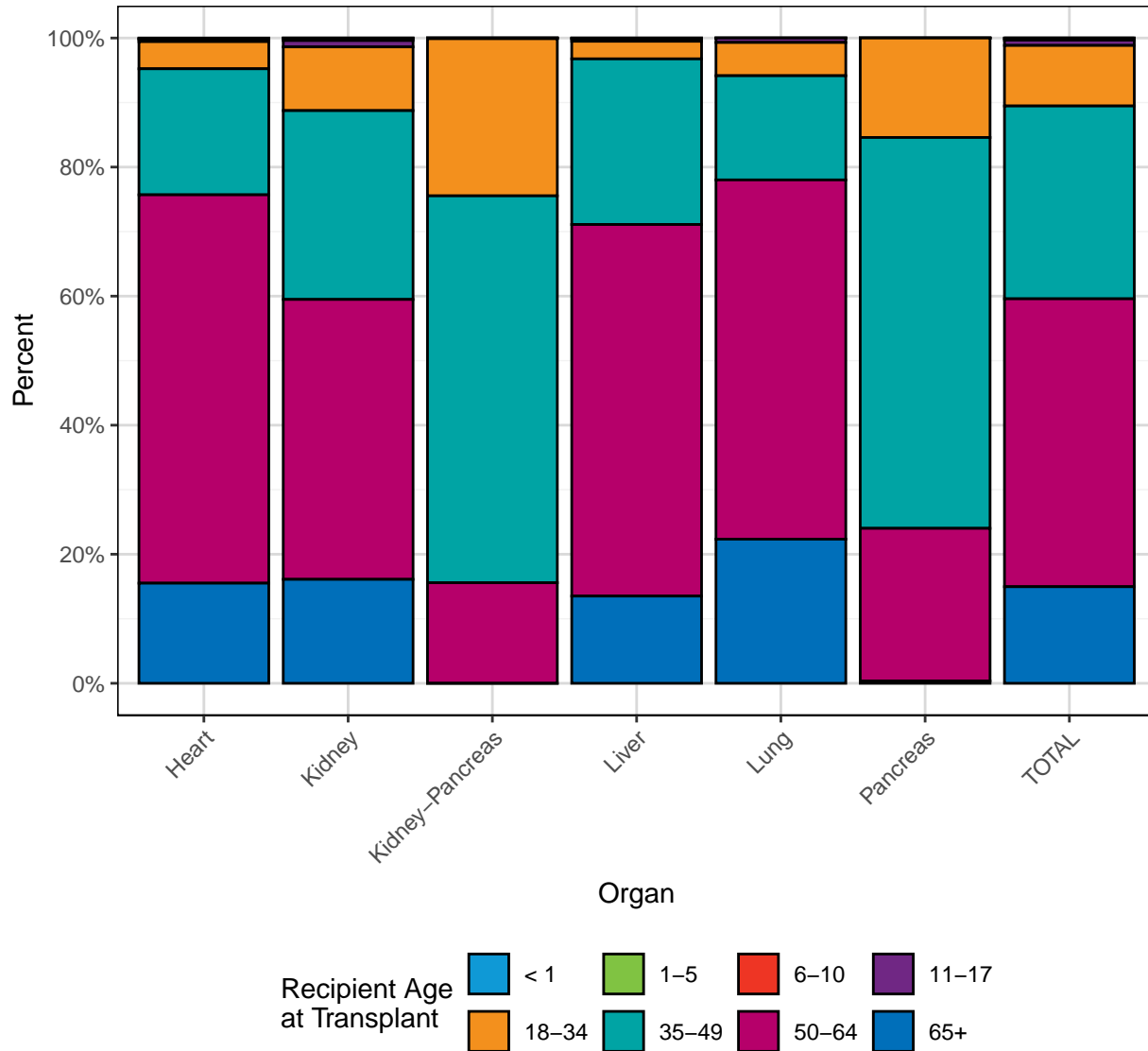


Table 5: External validation deaths for transplant recipients from March 2022 by organ and recipient age at transplant.

Recipient Age at Transplant	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
< 1	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1-5	*	*	21	0.1%	*	*	*	*	*	*	*	*	23	0.1%
6-10	*	*	48	0.3%	*	*	*	*	*	*	*	*	51	0.2%
11-17	*	*	175	1.0%	*	*	10	0.4%	*	*	*	*	192	0.8%
18-34	45	4.2%	1752	9.9%	236	24.4%	76	2.7%	15	5.2%	43	15.4%	2172	9.4%
35-49	209	19.5%	5193	29.3%	581	60.0%	714	25.7%	47	16.2%	169	60.6%	6919	29.9%
50-64	644	60.2%	7697	43.4%	151	15.6%	1602	57.6%	162	55.7%	66	23.7%	10330	44.6%
65+	166	15.5%	2858	16.1%	*	*	376	13.5%	65	22.3%	*	*	3466	15.0%

* Counts less than 10 not shown.

For kidney transplant recipients, 25% of these externally validated deaths were Black, Non-Hispanic. This was followed by 13% Hispanic-Latino transplant recipients. Black transplant recipients made up 14% and 10% of these kidney-pancreas and heart externally validated deaths, respectively. Hispanic/Latino transplant recipients made up 11% of these liver externally validated deaths.

Figure 7: External validation deaths for transplant recipients from March 2022 by organ and recipient race/ethnicity.

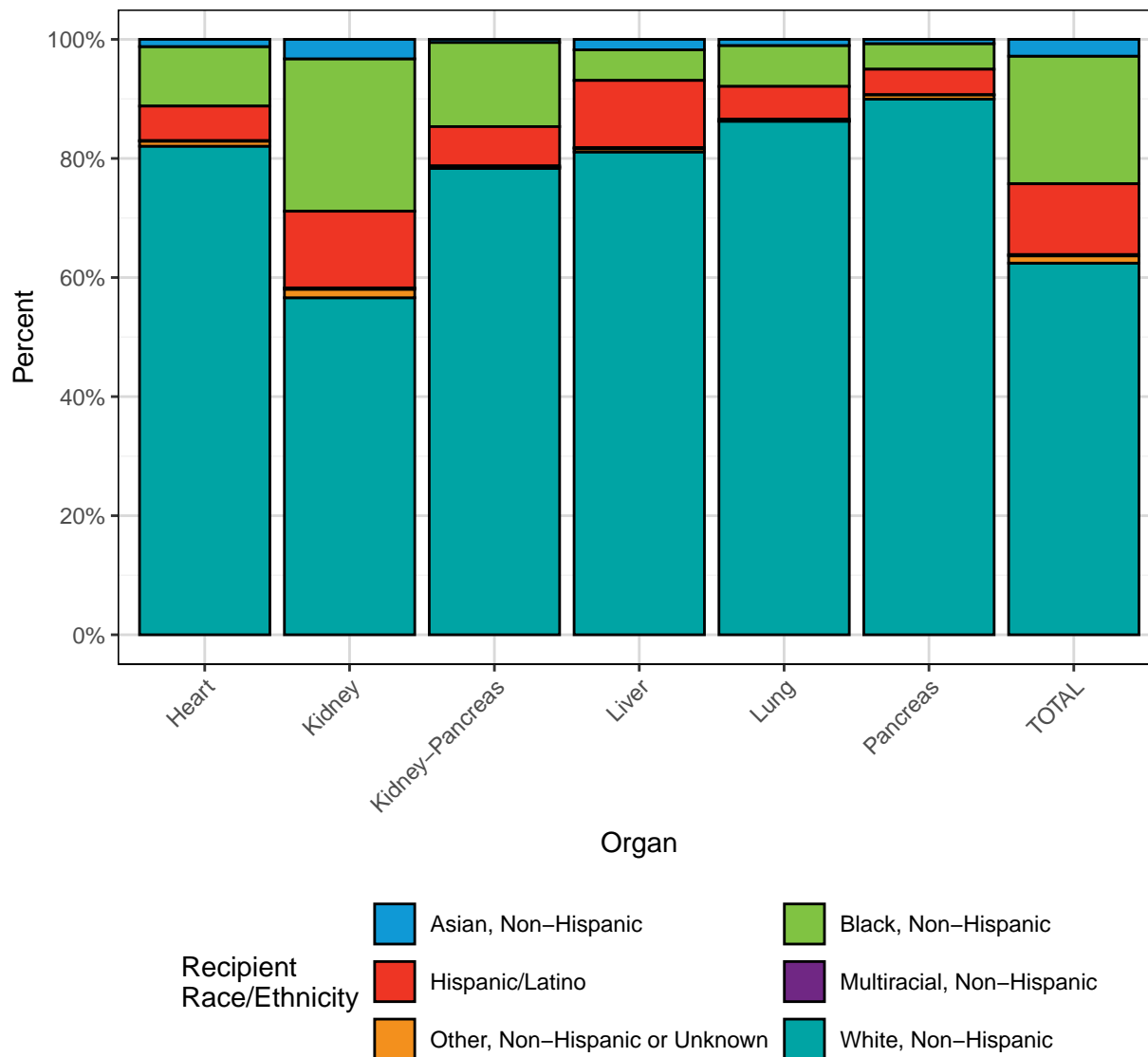


Table 6: External validation deaths for transplant recipients from March 2022 by organ and recipient race/ethnicity.

Recipient Race/Ethnicity	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
White, Non-Hispanic	878	82.1%	10044	56.6%	759	78.3%	2256	81.1%	251	86.3%	251	90.0%	14453	62.4%
Black, Non-Hispanic	107	10.0%	4542	25.6%	137	14.1%	143	5.1%	20	6.9%	12	4.3%	4964	21.4%
Hispanic/Latino	62	5.8%	2284	12.9%	64	6.6%	314	11.3%	16	5.5%	12	4.3%	2753	11.9%
Asian, Non-Hispanic	13	1.2%	580	3.3%	*	*	49	1.8%	*	*	*	*	653	2.8%
Other, Non-Hispanic or Unknown	*	*	253	1.4%	*	*	15	0.5%	*	*	*	*	281	1.2%
Multiracial, Non-Hispanic	*	*	41	0.2%	*	*	*	*	*	*	*	*	50	0.2%

* Counts less than 10 not shown.

The majority of these externally validated deaths for transplant recipients were male.

Figure 8: External validation deaths for transplant recipients from March 2022 by organ and recipient gender.

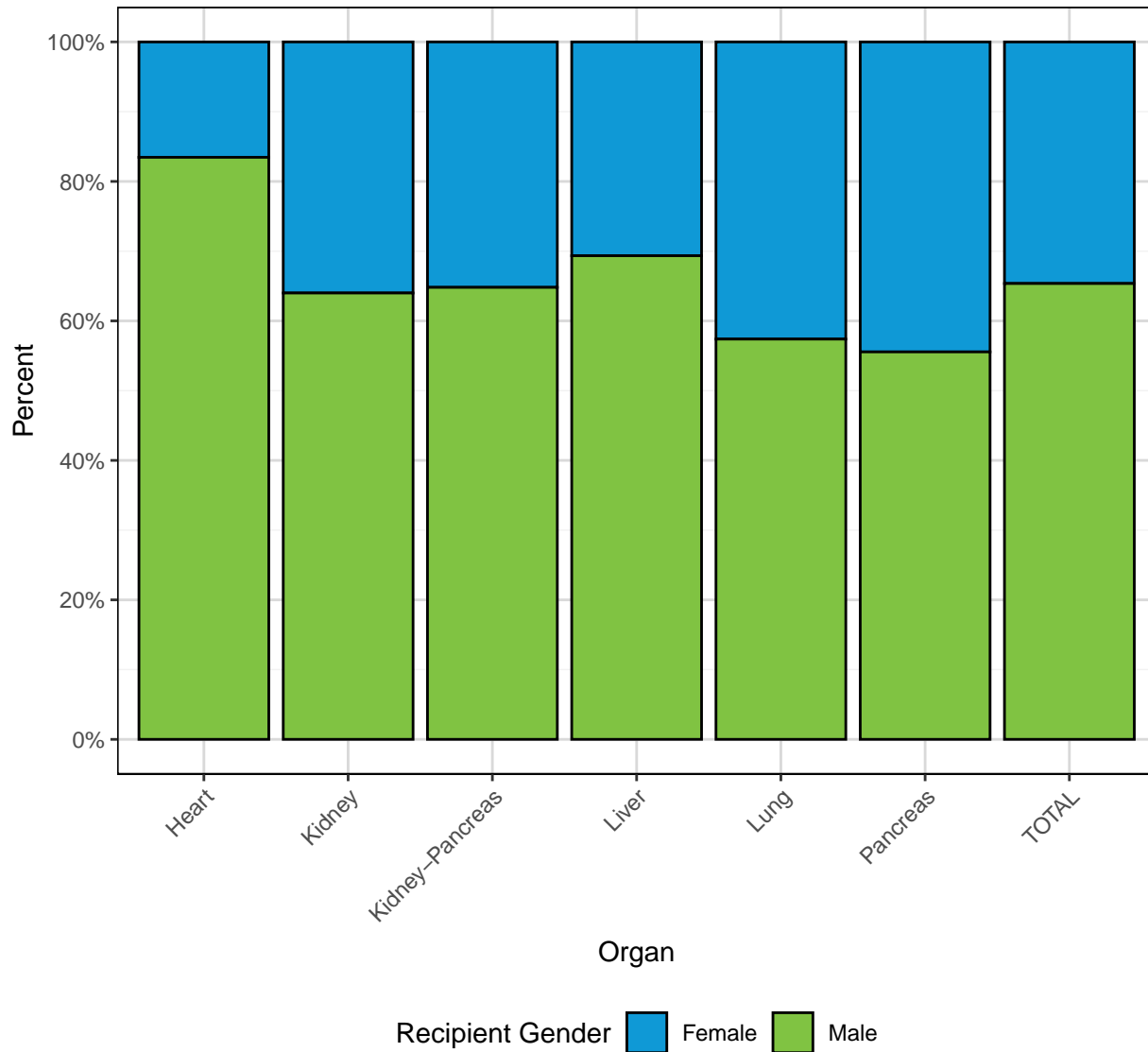


Table 7: External validation deaths for transplant recipients from March 2022 by organ and recipient gender.

Recipient Gender	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Female	177	16.5%	6388	36.0%	341	35.2%	853	30.7%	124	42.6%	124	44.4%	8020	34.6%
Male	893	83.5%	11356	64.0%	628	64.8%	1929	69.3%	167	57.4%	155	55.6%	15134	65.4%

* Counts less than 10 not shown.

There were fairly even distributions of education level across organ type, though lung transplant recipients in these externally validated deaths more often had college or GED and higher experience (49%).

Figure 9: External validation deaths for transplant recipients from March 2022 by organ and recipient education level.

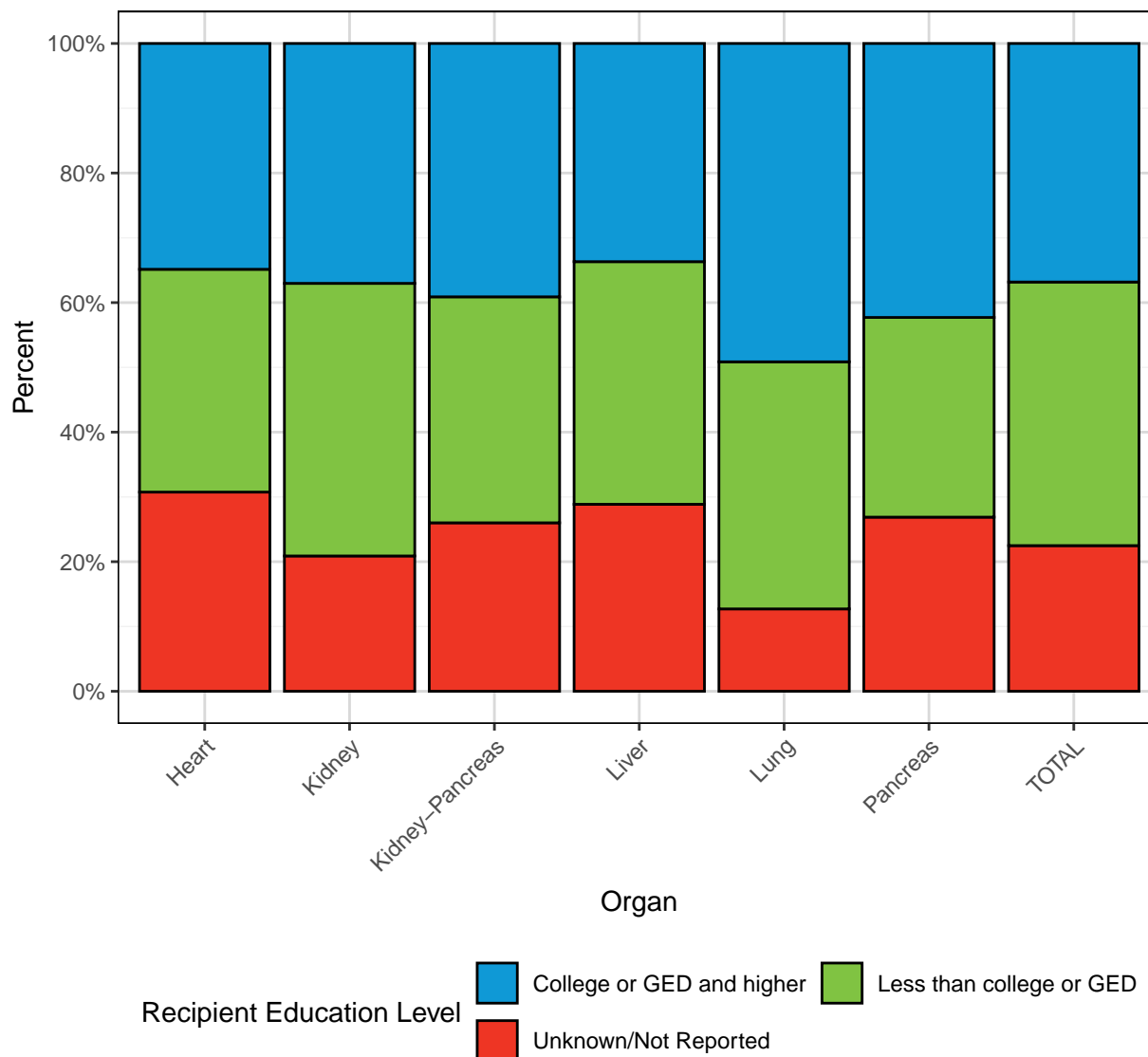


Table 8: External validation deaths for transplant recipients from March 2022 by organ and recipient education level.

Recipient Education Level	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Unknown/Not Reported	329	30.7%	3706	20.9%	252	26.0%	803	28.9%	37	12.7%	75	26.9%	5206	22.5%
Less than college or GED	368	34.4%	7467	42.1%	338	34.9%	1042	37.5%	111	38.1%	86	30.8%	9422	40.7%
College or GED and higher	373	34.9%	6571	37.0%	379	39.1%	937	33.7%	143	49.1%	118	42.3%	8526	36.8%

* Counts less than 10 not shown.

Heart, liver, lung, and pancreas transplant recipients in these externally validated deaths were more often private insurance holders, whereas public insurance was more common for the kidney and kidney-pancreas transplant recipient externally validated deaths. For heart, there was a larger (13%) proportion of unknown or not reported insurance status.

Figure 10: External validation deaths for transplant recipients from March 2022 by organ and recipient primary source of payment at transplant.

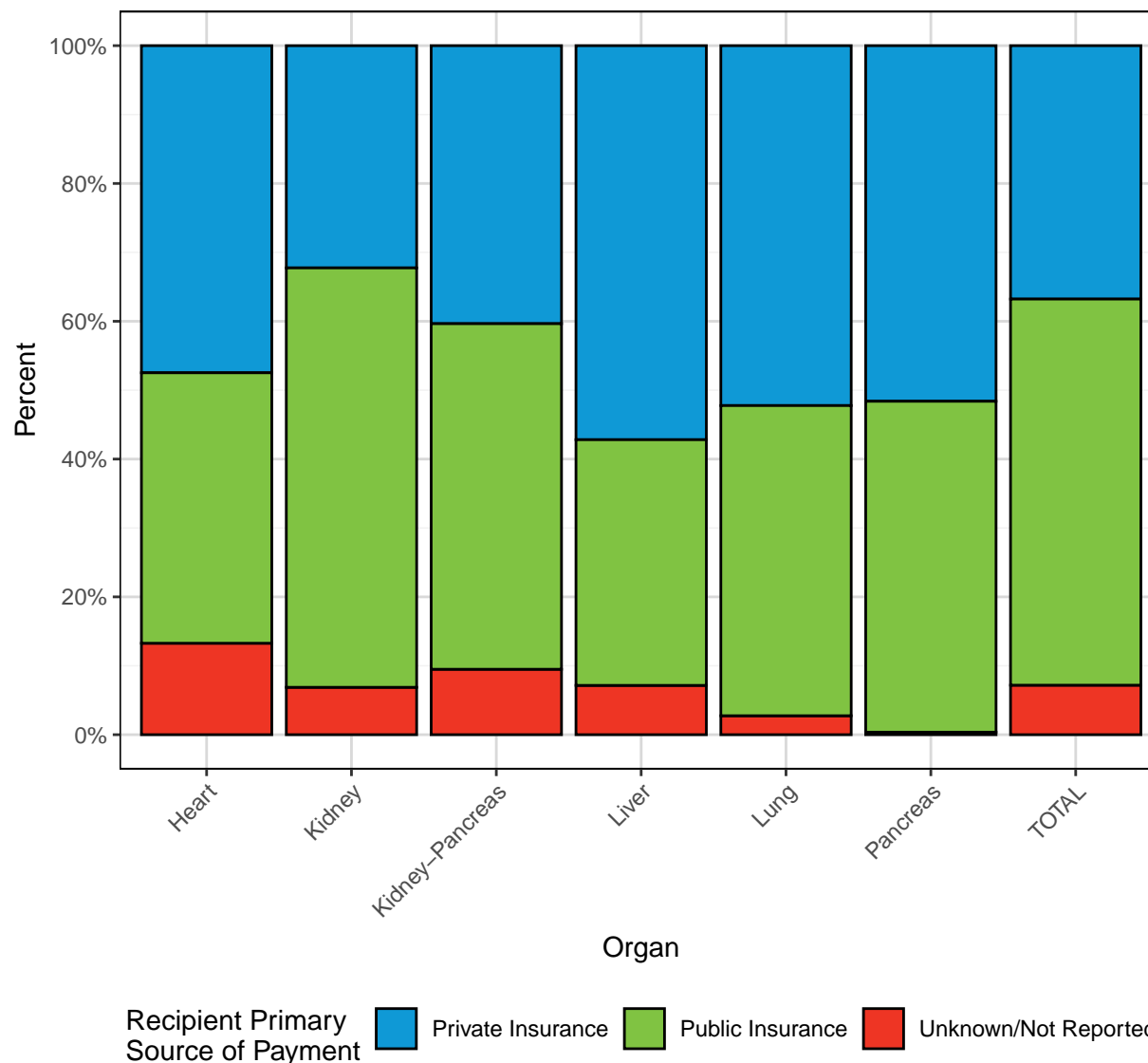


Table 9: External validation deaths for transplant recipients from March 2022 by organ and recipient primary source of payment at transplant.

Recipient Primary Source of Payment	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Private Insurance	508	47.5%	5723	32.3%	391	40.4%	1591	57.2%	152	52.2%	144	51.6%	8516	36.8%
Public Insurance	420	39.3%	10801	60.9%	486	50.2%	992	35.7%	131	45.0%	134	48.0%	12975	56.0%
Unknown/Not Reported	142	13.3%	1220	6.9%	92	9.5%	199	7.2%	*	*	*	*	1663	7.2%

* Counts less than 10 not shown.

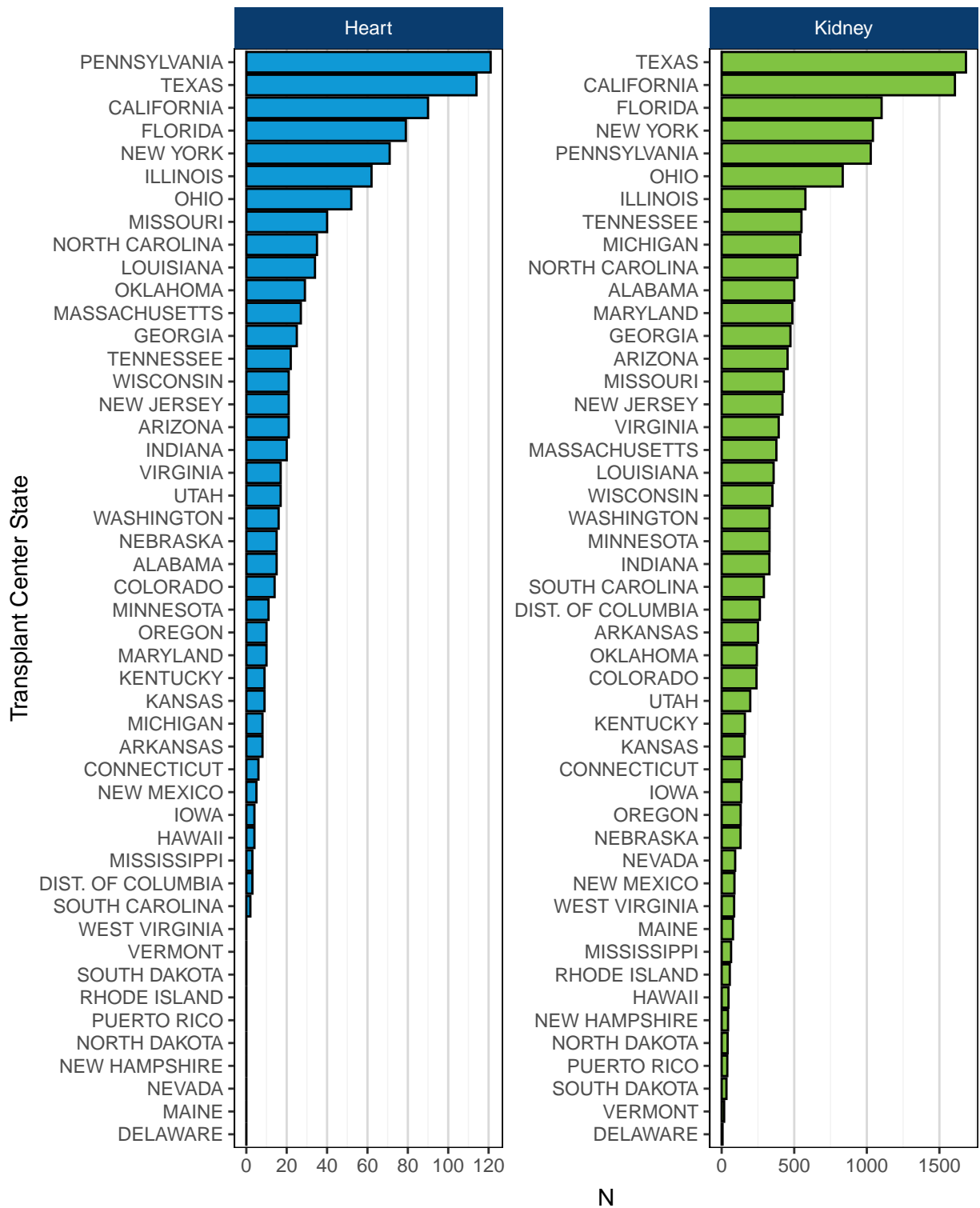
The top states where transplant recipients received transplants in these externally validated deaths were similar for heart, kidney, kidney-pancreas, and liver. Overall, California, Texas, Florida, Pennsylvania, and New York transplant center states had the largest volumes.

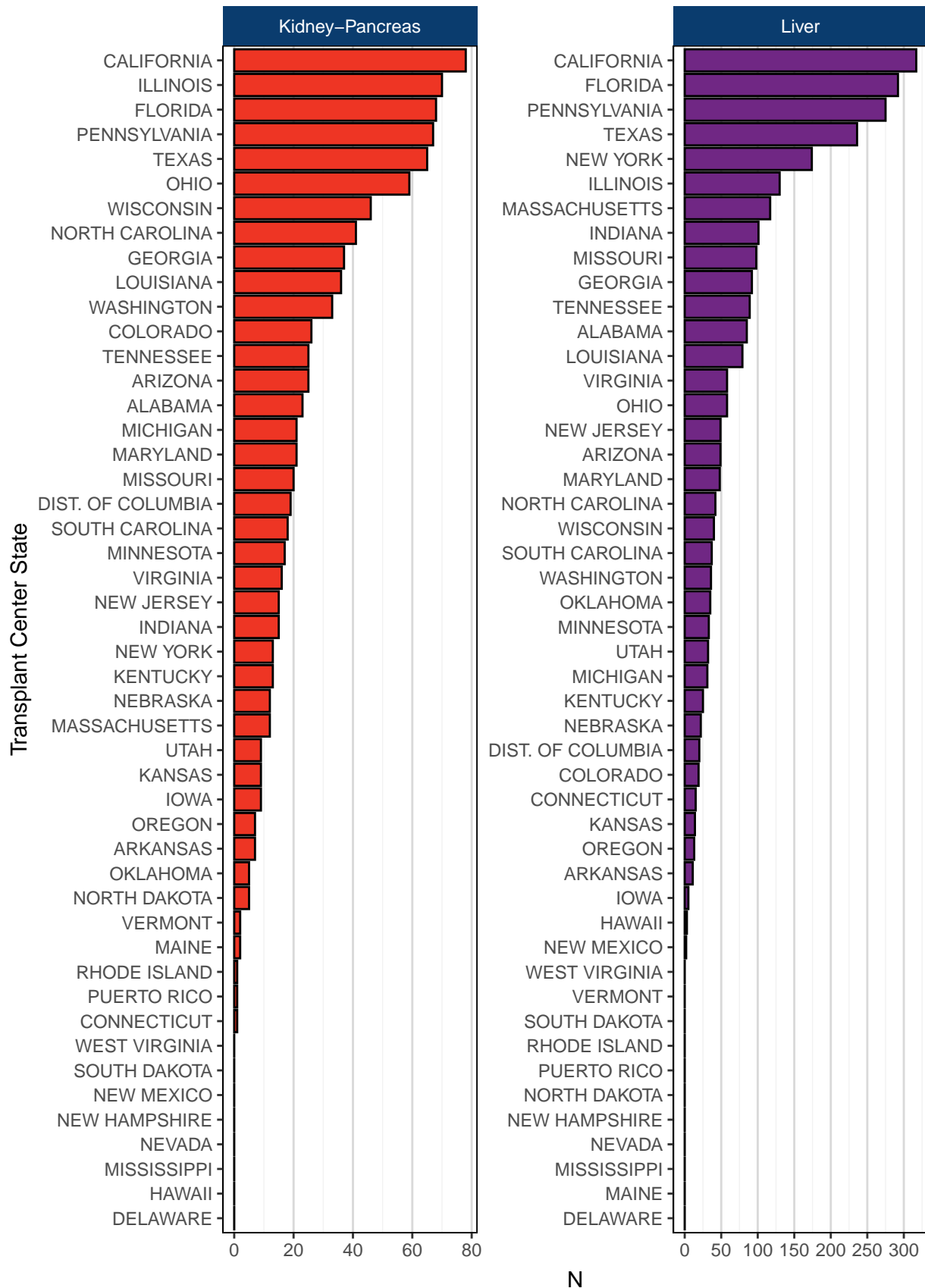
The table below provides a summary of the distribution of these externally validated deaths across transplant center states by organ.

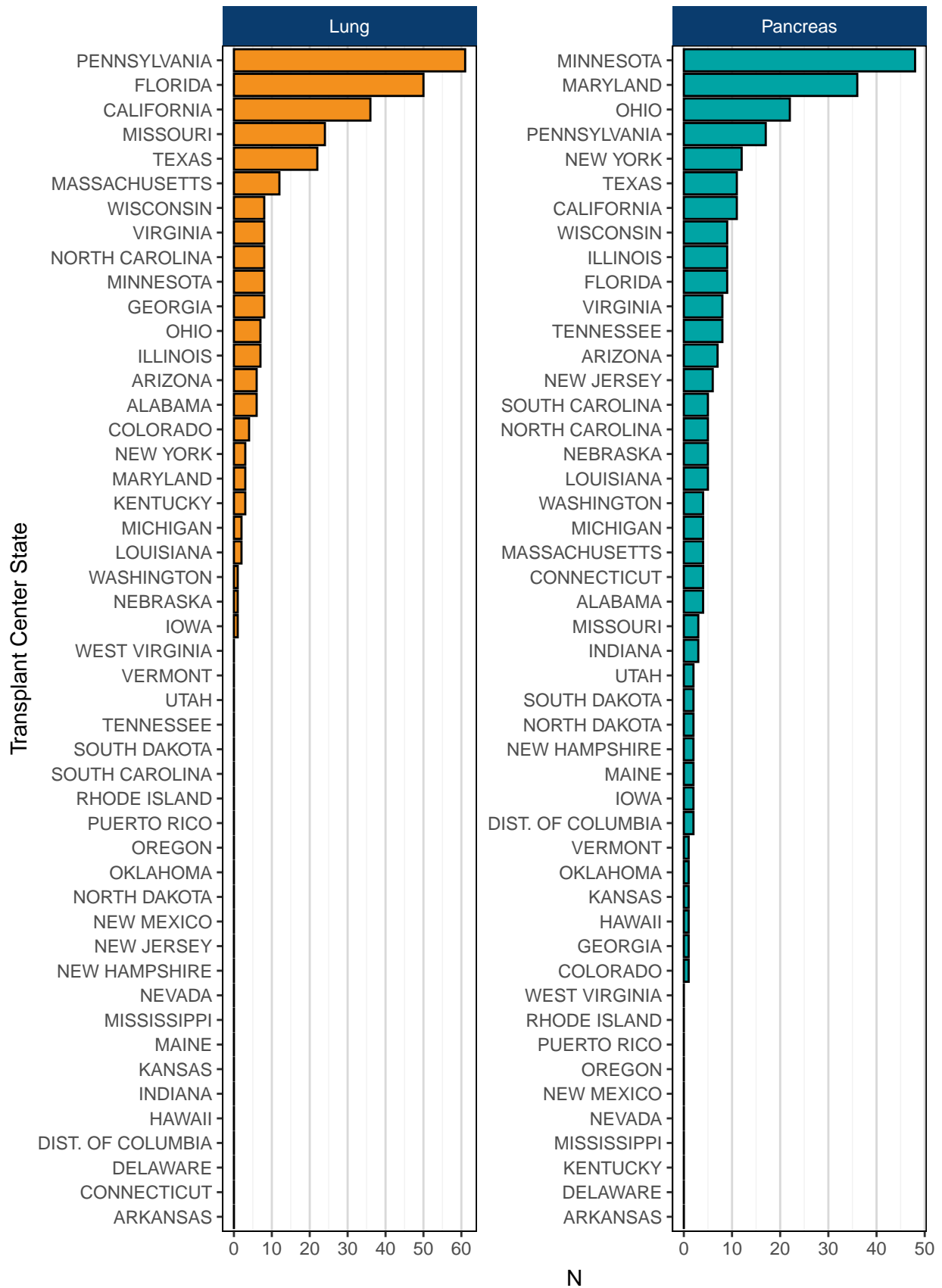
Table 10: Summary of number of external validation deaths for transplant recipients from March 2022 per transplant center state by organ. Transplant center states for each organ type included if at least one death.

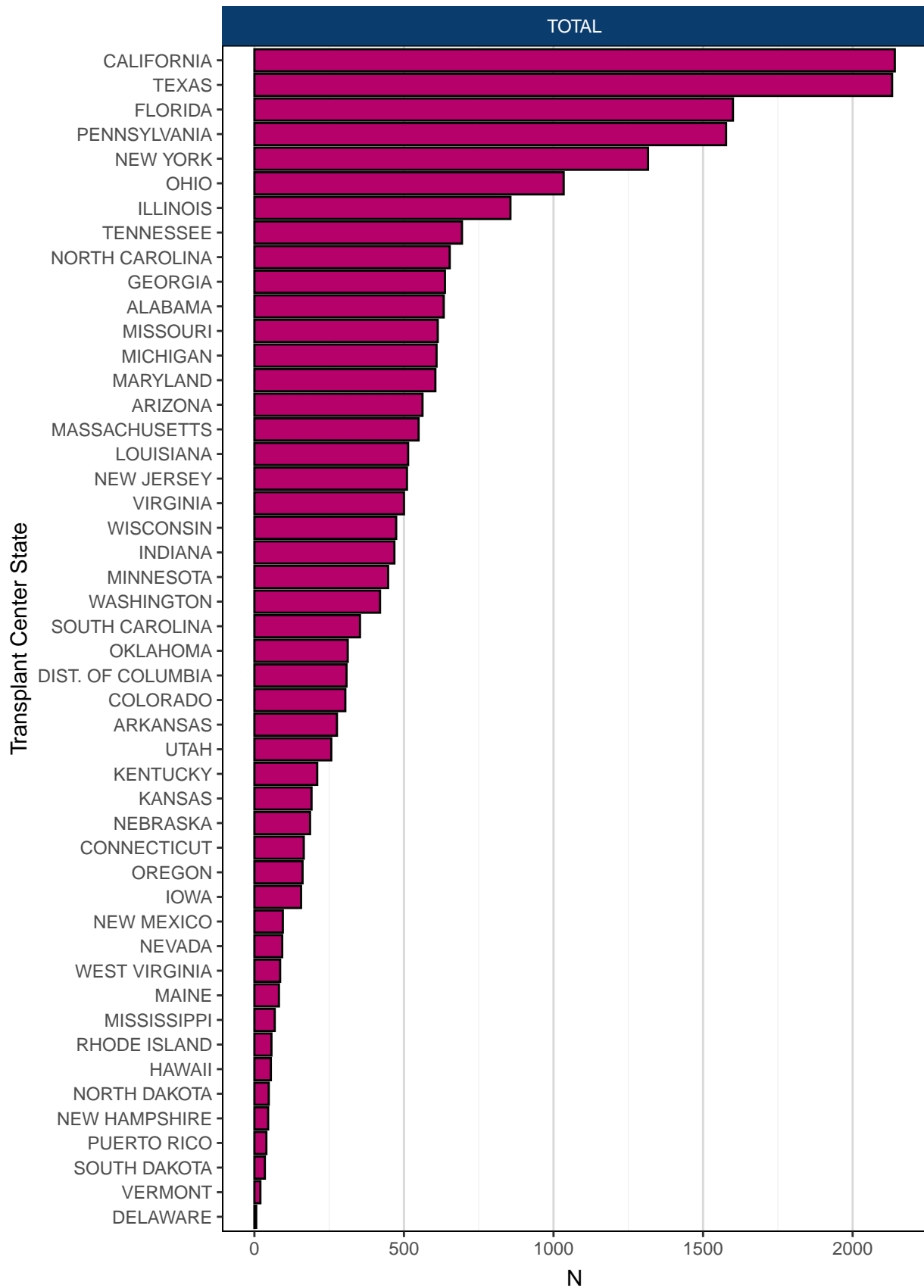
Organ	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Heart	2	9.00	28.2	17.0	32.75	121
Kidney	6	91.75	369.7	277.0	477.25	1683
Kidney-Pancreas	1	9.00	24.2	17.5	33.75	78
Liver	2	22.00	75.2	42.0	92.00	317
Lung	1	3.00	12.1	7.0	9.00	61
Pancreas	1	2.00	7.3	4.0	8.75	48
TOTAL	6	94.50	482.4	332.5	610.00	2141

Figure 11: External validation deaths for transplant recipients from March 2022 by organ and recipient transplant center state.







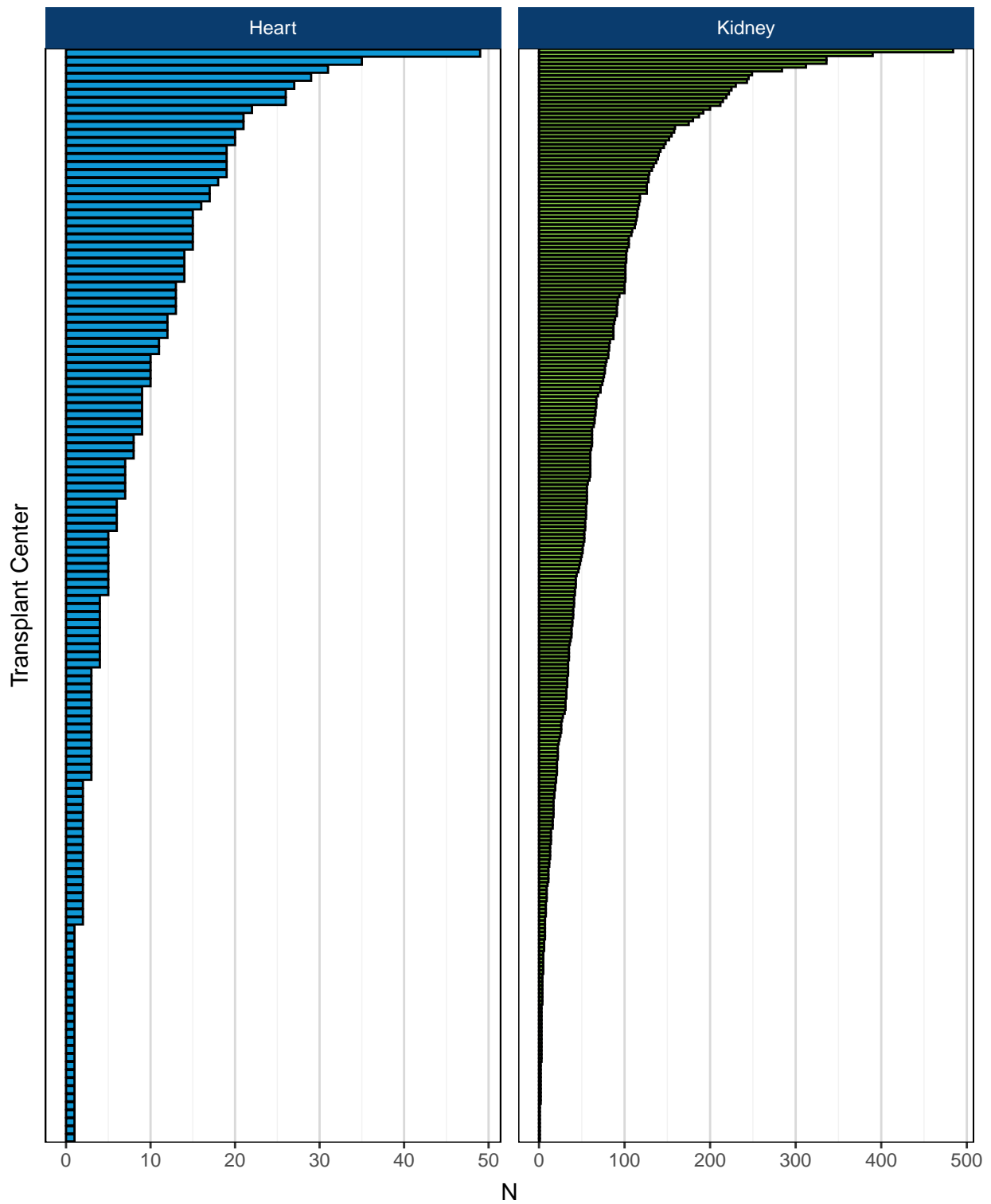


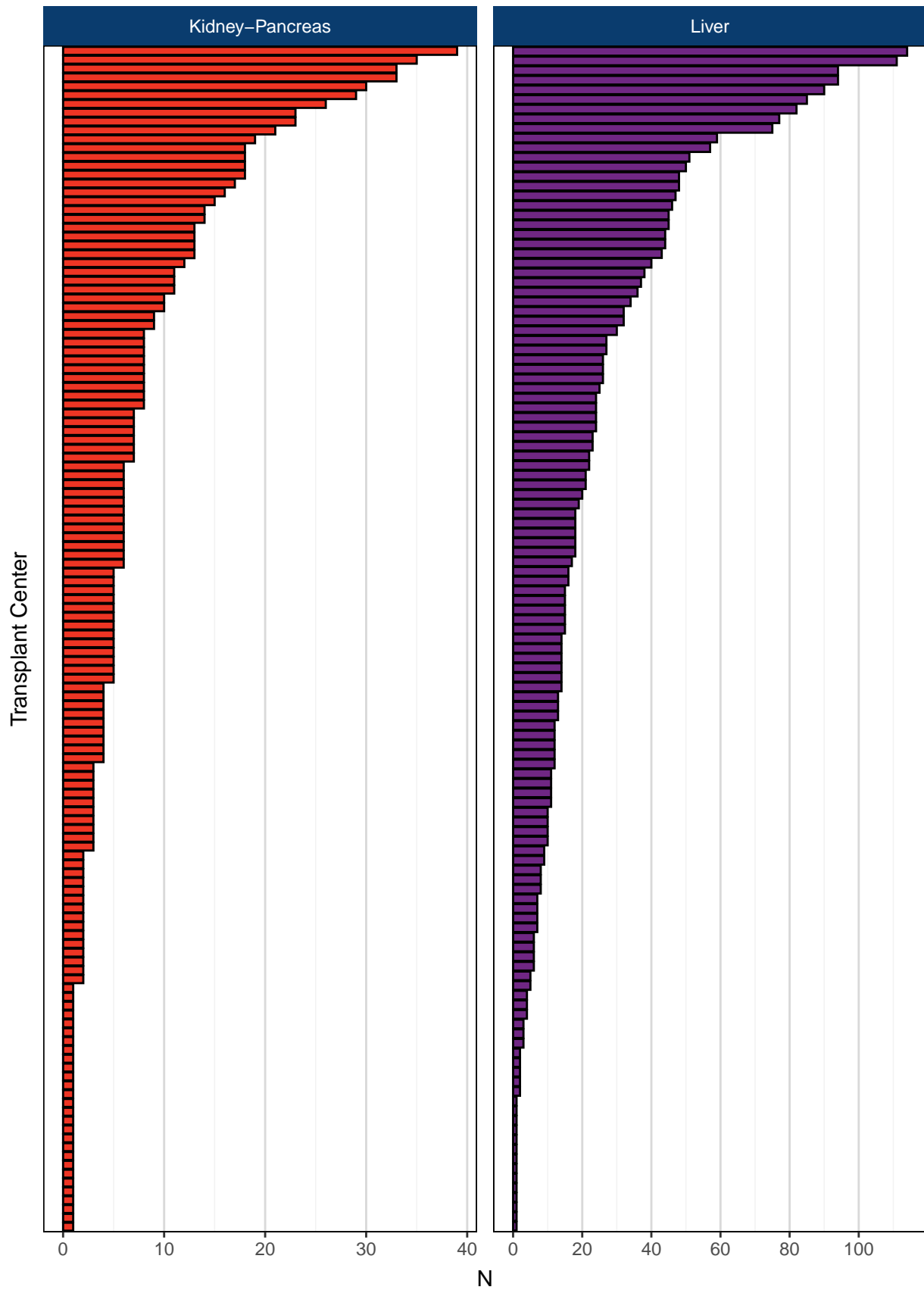
Similar to by state, there was wide variation in transplant center volumes across organs. A summary of the distribution of the number of these externally verified deaths per transplant center by organ is provided in Table ??.

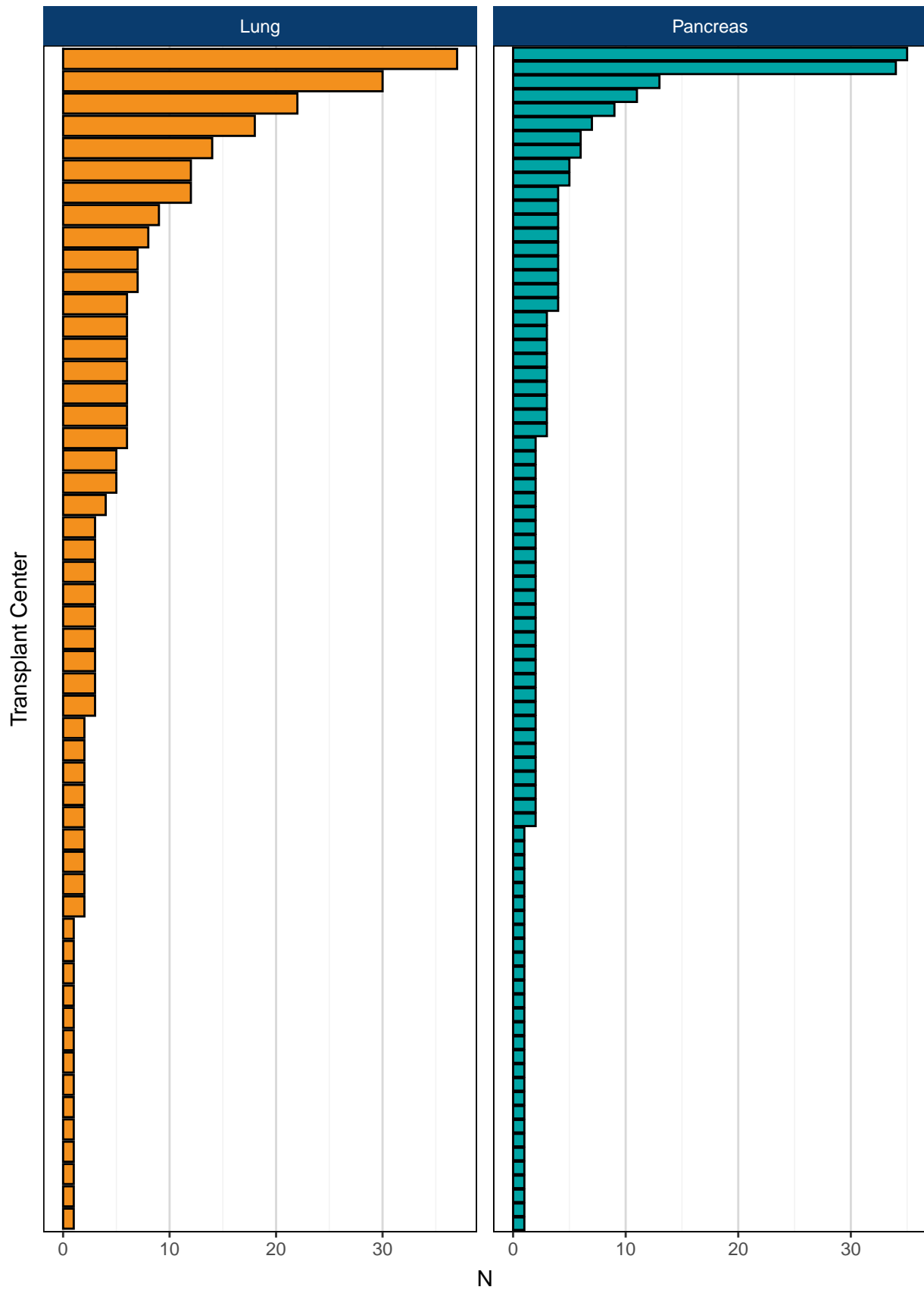
Table 11: Summary of number of external validation deaths for transplant recipients from March 2022 per recipient transplant center by organ. Transplant centers for each organ type included if at least one death.

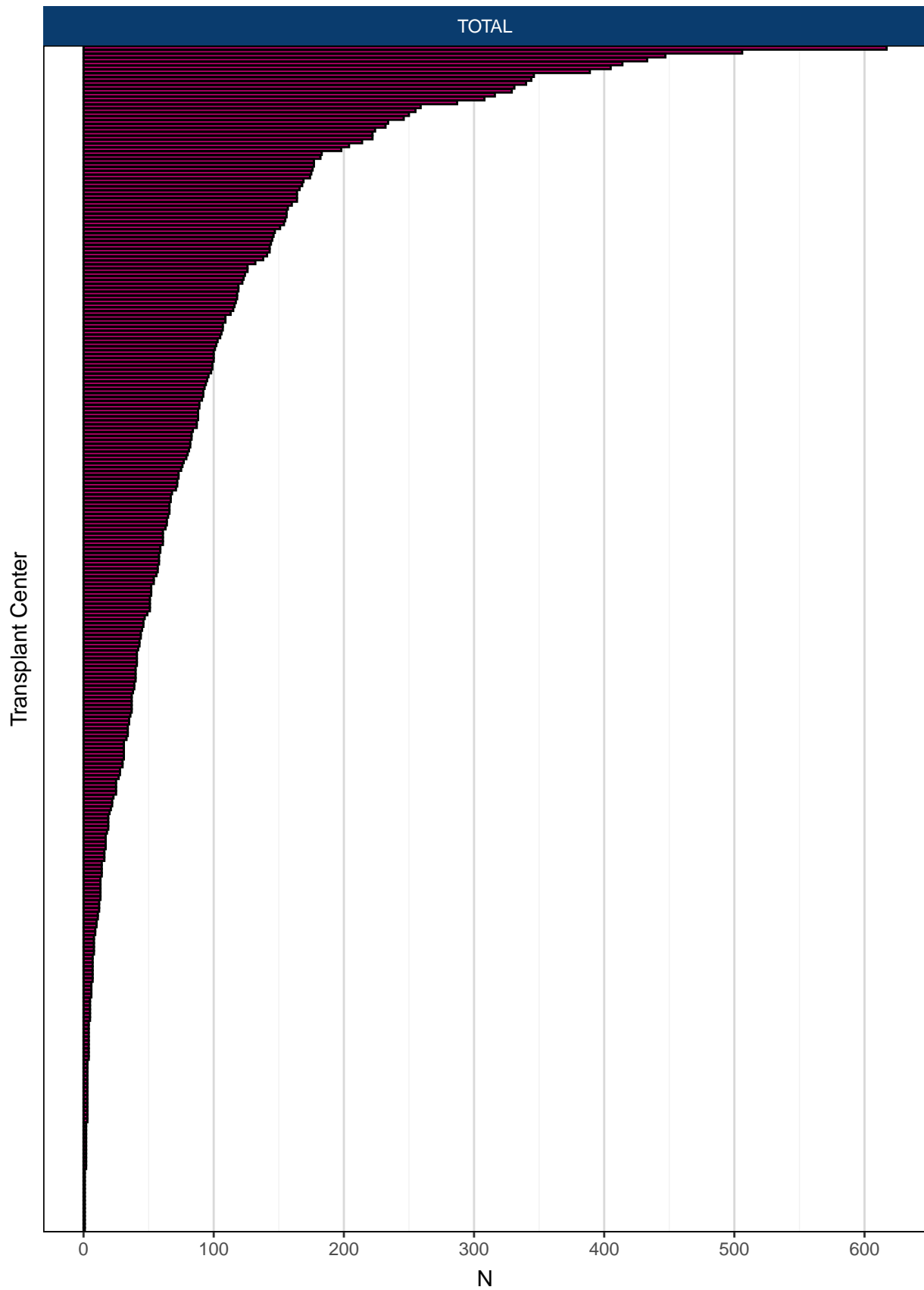
Organ	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Heart	1	2.00	7.9	4.5	12.00	49
Kidney	1	11.25	62.0	41.5	87.75	484
Kidney-Pancreas	1	2.00	7.2	5.0	8.00	39
Liver	1	6.50	22.6	14.0	27.00	114
Lung	1	1.00	5.5	3.0	6.00	37
Pancreas	1	1.00	3.3	2.0	3.00	35
TOTAL	1	8.75	76.2	43.5	102.25	617

Figure 12: External validation deaths for transplant recipients from March 2022 by organ and recipient transplant center.









Waitlist Registrations, Not Removed for Transplant

Because there were very few deaths for heart-lung and intestine transplant recipients with the updated external verification process, these organs are excluded in the graphics and tables in the rest of this section.

Table 12: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ.

Organ	N
Heart	1042
Heart-Lung	19
Intestine	10
Kidney	12958
Kidney-Pancreas	333
Liver	2896
Lung	501
Pancreas	417
TOTAL	18176

The order of magnitude is much larger for kidney and overall deaths each year, so the bottom panel of Figure 13 excludes these lines to provide a closer look at trends in other organs by year transplanted. There is a larger proportion of deaths that were captured from waitlist registrations removed around 2015. The earliest Spring 2022 Program Specific Report (PSR) cohort began January 1, 2016 and the latest ended December 31, 2021. There were 25% (4,636) of these externally verified deaths from the enhanced process that were removed from the waitlist during 2016 - 2021, with 8% occurring in 2016 and decreasing volumes each additional year.

Figure 13: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and time from transplant to death. Top panel contains all organs and total, bottom panel excludes kidney and total trends.

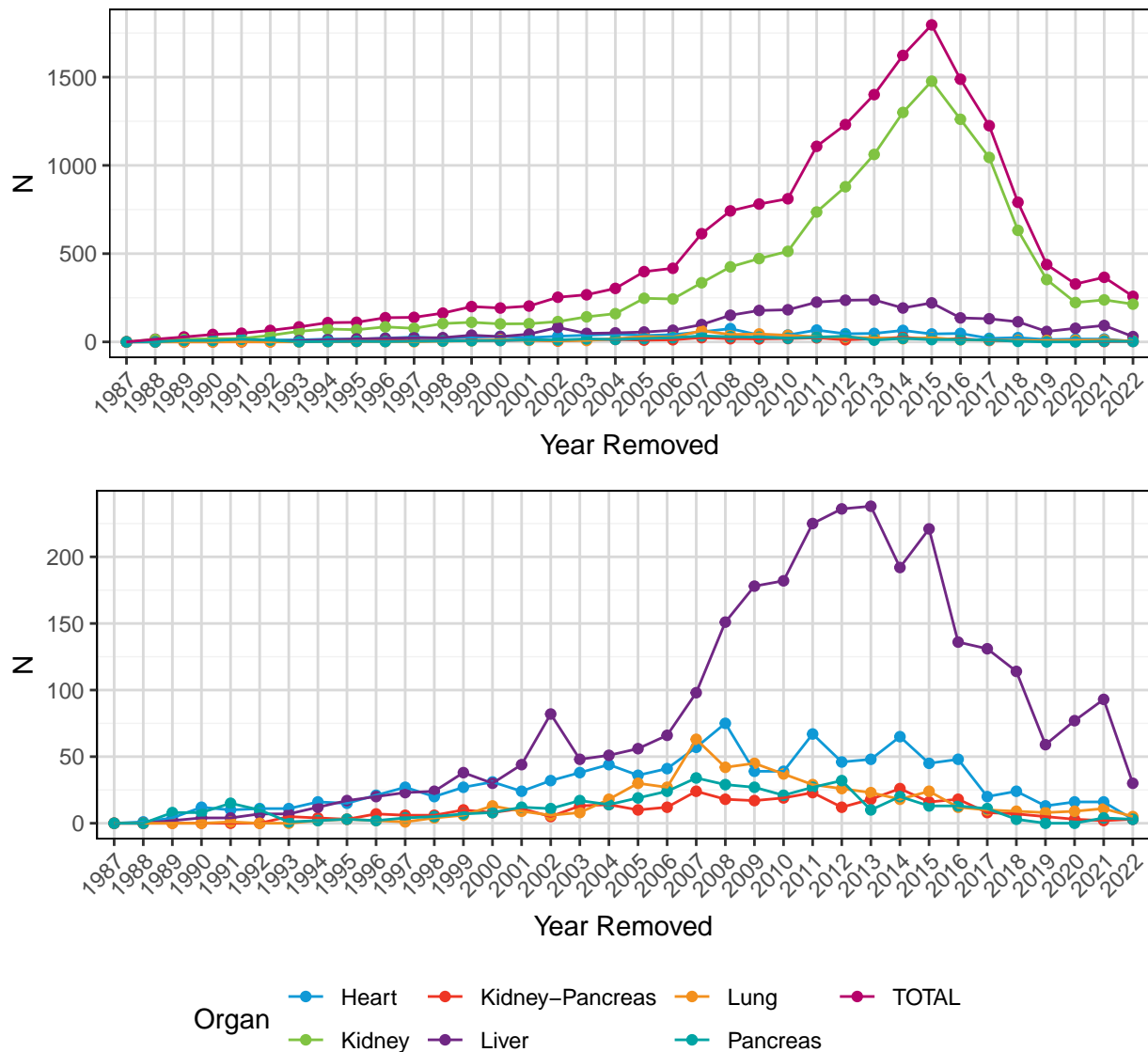


Table 13: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and year removed.

Year Removed	Heart	Kidney	Kidney-Pancreas	Liver	Lung	Pancreas	TOTAL
1987	*	*	*	*	*	*	*
1988	*	14	*	*	*	*	15
1989	*	14	*	*	*	*	28
1990	12	18	*	*	*	*	42
1991	10	19	*	*	*	15	49
1992	11	37	*	*	*	10	65
1993	11	60	*	*	*	*	85
1994	16	73	*	12	*	*	109
1995	15	69	*	17	*	*	111
1996	21	85	*	20	*	*	137
1997	27	77	*	23	*	*	139
1998	20	104	*	24	*	*	163
1999	27	111	10	38	*	*	200
2000	31	102	*	30	13	*	192
2001	24	103	11	44	*	12	203
2002	32	115	*	82	*	11	253
2003	38	142	13	48	*	17	267
2004	44	160	14	51	18	14	303
2005	36	247	10	56	30	19	398
2006	41	243	12	66	27	24	417
2007	57	335	24	98	63	34	613
2008	75	425	18	151	42	29	742
2009	39	472	17	178	45	27	781
2010	39	513	19	182	37	21	811
2011	67	736	23	225	29	27	1108
2012	46	879	12	236	26	32	1231
2013	48	1062	18	238	23	10	1401
2014	65	1300	26	192	18	20	1623
2015	45	1477	16	221	24	13	1796
2016	48	1261	18	136	12	13	1488
2017	20	1045	*	131	10	11	1225
2018	24	632	*	114	*	*	791
2019	13	353	*	59	*	*	438
2020	16	223	*	77	*	*	328
2021	16	238	*	93	11	*	366
2022	*	214	*	30	*	*	258

* Counts less than 10 not shown.

The largest proportion of waitlist registrations in these externally validated deaths were over 5 years from the time of removal; however, there was a substantial proportion that occurred between 1 - 5 years from time of removal.

Figure 14: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and time from removal to death. Top panel contains all organs and total, bottom panel excludes kidney and total trends.

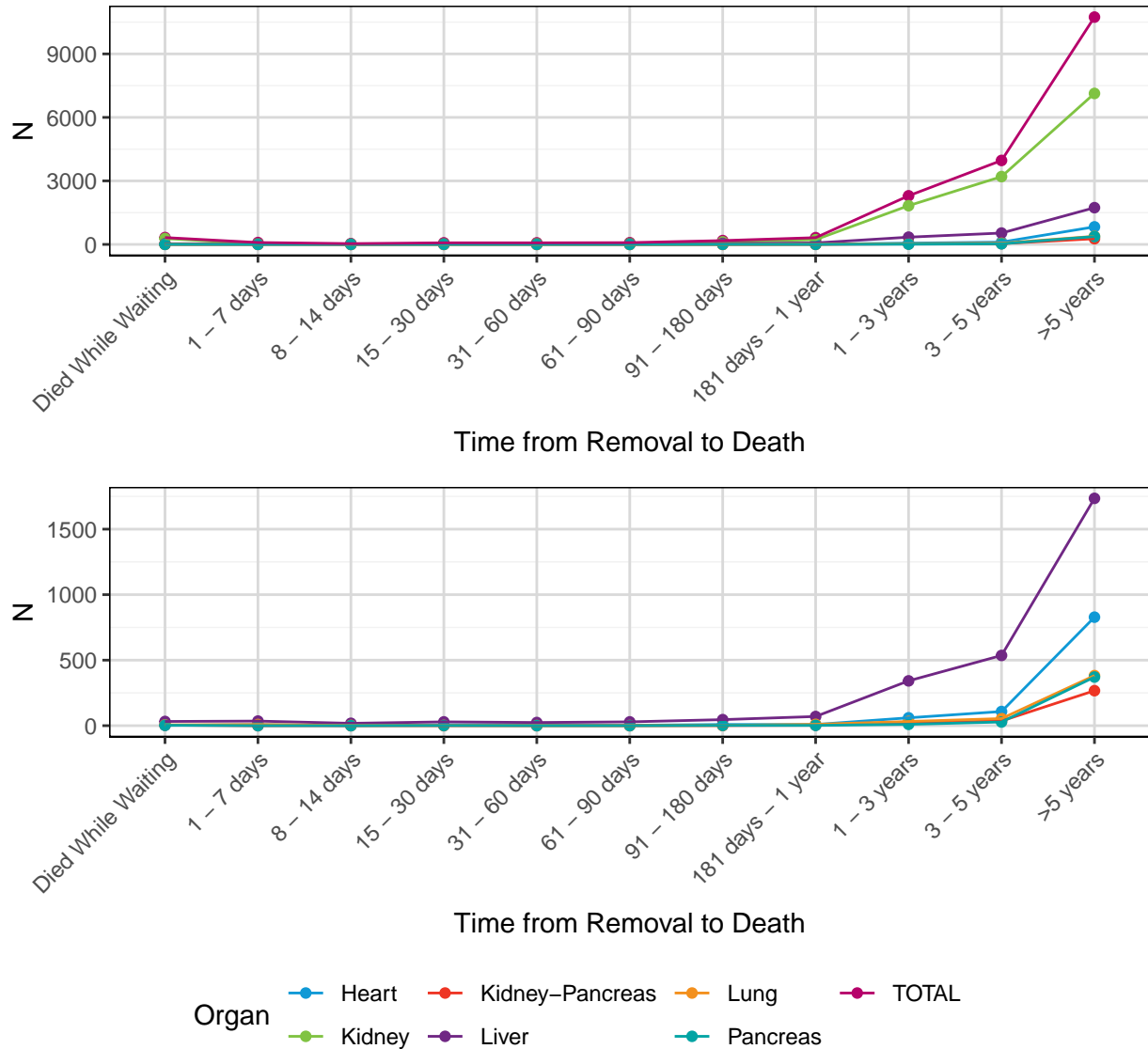


Table 14: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and time from removal to death.

Time from Removal to Death	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Died While Waiting	*	*	276	2.1%	*	*	32	1.1%	*	*	*	*	323	1.8%
1 - 7 days	*	*	36	0.3%	*	*	35	1.2%	*	*	*	*	88	0.5%
8 - 14 days	*	*	15	0.1%	*	*	18	0.6%	*	*	*	*	36	0.2%
15 - 30 days	*	*	35	0.3%	*	*	29	1.0%	*	*	*	*	74	0.4%
31 - 60 days	*	*	41	0.3%	*	*	24	0.8%	*	*	*	*	74	0.4%
61 - 90 days	*	*	49	0.4%	*	*	29	1.0%	*	*	*	*	82	0.5%
91 - 180 days	*	*	119	0.9%	*	*	46	1.6%	*	*	*	*	180	1.0%
181 days - 1 year	*	*	223	1.7%	*	*	70	2.4%	10	2.0%	*	*	318	1.7%
1 - 3 years	60	5.8%	1829	14.1%	22	6.6%	342	11.8%	32	6.4%	10	2.4%	2296	12.6%
3 - 5 years	108	10.4%	3203	24.7%	36	10.8%	536	18.5%	54	10.8%	28	6.7%	3966	21.8%
>5 years	828	79.5%	7132	55.0%	267	80.2%	1735	59.9%	382	76.2%	371	89.0%	10739	59.1%

* Counts less than 10 not shown.

For kidney, kidney-pancreas, and pancreas waitlist registrations, removals for “Other” (includes Other, Candidate removed in error, Candidate listed for unacceptable antigens only, Candidate listed in error, Transferred to another center) make up the majority of reasons for removal followed by “Candidate condition deteriorated, too sick to transplant” in these externally validated deaths. For heart, liver, and lung waitlist registrations, removal for “Candidate condition improved, transplant not needed” accounted for the largest proportion followed by “Other” and “Candidate condition deteriorated, too sick to transplant”.

Figure 15: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and removal reason.

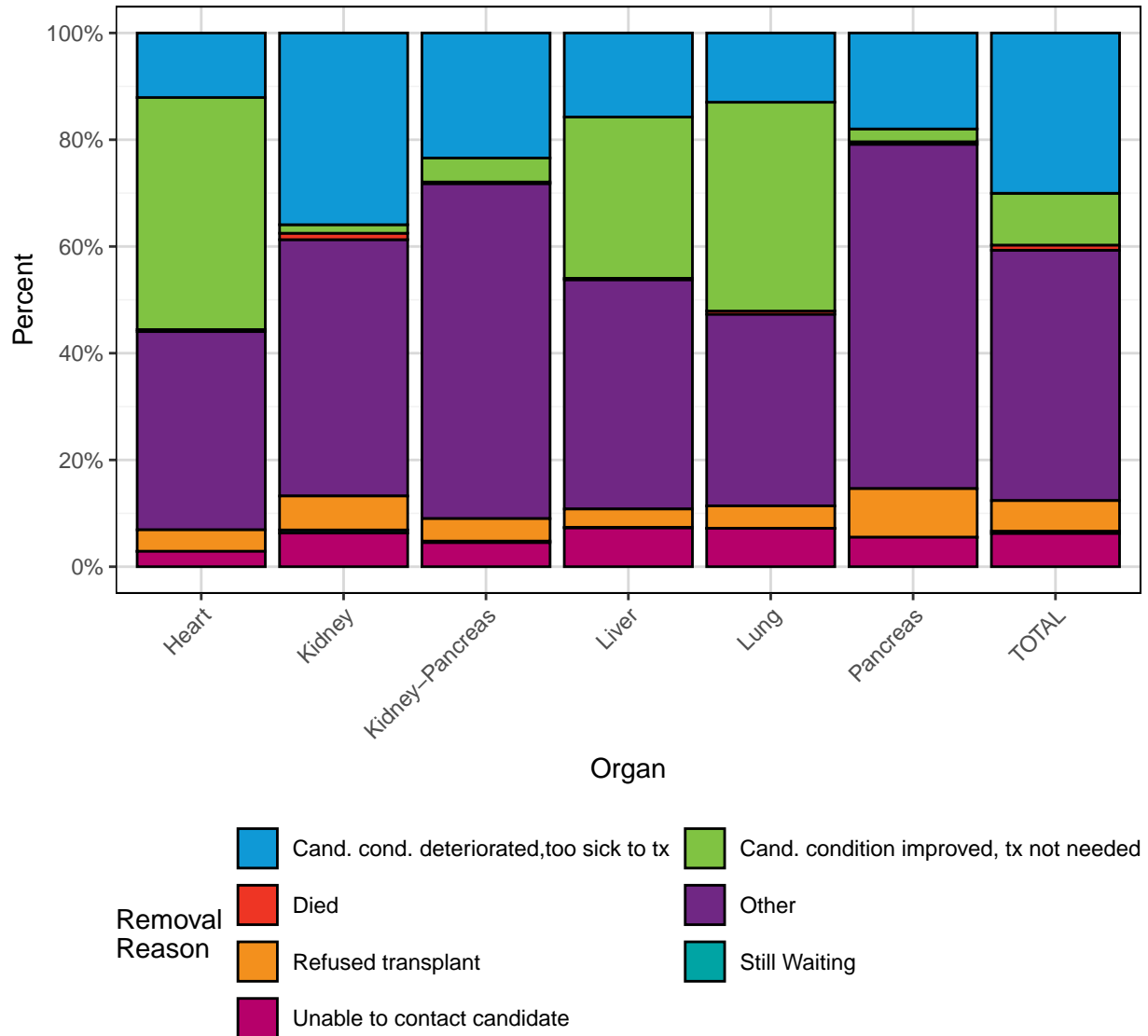


Table 15: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and removal reason.

Removal Reason	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Still Waiting	*	*	76	0.6%	*	*	*	*	*	*	*	*	81	0.4%
Other	387	37.1%	6224	48.0%	209	62.8%	1244	43.0%	180	35.9%	269	64.5%	8527	46.9%
Refused transplant	42	4.0%	824	6.4%	14	4.2%	99	3.4%	21	4.2%	38	9.1%	1040	5.7%
Died	*	*	156	1.2%	*	*	*	*	*	*	*	*	174	1.0%
Cand. condition improved, tx not needed	453	43.5%	207	1.6%	15	4.5%	875	30.2%	196	39.1%	10	2.4%	1765	9.7%
Cand. cond. deteriorated, too sick to tx	126	12.1%	4655	35.9%	78	23.4%	456	15.7%	65	13.0%	75	18.0%	5459	30.0%
Unable to contact candidate	30	2.9%	816	6.3%	15	4.5%	210	7.3%	36	7.2%	23	5.5%	1130	6.2%

* Counts less than 10 not shown.

For heart, kidney, liver, and lung waitlist registrations the majority of these externally validated deaths were for candidates aged 50-64 at removal, while the majority of kidney-pancreas and pancreas waitlist registrations were for candidates aged 35-49 at removal.

Figure 16: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate age at removal.

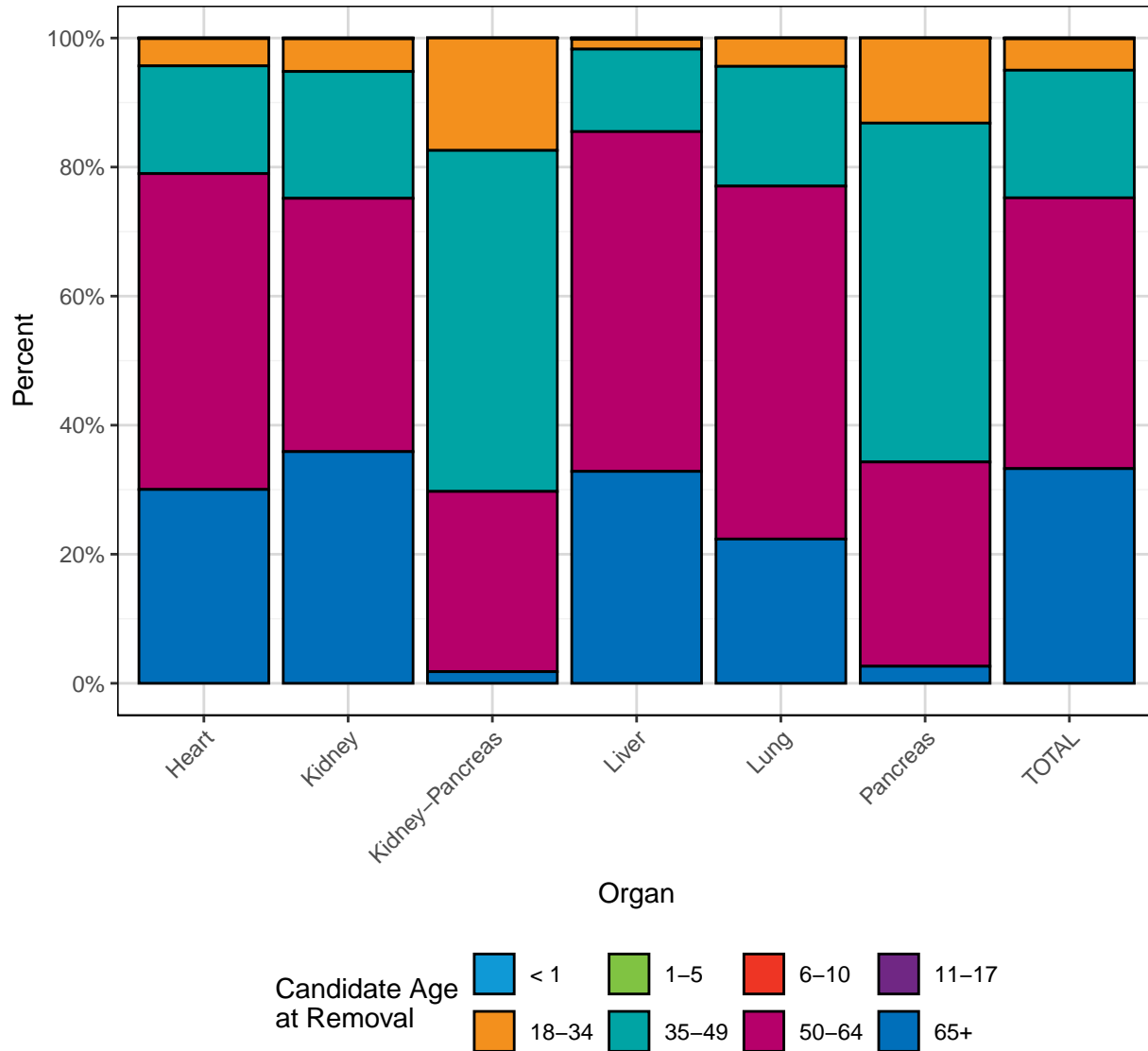


Table 16: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate age at removal.

Candidate Age at Removal	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
< 1	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1-5	*	*	*	*	*	*	*	*	*	*	*	*	*	*
6-10	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11-17	*	*	12	0.1%	*	*	*	*	*	*	*	*	19	0.1%
18-34	44	4.2%	656	5.1%	58	17.4%	44	1.5%	22	4.4%	55	13.2%	884	4.9%
35-49	174	16.7%	2547	19.7%	176	52.9%	370	12.8%	93	18.6%	219	52.5%	3595	19.8%
50-64	510	48.9%	5087	39.3%	93	27.9%	1525	52.7%	274	54.7%	132	31.7%	7627	42.0%
65+	313	30.0%	4652	35.9%	*	*	951	32.8%	112	22.4%	11	2.6%	6047	33.3%

* Counts less than 10 not shown.

For kidney waitlist registrations, 34% of these externally validated deaths were Black, Non-Hispanic followed by 16% Hispanic-Latino. Black waitlist registrations made up 17% of both kidney-pancreas and heart externally validated deaths and 12% of lung externally validated deaths. Hispanic/Latino waitlist registrations made up 13% of these liver externally validated deaths.

Figure 17: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate race/ethnicity.

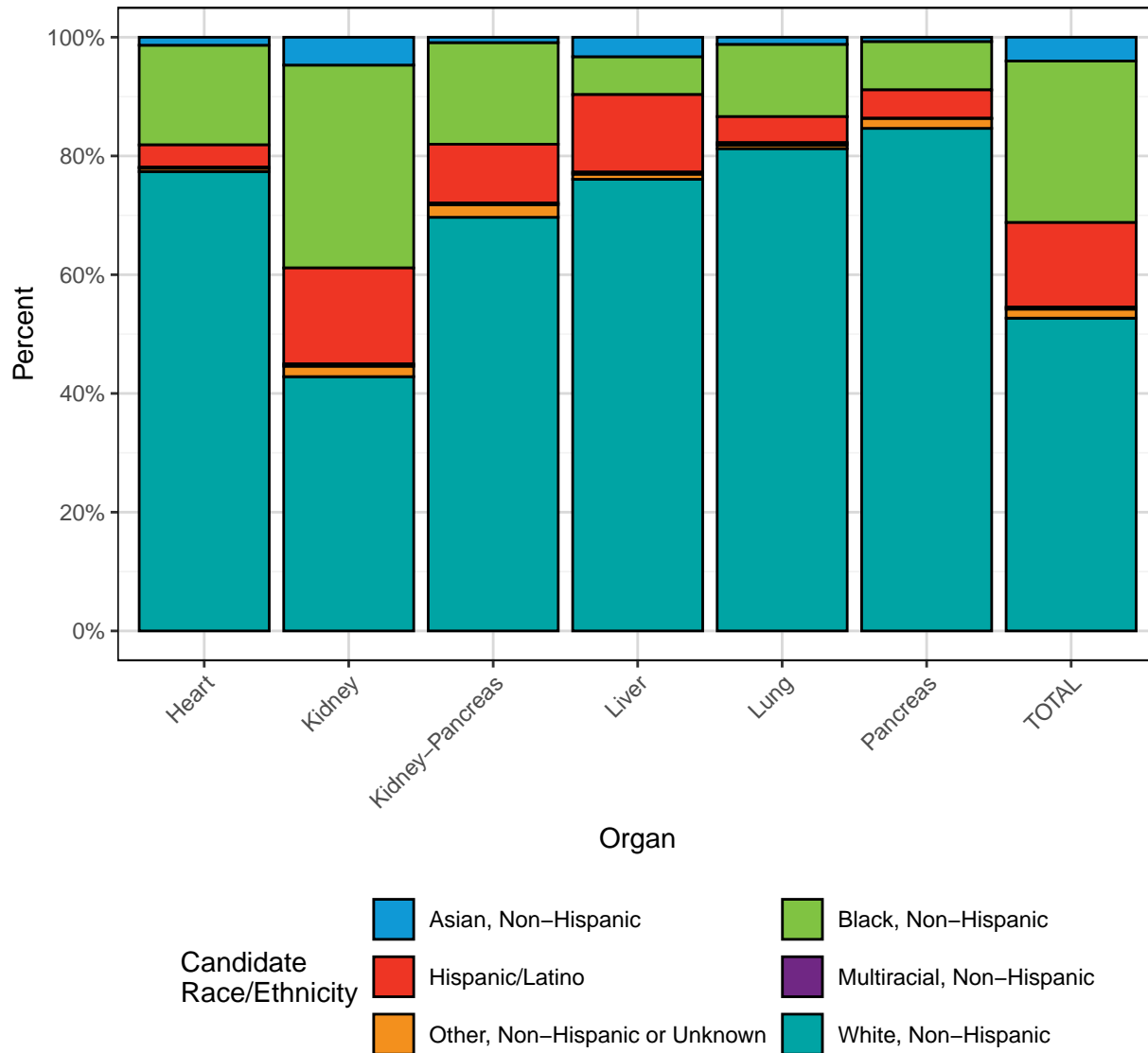


Table 17: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate race/ethnicity.

Candidate Race/Ethnicity	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
White, Non-Hispanic	806	77.4%	5550	42.8%	232	69.7%	2203	76.1%	407	81.2%	353	84.7%	9576	52.7%
Black, Non-Hispanic	175	16.8%	4428	34.2%	57	17.1%	185	6.4%	61	12.2%	34	8.2%	4944	27.2%
Hispanic/Latino	39	3.7%	2095	16.2%	33	9.9%	378	13.1%	22	4.4%	20	4.8%	2587	14.2%
Asian, Non-Hispanic	14	1.3%	608	4.7%	*	*	95	3.3%	*	*	*	*	729	4.0%
Other, Non-Hispanic or Unknown	*	*	228	1.8%	*	*	25	0.9%	*	*	*	*	276	1.5%
Multiracial, Non-Hispanic	*	*	49	0.4%	*	*	10	0.3%	*	*	*	*	64	0.4%

* Counts less than 10 not shown.

Except for lung registrations, the largest proportion of all other organ waitlist registrations in these externally validated deaths were male.

Figure 18: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate gender.

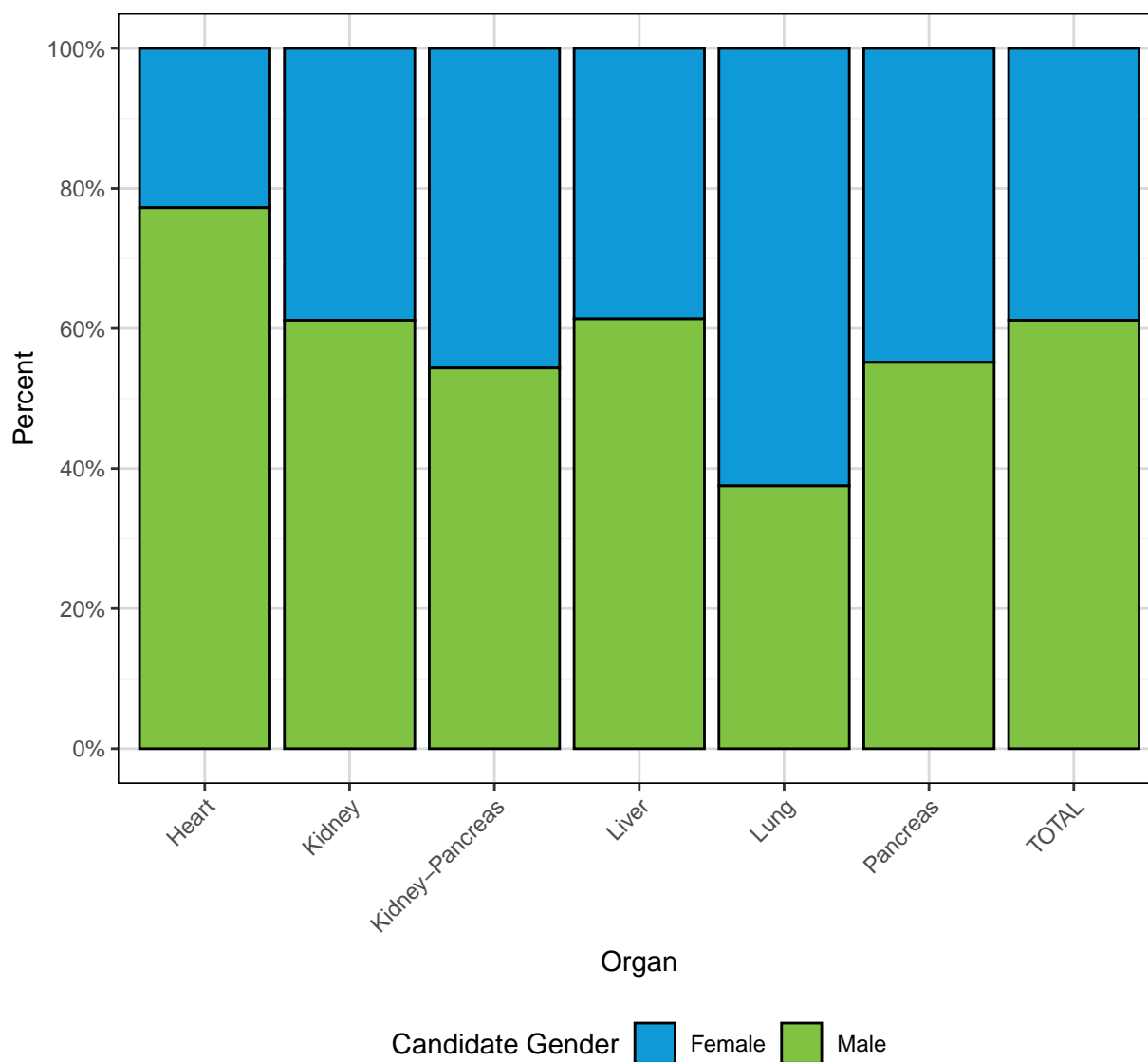


Table 18: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate gender.

Candidate Gender	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Female	237	22.7%	5032	38.8%	152	45.6%	1119	38.6%	313	62.5%	187	44.8%	7059	38.8%
Male	805	77.3%	7926	61.2%	181	54.4%	1777	61.4%	188	37.5%	230	55.2%	11117	61.2%

* Counts less than 10 not shown.

Anywhere between 12 - 29% of organ-specific waitlist registrations had unknown or not reported education levels. Across organs, most waitlist registrations in these externally validated deaths had less than college or GED level education except for pancreas.

Figure 19: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate education level.

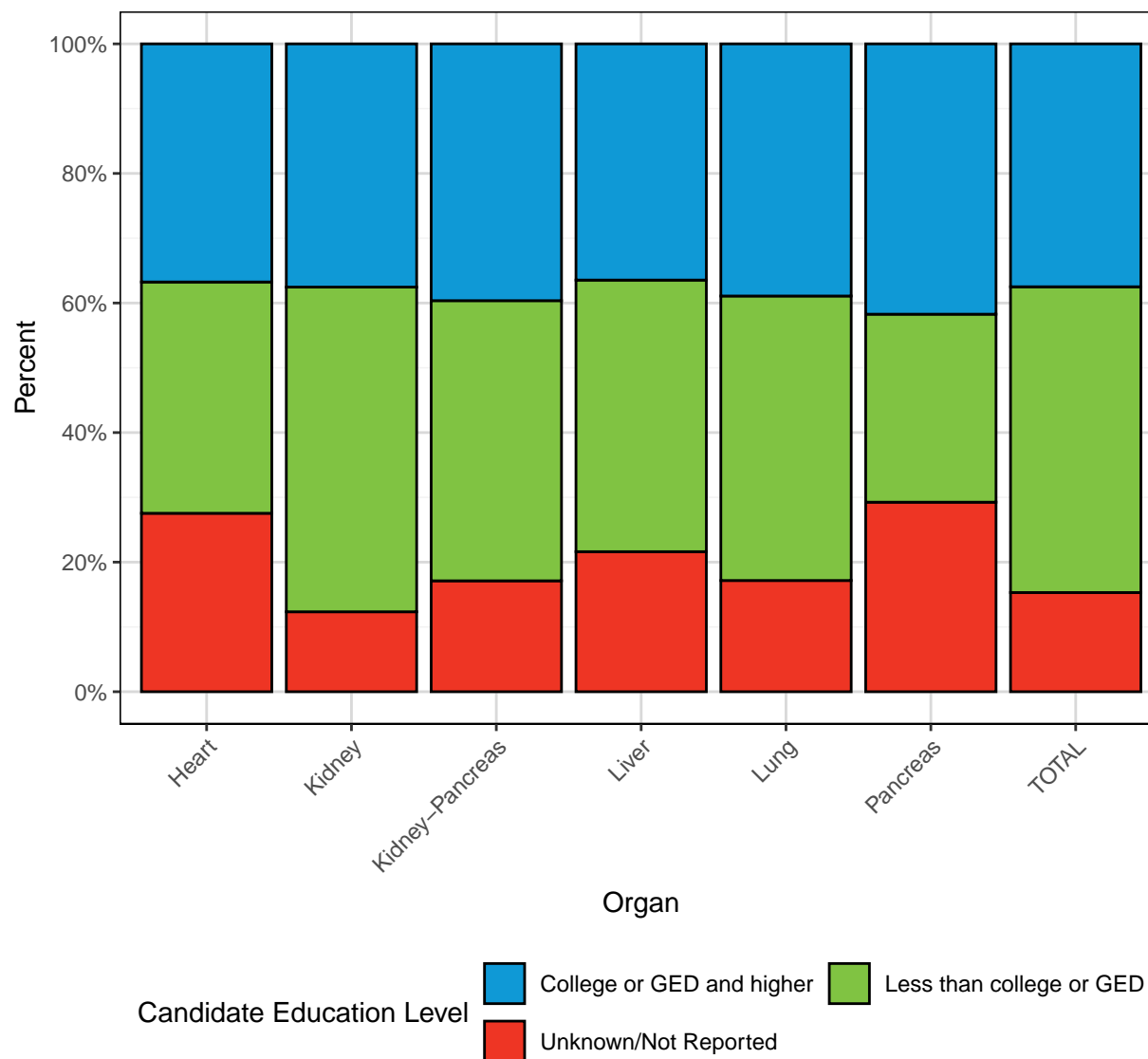


Table 19: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate education level.

Candidate Education Level	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Unknown/Not Reported	287	27.5%	1599	12.3%	57	17.1%	626	21.6%	86	17.2%	122	29.3%	2783	15.3%
Less than college or GED	372	35.7%	6494	50.1%	144	43.2%	1214	41.9%	220	43.9%	121	29.0%	8578	47.2%
College or GED and higher	383	36.8%	4865	37.5%	132	39.6%	1056	36.5%	195	38.9%	174	41.7%	6815	37.5%

* Counts less than 10 not shown.

Heart, liver, and lung waitlist registrations in these externally validated deaths were more often private insurance holders, whereas public insurance was more common for the kidney, kidney-pancreas, and pancreas waitlist registration externally validated deaths. For heart and pancreas waitlist registrations, there were larger proportions of unknown or not reported insurance status, at 10 and 11%, respectively.

Figure 20: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate primary source of payment at listing.

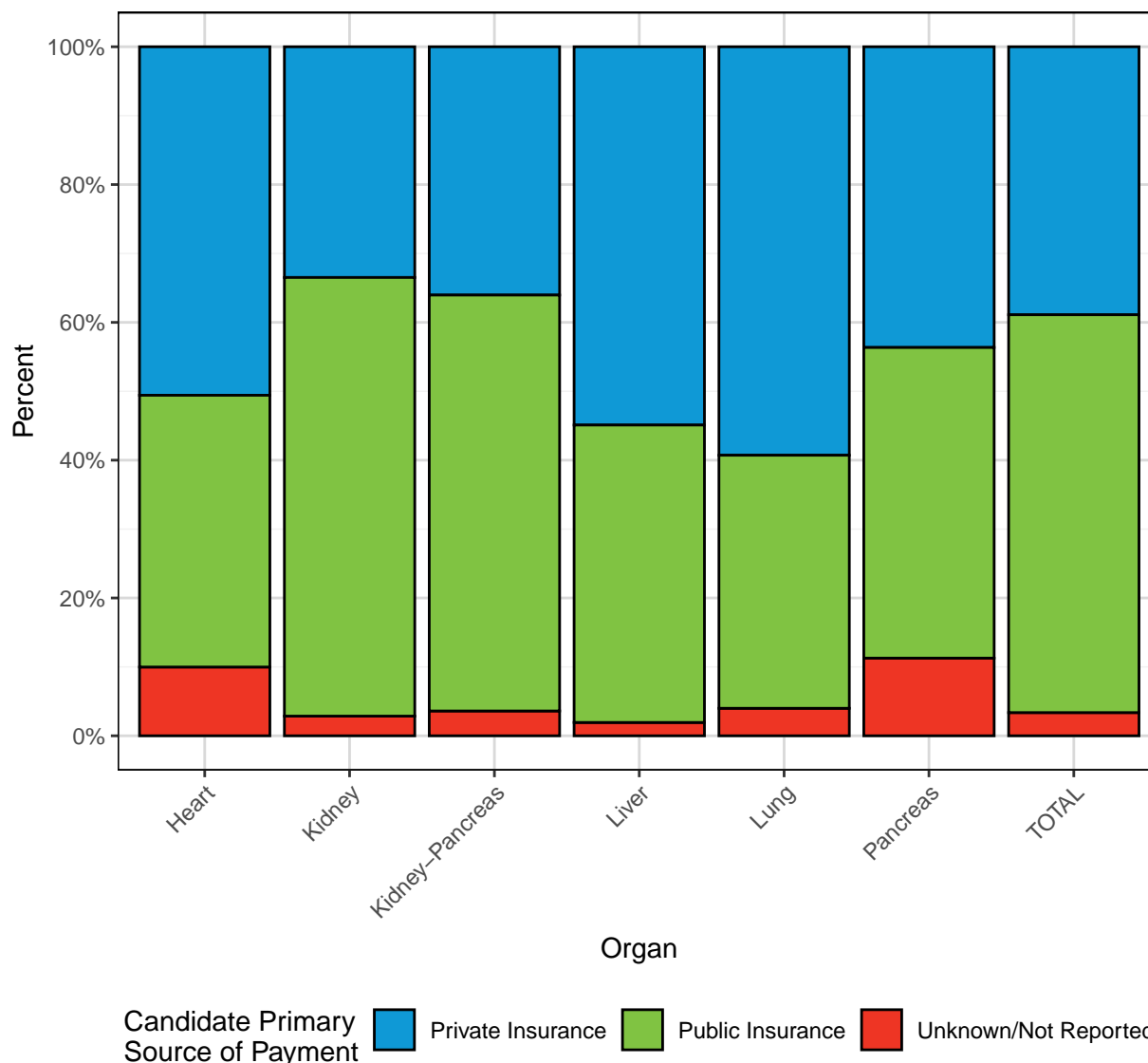


Table 20: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate primary source of payment at listing.

Candidate Primary Source of Payment	Heart		Kidney		Kidney-Pancreas		Liver		Lung		Pancreas		TOTAL	
	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%	N	col%
Private Insurance	527	50.6%	4339	33.5%	120	36.0%	1590	54.9%	297	59.3%	182	43.6%	7070	38.9%
Public Insurance	411	39.4%	8249	63.7%	201	60.4%	1250	43.2%	184	36.7%	188	45.1%	10494	57.7%
Unknown/Not Reported	104	10.0%	370	2.9%	12	3.6%	56	1.9%	20	4.0%	47	11.3%	612	3.4%

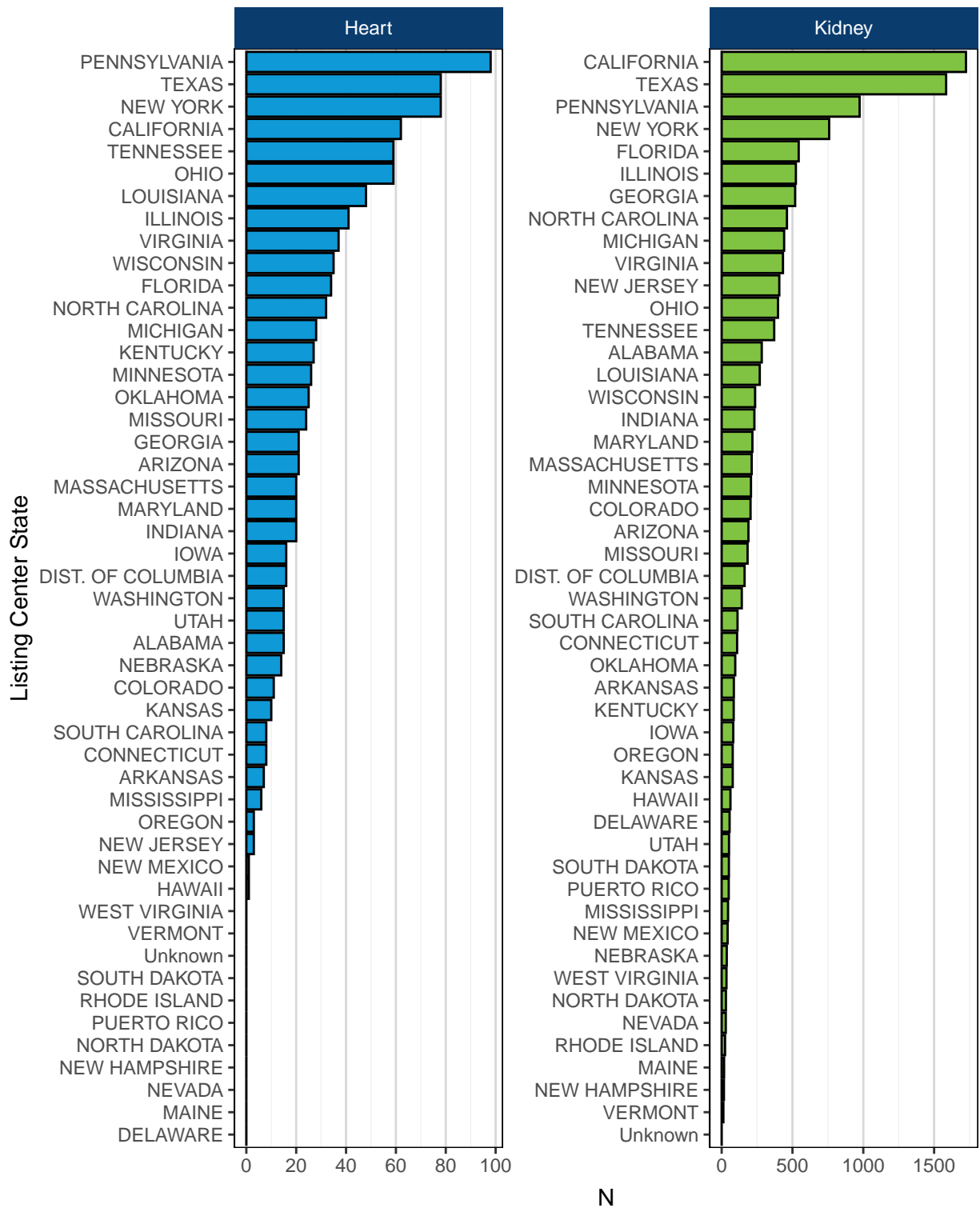
* Counts less than 10 not shown.

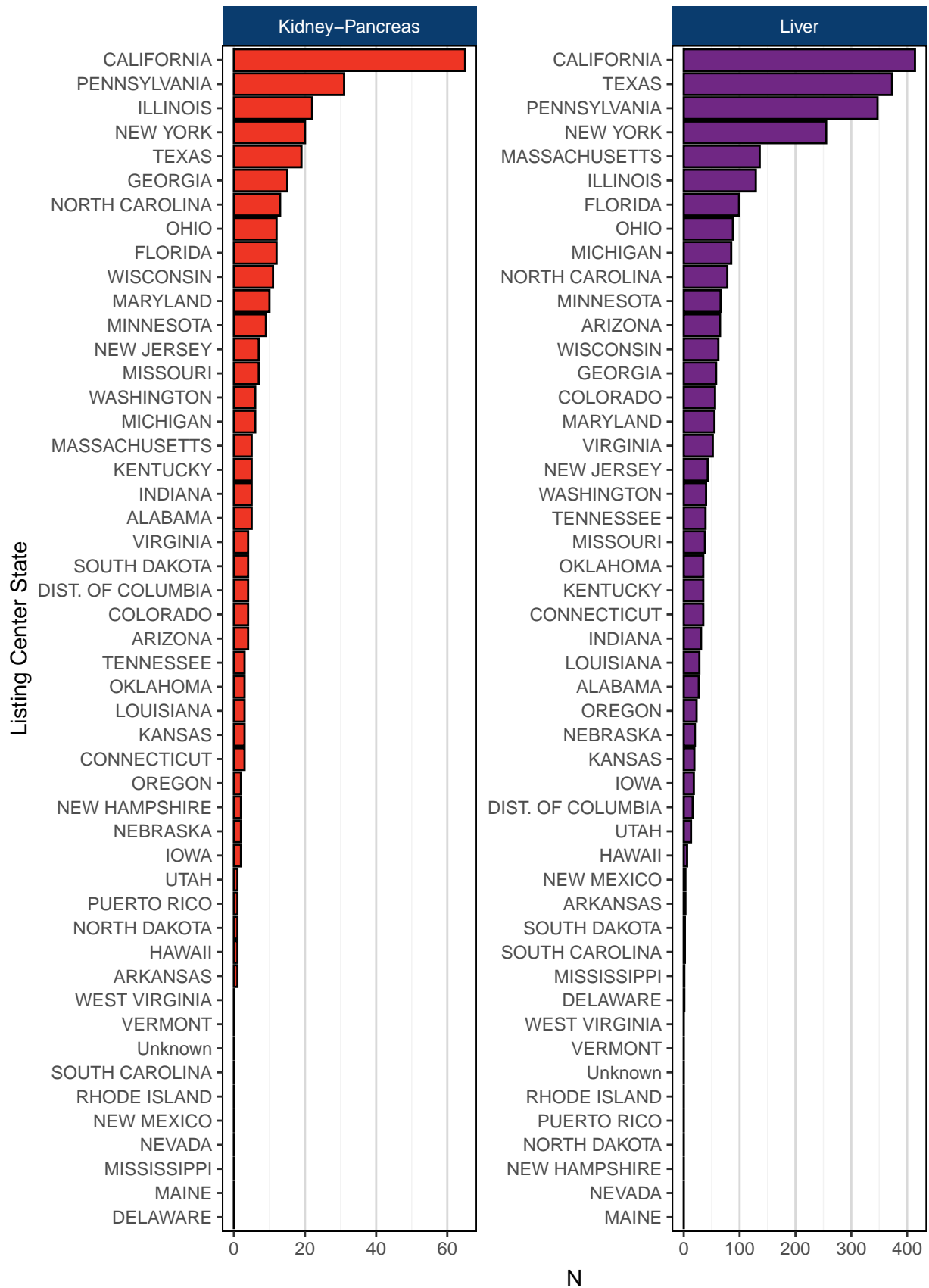
The top states where waitlist registrations were listed in these externally validated deaths slightly varied by organ. Overall, California, Texas, Pennsylvania, New York, and Illinois listing center states had the largest volumes. The table below provides a summary of the distribution of these externally validated deaths across listing center states by organ.

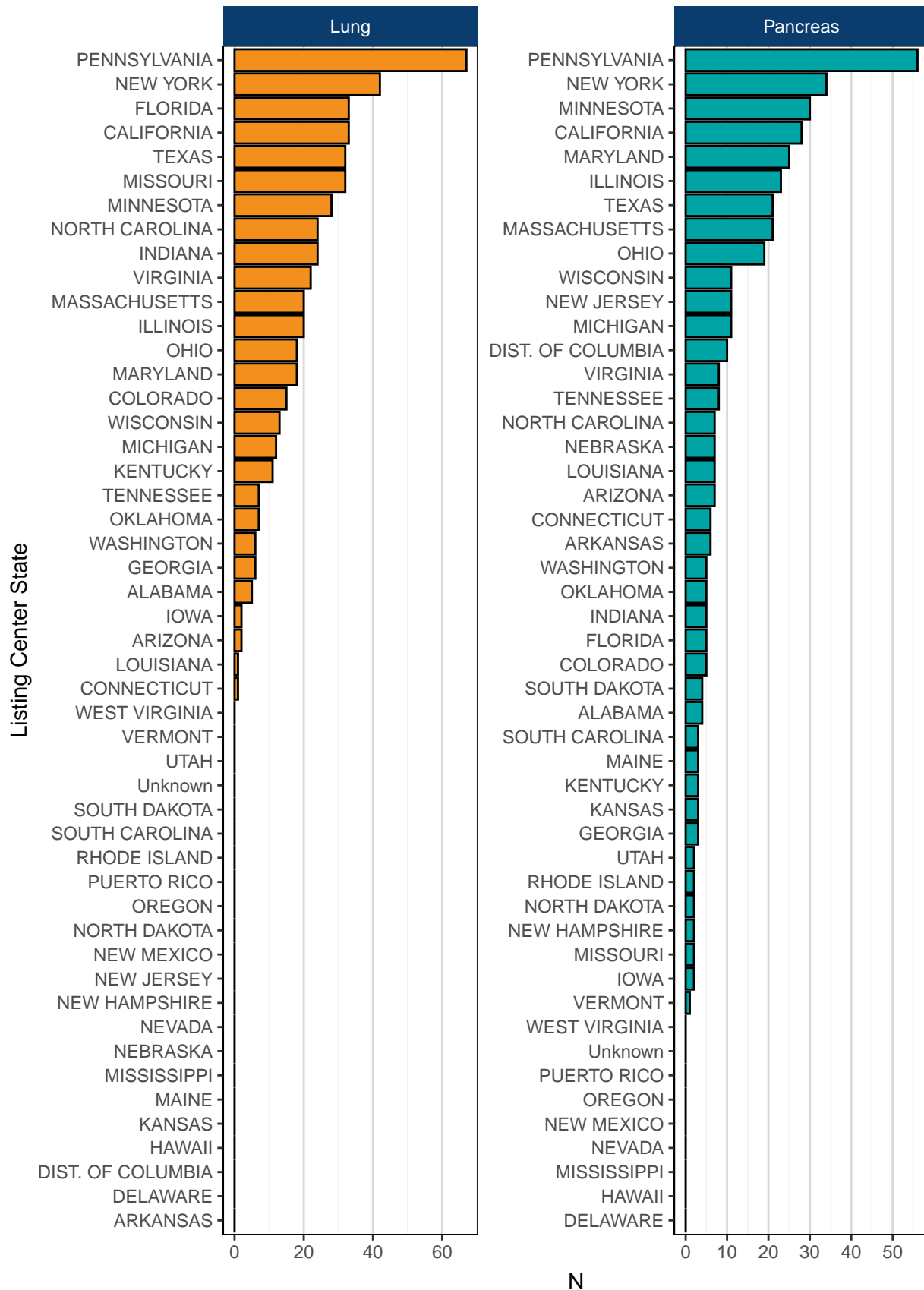
Table 21: Summary of number of external validation deaths for waitlist registrations not removed for transplant from March 2022 per listing center state by organ. Listing center states for each organ type included if at least one death.

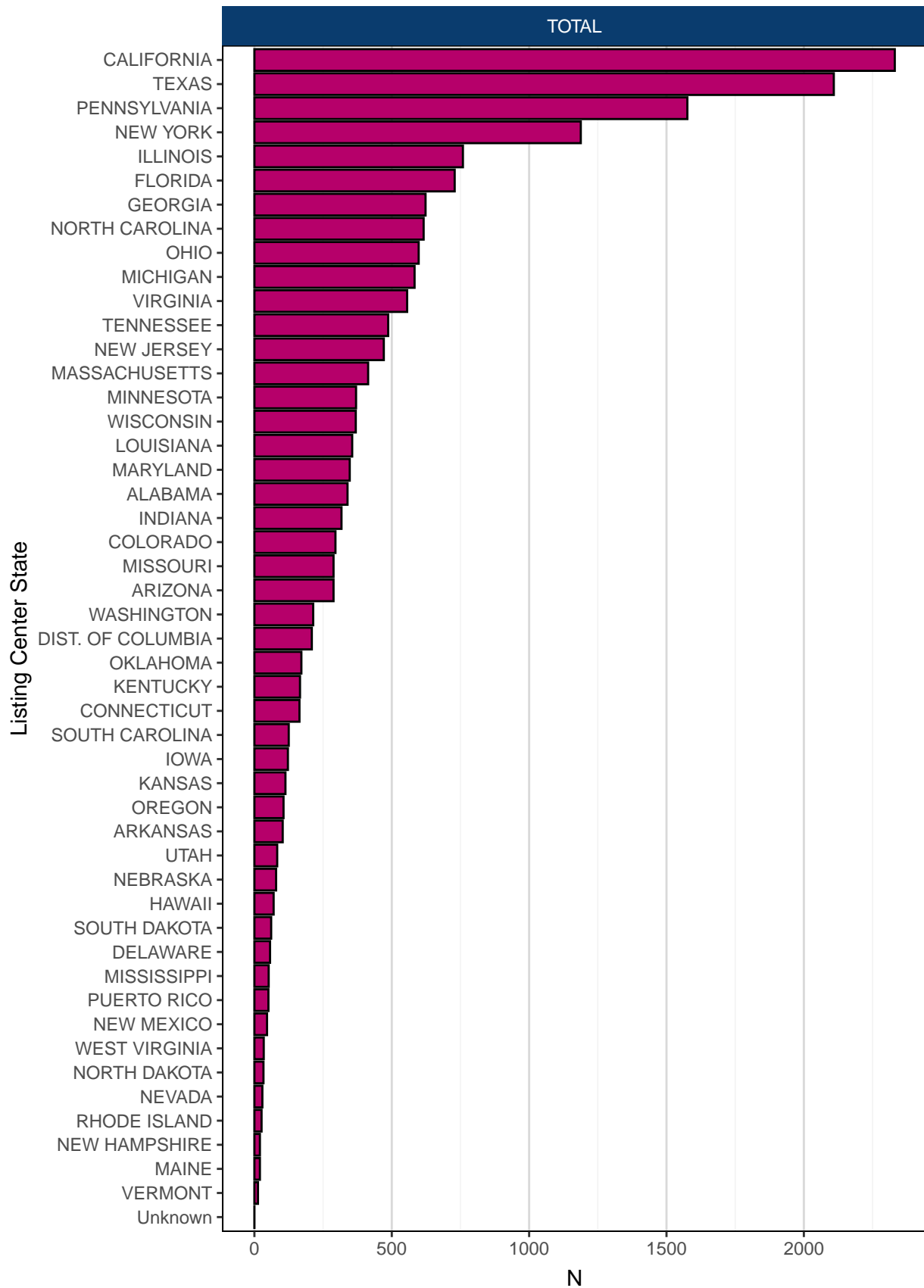
Organ	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Heart	1	11.75	27.4	20.5	34.75	98
Kidney	12	51.75	270.0	152.0	377.75	1725
Kidney-Pancreas	1	3.00	8.5	5.0	10.50	65
Liver	1	18.75	72.4	38.5	69.00	414
Lung	1	6.50	18.6	18.0	26.00	67
Pancreas	1	3.00	10.4	6.0	11.00	56
TOTAL	13	67.75	378.7	211.5	475.00	2331

Figure 21: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and listing center state.







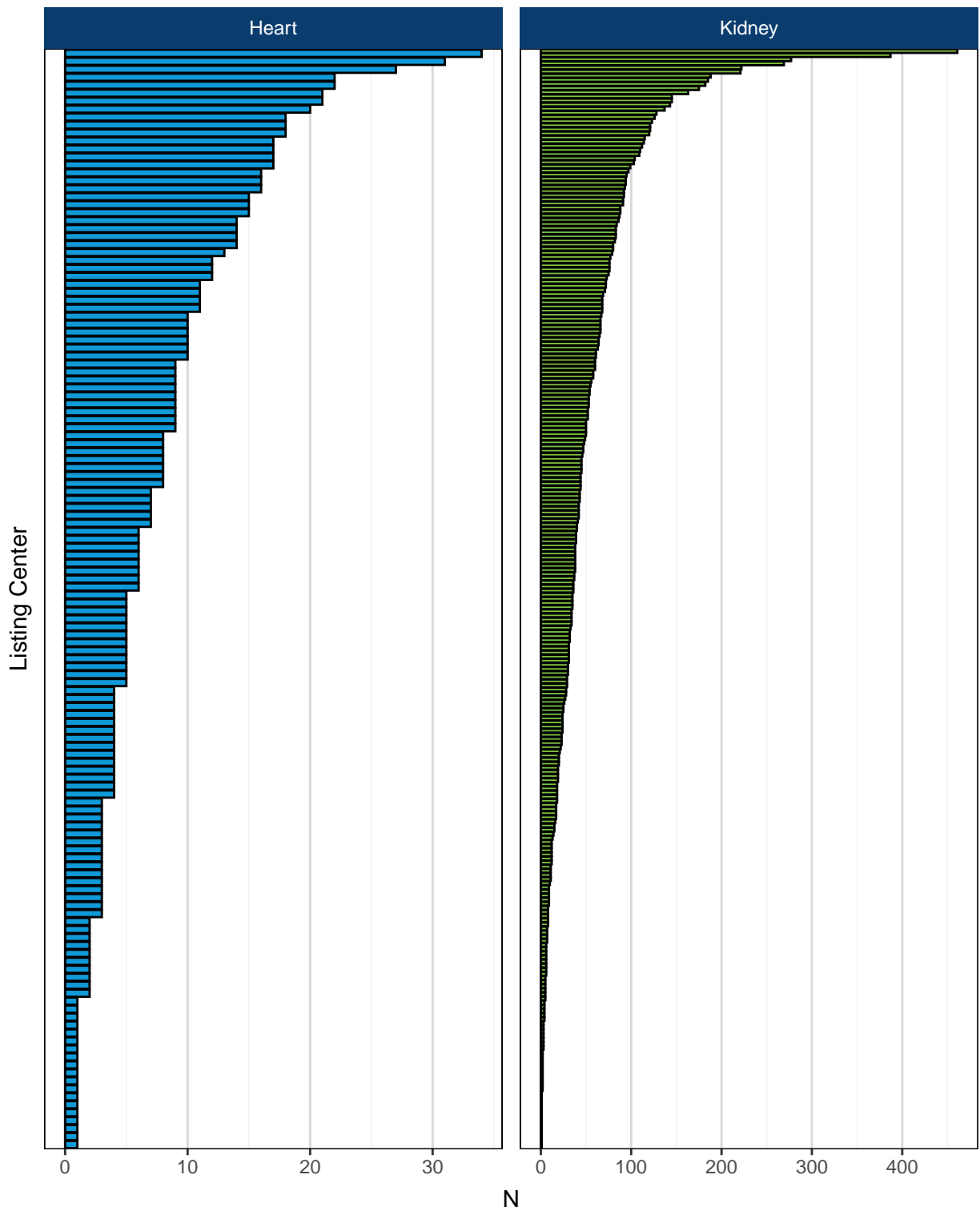


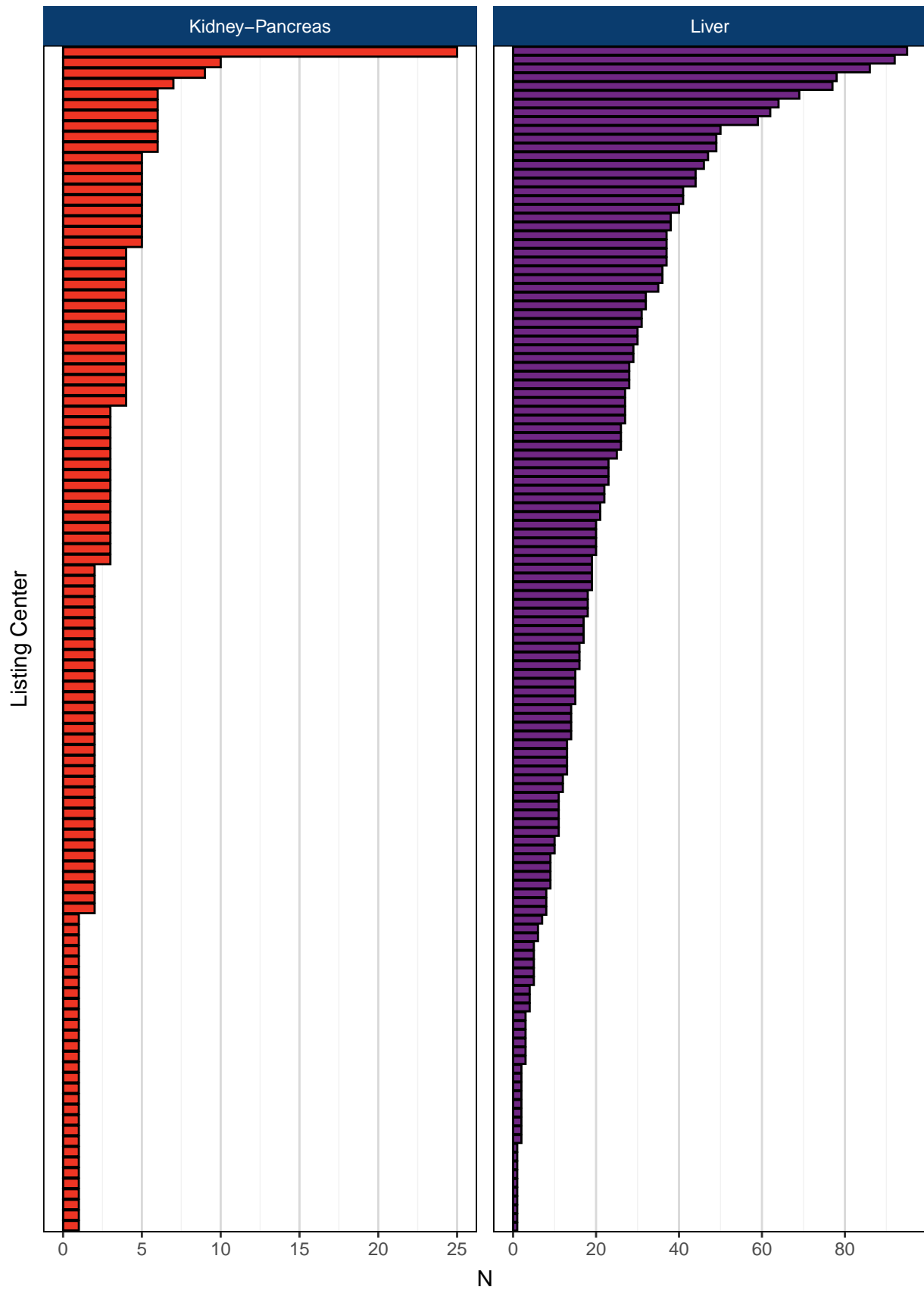
Similar to by state, there was wide variation in listing center volumes across organs. A summary of the distribution of the number of these externally verified deaths per transplant center by organ is provided below.

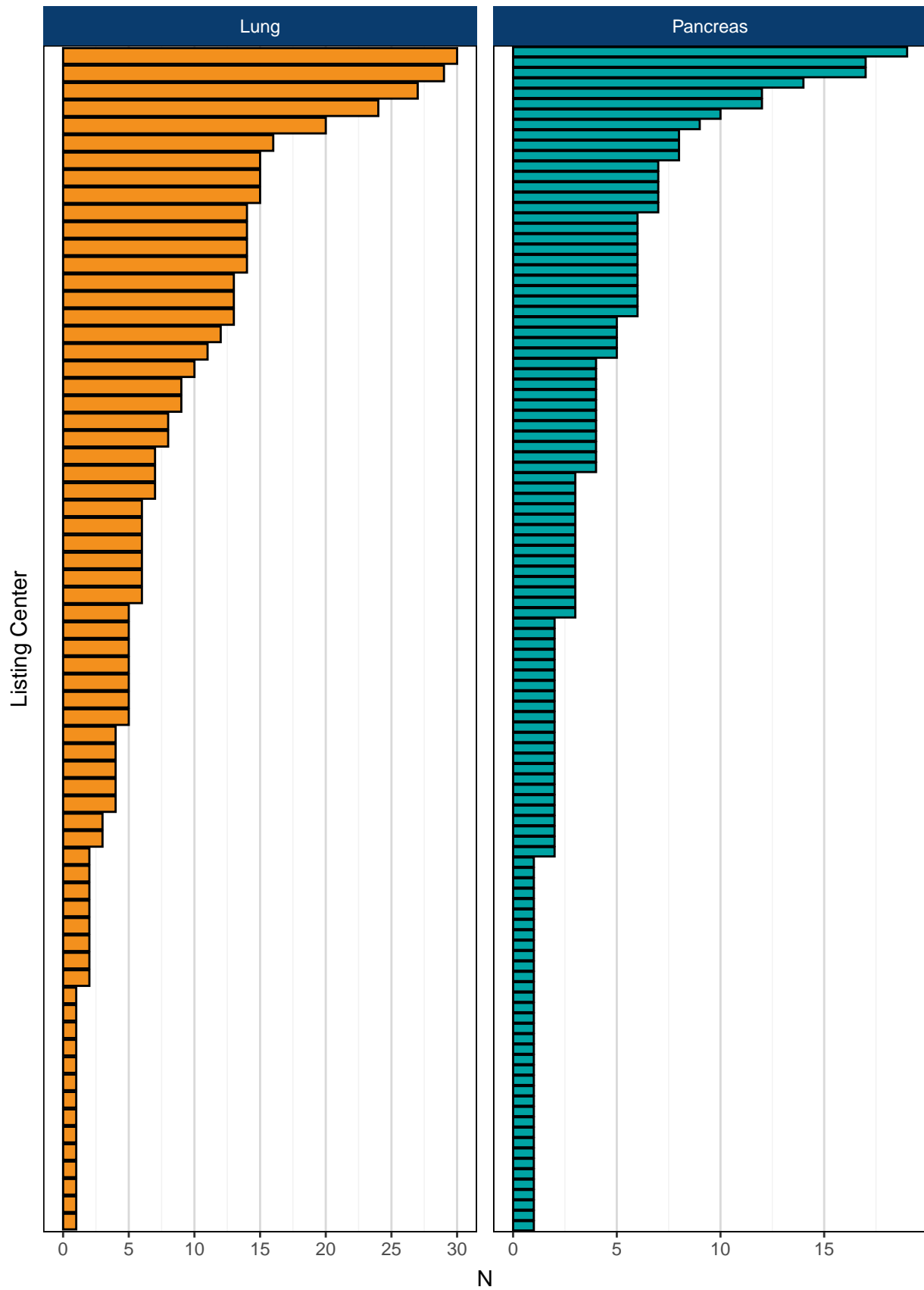
Table 22: Summary of number of external validation deaths for waitlist registrations not removed for transplant from March 2022 per listing center by organ. Listing centers for each organ type included if at least one death.

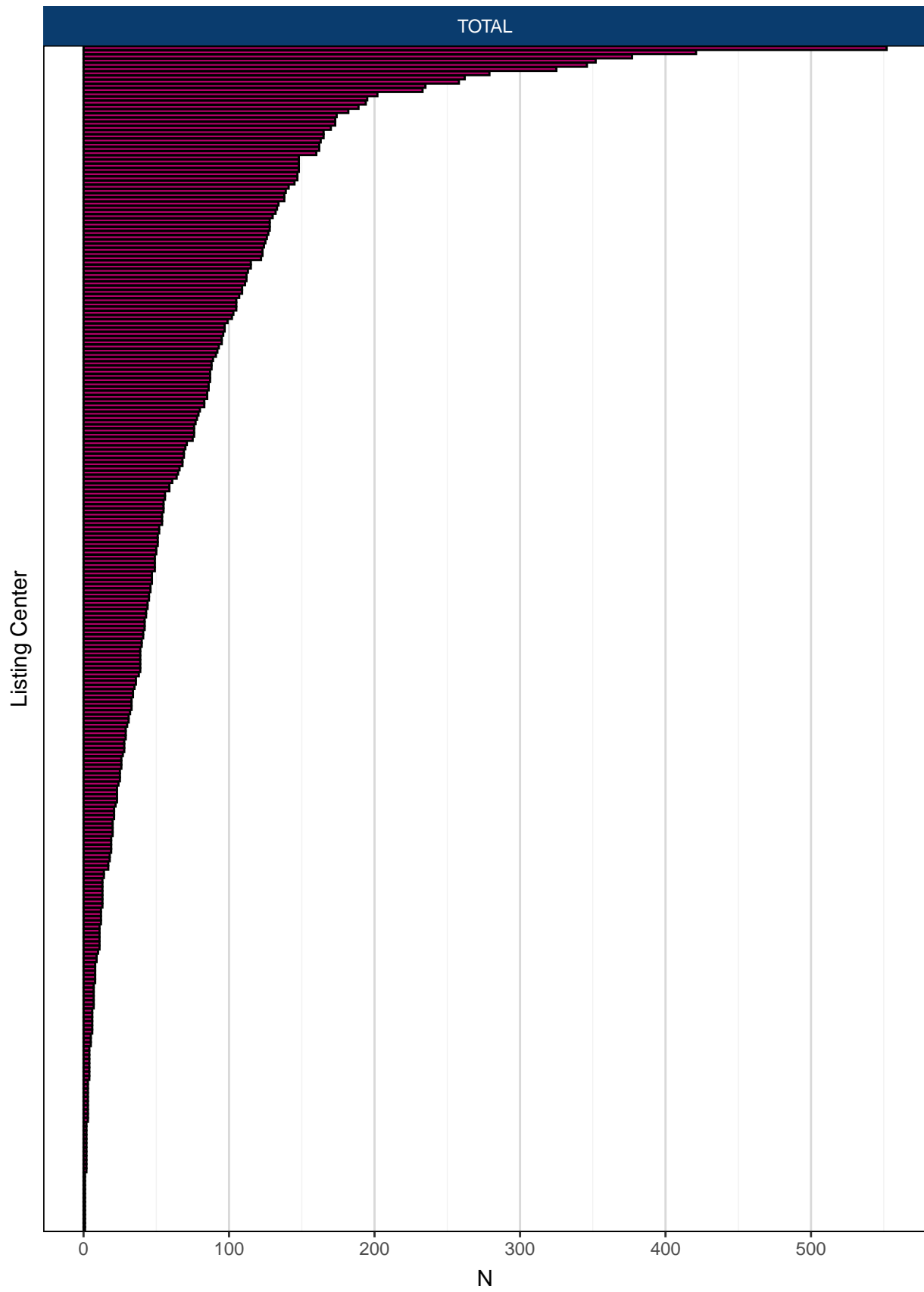
Organ	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Heart	1	3	7.6	5.0	10.00	34
Kidney	1	11	48.5	35.0	66.00	461
Kidney-Pancreas	1	1	3.0	2.0	4.00	25
Liver	1	6	21.5	17.0	29.50	95
Lung	1	2	7.4	5.0	11.25	30
Pancreas	1	1	3.7	2.0	5.00	19
TOTAL	1	11	64.5	40.5	94.50	552

Figure 22: External validation deaths for waitlist registrations not removed for transplant from March 2022 by organ and candidate listing center.









Deaths with Death Date between January 1, 2005 and December 31, 2021

Figure 23 illustrates all transplant recipient and waitlist registration (not removed for transplant) deaths that occurred between January 1, 2005 through December 31, 2021 by source of death information. Externally verified deaths begin accounting for a proportion of deaths information each year starting in 2012, when the external verification process was put in place.

By year, smaller proportions of transplant recipient deaths are externally validated or unverified compared to waitlist registration deaths. For both patient types, there are increased proportions of unverified deaths in the most recent three years. Over time, many externally verified and unverified deaths for transplant recipients are subsequently reported by OPTN members as follow-up visits occur.

The Relaxation of Data Submission Requirements was approved as an emergency action, effective March 13, 2020 through July 1, 2021 for Transplant Recipient Follow-Up Forms (TRF), Living Donor Follow-Up (LDF) forms, and Post-Transplant Malignancy (PTM) forms. This may have impacted the level of reporting from OPTN members during this time frame.

Figure 23: Deaths during January 1, 2005 - December 31, 2021 by patient type, year of death, and source of death information.

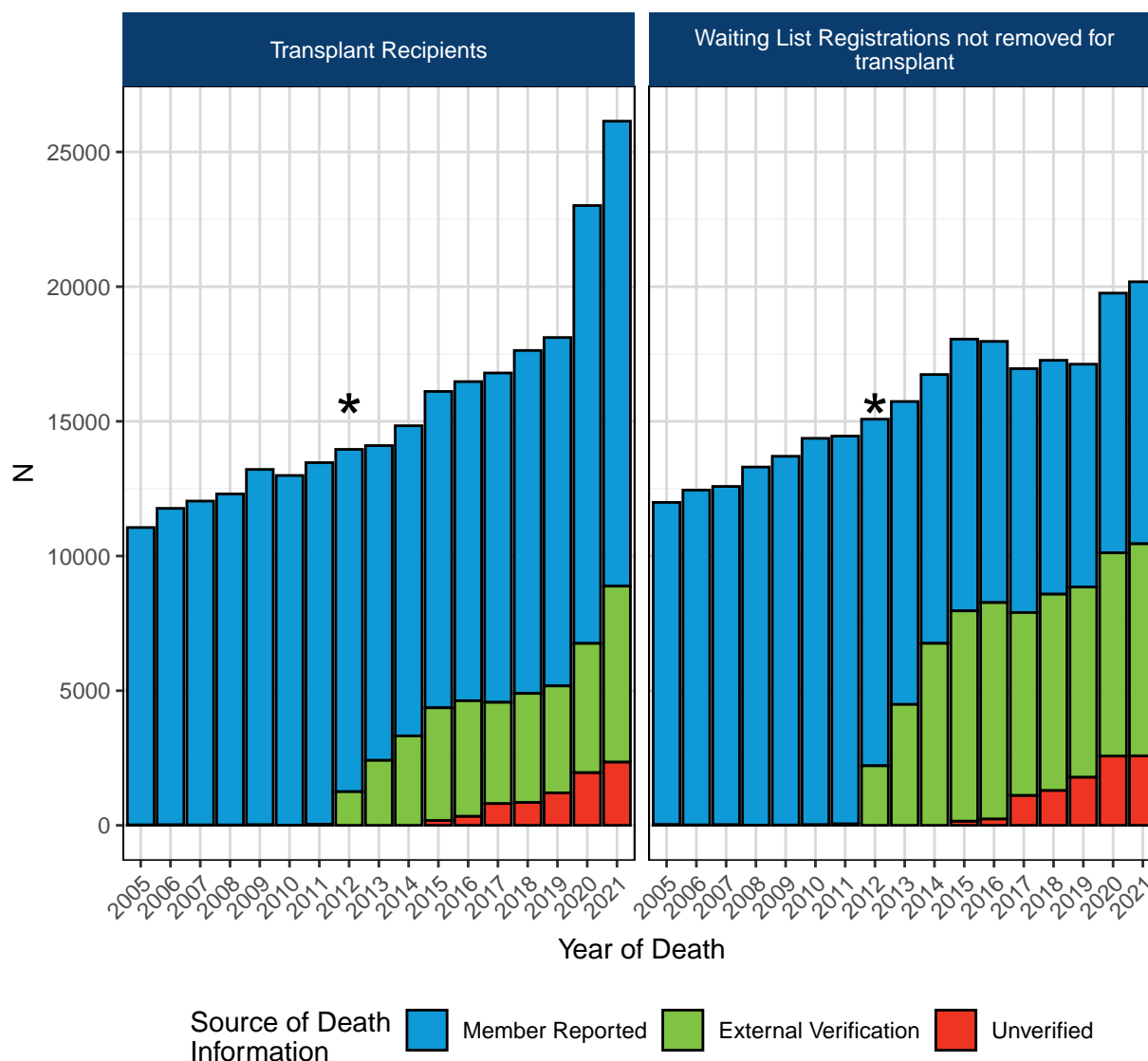


Table 23: Deaths during January 1, 2005 - December 31, 2021 by patient type, year of death, and source of death information.

Year of Death	Member Reported		External Validation		Unverified	
	N	%	N	%	N	%
Transplant Recipients						
2005	11043	99.9%	15	0.1%	0	0.0%
2006	11750	99.8%	19	0.2%	0	0.0%
2007	12026	99.9%	14	0.1%	0	0.0%
2008	12291	99.9%	13	0.1%	0	0.0%
2009	13194	99.8%	20	0.2%	0	0.0%
2010	12981	99.9%	8	0.1%	0	0.0%
2011	13427	99.7%	40	0.3%	0	0.0%
2012	12709	91.1%	1249	8.9%	0	0.0%
2013	11687	82.9%	2412	17.1%	0	0.0%
2014	11516	77.6%	3320	22.4%	0	0.0%
2015	11745	72.9%	4183	26.0%	182	1.1%
2016	11848	71.9%	4286	26.0%	340	2.1%
2017	12227	72.8%	3756	22.4%	812	4.8%
2018	12732	72.2%	4046	22.9%	853	4.8%
2019	12935	71.4%	3970	21.9%	1206	6.7%
2020	16257	70.6%	4794	20.8%	1961	8.5%
2021	17264	66.0%	6527	25.0%	2353	9.0%
Waitlist Registrations Not Removed for Transplant						
2005	11964	99.8%	26	0.2%	0	0.0%
2006	12434	99.9%	14	0.1%	0	0.0%
2007	12561	99.8%	21	0.2%	0	0.0%
2008	13298	100.0%	5	0.0%	0	0.0%
2009	13691	99.9%	12	0.1%	0	0.0%
2010	14348	99.9%	21	0.1%	0	0.0%
2011	14398	99.6%	52	0.4%	0	0.0%
2012	12869	85.3%	2211	14.7%	0	0.0%
2013	11247	71.5%	4489	28.5%	0	0.0%
2014	9981	59.6%	6756	40.4%	0	0.0%
2015	10090	55.9%	7804	43.2%	158	0.9%
2016	9697	54.0%	8029	44.7%	242	1.3%
2017	9055	53.4%	6786	40.0%	1115	6.6%
2018	8684	50.3%	7283	42.2%	1299	7.5%
2019	8273	48.3%	7057	41.2%	1791	10.5%
2020	9641	48.8%	7545	38.2%	2574	13.0%
2021	9730	48.2%	7870	39.0%	2582	12.8%

Overall, 77.5% of deaths during this time period came from OPTN member-reported sources, while 19.1% of deaths came from externally verified sources and 3.4% remain unverified and are not included in the OPTN database.

As a reminder, source of death information may change over time. Notably, a death may originally be picked up through an external validation death source and later be reported by the OPTN member. This death would then no longer fall under the “External Verification” category and would fall under the “Member Reported” category from then on.

Table 24: Deaths during January 1, 2005 - December 31, 2021 by source of death information.

Source of Death Information	N	%
Member Reported		
OPTN Data (WL Removals, TIEDI Forms)	432909	75.93
Semi-Annual Patient Status Verification Link	4925	0.86
Letters sent to patient last known address (through 2016)	492	0.09
Public SSDMF (through 2012)	3416	0.60
External Verification		
LexisNexis Data	20861	3.66
CMS Data	32953	5.78
Obituary Data	55140	9.67
Unverified		
Unverified	19458	3.41

Transplant Recipients

Because there were few deaths for heart-lung and intestine transplant recipients from externally verified sources or unverified, these organs will be excluded in the graphics and tables in the rest of this section.

Table 25: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ and source of death information.

Organ	Member Reported		External Verification		Unverified	
	N	%	N	%	N	%
Heart	25464	94.0%	1335	4.9%	284	1.0%
Heart-Lung	424	98.4%	4	0.9%	3	0.7%
Intestine	1163	97.6%	24	2.0%	4	0.3%
Kidney	111449	74.9%	31356	21.1%	5934	4.0%
Kidney-Pancreas	6729	77.9%	1631	18.9%	279	3.2%
Liver	49409	91.5%	3501	6.5%	1072	2.0%
Lung	20331	98.0%	337	1.6%	69	0.3%
Pancreas	2663	83.0%	484	15.1%	62	1.9%
TOTAL	217632	82.4%	38672	14.6%	7707	2.9%

Similar trends were seen as to Figure 3 within each death source, though at much smaller magnitudes for externally verified and unverified deaths. The trends in Figure 24 again align with those in Figure 25 on time from transplant to death. Most deaths that were captured were for recipients 5-20 years post-transplant across organs for all death sources. Less than 10% of all externally verified and unverified deaths were for transplant recipients within 5 years of death. Corresponding table to Figure 24 in Appendix.

Figure 24: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, year transplanted, and source of death information. Top panel contains all organs and total, bottom panel excludes kidney and total trends.

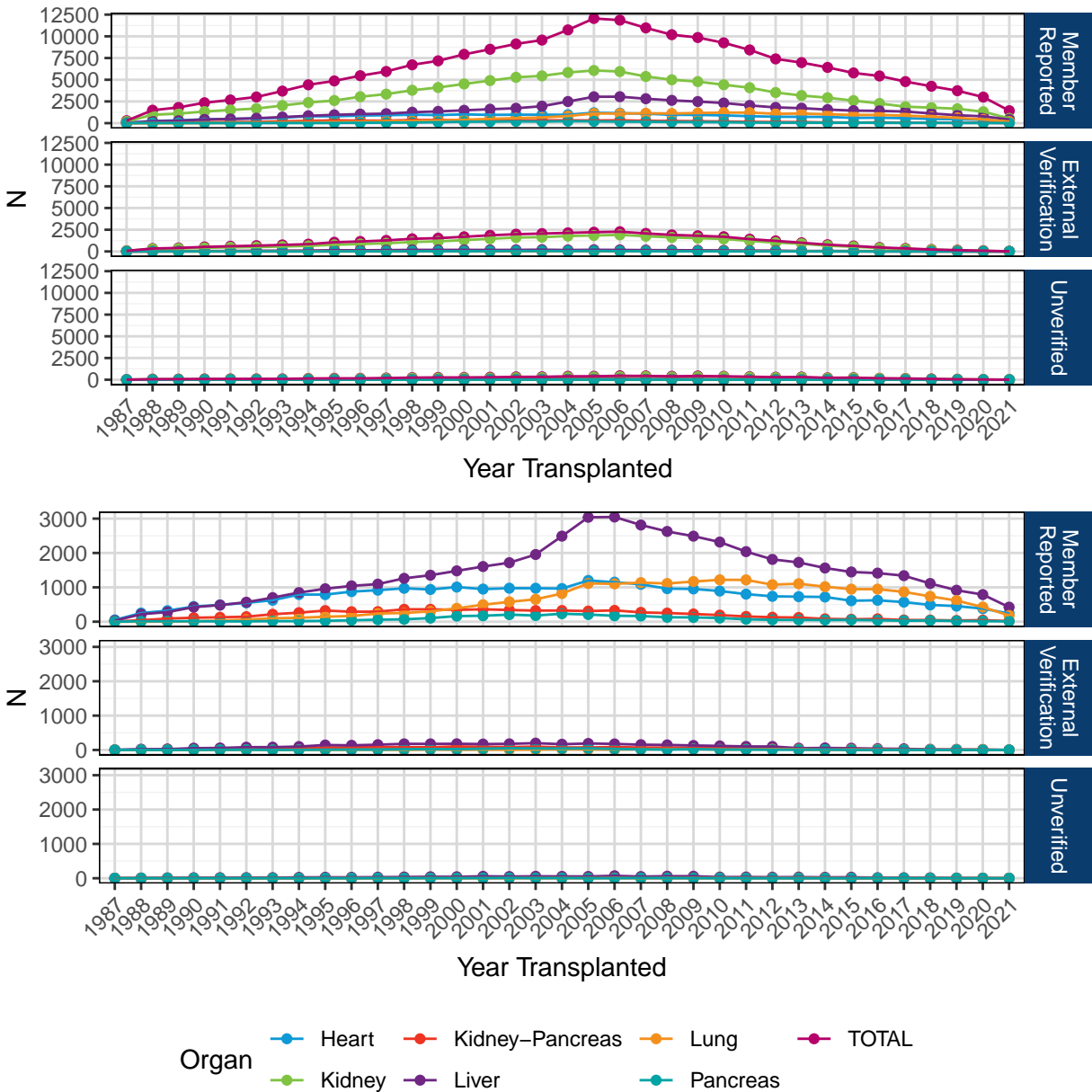


Figure 25: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, time from transplant to death, and source of death information. Top panel contains all organs and total, bottom panel excludes kidney and total trends.

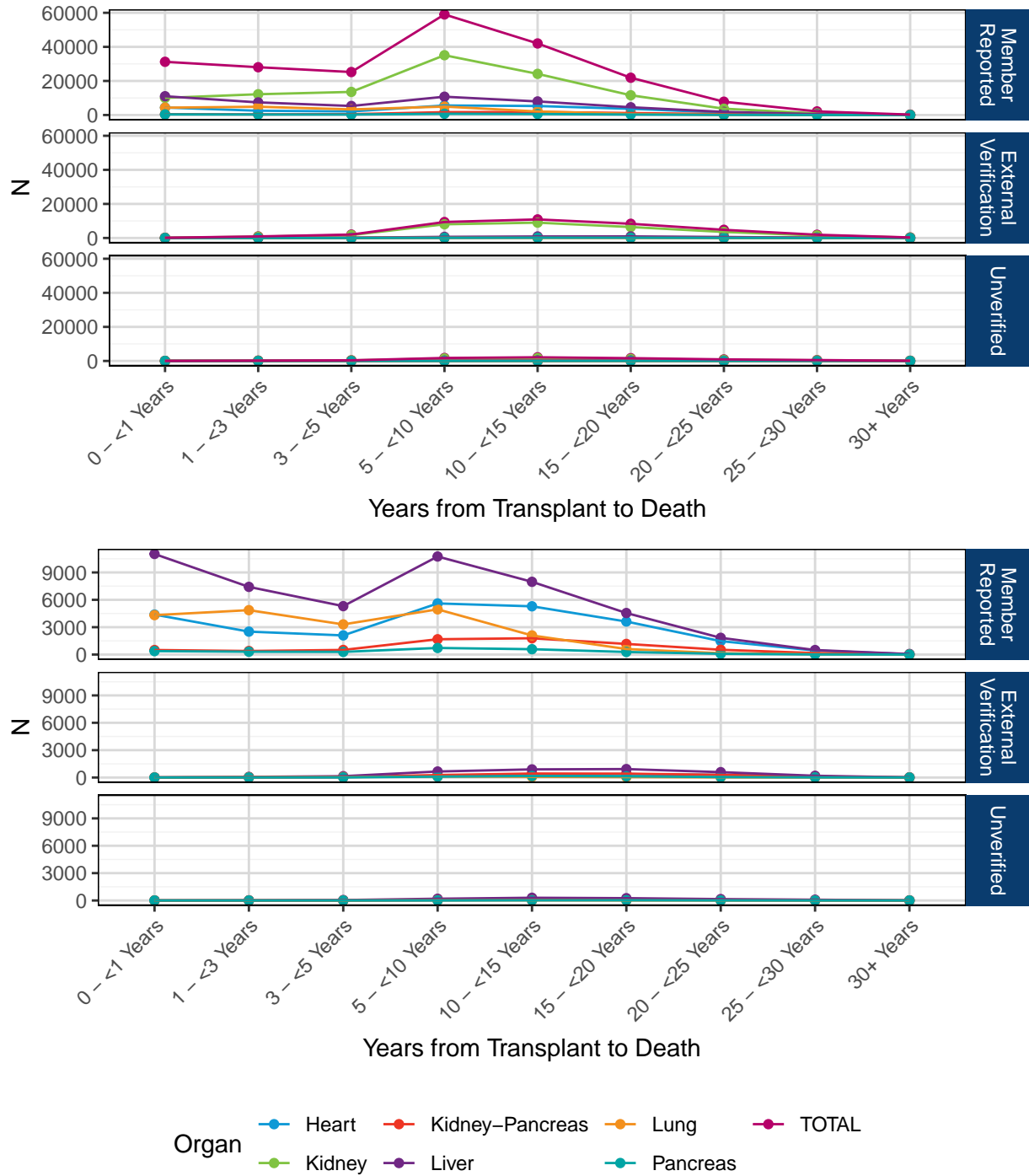


Table 26: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, time from transplant to death, and source of death information.

Years from Transplant to Death	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
0 - <1 Years	4382	17.2%	*	*	*	*
1 - <3 Years	2515	9.9%	19	1.4%	*	*
3 - <5 Years	2100	8.2%	38	2.8%	*	*
5 - <10 Years	5604	22.0%	182	13.6%	33	11.6%
10 - <15 Years	5289	20.8%	319	23.9%	66	23.2%
15 - <20 Years	3618	14.2%	374	28.0%	77	27.1%
20 - <25 Years	1473	5.8%	297	22.2%	60	21.1%
25 - <30 Years	443	1.7%	95	7.1%	32	11.3%
30+ Years	40	0.2%	10	0.7%	*	*
Organ = Kidney						
0 - <1 Years	10044	9.0%	96	0.3%	24	0.4%
1 - <3 Years	12190	10.9%	774	2.5%	157	2.6%
3 - <5 Years	13562	12.2%	1710	5.5%	314	5.3%
5 - <10 Years	35102	31.5%	8042	25.6%	1441	24.3%
10 - <15 Years	24154	21.7%	9008	28.7%	1683	28.4%
15 - <20 Years	11596	10.4%	6428	20.5%	1195	20.1%
20 - <25 Years	3716	3.3%	3551	11.3%	656	11.1%
25 - <30 Years	962	0.9%	1481	4.7%	372	6.3%
30+ Years	123	0.1%	266	0.8%	92	1.6%
Organ = Kidney-Pancreas						
0 - <1 Years	498	7.4%	*	*	*	*
1 - <3 Years	391	5.8%	18	1.1%	*	*
3 - <5 Years	505	7.5%	56	3.4%	10	3.6%
5 - <10 Years	1678	24.9%	272	16.7%	55	19.7%
10 - <15 Years	1786	26.5%	438	26.9%	59	21.1%
15 - <20 Years	1165	17.3%	424	26.0%	76	27.2%
20 - <25 Years	525	7.8%	295	18.1%	49	17.6%
25 - <30 Years	164	2.4%	112	6.9%	21	7.5%
30+ Years	17	0.3%	11	0.7%	*	*
Organ = Liver						
0 - <1 Years	11025	22.3%	*	*	*	*
1 - <3 Years	7418	15.0%	70	2.0%	19	1.8%
3 - <5 Years	5307	10.7%	145	4.1%	51	4.8%
5 - <10 Years	10747	21.8%	660	18.9%	192	17.9%
10 - <15 Years	7973	16.1%	892	25.5%	299	27.9%
15 - <20 Years	4552	9.2%	926	26.4%	254	23.7%
20 - <25 Years	1834	3.7%	590	16.9%	154	14.4%
25 - <30 Years	495	1.0%	192	5.5%	88	8.2%
30+ Years	58	0.1%	18	0.5%	13	1.2%
Organ = Lung						
0 - <1 Years	4321	21.3%	*	*	*	*
1 - <3 Years	4866	23.9%	30	8.9%	*	*
3 - <5 Years	3305	16.3%	46	13.6%	*	*
5 - <10 Years	4955	24.4%	106	31.5%	24	34.8%
10 - <15 Years	2095	10.3%	78	23.1%	24	34.8%

Table 26: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, time from transplant to death, and source of death information. (*continued*)

Years from Transplant to Death	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
15 - <20 Years	608	3.0%	47	13.9%	*	*
20 - <25 Years	146	0.7%	18	5.3%	*	*
25 - <30 Years	35	0.2%	*	*	*	*
30+ Years	*	*	*	*	*	*
Organ = Pancreas						
0 - <1 Years	378	14.2%	*	*	*	*
1 - <3 Years	309	11.6%	*	*	*	*
3 - <5 Years	291	10.9%	15	3.1%	*	*
5 - <10 Years	722	27.1%	96	19.8%	*	*
10 - <15 Years	587	22.0%	168	34.7%	20	32.3%
15 - <20 Years	283	10.6%	135	27.9%	25	40.3%
20 - <25 Years	83	3.1%	48	9.9%	*	*
25 - <30 Years	10	0.4%	14	2.9%	*	*
30+ Years	*	*	*	*	*	*
TOTAL						
0 - <1 Years	31236	14.4%	117	0.3%	28	0.4%
1 - <3 Years	28050	12.9%	919	2.4%	192	2.5%
3 - <5 Years	25232	11.6%	2011	5.2%	389	5.0%
5 - <10 Years	59042	27.1%	9371	24.2%	1754	22.8%
10 - <15 Years	42013	19.3%	10908	28.2%	2152	27.9%
15 - <20 Years	21889	10.1%	8338	21.6%	1639	21.3%
20 - <25 Years	7808	3.6%	4800	12.4%	926	12.0%
25 - <30 Years	2122	1.0%	1903	4.9%	513	6.7%
30+ Years	240	0.1%	305	0.8%	114	1.5%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

For all organs except kidney-pancreas, the majority of member reported deaths occurred under the status of follow-up received without graft failure, meaning that the transplant center was continuing to follow-up post-transplant with the patients and able to report the death event prior to any graft failure event. However, the majority of externally verified deaths occurred under the status of death after lost to follow-up for heart, liver, and lung transplant recipients. The majority of externally verified deaths for kidney, kidney-pancreas, and pancreas transplant recipients occurred under the status of death after graft failure closely followed by lost to follow-up. The majority of unverified deaths for all organs except pancreas fell under death after lost to follow-up status.

Figure 26: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, follow-up status at death, and source of death information.

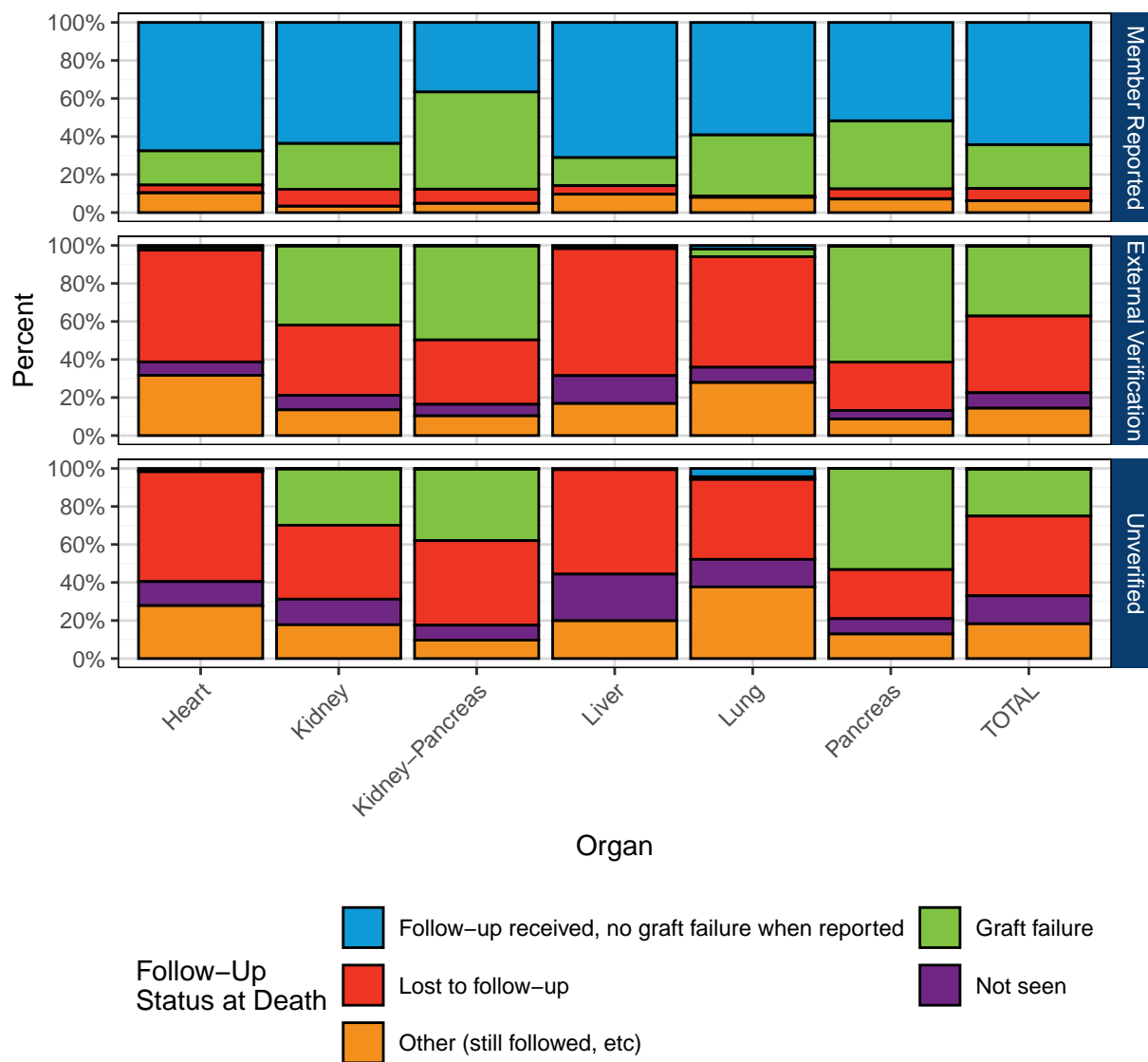


Table 27: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, follow-up status at death, and source of death information.

Follow-Up Status at Death	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Follow-up received, no graft failure when reported	17181	67.5%	11	0.8%	*	*
Graft failure	4596	18.0%	22	1.6%	*	*
Lost to follow-up	1048	4.1%	785	58.8%	164	57.7%
Not seen	*	*	94	7.0%	36	12.7%
Other (still followed, etc)	2630	10.3%	423	31.7%	79	27.8%
Organ = Kidney						
Follow-up received, no graft failure when reported	70849	63.6%	91	0.3%	16	0.3%
Graft failure	26952	24.2%	13044	41.6%	1758	29.6%
Lost to follow-up	9894	8.9%	11595	37.0%	2307	38.9%
Not seen	111	0.1%	2391	7.6%	799	13.5%
Other (still followed, etc)	3643	3.3%	4235	13.5%	1054	17.8%
Organ = Kidney-Pancreas						
Follow-up received, no graft failure when reported	2456	36.5%	*	*	*	*
Graft failure	3446	51.2%	807	49.5%	105	37.6%
Lost to follow-up	502	7.5%	552	33.8%	124	44.4%
Not seen	*	*	99	6.1%	22	7.9%
Other (still followed, etc)	321	4.8%	169	10.4%	27	9.7%
Organ = Liver						
Follow-up received, no graft failure when reported	35076	71.0%	44	1.3%	*	*
Graft failure	7352	14.9%	16	0.5%	*	*
Lost to follow-up	2169	4.4%	2338	66.8%	589	54.9%
Not seen	45	0.1%	513	14.7%	263	24.5%
Other (still followed, etc)	4767	9.6%	590	16.9%	213	19.9%
Organ = Lung						
Follow-up received, no graft failure when reported	12011	59.1%	*	*	*	*
Graft failure	6549	32.2%	14	4.2%	*	*
Lost to follow-up	144	0.7%	196	58.2%	29	42.0%
Not seen	*	*	27	8.0%	10	14.5%
Other (still followed, etc)	1625	8.0%	94	27.9%	26	37.7%
Organ = Pancreas						
Follow-up received, no graft failure when reported	1377	51.7%	*	*	*	*
Graft failure	955	35.9%	295	61.0%	33	53.2%
Lost to follow-up	137	5.1%	123	25.4%	16	25.8%
Not seen	*	*	22	4.5%	*	*
Other (still followed, etc)	189	7.1%	42	8.7%	*	*
TOTAL						
Follow-up received, no graft failure when reported	139896	64.3%	158	0.4%	28	0.4%
Graft failure	50195	23.1%	14210	36.7%	1903	24.7%
Lost to follow-up	13908	6.4%	15596	40.3%	3232	41.9%
Not seen	176	0.1%	3147	8.1%	1136	14.7%
Other (still followed, etc)	13457	6.2%	5561	14.4%	1408	18.3%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

The majority of kidney-pancreas and pancreas transplant recipients across all death sources were between ages 35-49 at time of transplant, while this was a bit older for all other organs across death sources, with ages 50-64 at time of transplant.

Figure 27: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient age at transplant, and source of death information.

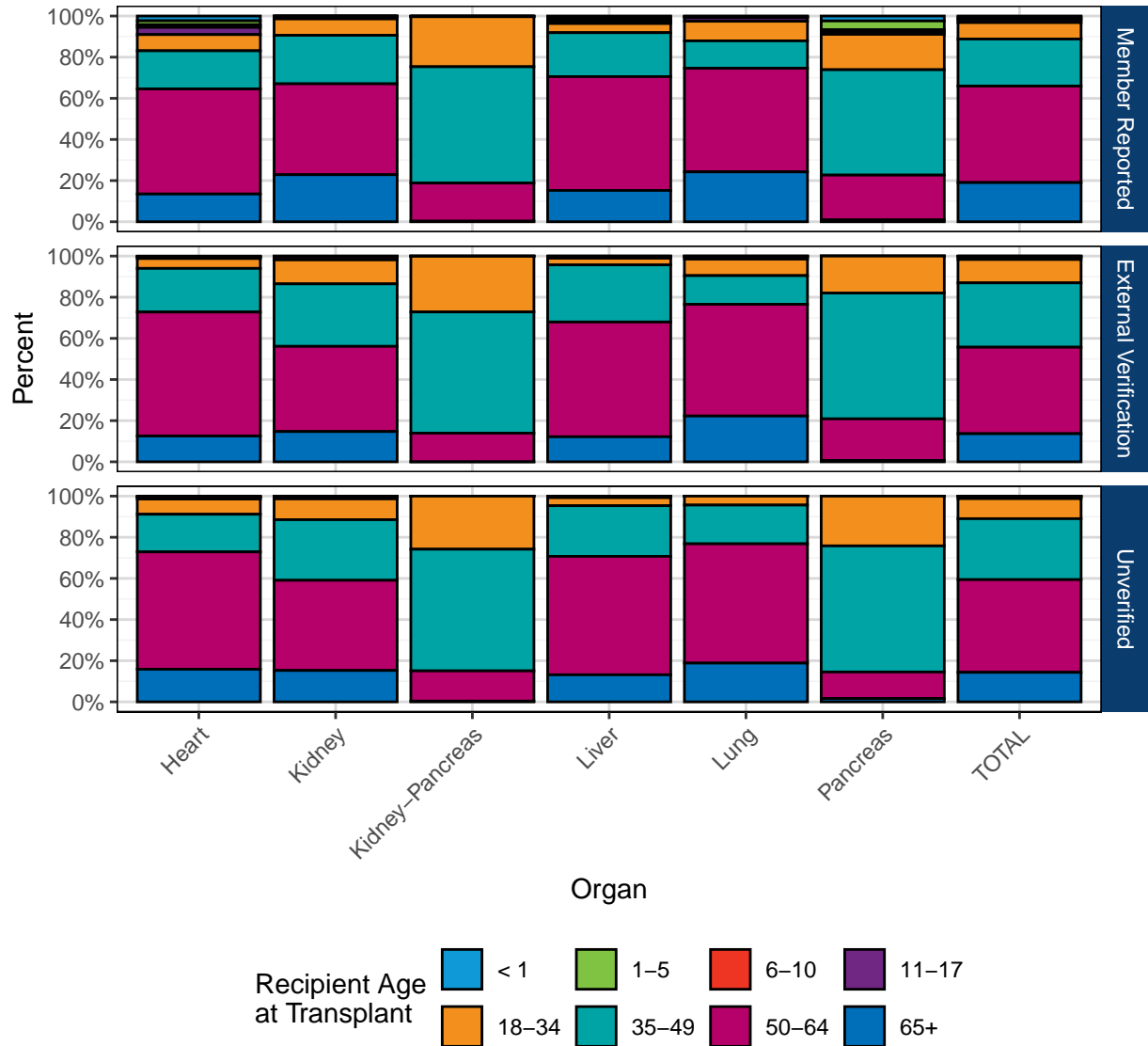


Table 28: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient age at transplant, and source of death information.

Recipient Age at Transplant (years)	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
< 1	593	2.3%	*	*	*	*
1-5	486	1.9%	*	*	*	*
6-10	325	1.3%	*	*	*	*
11-17	895	3.5%	*	*	*	*
18-34	2001	7.9%	64	4.8%	21	7.4%
35-49	4728	18.6%	283	21.2%	52	18.3%
50-64	13002	51.1%	805	60.3%	162	57.0%
65+	3433	13.5%	167	12.5%	45	15.8%
Organ = Kidney						
< 1	*	*	*	*	*	*
1-5	232	0.2%	46	0.1%	*	*
6-10	261	0.2%	107	0.3%	17	0.3%
11-17	1075	1.0%	428	1.4%	59	1.0%
18-34	8870	8.0%	3654	11.7%	598	10.1%
35-49	26274	23.6%	9528	30.4%	1749	29.5%
50-64	49236	44.2%	12977	41.4%	2601	43.8%
65+	25492	22.9%	4616	14.7%	905	15.3%
Organ = Kidney-Pancreas						
< 1	*	*	*	*	*	*
1-5	*	*	*	*	*	*
6-10	*	*	*	*	*	*
11-17	*	*	*	*	*	*
18-34	1636	24.3%	441	27.0%	72	25.8%
35-49	3804	56.5%	961	58.9%	165	59.1%
50-64	1247	18.5%	227	13.9%	41	14.7%
65+	19	0.3%	*	*	*	*
Organ = Liver						
< 1	399	0.8%	*	*	*	*
1-5	621	1.3%	*	*	*	*
6-10	257	0.5%	*	*	*	*
11-17	529	1.1%	24	0.7%	*	*
18-34	2193	4.4%	113	3.2%	42	3.9%
35-49	10555	21.4%	972	27.8%	264	24.6%
50-64	27333	55.3%	1953	55.8%	617	57.6%
65+	7522	15.2%	426	12.2%	141	13.2%
Organ = Lung						
< 1	34	0.2%	*	*	*	*
1-5	54	0.3%	*	*	*	*
6-10	80	0.4%	*	*	*	*
11-17	350	1.7%	*	*	*	*
18-34	1937	9.5%	27	8.0%	*	*
35-49	2709	13.3%	47	13.9%	13	18.8%
50-64	10238	50.4%	183	54.3%	40	58.0%
65+	4929	24.2%	75	22.3%	13	18.8%
Organ = Pancreas						

Table 28: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient age at transplant, and source of death information. *(continued)*

Recipient Age at Transplant (years)	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
< 1	64	2.4%	*	*	*	*
1-5	114	4.3%	*	*	*	*
6-10	28	1.1%	*	*	*	*
11-17	31	1.2%	*	*	*	*
18-34	458	17.2%	87	18.0%	15	24.2%
35-49	1364	51.2%	296	61.2%	38	61.3%
50-64	580	21.8%	98	20.2%	*	*
65+	24	0.9%	*	*	*	*
TOTAL						
< 1	1214	0.6%	*	*	*	*
1-5	1734	0.8%	54	0.1%	*	*
6-10	1011	0.5%	118	0.3%	18	0.2%
11-17	2975	1.4%	468	1.2%	69	0.9%
18-34	17406	8.0%	4393	11.4%	752	9.8%
35-49	49842	22.9%	12096	31.3%	2284	29.6%
50-64	101991	46.9%	16253	42.0%	3472	45.0%
65+	41457	19.0%	5287	13.7%	1106	14.4%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Overall, a higher proportion of externally verified deaths were Black, Non-Hispanic while a higher proportion of unverified deaths were Hispanic/Latino. This was true across most organs as well, though to a lesser degree for increased proportion of Black, Non-Hispanic externally verified deaths.

Figure 28: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient race/ethnicity, and source of death information.

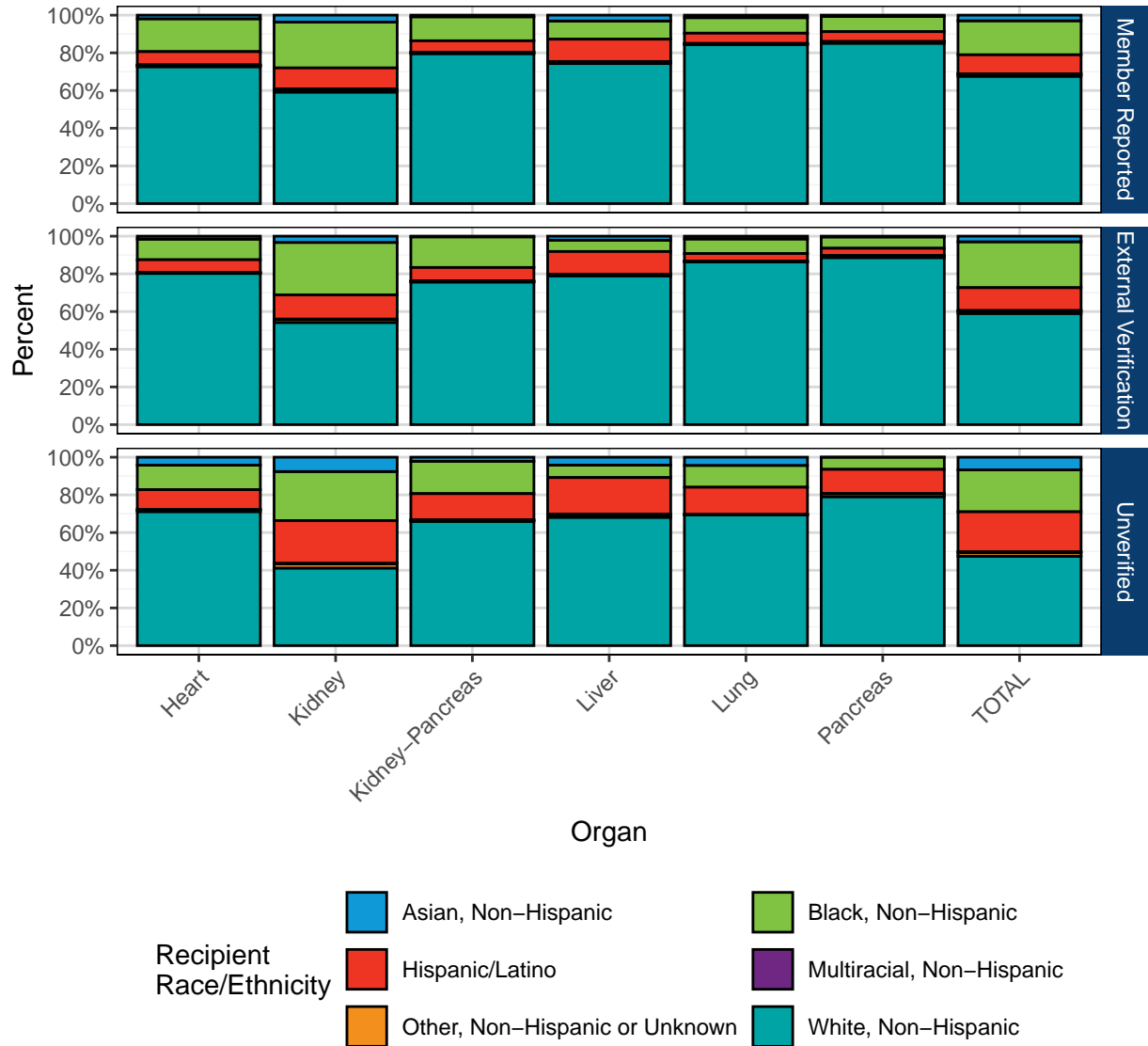


Table 29: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient race/ethnicity, and source of death information.

Recipient Race/Ethnicity	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Asian, Non-Hispanic	492	1.9%	21	1.6%	12	4.2%
Black, Non-Hispanic	4439	17.4%	146	10.9%	37	13.0%
Hispanic/Latino	1786	7.0%	90	6.7%	30	10.6%
Multiracial, Non-Hispanic	80	0.3%	*	*	*	*
Other, Non-Hispanic or Unknown	174	0.7%	*	*	*	*
White, Non-Hispanic	18493	72.6%	1071	80.2%	202	71.1%
Organ = Kidney						
Asian, Non-Hispanic	4078	3.7%	1040	3.3%	452	7.6%
Black, Non-Hispanic	27153	24.4%	8743	27.9%	1545	26.0%
Hispanic/Latino	12473	11.2%	4019	12.8%	1347	22.7%
Multiracial, Non-Hispanic	215	0.2%	63	0.2%	13	0.2%
Other, Non-Hispanic or Unknown	1576	1.4%	495	1.6%	134	2.3%
White, Non-Hispanic	65954	59.2%	16996	54.2%	2443	41.2%
Organ = Kidney-Pancreas						
Asian, Non-Hispanic	58	0.9%	*	*	*	*
Black, Non-Hispanic	858	12.8%	265	16.2%	48	17.2%
Hispanic/Latino	411	6.1%	118	7.2%	39	14.0%
Multiracial, Non-Hispanic	*	*	*	*	*	*
Other, Non-Hispanic or Unknown	41	0.6%	*	*	*	*
White, Non-Hispanic	5355	79.6%	1234	75.7%	184	65.9%
Organ = Liver						
Asian, Non-Hispanic	1531	3.1%	74	2.1%	45	4.2%
Black, Non-Hispanic	4774	9.7%	211	6.0%	71	6.6%
Hispanic/Latino	5854	11.8%	425	12.1%	209	19.5%
Multiracial, Non-Hispanic	138	0.3%	*	*	*	*
Other, Non-Hispanic or Unknown	398	0.8%	20	0.6%	15	1.4%
White, Non-Hispanic	36714	74.3%	2764	78.9%	730	68.1%
Organ = Lung						
Asian, Non-Hispanic	269	1.3%	*	*	*	*
Black, Non-Hispanic	1677	8.2%	26	7.7%	*	*
Hispanic/Latino	1107	5.4%	14	4.2%	10	14.5%
Multiracial, Non-Hispanic	50	0.2%	*	*	*	*
Other, Non-Hispanic or Unknown	80	0.4%	*	*	*	*
White, Non-Hispanic	17148	84.3%	291	86.4%	48	69.6%
Organ = Pancreas						
Asian, Non-Hispanic	19	0.7%	*	*	*	*
Black, Non-Hispanic	214	8.0%	29	6.0%	*	*
Hispanic/Latino	140	5.3%	19	3.9%	*	*
Multiracial, Non-Hispanic	*	*	*	*	*	*
Other, Non-Hispanic or Unknown	21	0.8%	*	*	*	*
White, Non-Hispanic	2266	85.1%	429	88.6%	49	79.0%
TOTAL						
Asian, Non-Hispanic	6488	3.0%	1148	3.0%	518	6.7%
Black, Non-Hispanic	39335	18.1%	9425	24.4%	1715	22.3%
Hispanic/Latino	21933	10.1%	4687	12.1%	1644	21.3%

Table 29: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient race/ethnicity, and source of death information. (*continued*)

Recipient Race/Ethnicity	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Multiracial, Non-Hispanic	499	0.2%	74	0.2%	15	0.2%
Other, Non-Hispanic or Unknown	2309	1.1%	532	1.4%	155	2.0%
White, Non-Hispanic	147068	67.6%	22806	59.0%	3660	47.5%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Across all organs and death sources, except pancreas transplant recipients from unverified deaths, the majority of deaths were males.

Figure 29: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient gender, and source of death information.

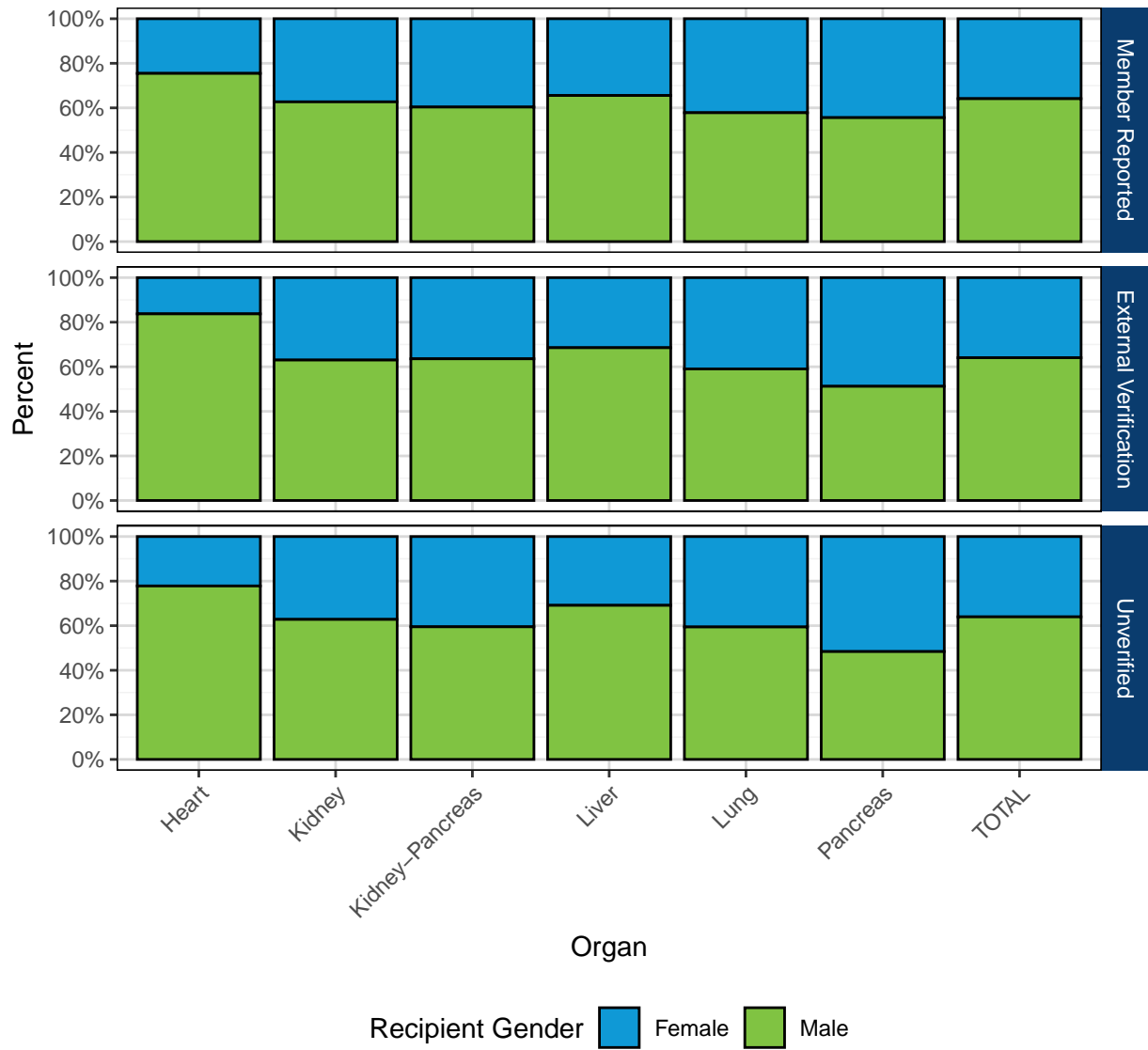


Table 30: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient gender, and source of death information.

Recipient Gender	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Female	6247	24.5%	217	16.3%	63	22.2%
Male	19217	75.5%	1118	83.7%	221	77.8%
Organ = Kidney						
Female	41574	37.3%	11596	37.0%	2207	37.2%
Male	69875	62.7%	19760	63.0%	3727	62.8%
Organ = Kidney-Pancreas						
Female	2667	39.6%	594	36.4%	113	40.5%
Male	4062	60.4%	1037	63.6%	166	59.5%
Organ = Liver						
Female	17019	34.4%	1101	31.4%	331	30.9%
Male	32390	65.6%	2400	68.6%	741	69.1%
Organ = Lung						
Female	8576	42.2%	138	40.9%	28	40.6%
Male	11755	57.8%	199	59.1%	41	59.4%
Organ = Pancreas						
Female	1182	44.4%	236	48.8%	32	51.6%
Male	1481	55.6%	248	51.2%	30	48.4%
TOTAL						
Female	78090	35.9%	13900	35.9%	2778	36.0%
Male	139542	64.1%	24772	64.1%	4929	64.0%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

There were no consistent patterns across organs or death source for recipient education level; however, the proportions falling within higher and lower education level as well as unknown/not reported status were fairly evenly distributed.

Figure 30: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient education level, and source of death information.

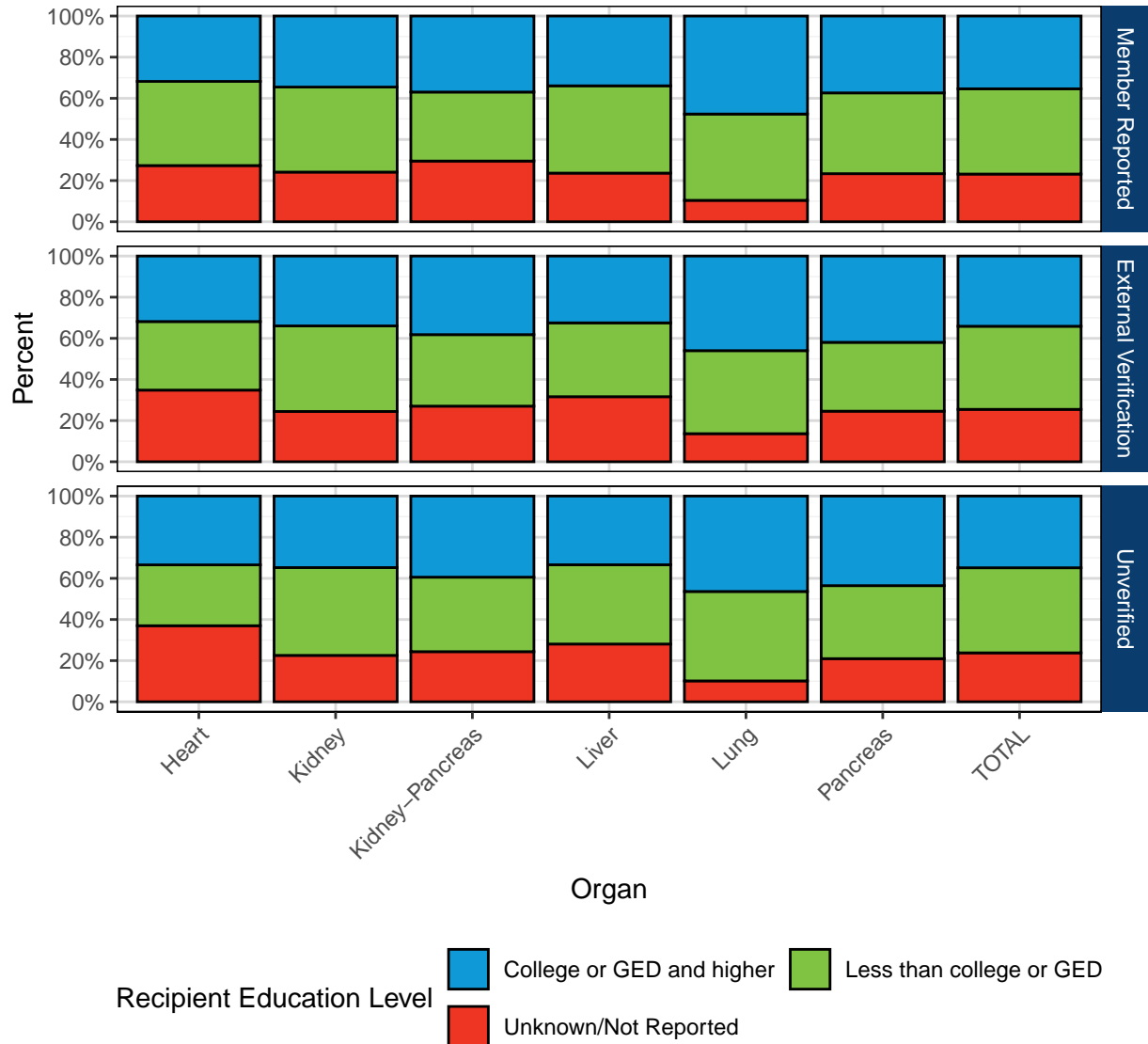


Table 31: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient education level, and source of death information.

Education Level	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
College or GED and higher	8093	31.8%	425	31.8%	95	33.5%
Less than college or GED	10416	40.9%	445	33.3%	84	29.6%
Unknown/Not Reported	6955	27.3%	465	34.8%	105	37.0%
Organ = Kidney						
College or GED and higher	38496	34.5%	10646	34.0%	2062	34.7%
Less than college or GED	46055	41.3%	13046	41.6%	2534	42.7%
Unknown/Not Reported	26898	24.1%	7664	24.4%	1338	22.5%
Organ = Kidney-Pancreas						
College or GED and higher	2487	37.0%	623	38.2%	110	39.4%
Less than college or GED	2257	33.5%	567	34.8%	101	36.2%
Unknown/Not Reported	1985	29.5%	441	27.0%	68	24.4%
Organ = Liver						
College or GED and higher	16768	33.9%	1137	32.5%	358	33.4%
Less than college or GED	20960	42.4%	1257	35.9%	413	38.5%
Unknown/Not Reported	11681	23.6%	1107	31.6%	301	28.1%
Organ = Lung						
College or GED and higher	9686	47.6%	155	46.0%	32	46.4%
Less than college or GED	8530	42.0%	136	40.4%	30	43.5%
Unknown/Not Reported	2115	10.4%	46	13.6%	*	*
Organ = Pancreas						
College or GED and higher	995	37.4%	203	41.9%	27	43.5%
Less than college or GED	1046	39.3%	162	33.5%	22	35.5%
Unknown/Not Reported	622	23.4%	119	24.6%	13	21.0%
TOTAL						
College or GED and higher	77014	35.4%	13198	34.1%	2687	34.9%
Less than college or GED	90180	41.4%	15627	40.4%	3187	41.4%
Unknown/Not Reported	50438	23.2%	9847	25.5%	1833	23.8%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Most deaths across death sources for heart and liver transplant recipients were in the private insurance category, while the majority for kidney and kidney-pancreas transplant recipients had public insurance. For both lung and pancreas transplant recipients, the majority of member reported and externally verified deaths were in the private insurance category while unverified deaths were in the public insurance category.

Figure 31: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient primary source of payment at transplant, and source of death information.

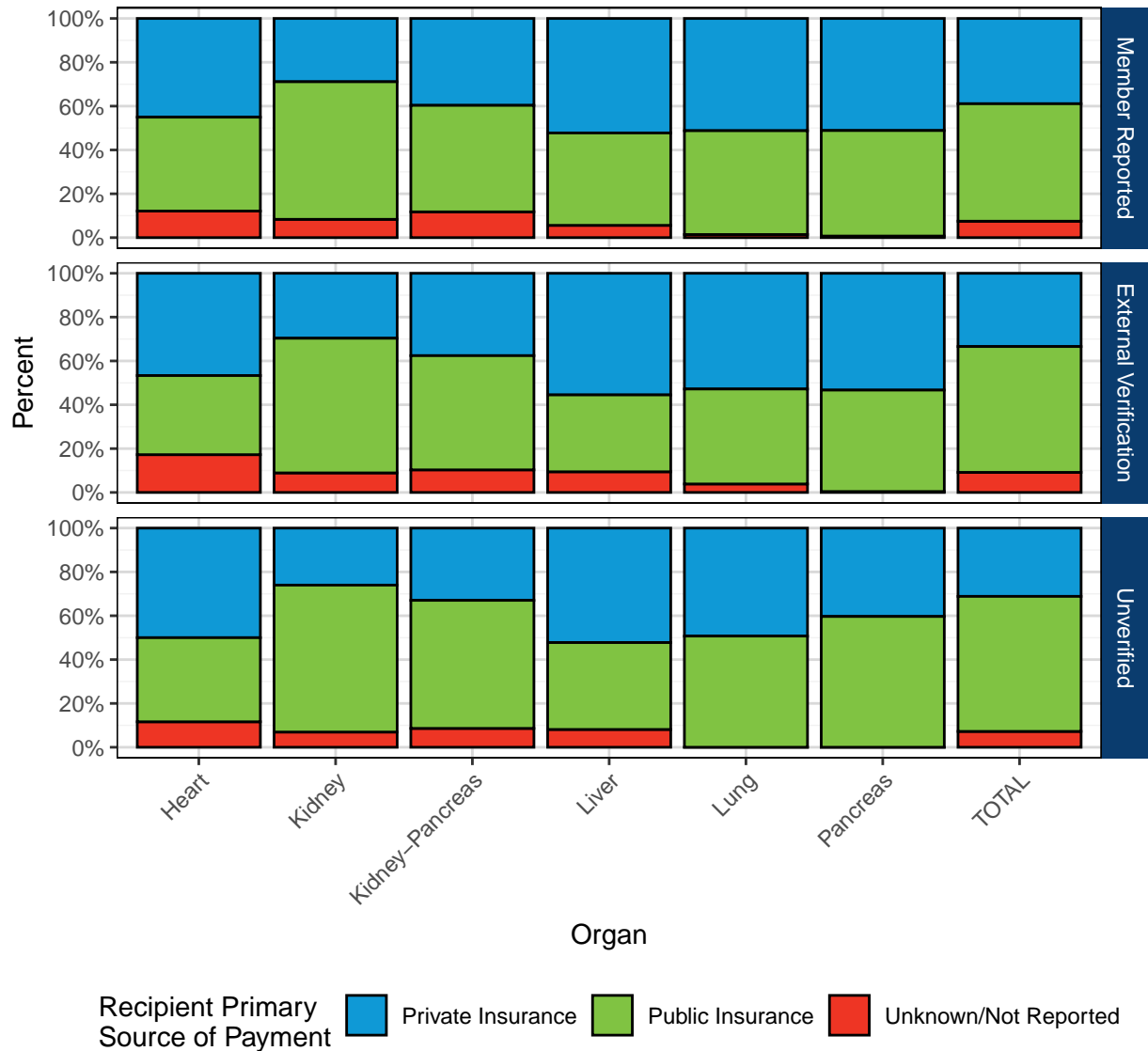


Table 32: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient primary source of payment at transplant, and source of death information.

Recipient Primary Source of Payment	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Private Insurance	11470	45.0%	623	46.7%	142	50.0%
Public Insurance	10911	42.8%	482	36.1%	109	38.4%
Unknown/Not Reported	3083	12.1%	230	17.2%	33	11.6%
Organ = Kidney						
Private Insurance	32187	28.9%	9299	29.7%	1544	26.0%
Public Insurance	69967	62.8%	19262	61.4%	3978	67.0%
Unknown/Not Reported	9295	8.3%	2795	8.9%	412	6.9%
Organ = Kidney-Pancreas						
Private Insurance	2668	39.6%	613	37.6%	92	33.0%
Public Insurance	3270	48.6%	850	52.1%	163	58.4%
Unknown/Not Reported	791	11.8%	168	10.3%	24	8.6%
Organ = Liver						
Private Insurance	25811	52.2%	1943	55.5%	560	52.2%
Public Insurance	20830	42.2%	1228	35.1%	425	39.6%
Unknown/Not Reported	2768	5.6%	330	9.4%	87	8.1%
Organ = Lung						
Private Insurance	10414	51.2%	178	52.8%	34	49.3%
Public Insurance	9630	47.4%	146	43.3%	35	50.7%
Unknown/Not Reported	287	1.4%	13	3.9%	*	*
Organ = Pancreas						
Private Insurance	1362	51.1%	258	53.3%	25	40.3%
Public Insurance	1282	48.1%	224	46.3%	37	59.7%
Unknown/Not Reported	19	0.7%	*	*	*	*
TOTAL						
Private Insurance	84671	38.9%	12927	33.4%	2401	31.2%
Public Insurance	116658	53.6%	22206	57.4%	4749	61.6%
Unknown/Not Reported	16303	7.5%	3539	9.2%	557	7.2%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Table 33 provides a summary of the distribution of the number of deaths, from each death source, per transplant center state for each organ. Across organs and death sources, the number of transplant recipient deaths per state is right-skewed.

Table 33: Summary of number of deaths for transplant recipients during January 1, 2005 - December 31, 2021 per recipient transplant center state by organ and source of death information. Recipient transplant center states for each organ type included if at least one death.

Source of Death Information	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	1	230.00	621.1	416.0	799.00	2875
External Verification	1	9.00	34.2	22.0	36.50	175
Unverified	1	2.00	8.6	4.0	8.00	75
Organ = Kidney						
Member Reported	81	549.75	2321.9	1557.5	3044.00	10465
External Verification	11	147.00	653.3	505.5	818.00	3494
Unverified	1	20.00	123.6	60.5	110.25	1383
Organ = Kidney-Pancreas						
Member Reported	1	28.00	149.5	101.0	181.00	595
External Verification	1	12.25	38.8	25.5	54.75	166
Unverified	1	1.25	7.3	3.0	9.00	74
Organ = Liver						
Member Reported	9	473.00	1205.1	852.0	1458.00	5132
External Verification	1	20.25	92.1	50.5	110.50	559
Unverified	1	7.75	29.8	12.0	27.75	292
Organ = Lung						
Member Reported	6	243.50	655.8	511.0	664.00	2370
External Verification	1	3.00	13.0	7.5	13.75	62
Unverified	1	1.00	3.8	2.0	5.00	24
Organ = Pancreas						
Member Reported	1	11.00	63.4	27.5	93.50	476
External Verification	1	3.00	12.1	7.0	12.00	76
Unverified	1	1.00	2.4	1.5	2.75	9
TOTAL						
Member Reported	117	608.25	4534.0	3030.5	5763.75	21537
External Verification	11	152.50	805.7	581.0	1025.25	4481
Unverified	1	30.50	160.6	77.5	137.50	1855

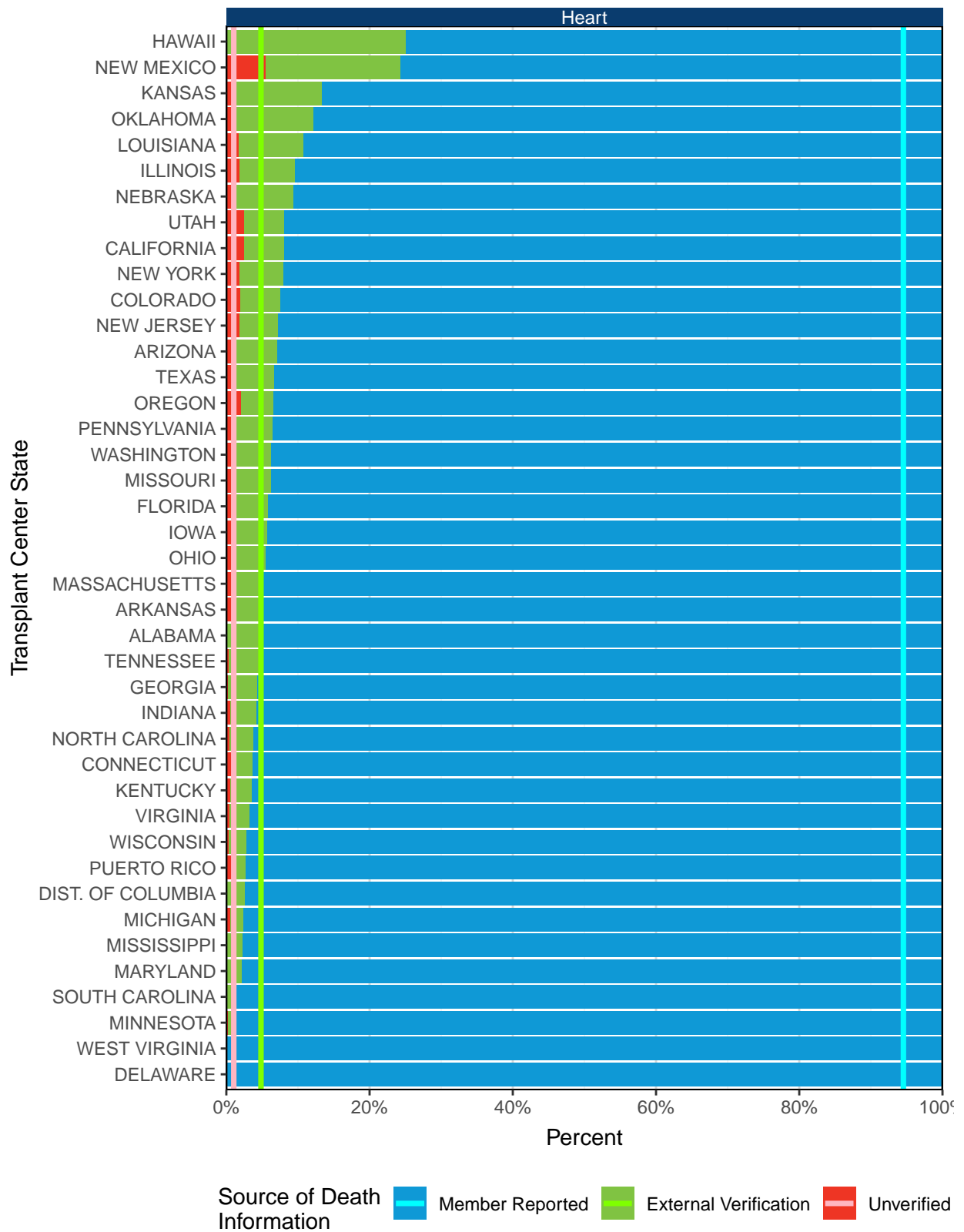
Similarly, Table 34 provides a summary of the percentage of transplant recipient deaths per transplant center state from member reported, externally verified, or unverified sources of death information. This is given per state across each organ. For lung transplant recipients, a minimum of 95% of deaths are member reported across all states. On the other hand, no state had 100% of kidney transplant recipient deaths from member reported sources.

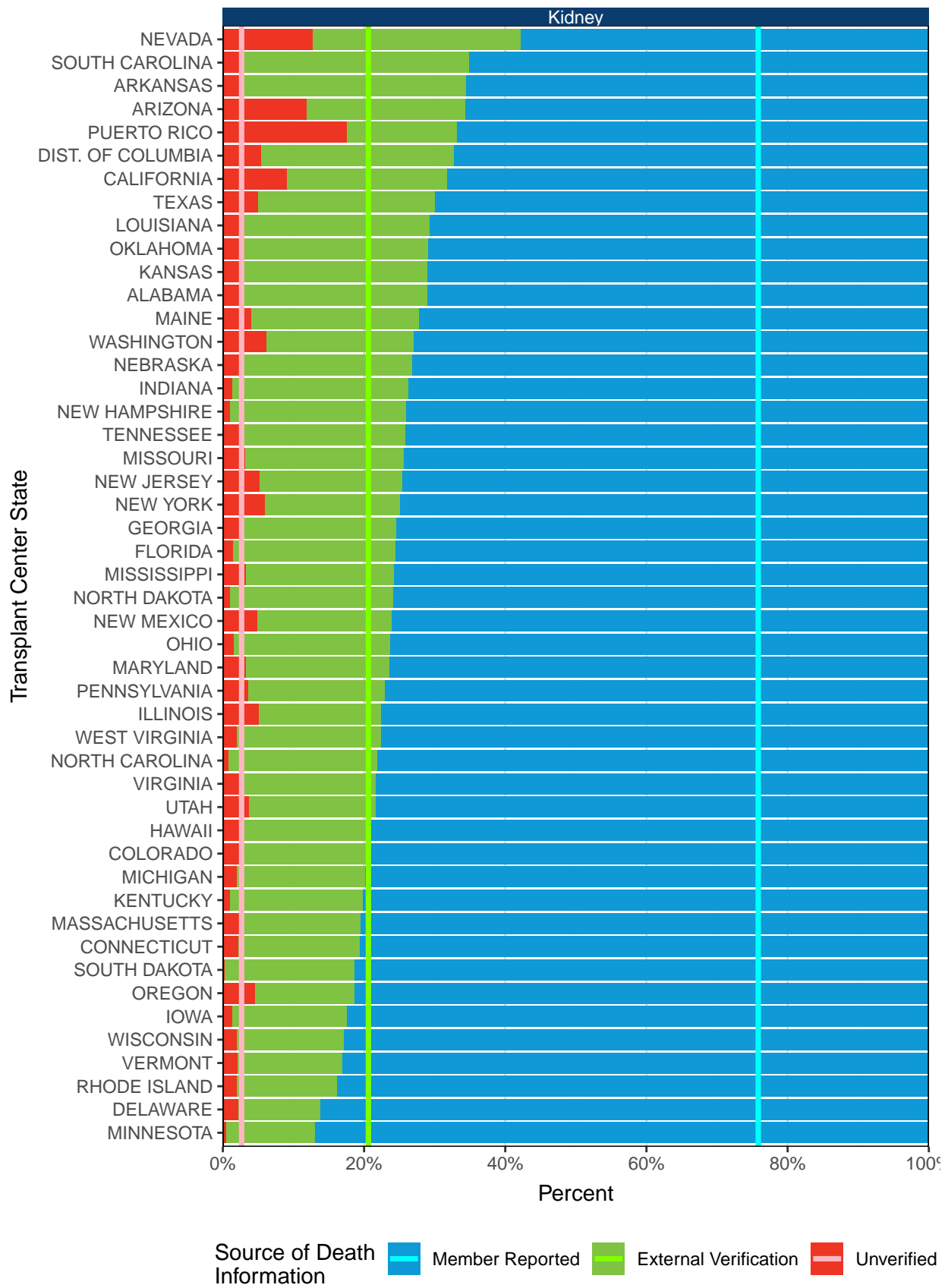
The following figures illustrate the distribution of percentages of source of death information per state for each organ.

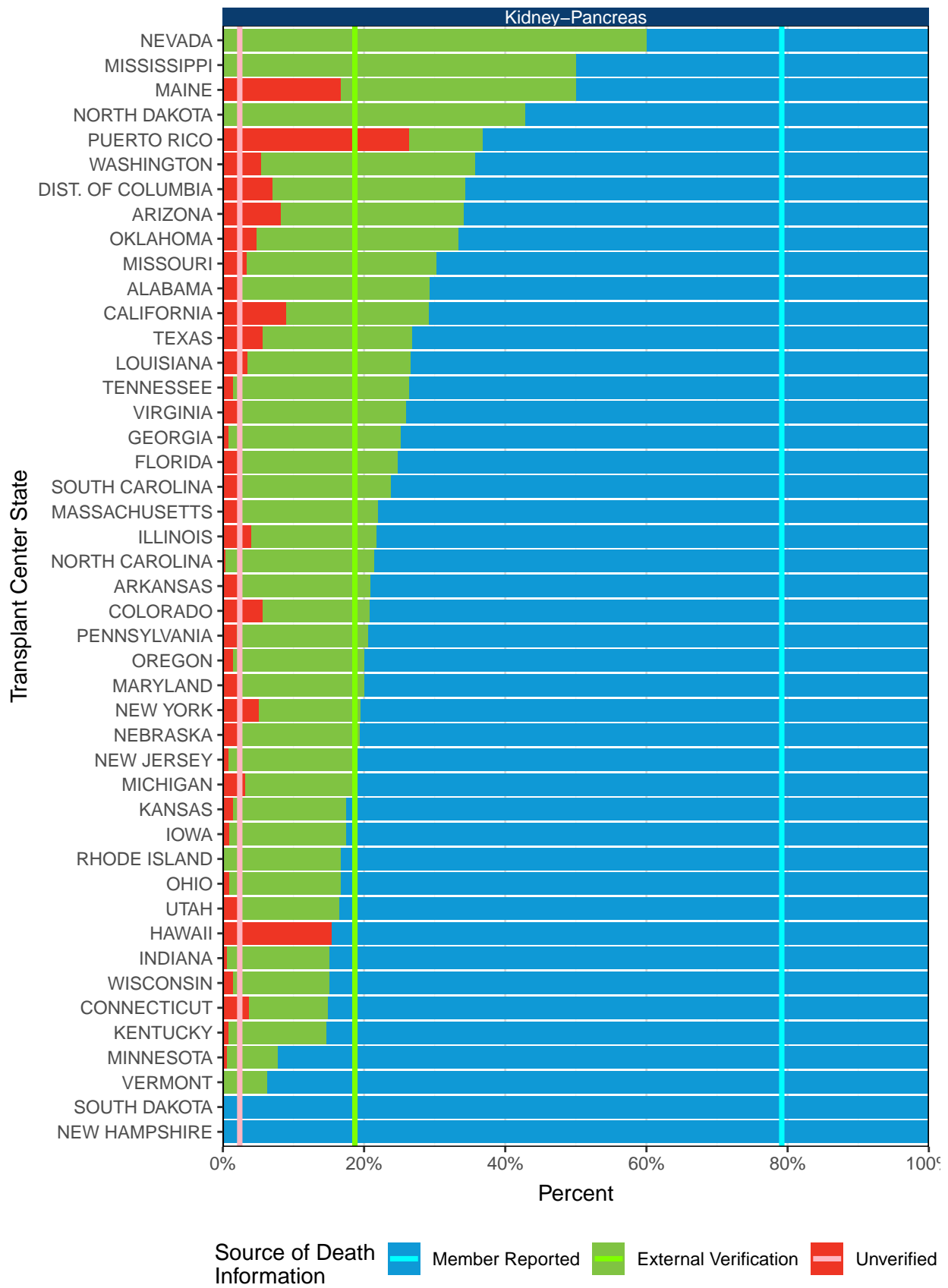
Table 34: Summary of percent of deaths for transplant recipients during January 1, 2005 - December 31, 2021 per recipient transplant center state by organ and source of death information. Recipient transplant center states for each organ type included if at least one death.

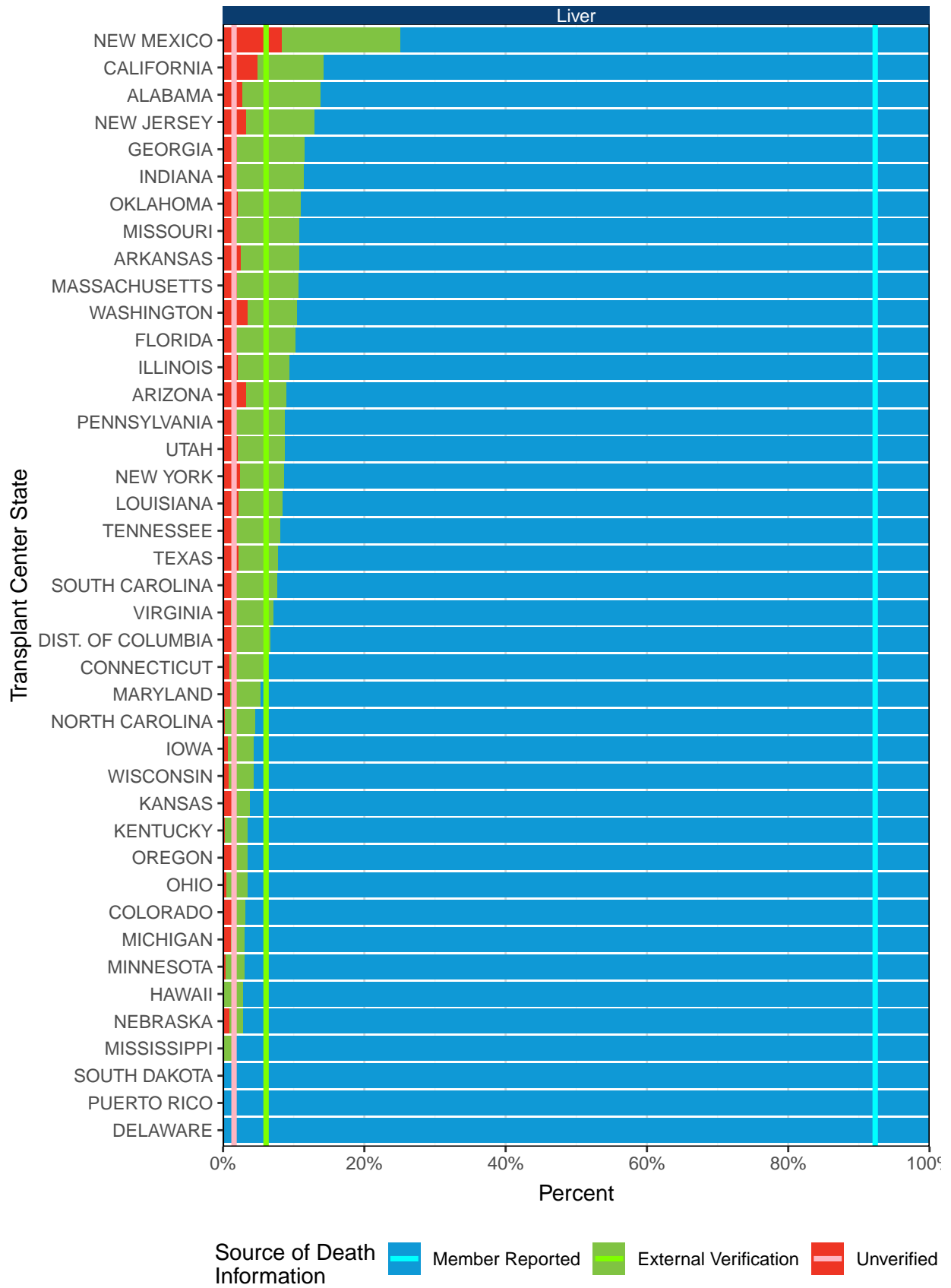
Source of Death Information	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	75.0%	92.5%	93.7%	94.5%	96.7%	100.0%
External Verification	1.0%	3.0%	5.6%	4.8%	5.6%	25.0%
Unverified	0.1%	0.5%	1.2%	1.0%	1.7%	5.4%
Organ = Kidney						
Member Reported	57.9%	72.0%	75.5%	75.8%	79.8%	87.0%
External Verification	11.7%	17.8%	21.0%	20.6%	23.9%	32.1%
Unverified	0.2%	2.0%	3.6%	2.7%	4.1%	17.6%
Organ = Kidney-Pancreas						
Member Reported	40.0%	70.8%	76.4%	79.2%	83.3%	100.0%
External Verification	6.2%	15.3%	21.4%	18.7%	24.8%	60.0%
Unverified	0.3%	1.5%	4.2%	2.4%	5.0%	26.3%
Organ = Liver						
Member Reported	75.0%	89.5%	92.7%	92.3%	96.6%	100.0%
External Verification	1.8%	3.3%	6.1%	6.1%	8.6%	16.7%
Unverified	0.3%	1.0%	1.9%	1.6%	2.2%	8.3%
Organ = Lung						
Member Reported	94.9%	97.8%	98.4%	98.5%	99.4%	100.0%
External Verification	0.2%	0.9%	1.6%	1.3%	2.0%	4.7%
Unverified	0.1%	0.2%	0.4%	0.3%	0.4%	1.1%
Organ = Pancreas						
Member Reported	33.3%	70.7%	78.5%	78.2%	87.7%	100.0%
External Verification	3.8%	12.7%	19.3%	19.5%	24.5%	36.8%
Unverified	0.4%	1.1%	5.1%	2.4%	8.3%	33.3%
TOTAL						
Member Reported	57.7%	77.6%	81.2%	82.1%	85.3%	91.0%
External Verification	8.5%	12.9%	15.9%	15.2%	17.7%	29.7%
Unverified	0.2%	1.5%	2.9%	2.1%	3.5%	14.7%

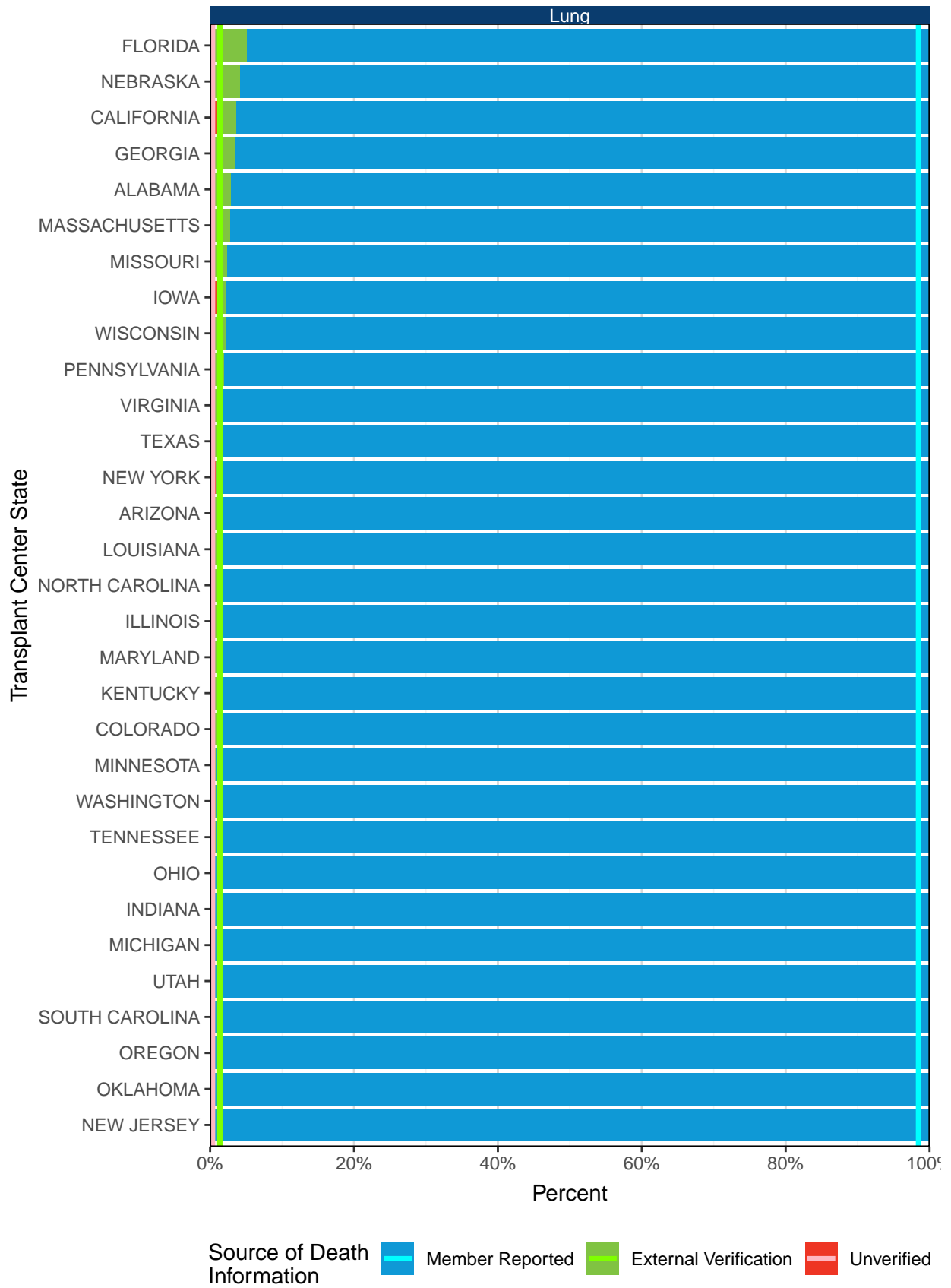
Figure 32: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient transplant center state, and source of death information. Vertical lines represent medians across states.











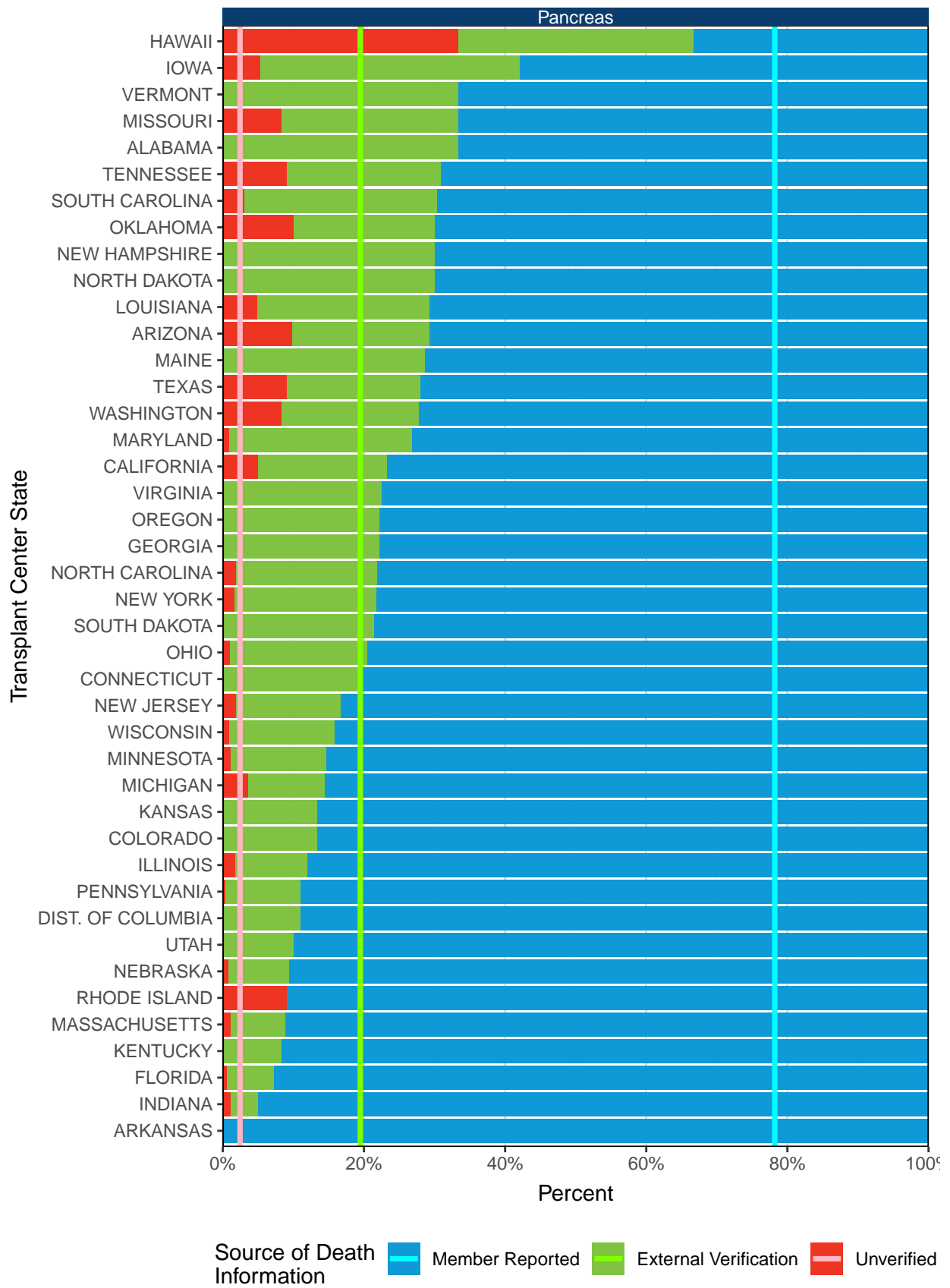


Table 35 provides a summary of the distribution of the number of deaths, from each death source, per transplant center for each organ. Across organs and death sources, the number of transplant recipient deaths per center is right-skewed.

Table 35: Summary of number of deaths for transplant recipients during January 1, 2005 - December 31, 2021 per recipient transplant center by organ and source of death information. Recipient transplant centers for each organ type included if at least one death.

Source of Death Information	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	1	12.00	124.8	72.0	180.75	795
External Verification	1	2.00	9.1	5.0	13.00	78
Unverified	1	1.00	3.1	2.0	3.00	28
Organ = Kidney						
Member Reported	1	38.25	359.5	239.5	545.50	2321
External Verification	1	18.00	105.9	75.0	140.25	850
Unverified	1	4.00	22.9	11.0	26.00	321
Organ = Kidney-Pancreas						
Member Reported	1	8.00	39.8	21.0	53.00	420
External Verification	1	3.00	11.2	7.0	13.00	71
Unverified	1	1.00	3.0	2.0	4.00	14
Organ = Liver						
Member Reported	1	36.75	301.3	182.0	461.25	1845
External Verification	1	5.00	27.1	16.0	33.00	217
Unverified	1	2.00	9.7	6.0	12.00	101
Organ = Lung						
Member Reported	1	17.00	209.6	127.0	325.00	1127
External Verification	1	1.00	6.1	4.0	7.50	37
Unverified	1	1.00	2.2	1.0	2.50	9
Organ = Pancreas						
Member Reported	1	3.00	18.1	7.0	14.00	379
External Verification	1	1.00	4.7	3.0	5.00	58
Unverified	1	1.00	1.4	1.0	1.00	6
TOTAL						
Member Reported	1	51.75	647.7	272.0	937.25	5542
External Verification	1	15.00	122.8	77.0	163.00	1025
Unverified	1	4.00	28.5	14.0	35.75	473

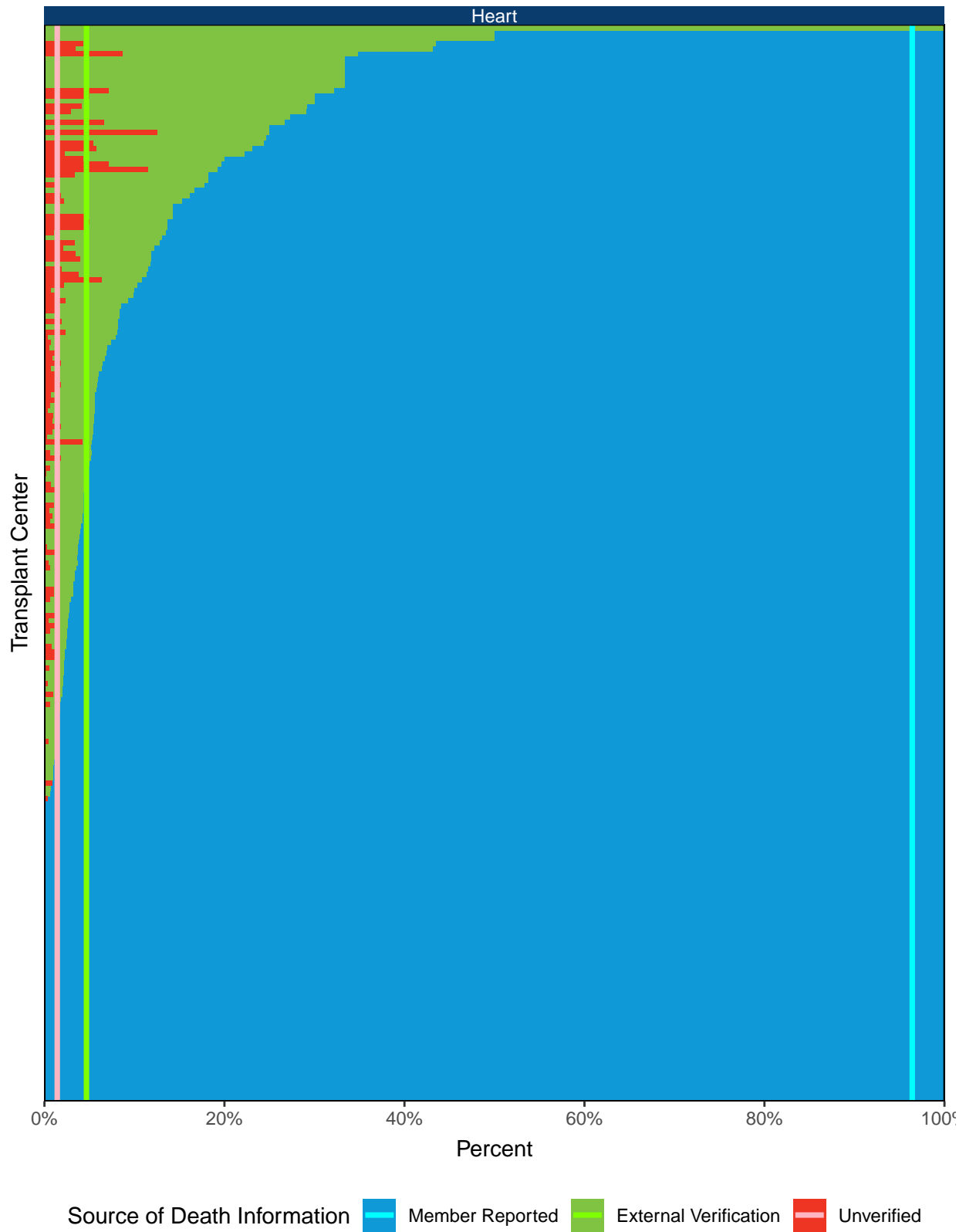
Similarly, Table 36 provides a summary of the percentage of transplant recipient deaths per transplant center from member reported, externally verified, or unverified sources of death information. This is given per center across each organ. For lung transplant recipients, a minimum of 84% of deaths are member reported across all centers. For heart, kidney-pancreas, liver, and pancreas transplant recipients, there was at least one transplant center with 100% of deaths from external verification sources. Half of all transplant centers had at least 81% of transplant recipient deaths from member reported sources.

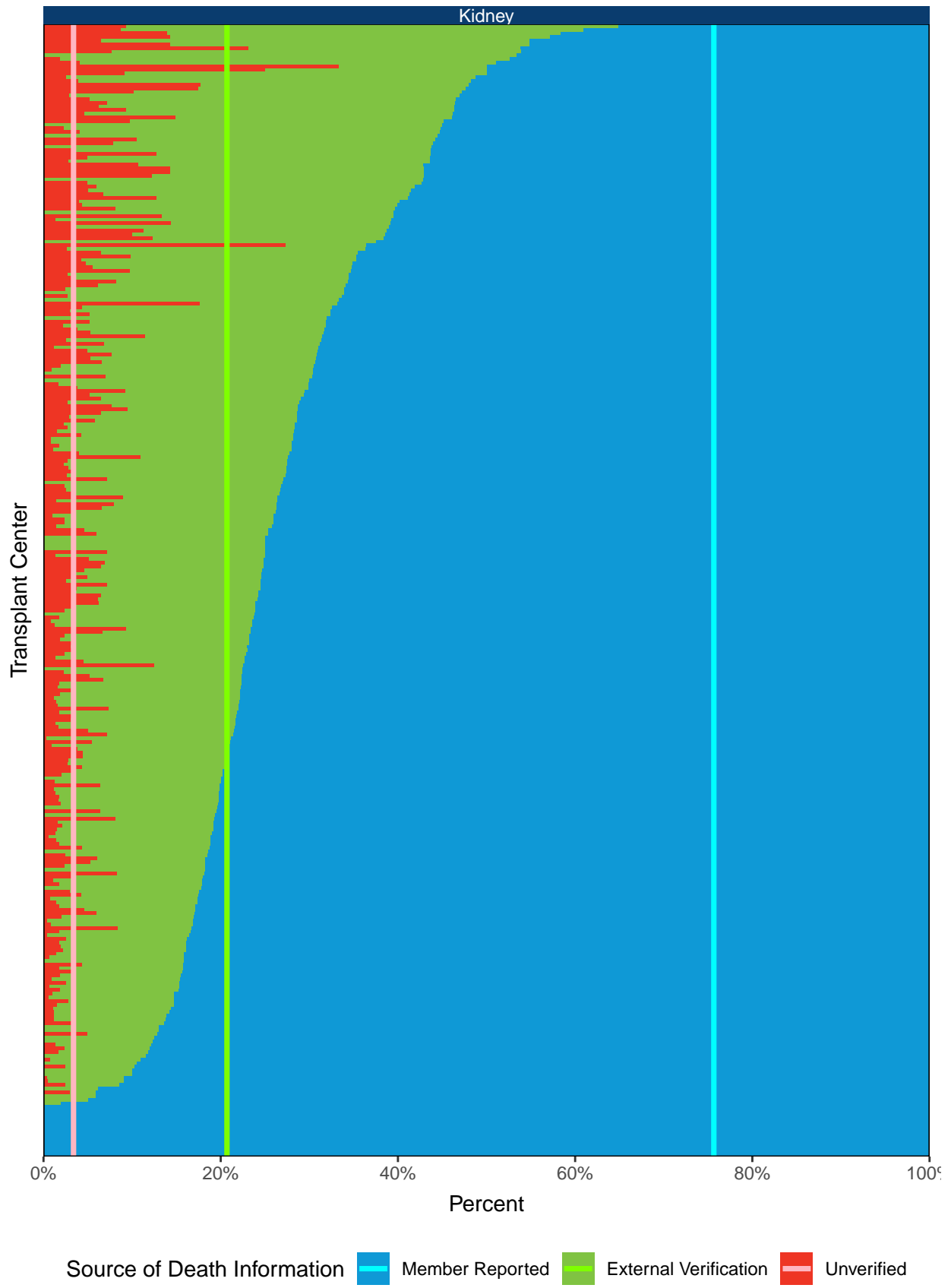
The following figures illustrate the distribution of percentages of source of death information per center for each organ.

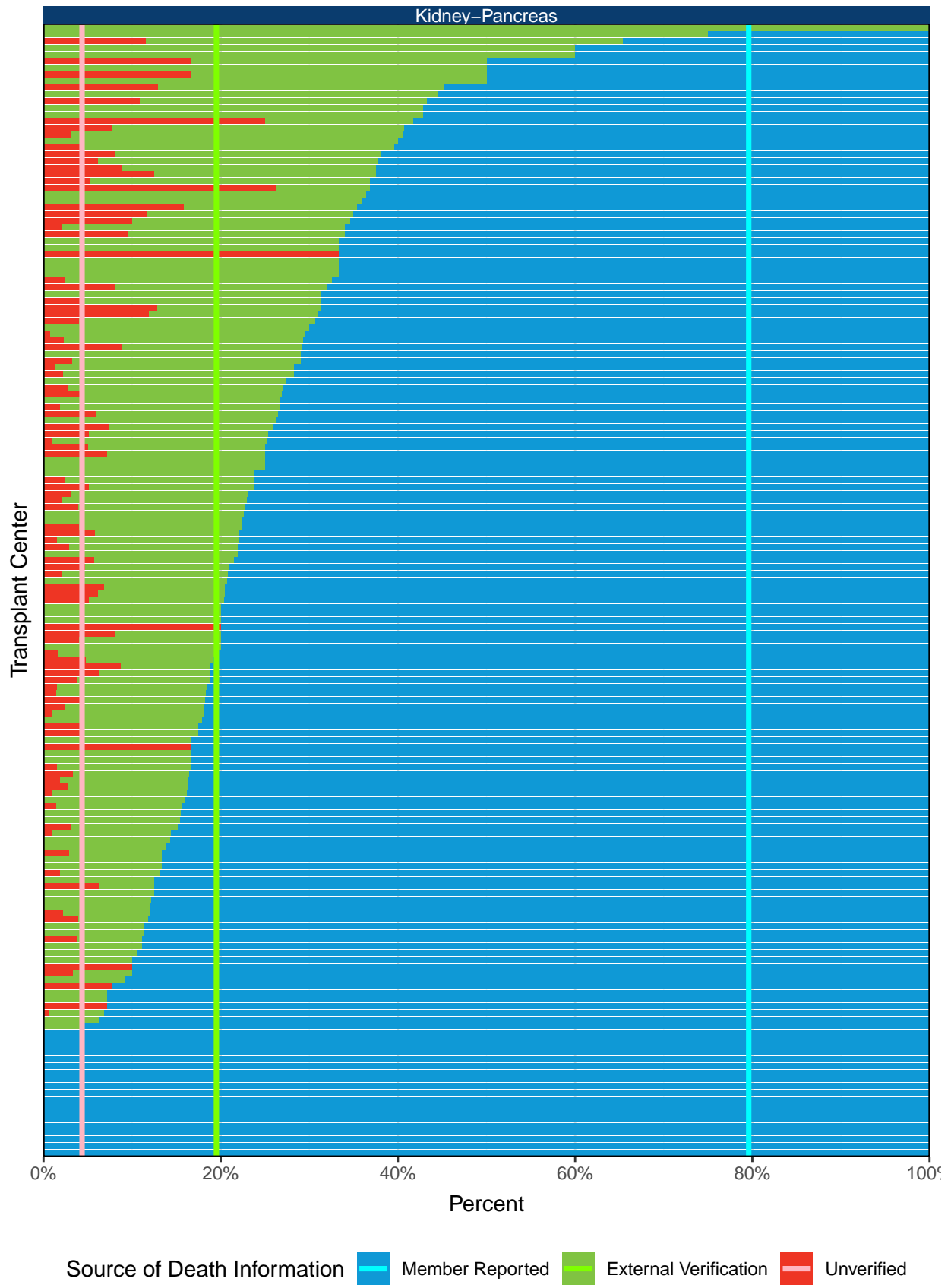
Table 36: Summary of percent of deaths for transplant recipients during January 1, 2005 - December 31, 2021 per recipient transplant center by organ and source of death information. Recipient transplant centers for each organ type included if at least one death.

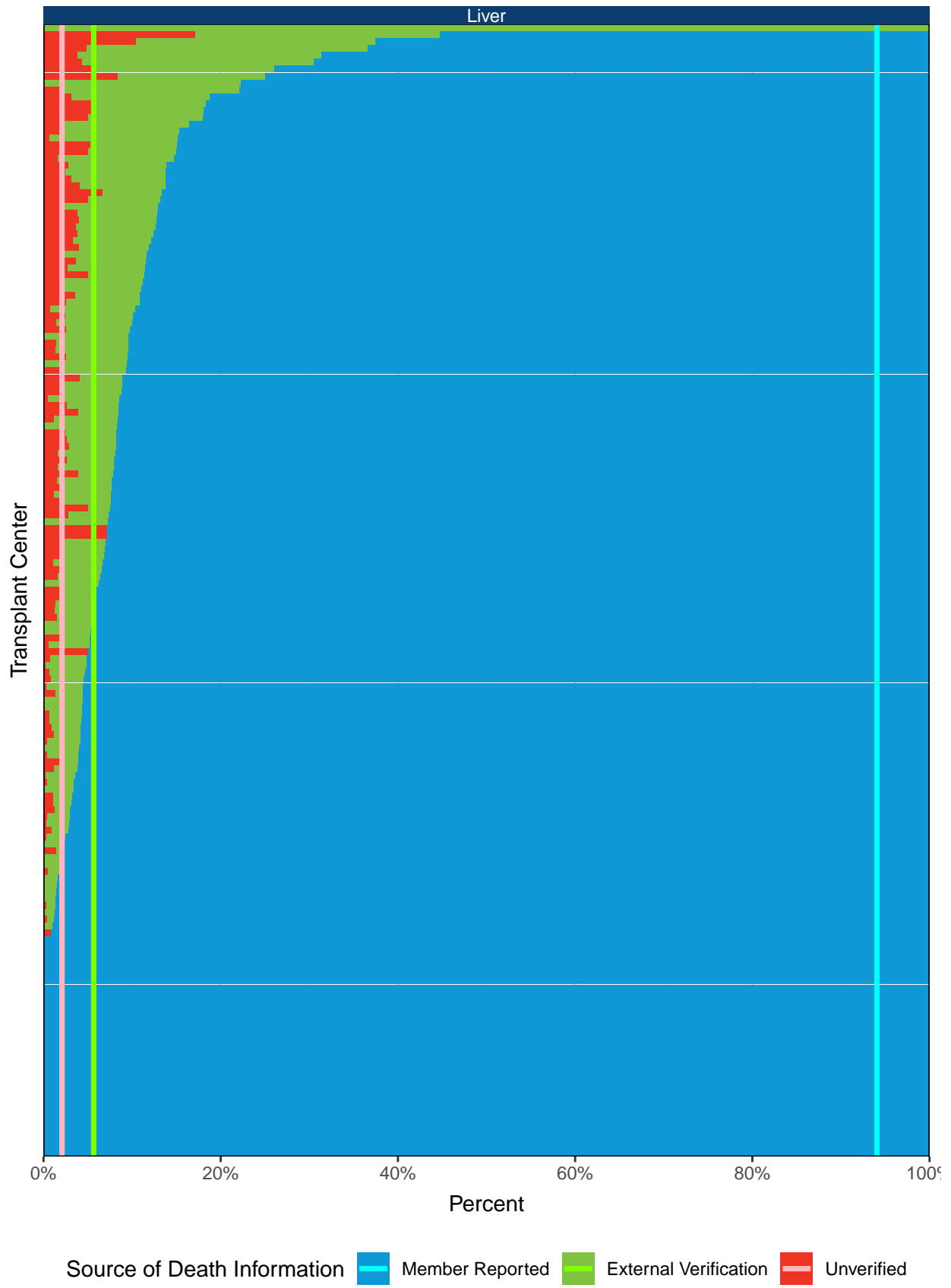
Source of Death Information	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	50.0%	90.6%	92.5%	96.4%	100.0%	100.0%
External Verification	0.6%	2.4%	9.7%	4.7%	12.3%	100.0%
Unverified	0.2%	0.7%	2.3%	1.4%	3.1%	12.5%
Organ = Kidney						
Member Reported	35.2%	67.5%	74.0%	75.7%	81.9%	100.0%
External Verification	1.9%	16.1%	22.9%	20.7%	28.3%	55.6%
Unverified	0.2%	1.8%	4.9%	3.4%	6.5%	33.3%
Organ = Kidney-Pancreas						
Member Reported	25.0%	69.0%	77.9%	79.6%	86.9%	100.0%
External Verification	4.5%	13.7%	22.4%	19.5%	27.1%	100.0%
Unverified	0.6%	2.4%	6.3%	4.3%	8.0%	33.3%
Organ = Liver						
Member Reported	55.3%	89.9%	92.6%	94.1%	98.3%	100.0%
External Verification	0.7%	3.7%	8.0%	5.7%	8.9%	100.0%
Unverified	0.2%	1.1%	2.6%	2.1%	3.6%	17.1%
Organ = Lung						
Member Reported	84.4%	97.9%	98.2%	99.1%	100.0%	100.0%
External Verification	0.2%	0.9%	2.7%	1.6%	2.6%	15.6%
Unverified	0.1%	0.3%	0.7%	0.5%	0.6%	2.5%
Organ = Pancreas						
Member Reported	25.0%	68.6%	79.9%	81.8%	96.1%	100.0%
External Verification	2.1%	14.2%	23.7%	20.5%	33.3%	100.0%
Unverified	0.5%	4.0%	13.4%	8.0%	20.0%	50.0%
TOTAL						
Member Reported	41.3%	72.6%	79.8%	81.9%	88.6%	100.0%
External Verification	0.8%	10.3%	18.3%	16.1%	24.2%	53.3%
Unverified	0.2%	1.4%	3.9%	2.7%	4.9%	25.0%

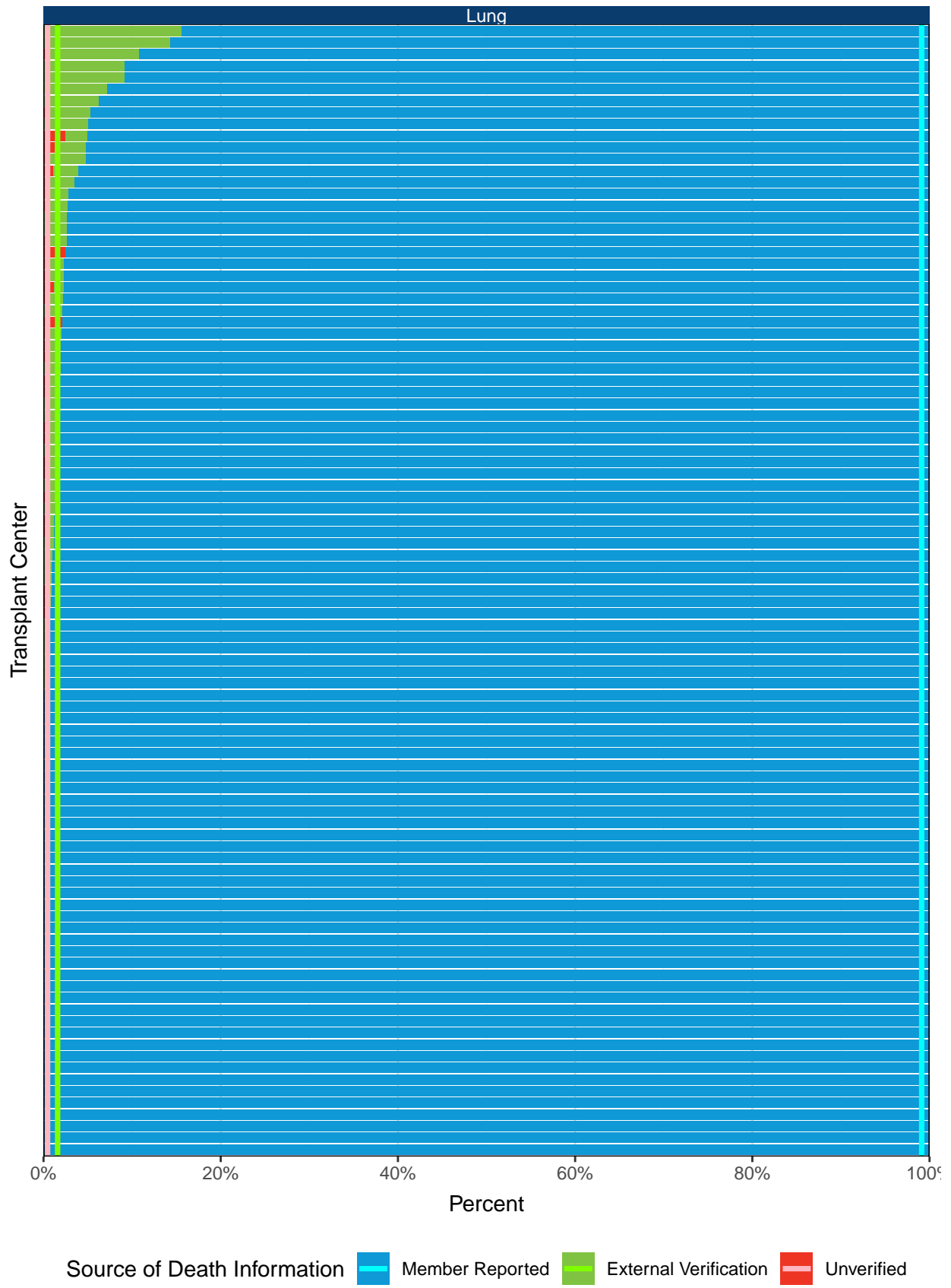
Figure 33: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, recipient transplant center, and source of death information. Vertical lines represent medians across centers.

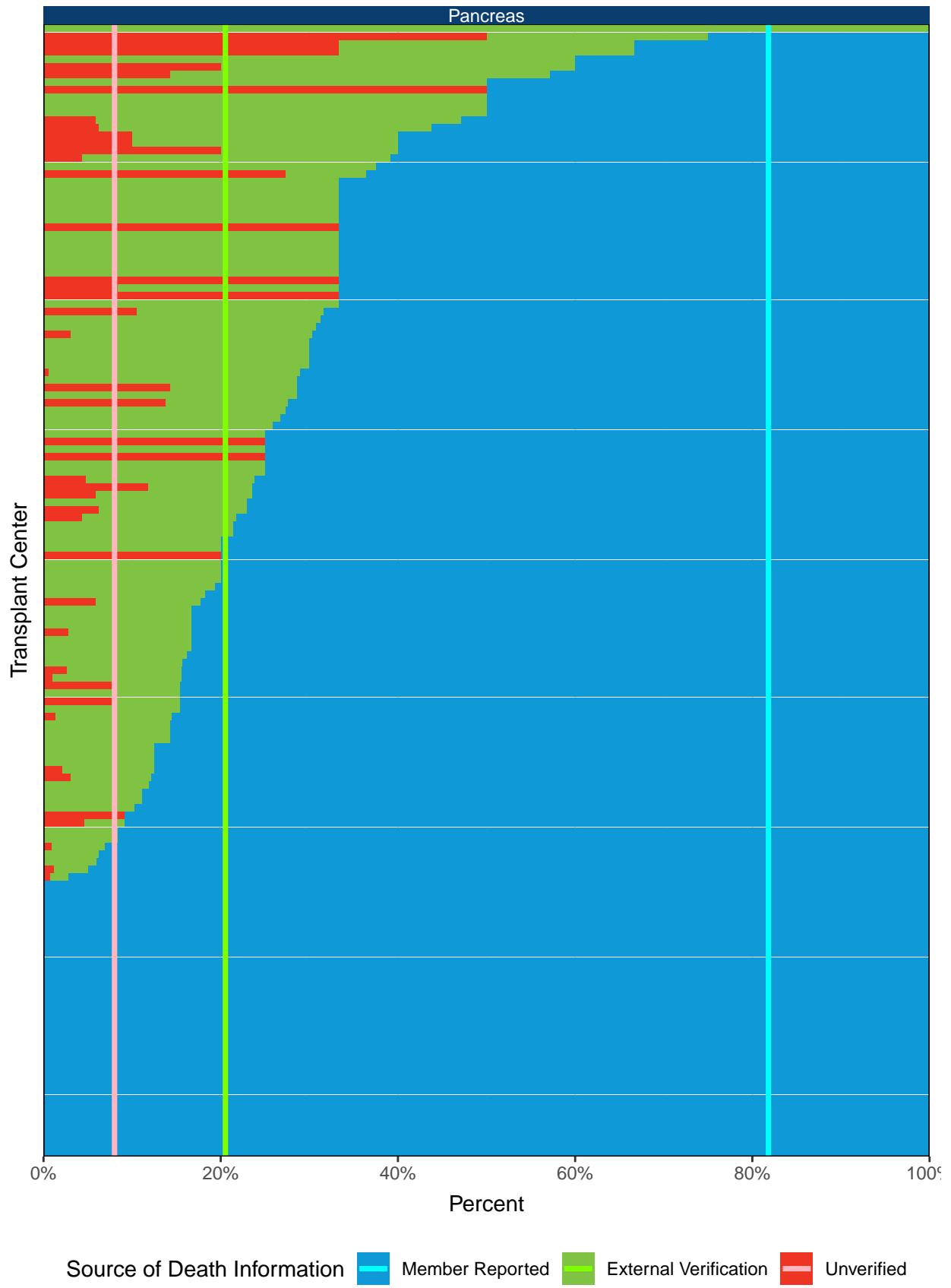












Waitlist Registrations, Not Removed for Transplant

Because there were few deaths for heart-lung and intestine waitlist registrations from externally verified sources or unverified, these organs will be excluded in the graphics and tables in the rest of this section.

Table 37: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ and source of death information.

Organ	Member Reported		External Verification		Unverified	
	N	%	N	%	N	%
Heart	10781	74.1%	3360	23.1%	409	2.8%
Heart-Lung	436	87.6%	57	11.4%	5	1.0%
Intestine	548	91.2%	50	8.3%	3	0.5%
Kidney	121150	70.0%	44938	26.0%	6889	4.0%
Kidney-Pancreas	4838	79.4%	1102	18.1%	151	2.5%
Liver	44347	73.4%	14022	23.2%	2042	3.4%
Lung	7049	79.0%	1695	19.0%	183	2.0%
Pancreas	2812	77.1%	757	20.8%	79	2.2%
TOTAL	191961	71.7%	65981	24.6%	9761	3.6%

There was a substantial uptick in deaths for waitlist registrations removed 2005 and later from member-reported death sources. A more gradual increase in externally verified deaths was seen for waitlist registrations removed from 2012 on, which coincides with changes to this process that occurred at this time. The corresponding table is included in the Appendix.

The large majority of deaths across all organs from member-reported sources were for waitlist registrations while they were still on the waiting list (Figure 35). There was a surprising proportion of member-reported waitlist registration deaths reported across organs that were over 5 years from time from removal to death (12%). Most waitlist registration deaths from externally verified and unverified sources were over a year from removal and death.

Figure 34: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. Top panel contains all organs and total, bottom panel excludes kidney and total trends.

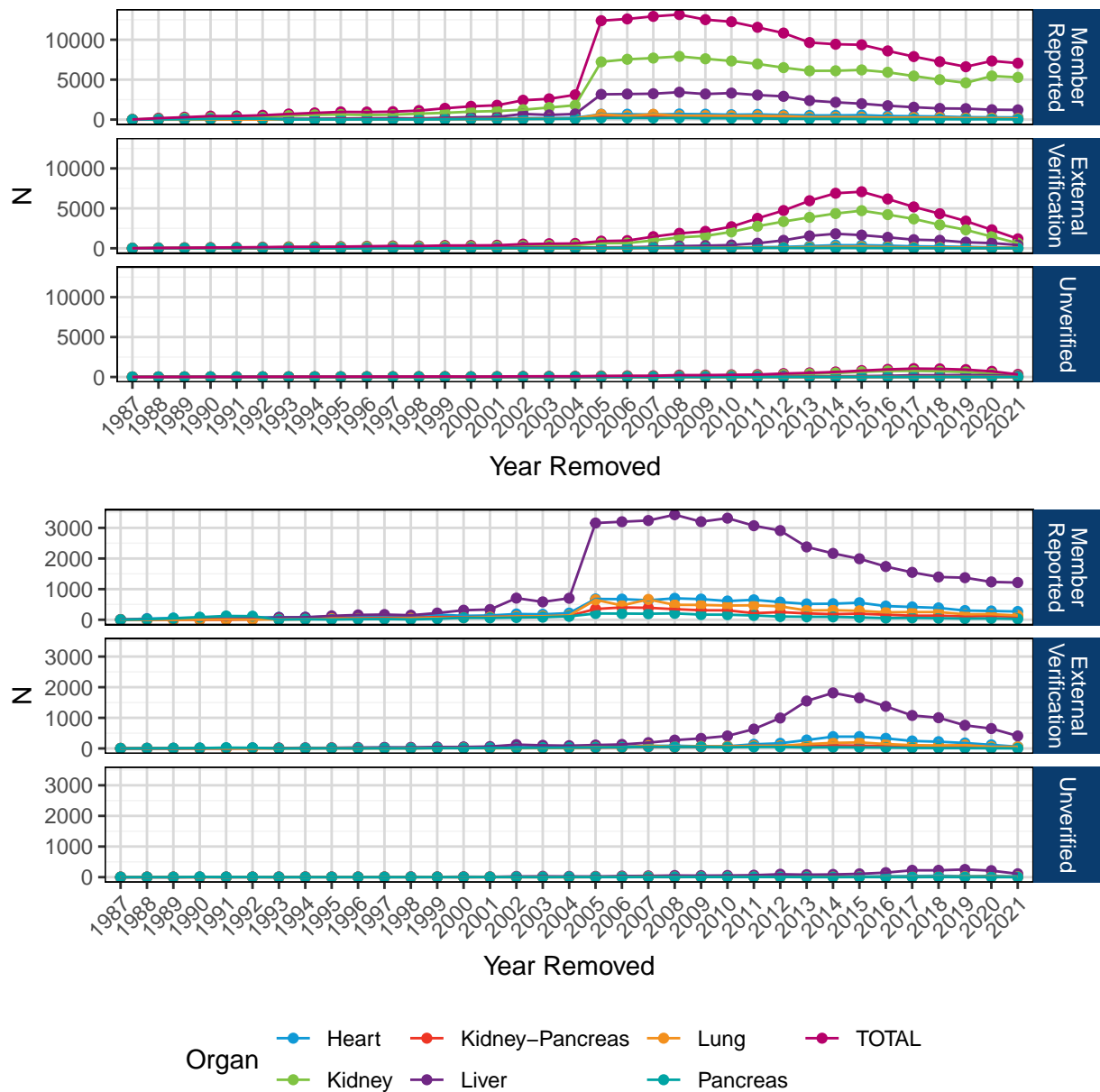
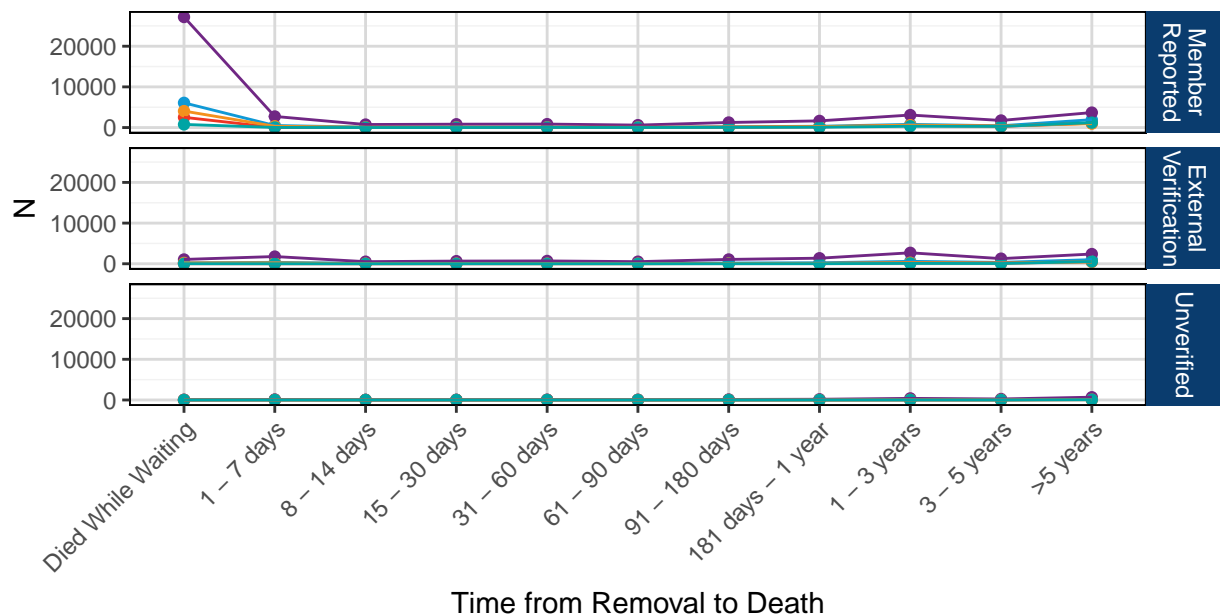
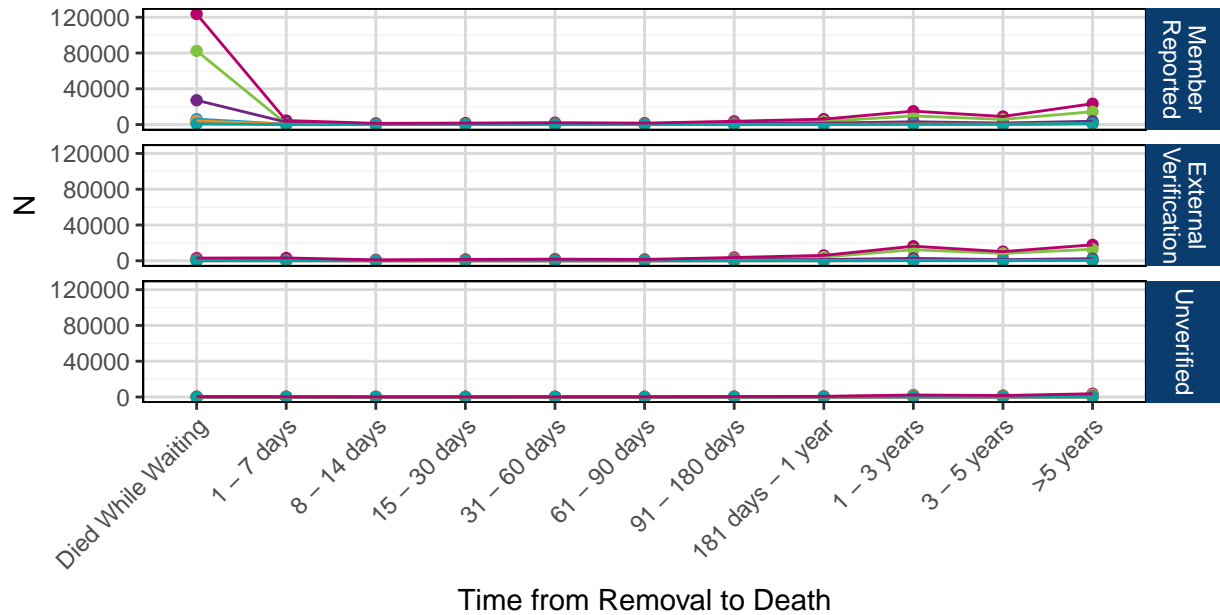


Figure 35: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, time from removal to death, and source of death information. Top panel contains all organs and total, bottom panel excludes kidney and total trends.



Organ

- Heart
- Kidney-Pancreas
- Lung
- TOTAL
- Kidney
- Liver
- Pancreas

Table 38: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, time from removal to death, and source of death information.

Time from Removal to Death	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Died While Waiting	6080	56.4%	237	7.1%	11	2.7%
1 - 7 days	501	4.6%	358	10.7%	33	8.1%
8 - 14 days	115	1.1%	98	2.9%	*	*
15 - 30 days	142	1.3%	112	3.3%	11	2.7%
31 - 60 days	136	1.3%	115	3.4%	11	2.7%
61 - 90 days	111	1.0%	78	2.3%	*	*
91 - 180 days	215	2.0%	175	5.2%	16	3.9%
181 days - 1 year	318	2.9%	251	7.5%	31	7.6%
1 - 3 years	786	7.3%	594	17.7%	65	15.9%
3 - 5 years	442	4.1%	333	9.9%	42	10.3%
>5 years	1935	17.9%	1009	30.0%	175	42.8%
Organ = Kidney						
Died While Waiting	82396	68.0%	1454	3.2%	256	3.7%
1 - 7 days	854	0.7%	764	1.7%	67	1.0%
8 - 14 days	364	0.3%	342	0.8%	48	0.7%
15 - 30 days	582	0.5%	653	1.5%	71	1.0%
31 - 60 days	929	0.8%	948	2.1%	99	1.4%
61 - 90 days	767	0.6%	850	1.9%	87	1.3%
91 - 180 days	1941	1.6%	2280	5.1%	264	3.8%
181 days - 1 year	3564	2.9%	4168	9.3%	502	7.3%
1 - 3 years	9606	7.9%	12373	27.5%	1687	24.5%
3 - 5 years	5820	4.8%	8223	18.3%	1286	18.7%
>5 years	14327	11.8%	12883	28.7%	2522	36.6%
Organ = Kidney-Pancreas						
Died While Waiting	2517	52.0%	27	2.5%	*	*
1 - 7 days	22	0.5%	12	1.1%	*	*
8 - 14 days	14	0.3%	*	*	*	*
15 - 30 days	23	0.5%	*	*	*	*
31 - 60 days	35	0.7%	11	1.0%	*	*
61 - 90 days	41	0.8%	18	1.6%	*	*
91 - 180 days	84	1.7%	53	4.8%	*	*
181 days - 1 year	184	3.8%	76	6.9%	*	*
1 - 3 years	530	11.0%	239	21.7%	17	11.3%
3 - 5 years	317	6.6%	172	15.6%	16	10.6%
>5 years	1071	22.1%	481	43.6%	100	66.2%
Organ = Liver						
Died While Waiting	27174	61.3%	1060	7.6%	60	2.9%
1 - 7 days	2736	6.2%	1777	12.7%	125	6.1%
8 - 14 days	747	1.7%	520	3.7%	43	2.1%
15 - 30 days	826	1.9%	654	4.7%	55	2.7%
31 - 60 days	852	1.9%	697	5.0%	73	3.6%
61 - 90 days	604	1.4%	522	3.7%	61	3.0%
91 - 180 days	1251	2.8%	1069	7.6%	129	6.3%
181 days - 1 year	1648	3.7%	1369	9.8%	177	8.7%
1 - 3 years	3077	6.9%	2696	19.2%	393	19.2%
3 - 5 years	1746	3.9%	1263	9.0%	248	12.1%

Table 38: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, time from removal to death, and source of death information. (continued)

Time from Removal to Death	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
>5 years	3686	8.3%	2395	17.1%	678	33.2%
Organ = Lung						
Died While Waiting	4057	57.6%	212	12.5%	10	5.5%
1 - 7 days	320	4.5%	233	13.7%	20	10.9%
8 - 14 days	91	1.3%	42	2.5%	*	*
15 - 30 days	92	1.3%	46	2.7%	*	*
31 - 60 days	94	1.3%	35	2.1%	*	*
61 - 90 days	68	1.0%	30	1.8%	*	*
91 - 180 days	142	2.0%	87	5.1%	*	*
181 days - 1 year	244	3.5%	114	6.7%	*	*
1 - 3 years	592	8.4%	257	15.2%	28	15.3%
3 - 5 years	386	5.5%	176	10.4%	19	10.4%
>5 years	963	13.7%	463	27.3%	72	39.3%
Organ = Pancreas						
Died While Waiting	772	27.5%	14	1.8%	*	*
1 - 7 days	26	0.9%	*	*	*	*
8 - 14 days	11	0.4%	*	*	*	*
15 - 30 days	12	0.4%	*	*	*	*
31 - 60 days	30	1.1%	*	*	*	*
61 - 90 days	17	0.6%	*	*	*	*
91 - 180 days	42	1.5%	*	*	*	*
181 days - 1 year	84	3.0%	21	2.8%	*	*
1 - 3 years	320	11.4%	83	11.0%	*	*
3 - 5 years	290	10.3%	60	7.9%	*	*
>5 years	1208	43.0%	554	73.2%	67	84.8%
TOTAL						
Died While Waiting	123610	64.4%	3020	4.6%	342	3.5%
1 - 7 days	4502	2.3%	3165	4.8%	246	2.5%
8 - 14 days	1356	0.7%	1009	1.5%	108	1.1%
15 - 30 days	1686	0.9%	1484	2.2%	142	1.5%
31 - 60 days	2094	1.1%	1814	2.7%	187	1.9%
61 - 90 days	1612	0.8%	1501	2.3%	160	1.6%
91 - 180 days	3692	1.9%	3673	5.6%	422	4.3%
181 days - 1 year	6074	3.2%	6004	9.1%	725	7.4%
1 - 3 years	14973	7.8%	16257	24.6%	2200	22.5%
3 - 5 years	9042	4.7%	10234	15.5%	1611	16.5%
>5 years	23320	12.1%	17820	27.0%	3618	37.1%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

For all organs except pancreas, over 50% of waitlist registrations with member-reported deaths had a removal reason of “Died”. Externally verified deaths for heart, kidney, liver, and lung waitlist registrations were most often removed for “Candidate condition deteriorated, too sick to transplant” followed by “Other”. Externally verified deaths for kidney-pancreas and pancreas waitlist registrations were most often removed for “Other”. Unverified deaths were similarly distributed for heart, kidney, liver, and lung waitlist registrations between “Candidate condition deteriorated, too sick to transplant” and “Other”, while unverified deaths for kidney-pancreas and pancreas waitlist registrations were for “Other” removal reason over 50% of the time.

Figure 36: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, removal reason, and source of death information.

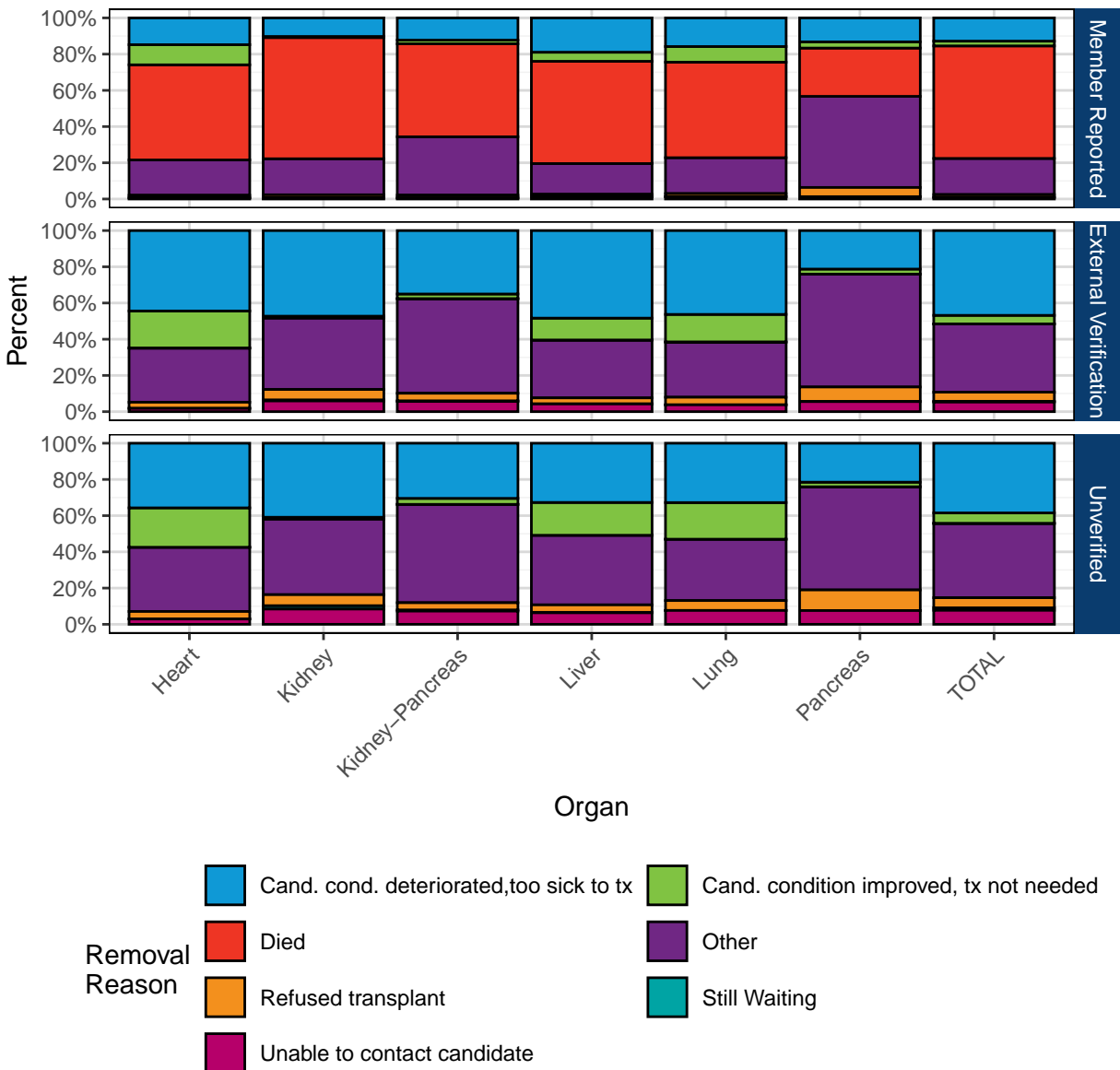


Table 39: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, removal reason, and source of death information.

Removal Reason	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Cand. cond. deteriorated,too sick to tx	1594	14.8%	1492	44.4%	146	35.7%
Cand. condition improved, tx not needed	1199	11.1%	686	20.4%	89	21.8%
Died	5665	52.5%	*	*	*	*
Other	2102	19.5%	1003	29.9%	145	35.5%
Refused transplant	155	1.4%	112	3.3%	17	4.2%
Still Waiting	*	*	*	*	*	*
Unable to contact candidate	65	0.6%	60	1.8%	12	2.9%
Organ = Kidney						
Cand. cond. deteriorated,too sick to tx	12411	10.2%	21242	47.3%	2817	40.9%
Cand. condition improved, tx not needed	733	0.6%	411	0.9%	54	0.8%
Died	81082	66.9%	14	0.0%	*	*
Other	24120	19.9%	17768	39.5%	2882	41.8%
Refused transplant	1855	1.5%	2578	5.7%	418	6.1%
Still Waiting	77	0.1%	273	0.6%	129	1.9%
Unable to contact candidate	872	0.7%	2652	5.9%	580	8.4%
Organ = Kidney-Pancreas						
Cand. cond. deteriorated,too sick to tx	594	12.3%	386	35.0%	46	30.5%
Cand. condition improved, tx not needed	97	2.0%	28	2.5%	*	*
Died	2485	51.4%	*	*	*	*
Other	1560	32.2%	575	52.2%	82	54.3%
Refused transplant	72	1.5%	46	4.2%	*	*
Still Waiting	*	*	*	*	*	*
Unable to contact candidate	28	0.6%	62	5.6%	11	7.3%
Organ = Liver						
Cand. cond. deteriorated,too sick to tx	8401	18.9%	6781	48.4%	668	32.7%
Cand. condition improved, tx not needed	2227	5.0%	1692	12.1%	370	18.1%
Died	25038	56.5%	*	*	*	*
Other	7532	17.0%	4481	32.0%	785	38.4%
Refused transplant	556	1.3%	455	3.2%	84	4.1%
Still Waiting	*	*	16	0.1%	*	*
Unable to contact candidate	593	1.3%	594	4.2%	130	6.4%
Organ = Lung						
Cand. cond. deteriorated,too sick to tx	1114	15.8%	785	46.3%	60	32.8%
Cand. condition improved, tx not needed	610	8.7%	257	15.2%	37	20.2%
Died	3717	52.7%	*	*	*	*
Other	1398	19.8%	516	30.4%	62	33.9%
Refused transplant	117	1.7%	71	4.2%	10	5.5%
Still Waiting	*	*	*	*	*	*
Unable to contact candidate	91	1.3%	64	3.8%	14	7.7%
Organ = Pancreas						
Cand. cond. deteriorated,too sick to tx	372	13.2%	161	21.3%	17	21.5%
Cand. condition improved, tx not needed	96	3.4%	21	2.8%	*	*
Died	750	26.7%	*	*	*	*
Other	1415	50.3%	472	62.4%	45	57.0%
Refused transplant	143	5.1%	60	7.9%	*	*

Table 39: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, removal reason, and source of death information. (*continued*)

Removal Reason	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Still Waiting	*	*	*	*	*	*
Unable to contact candidate	36	1.3%	42	5.5%	*	*
TOTAL						
Cand. cond. deteriorated, too sick to tx	24623	12.8%	30895	46.8%	3757	38.5%
Cand. condition improved, tx not needed	5044	2.6%	3112	4.7%	559	5.7%
Died	119311	62.2%	24	0.0%	*	*
Other	38300	20.0%	24844	37.7%	4003	41.0%
Refused transplant	2914	1.5%	3329	5.0%	544	5.6%
Still Waiting	82	0.0%	297	0.5%	135	1.4%
Unable to contact candidate	1687	0.9%	3480	5.3%	754	7.7%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Again the majority of kidney-pancreas and pancreas waitlist registrations across all death sources were between ages 35-49 at time of removal. For heart, kidney, liver, and lung waitlist registrations across all death sources, the largest proportions of deaths were for ages 50-64 at time of removal. Particularly for heart, kidney, and liver waitlist registrations, 28% of externally verified and unverified sources of death were for ages 65 and older at time of removal.

Figure 37: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate age at removal, and source of death information.

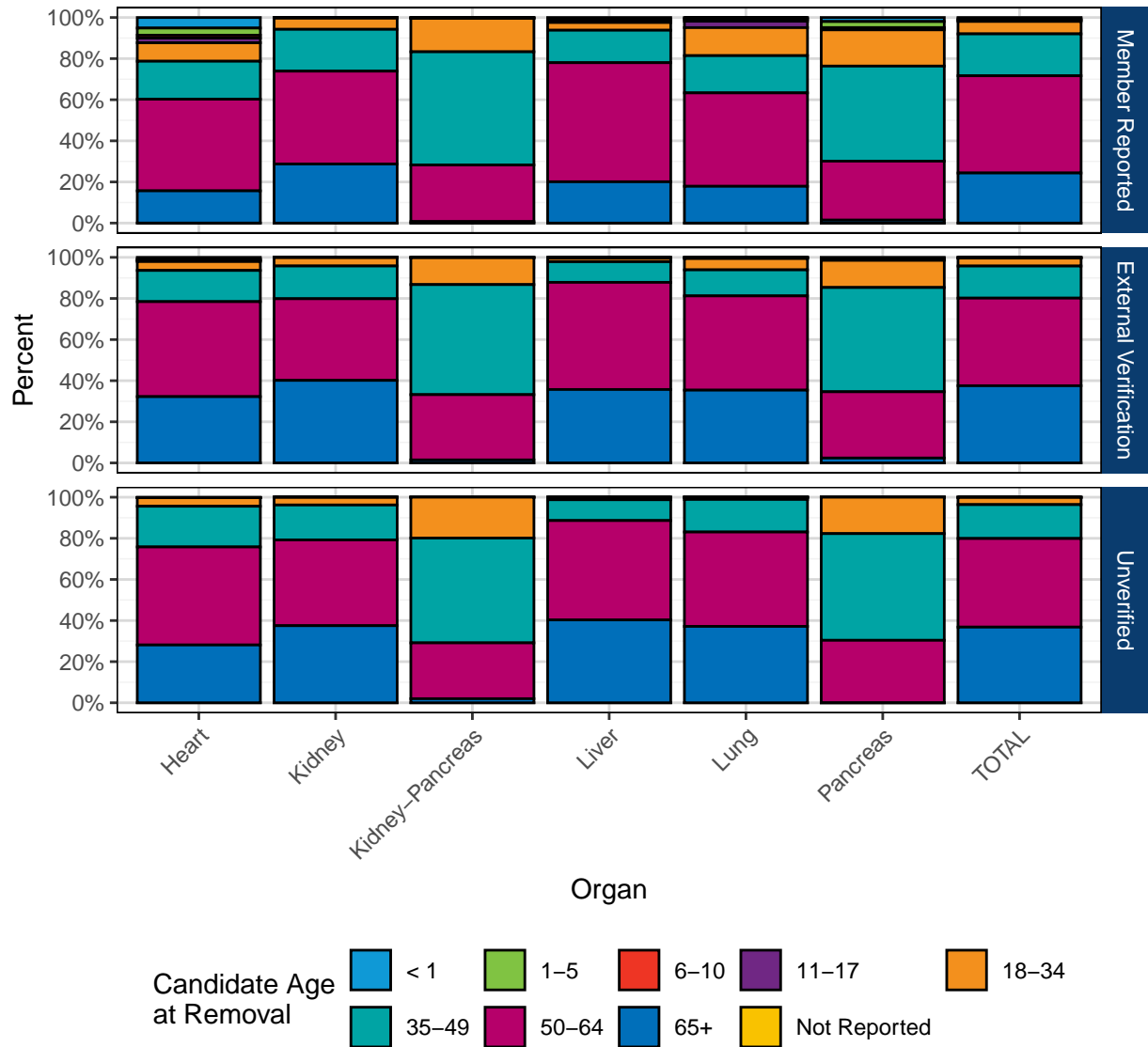


Table 40: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate age at removal, and source of death information.

Candidate Age at Removal (years)	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
< 1	554	5.1%	23	0.7%	*	*
1-5	373	3.5%	21	0.6%	*	*
6-10	152	1.4%	10	0.3%	*	*
11-17	246	2.3%	15	0.4%	*	*
18-34	969	9.0%	145	4.3%	17	4.2%
35-49	1991	18.5%	510	15.2%	81	19.8%
50-64	4806	44.6%	1553	46.2%	195	47.7%
65+	1688	15.7%	1083	32.2%	115	28.1%
Not Reported	*	*	*	*	*	*
Organ = Kidney						
< 1	*	*	*	*	*	*
1-5	102	0.1%	*	*	*	*
6-10	72	0.1%	13	0.0%	*	*
11-17	237	0.2%	53	0.1%	*	*
18-34	6554	5.4%	1820	4.1%	253	3.7%
35-49	24663	20.4%	7153	15.9%	1170	17.0%
50-64	54720	45.2%	17850	39.7%	2875	41.7%
65+	34796	28.7%	18042	40.1%	2583	37.5%
Not Reported	*	*	*	*	*	*
Organ = Kidney-Pancreas						
< 1	*	*	*	*	*	*
1-5	12	0.2%	*	*	*	*
6-10	*	*	*	*	*	*
11-17	*	*	*	*	*	*
18-34	786	16.2%	144	13.1%	30	19.9%
35-49	2664	55.1%	590	53.5%	77	51.0%
50-64	1332	27.5%	350	31.8%	41	27.2%
65+	35	0.7%	16	1.5%	*	*
Not Reported	*	*	*	*	*	*
Organ = Liver						
< 1	350	0.8%	15	0.1%	*	*
1-5	356	0.8%	13	0.1%	*	*
6-10	127	0.3%	10	0.1%	*	*
11-17	246	0.6%	26	0.2%	*	*
18-34	1668	3.8%	234	1.7%	22	1.1%
35-49	7004	15.8%	1407	10.0%	207	10.1%
50-64	25683	57.9%	7308	52.1%	987	48.3%
65+	8913	20.1%	5009	35.7%	823	40.3%
Not Reported	*	*	*	*	*	*
Organ = Lung						
< 1	20	0.3%	*	*	*	*
1-5	42	0.6%	*	*	*	*
6-10	66	0.9%	*	*	*	*
11-17	219	3.1%	*	*	*	*
18-34	961	13.6%	93	5.5%	*	*

Table 40: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate age at removal, and source of death information. (*continued*)

Candidate Age at Removal (years)	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
35-49	1277	18.1%	215	12.7%	29	15.8%
50-64	3203	45.4%	777	45.8%	84	45.9%
65+	1261	17.9%	600	35.4%	68	37.2%
Not Reported	*	*	*	*	*	*
Organ = Pancreas						
< 1	55	2.0%	*	*	*	*
1-5	83	3.0%	*	*	*	*
6-10	*	*	*	*	*	*
11-17	23	0.8%	*	*	*	*
18-34	496	17.6%	100	13.2%	14	17.7%
35-49	1300	46.2%	384	50.7%	41	51.9%
50-64	807	28.7%	244	32.2%	24	30.4%
65+	40	1.4%	18	2.4%	*	*
Not Reported	*	*	*	*	*	*
TOTAL						
< 1	1098	0.6%	44	0.1%	*	*
1-5	1106	0.6%	56	0.1%	*	*
6-10	447	0.2%	35	0.1%	*	*
11-17	1039	0.5%	106	0.2%	*	*
18-34	11602	6.0%	2552	3.9%	339	3.5%
35-49	39118	20.4%	10296	15.6%	1609	16.5%
50-64	90795	47.3%	28113	42.6%	4208	43.1%
65+	46754	24.4%	24779	37.6%	3592	36.8%
Not Reported	*	*	*	*	*	*

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Overall, approximately 25% of waitlist registrations for each death source are Black, Non-Hispanic, while 15% of member-reported and externally verified death sources and 25% of unverified death sources are Hispanic/Latino. These proportions varied by organ; however, within each organ type, there was a higher proportion of unverified deaths that were Hispanic/Latino compared to member reported and externally verified. Kidney waitlist registration deaths had the highest proportions of Black, Non-Hispanics across death sources, while liver waitlist registration deaths had the lowest.

Figure 38: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate race/ethnicity, and source of death information.

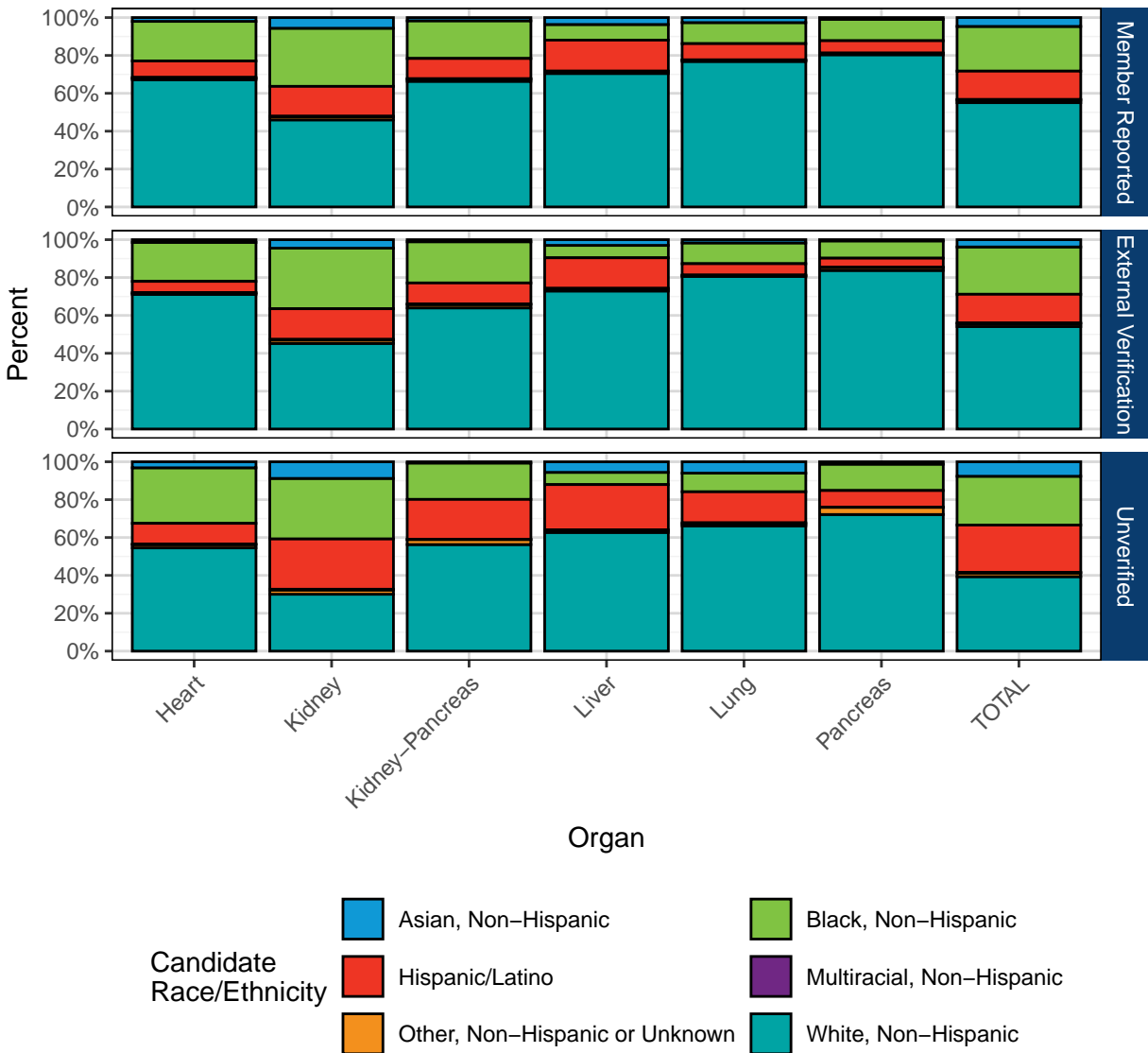


Table 41: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate race/ethnicity, and source of death information.

Candidate Race/Ethnicity	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Asian, Non-Hispanic	216	2.0%	48	1.4%	13	3.2%
Black, Non-Hispanic	2256	20.9%	692	20.6%	120	29.3%
Hispanic/Latino	935	8.7%	198	5.9%	45	11.0%
Multiracial, Non-Hispanic	43	0.4%	13	0.4%	*	*
Other, Non-Hispanic or Unknown	85	0.8%	20	0.6%	*	*
White, Non-Hispanic	7246	67.2%	2389	71.1%	223	54.5%
Organ = Kidney						
Asian, Non-Hispanic	6828	5.6%	2023	4.5%	606	8.8%
Black, Non-Hispanic	37192	30.7%	14366	32.0%	2203	32.0%
Hispanic/Latino	19114	15.8%	7276	16.2%	1829	26.5%
Multiracial, Non-Hispanic	387	0.3%	160	0.4%	30	0.4%
Other, Non-Hispanic or Unknown	1949	1.6%	806	1.8%	151	2.2%
White, Non-Hispanic	55680	46.0%	20307	45.2%	2070	30.0%
Organ = Kidney-Pancreas						
Asian, Non-Hispanic	82	1.7%	12	1.1%	*	*
Black, Non-Hispanic	963	19.9%	240	21.8%	29	19.2%
Hispanic/Latino	517	10.7%	122	11.1%	32	21.2%
Multiracial, Non-Hispanic	11	0.2%	*	*	*	*
Other, Non-Hispanic or Unknown	55	1.1%	19	1.7%	*	*
White, Non-Hispanic	3210	66.3%	705	64.0%	85	56.3%
Organ = Liver						
Asian, Non-Hispanic	1621	3.7%	423	3.0%	114	5.6%
Black, Non-Hispanic	3663	8.3%	919	6.6%	132	6.5%
Hispanic/Latino	7254	16.4%	2260	16.1%	489	23.9%
Multiracial, Non-Hispanic	125	0.3%	56	0.4%	*	*
Other, Non-Hispanic or Unknown	431	1.0%	142	1.0%	21	1.0%
White, Non-Hispanic	31253	70.5%	10222	72.9%	1280	62.7%
Organ = Lung						
Asian, Non-Hispanic	187	2.7%	29	1.7%	11	6.0%
Black, Non-Hispanic	784	11.1%	186	11.0%	18	9.8%
Hispanic/Latino	603	8.6%	102	6.0%	30	16.4%
Multiracial, Non-Hispanic	17	0.2%	*	*	*	*
Other, Non-Hispanic or Unknown	42	0.6%	10	0.6%	*	*
White, Non-Hispanic	5416	76.8%	1365	80.5%	121	66.1%
Organ = Pancreas						
Asian, Non-Hispanic	26	0.9%	*	*	*	*
Black, Non-Hispanic	318	11.3%	69	9.1%	11	13.9%
Hispanic/Latino	184	6.5%	37	4.9%	*	*
Multiracial, Non-Hispanic	*	*	*	*	*	*
Other, Non-Hispanic or Unknown	22	0.8%	12	1.6%	*	*
White, Non-Hispanic	2260	80.4%	634	83.8%	57	72.2%
TOTAL						
Asian, Non-Hispanic	8983	4.7%	2542	3.9%	747	7.7%
Black, Non-Hispanic	45330	23.6%	16488	25.0%	2514	25.8%
Hispanic/Latino	28750	15.0%	10001	15.2%	2435	24.9%

Table 41: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate race/ethnicity, and source of death information. *(continued)*

Candidate Race/Ethnicity	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Multiracial, Non-Hispanic	589	0.3%	236	0.4%	38	0.4%
Other, Non-Hispanic or Unknown	2600	1.4%	1012	1.5%	188	1.9%
White, Non-Hispanic	105709	55.1%	35702	54.1%	3839	39.3%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Lung waitlist registrations across all death sources were more often female, as were kidney-pancreas waitlist registrations from unverified death sources.

Figure 39: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate gender, and source of death information.

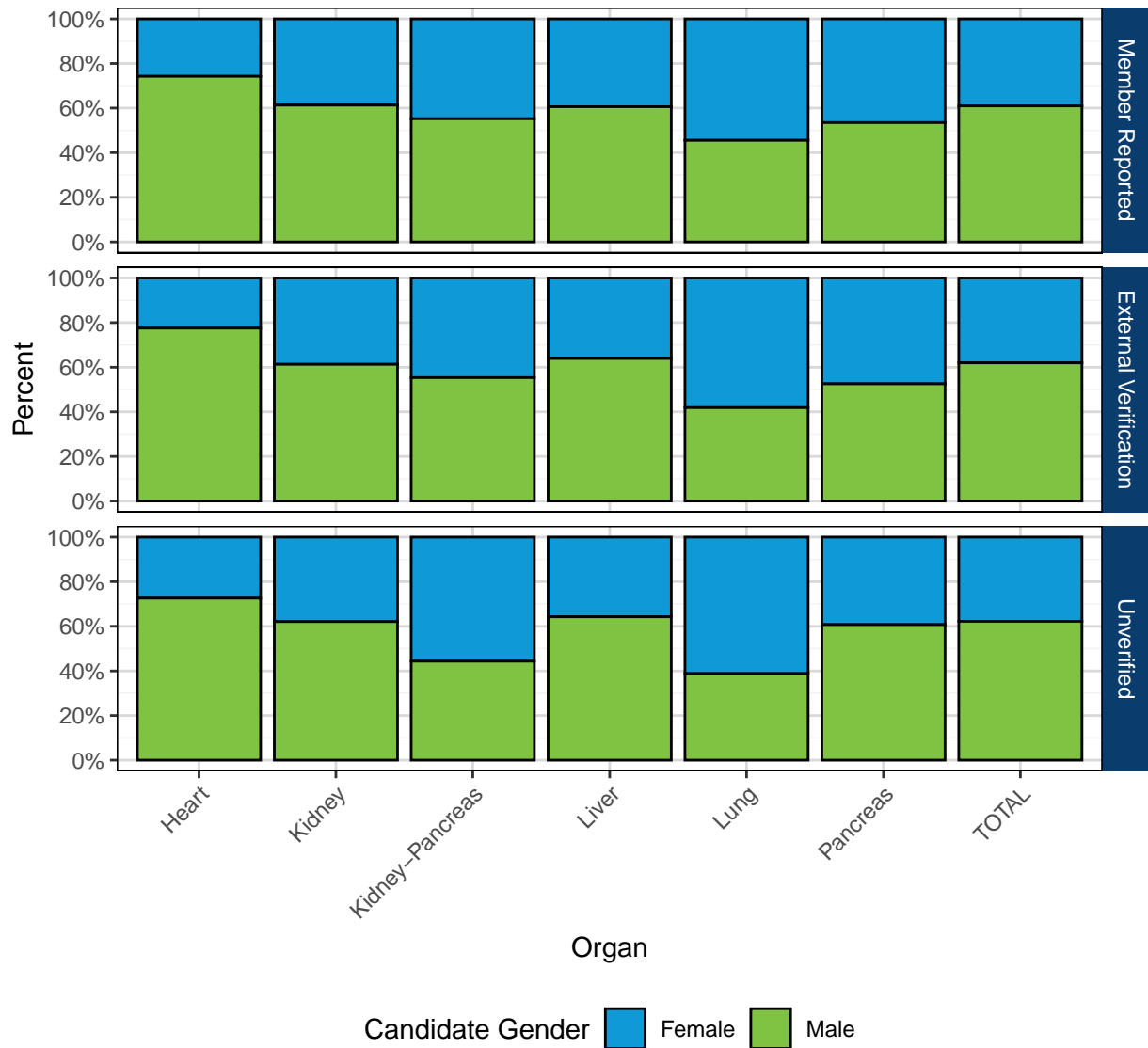


Table 42: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate gender, and source of death information.

Candidate Gender	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Female	2779	25.8%	755	22.5%	112	27.4%
Male	8002	74.2%	2605	77.5%	297	72.6%
Organ = Kidney						
Female	46883	38.7%	17379	38.7%	2610	37.9%
Male	74267	61.3%	27559	61.3%	4279	62.1%
Organ = Kidney-Pancreas						
Female	2167	44.8%	492	44.6%	84	55.6%
Male	2671	55.2%	610	55.4%	67	44.4%
Organ = Liver						
Female	17473	39.4%	5058	36.1%	730	35.7%
Male	26874	60.6%	8964	63.9%	1312	64.3%
Organ = Lung						
Female	3839	54.5%	985	58.1%	112	61.2%
Male	3210	45.5%	710	41.9%	71	38.8%
Organ = Pancreas						
Female	1308	46.5%	359	47.4%	31	39.2%
Male	1504	53.5%	398	52.6%	48	60.8%
TOTAL						
Female	74951	39.0%	25086	38.0%	3685	37.8%
Male	117010	61.0%	40895	62.0%	6076	62.2%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

There were no consistent patterns across organs or death source for education level; however, the proportions falling within higher and lower education level were fairly evenly distributed. A larger percentage of pancreas waitlist registrations across death sources had unknown/not reported statuses.

Figure 40: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate education level, and source of death information.

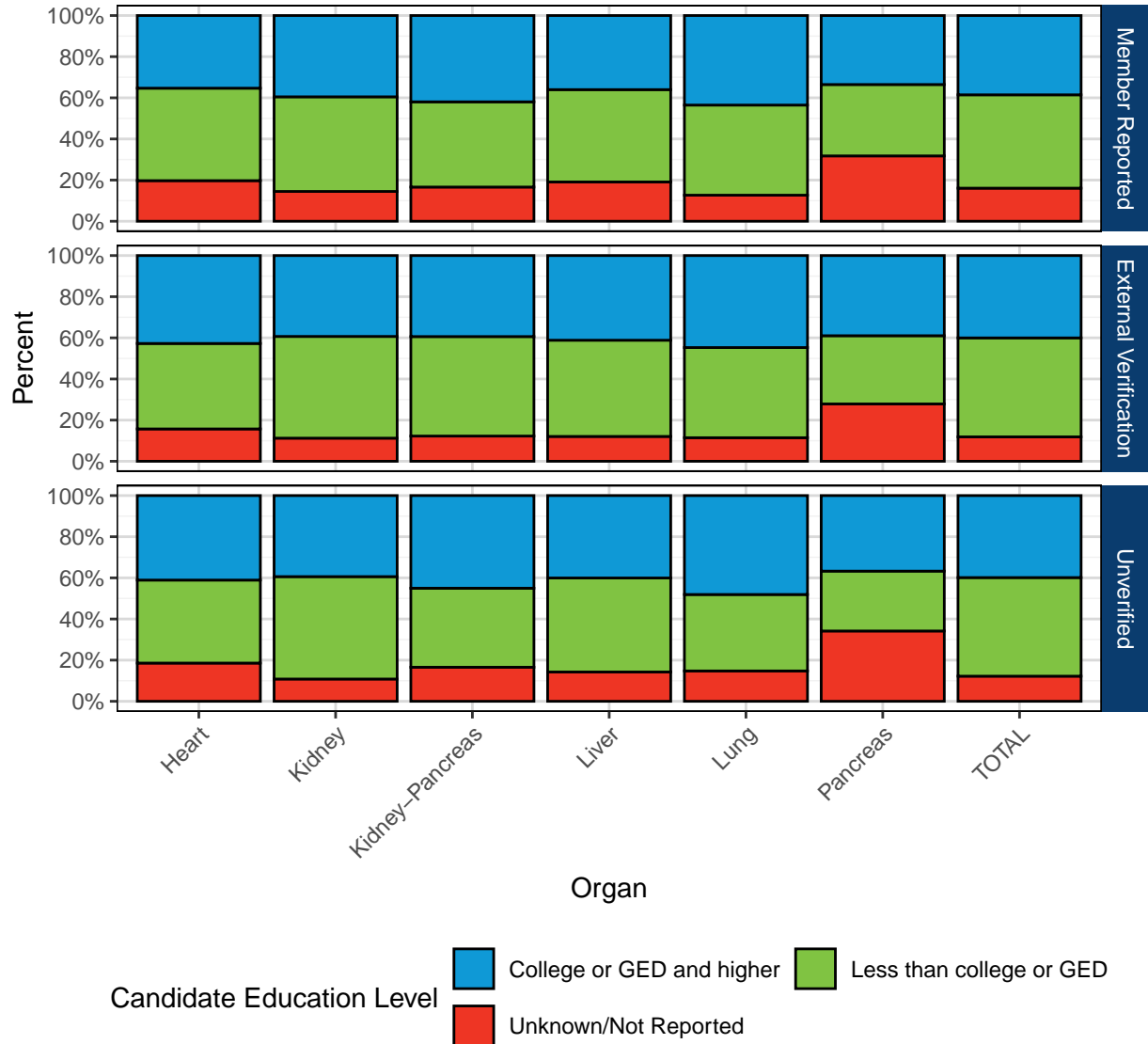


Table 43: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate education level, and source of death information.

Education Level	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
College or GED and higher	3808	35.3%	1436	42.7%	168	41.1%
Less than college or GED	4845	44.9%	1396	41.5%	165	40.3%
Unknown/Not Reported	2128	19.7%	528	15.7%	76	18.6%
Organ = Kidney						
College or GED and higher	47875	39.5%	17670	39.3%	2714	39.4%
Less than college or GED	55736	46.0%	22219	49.4%	3429	49.8%
Unknown/Not Reported	17539	14.5%	5049	11.2%	746	10.8%
Organ = Kidney-Pancreas						
College or GED and higher	2030	42.0%	434	39.4%	68	45.0%
Less than college or GED	2004	41.4%	533	48.4%	58	38.4%
Unknown/Not Reported	804	16.6%	135	12.3%	25	16.6%
Organ = Liver						
College or GED and higher	15973	36.0%	5771	41.2%	818	40.1%
Less than college or GED	19901	44.9%	6559	46.8%	933	45.7%
Unknown/Not Reported	8473	19.1%	1692	12.1%	291	14.3%
Organ = Lung						
College or GED and higher	3068	43.5%	758	44.7%	88	48.1%
Less than college or GED	3088	43.8%	743	43.8%	68	37.2%
Unknown/Not Reported	893	12.7%	194	11.4%	27	14.8%
Organ = Pancreas						
College or GED and higher	943	33.5%	295	39.0%	29	36.7%
Less than college or GED	976	34.7%	251	33.2%	23	29.1%
Unknown/Not Reported	893	31.8%	211	27.9%	27	34.2%
TOTAL						
College or GED and higher	73985	38.5%	26407	40.0%	3890	39.9%
Less than college or GED	87115	45.4%	31751	48.1%	4679	47.9%
Unknown/Not Reported	30861	16.1%	7823	11.9%	1192	12.2%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Pancreas waitlist registrations had larger proportions of unknown or not reported insurance status across death sources. Across organs, more waitlist registrations from externally verified and unverified death sources had public insurance. This was mixed across organs for member-reported deaths; heart, liver, and lung waitlist registrations were more often from private insurance while kidney, kidney-pancreas, and pancreas waitlist registrations had public insurance.

Figure 41: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate primary source of payment at listing, and source of death information.

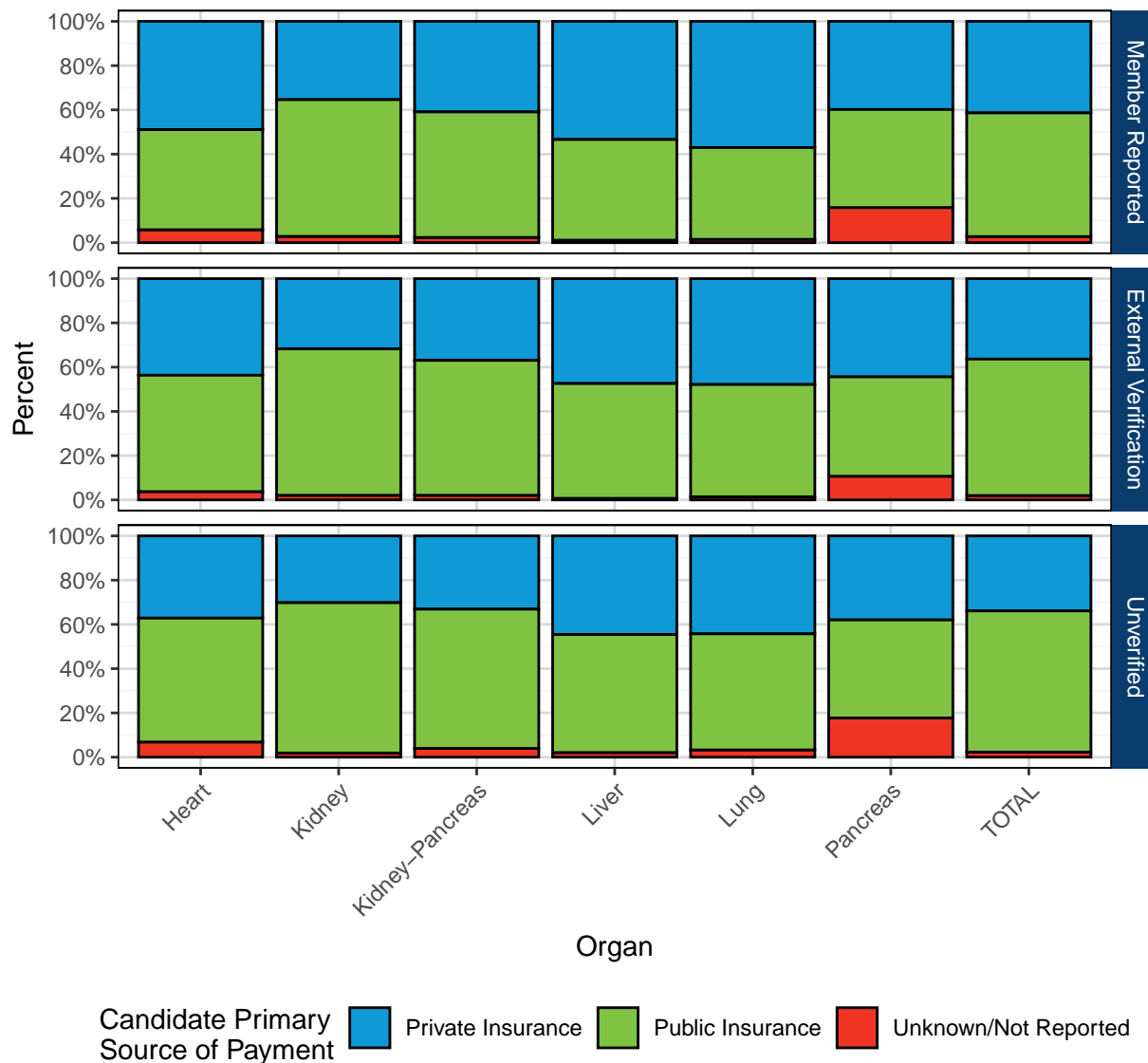


Table 44: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate primary source of payment at listing, and source of death information.

Candidate Primary Source of Payment	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Private Insurance	5274	48.9%	1467	43.7%	152	37.2%
Public Insurance	4879	45.3%	1767	52.6%	229	56.0%
Unknown/Not Reported	628	5.8%	126	3.8%	28	6.8%
Organ = Kidney						
Private Insurance	42876	35.4%	14267	31.7%	2079	30.2%
Public Insurance	74847	61.8%	29732	66.2%	4680	67.9%
Unknown/Not Reported	3427	2.8%	939	2.1%	130	1.9%
Organ = Kidney-Pancreas						
Private Insurance	1980	40.9%	407	36.9%	50	33.1%
Public Insurance	2745	56.7%	672	61.0%	95	62.9%
Unknown/Not Reported	113	2.3%	23	2.1%	*	*
Organ = Liver						
Private Insurance	23675	53.4%	6646	47.4%	910	44.6%
Public Insurance	20176	45.5%	7276	51.9%	1089	53.3%
Unknown/Not Reported	496	1.1%	100	0.7%	43	2.1%
Organ = Lung						
Private Insurance	4019	57.0%	811	47.8%	81	44.3%
Public Insurance	2925	41.5%	860	50.7%	96	52.5%
Unknown/Not Reported	105	1.5%	24	1.4%	*	*
Organ = Pancreas						
Private Insurance	1120	39.8%	336	44.4%	30	38.0%
Public Insurance	1246	44.3%	340	44.9%	35	44.3%
Unknown/Not Reported	446	15.9%	81	10.7%	14	17.7%
TOTAL						
Private Insurance	79394	41.4%	23988	36.4%	3308	33.9%
Public Insurance	107297	55.9%	40697	61.7%	6226	63.8%
Unknown/Not Reported	5270	2.7%	1296	2.0%	227	2.3%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

The table below provides a summary of the distribution of the number of deaths, from each death source, per listing center state for each organ. Across organs and death sources, the number of waitlist registration deaths per state is right-skewed.

Table 45: Summary of number of deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 per listing center state by organ and source of death information. Listing center states for each organ type included if at least one death.

Source of Death Information	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	2	78.00	263.0	182.0	360.00	1085
External Verification	1	31.00	86.2	56.0	125.00	305
Unverified	1	3.00	11.4	6.0	11.50	70
Organ = Kidney						
Member Reported	8	374.00	2472.4	1288.0	3128.00	22897
External Verification	6	194.00	917.1	465.0	1274.00	6316
Unverified	1	19.25	143.5	43.5	114.75	1790
Organ = Kidney-Pancreas						
Member Reported	1	19.50	105.2	67.0	120.00	863
External Verification	1	6.25	26.2	17.0	27.25	181
Unverified	1	1.25	5.0	2.0	5.00	47
Organ = Liver						
Member Reported	4	275.50	1055.9	575.5	1023.75	8051
External Verification	2	84.00	333.9	182.5	309.50	2286
Unverified	1	8.50	52.4	19.0	39.00	633
Organ = Lung						
Member Reported	1	37.75	220.3	150.5	261.50	990
External Verification	1	15.50	54.7	40.0	74.00	208
Unverified	1	2.00	7.6	4.0	7.00	34
Organ = Pancreas						
Member Reported	1	13.75	63.9	32.0	77.75	421
External Verification	1	5.00	18.0	11.5	21.00	103
Unverified	1	1.00	2.9	2.0	3.00	15
TOTAL						
Member Reported	17	558.00	3917.6	2264.0	4892.00	34012
External Verification	8	226.00	1346.6	718.0	1594.00	9281
Unverified	1	26.75	203.4	60.0	182.25	2593

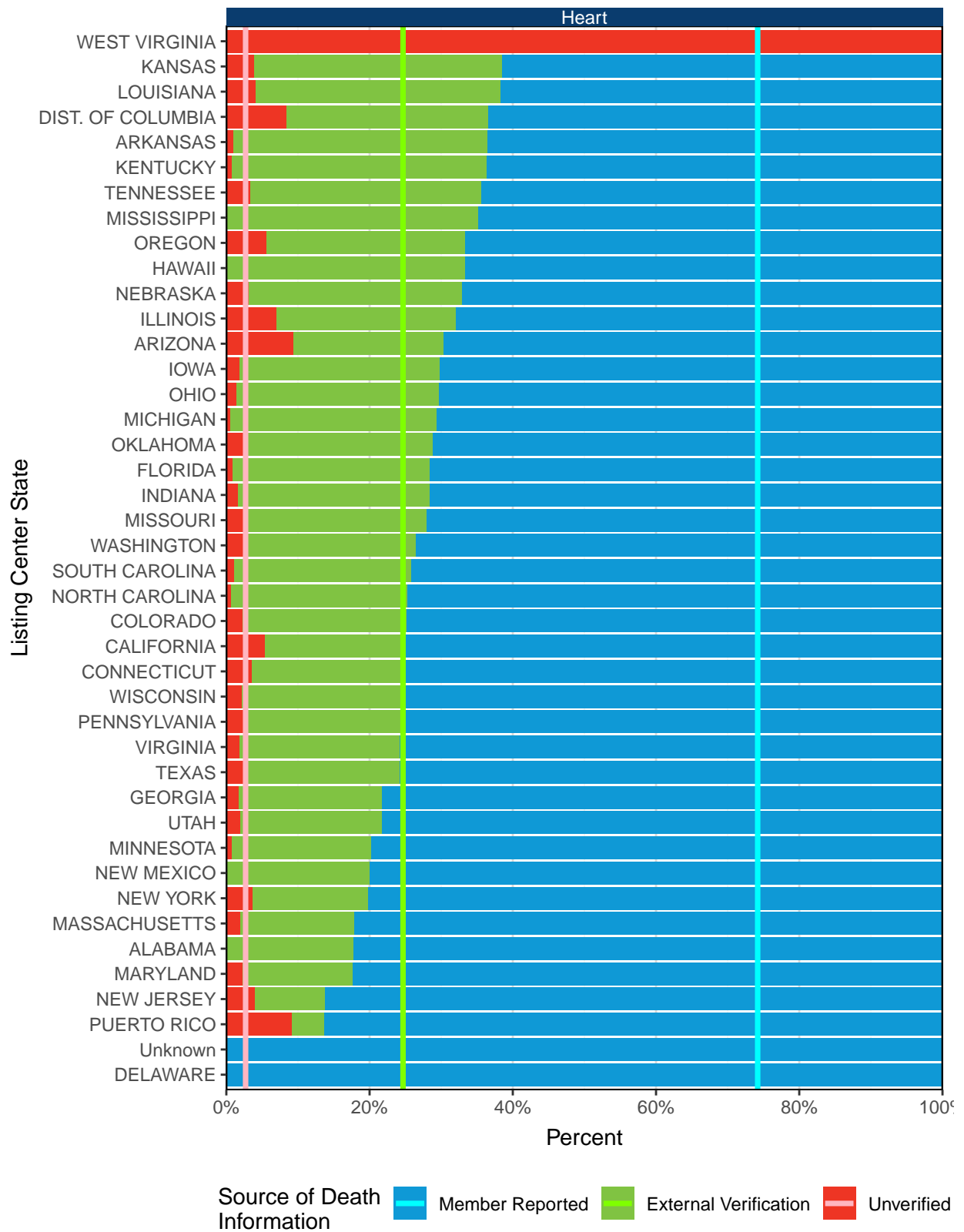
Similarly, Table 46 provides a summary of the percentage of waitlist registration deaths per listing center state from member reported, externally verified, or unverified sources of death information. This is given per state across each organ. For heart waitlist registrations, a minimum of 62% of deaths are member reported across all states. On the other hand, there was at least one state with 100% of heart waitlist registrations from unverified death sources and at least one state with 100% of pancreas waitlist registrations from externally verified death sources. No state had 100% of kidney or liver waitlist registration deaths as member reported.

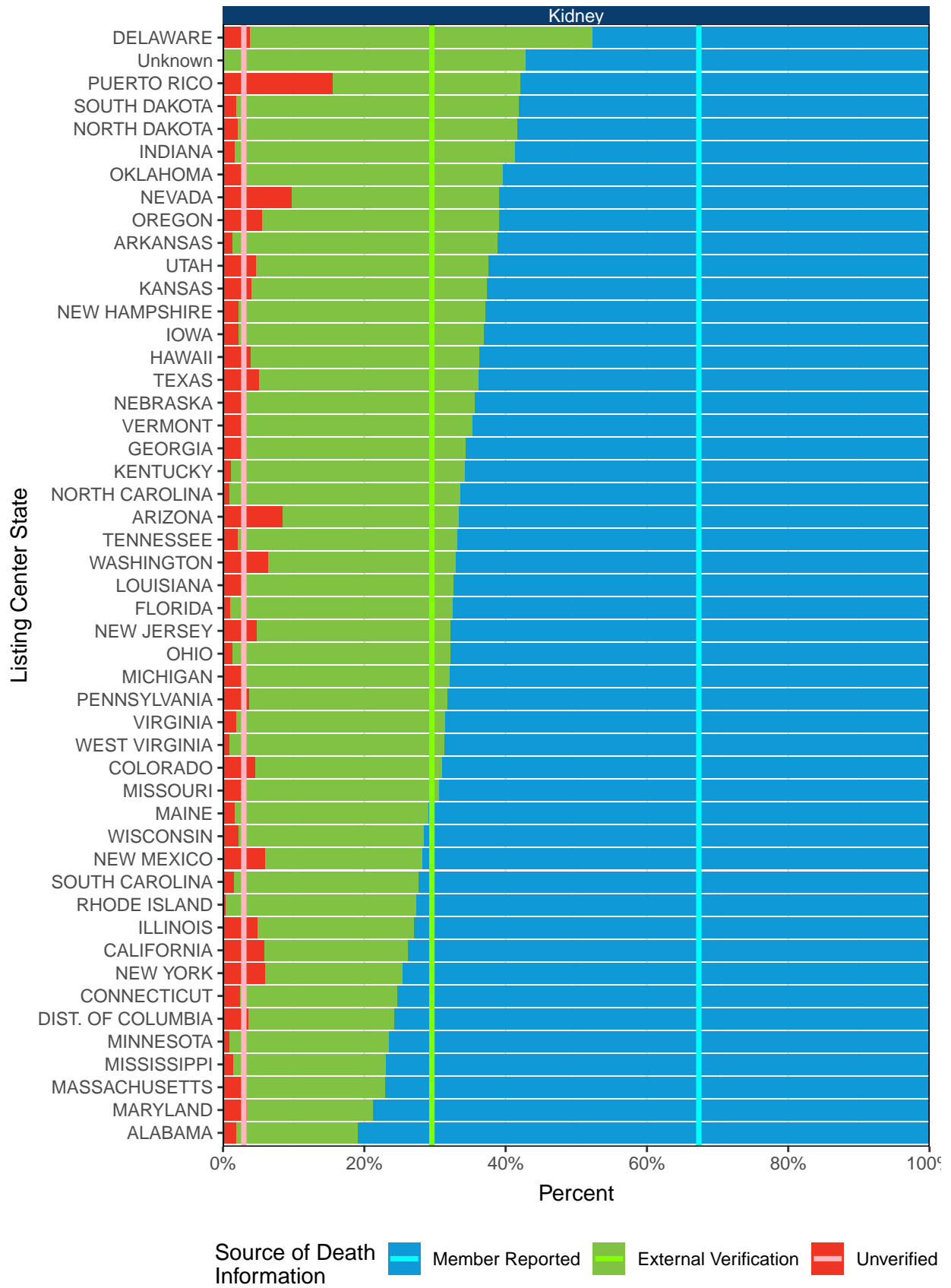
The following figures illustrate the distribution of percentages of source of death information per state for each organ.

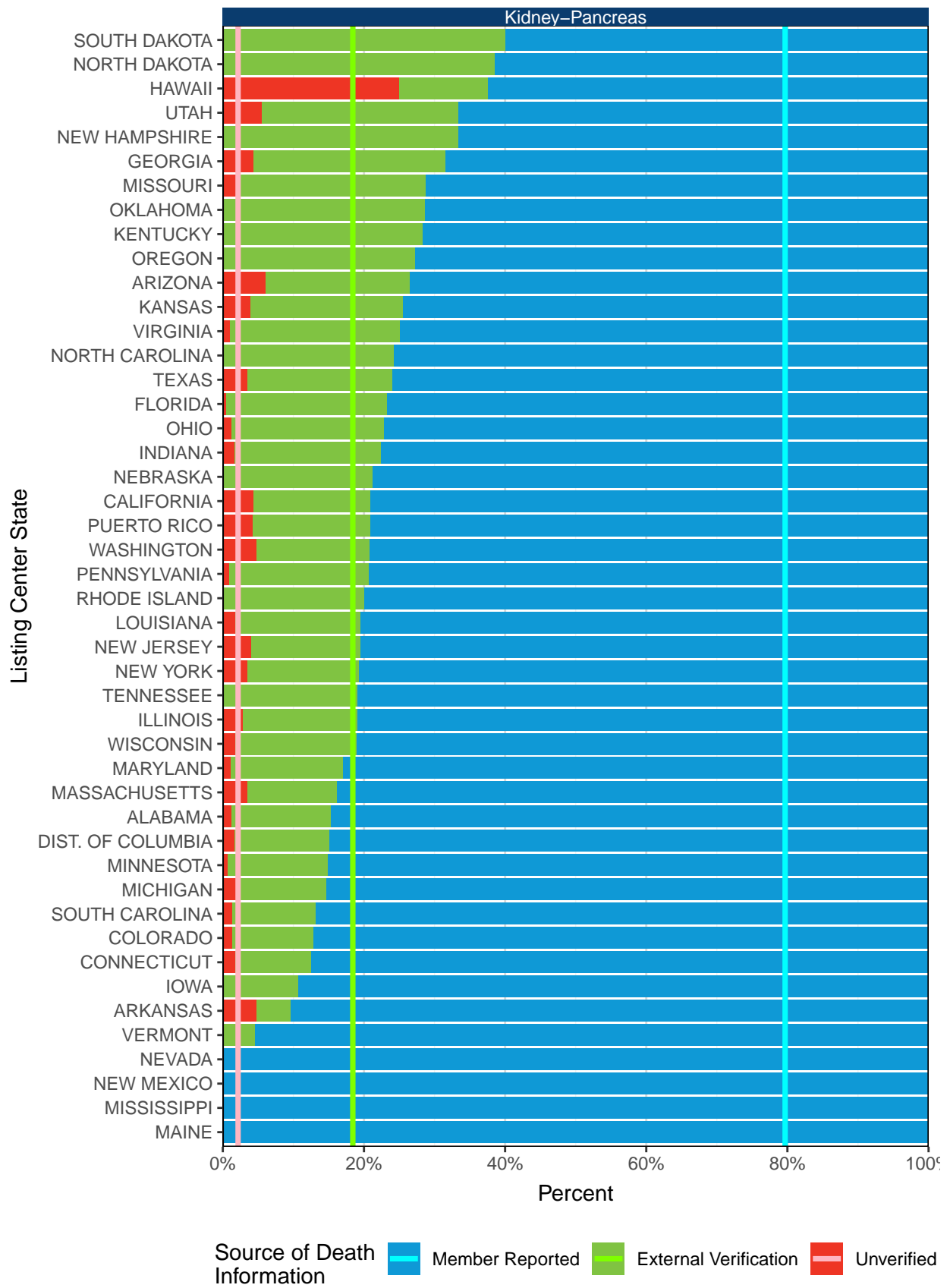
Table 46: Summary of percent of deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 per listing center state by organ and source of death information. Listing center states for each organ type included if at least one death.

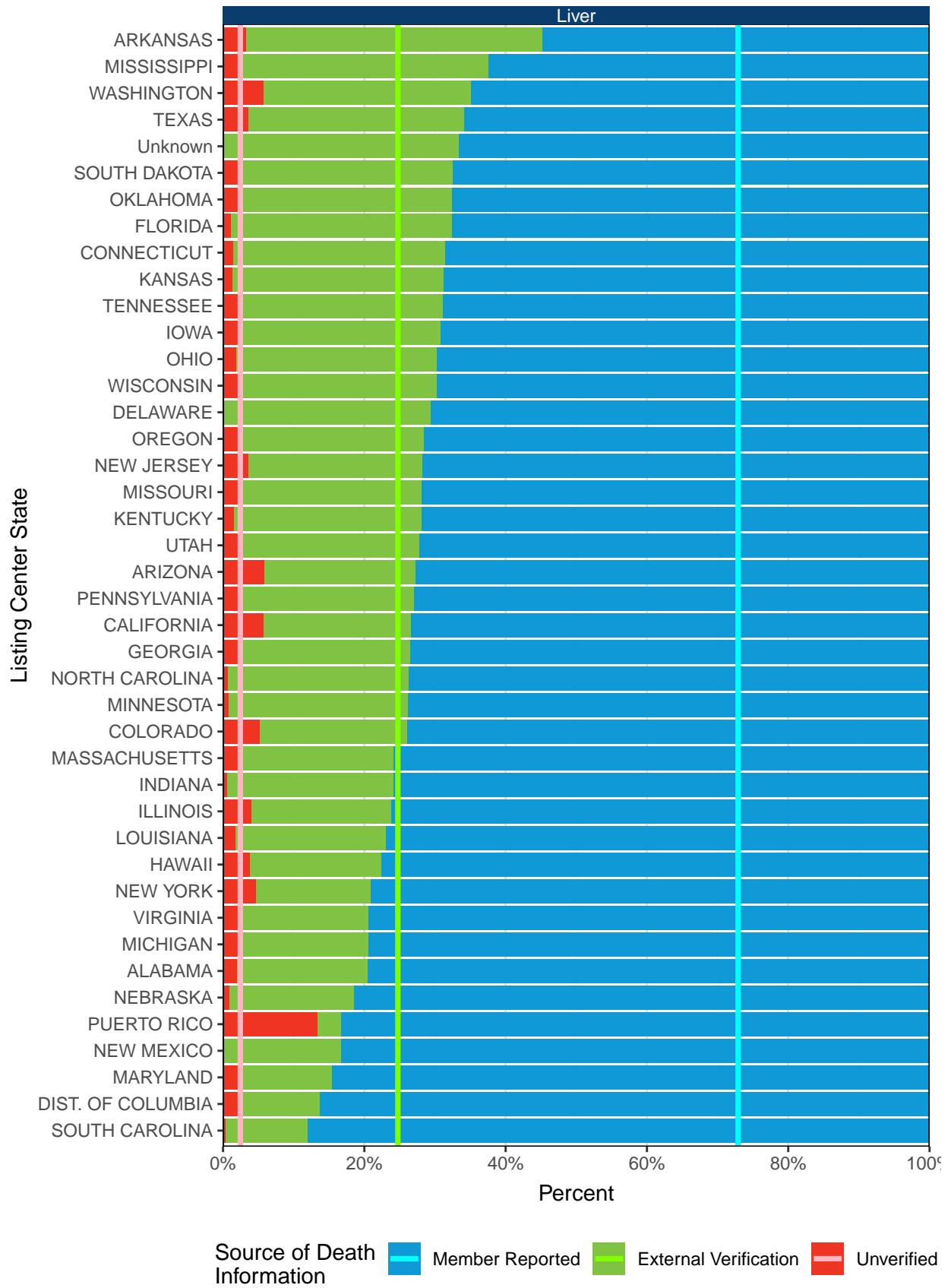
Source of Death Information	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	61.5%	68.1%	74.3%	74.2%	78.3%	100.0%
External Verification	4.5%	20.0%	24.2%	24.7%	28.2%	35.7%
Unverified	0.5%	1.7%	5.8%	2.7%	3.9%	100.0%
Organ = Kidney						
Member Reported	47.7%	62.9%	67.2%	67.3%	71.8%	80.9%
External Verification	17.2%	26.2%	29.4%	29.6%	33.0%	48.6%
Unverified	0.3%	1.8%	3.4%	2.9%	4.6%	15.5%
Organ = Kidney-Pancreas						
Member Reported	60.0%	74.6%	80.1%	79.7%	85.1%	100.0%
External Verification	4.5%	14.1%	19.4%	18.4%	23.7%	40.0%
Unverified	0.5%	1.3%	3.4%	2.2%	4.1%	25.0%
Organ = Liver						
Member Reported	54.8%	69.0%	73.4%	72.9%	77.4%	88.0%
External Verification	3.3%	19.0%	23.9%	24.7%	29.3%	41.9%
Unverified	0.3%	1.8%	2.9%	2.4%	3.4%	13.3%
Organ = Lung						
Member Reported	58.3%	74.9%	78.3%	76.6%	82.8%	100.0%
External Verification	11.1%	15.6%	20.3%	21.1%	25.0%	33.3%
Unverified	0.3%	1.0%	2.7%	1.6%	3.4%	8.8%
Organ = Pancreas						
Member Reported	42.9%	69.2%	74.0%	75.2%	82.0%	100.0%
External Verification	11.1%	16.7%	26.1%	22.7%	30.4%	100.0%
Unverified	0.8%	1.6%	5.5%	2.7%	4.9%	50.0%
TOTAL						
Member Reported	49.4%	65.9%	69.3%	68.9%	73.4%	81.0%
External Verification	16.6%	23.5%	27.6%	27.4%	30.3%	47.1%
Unverified	0.3%	1.6%	3.2%	2.6%	4.1%	15.0%

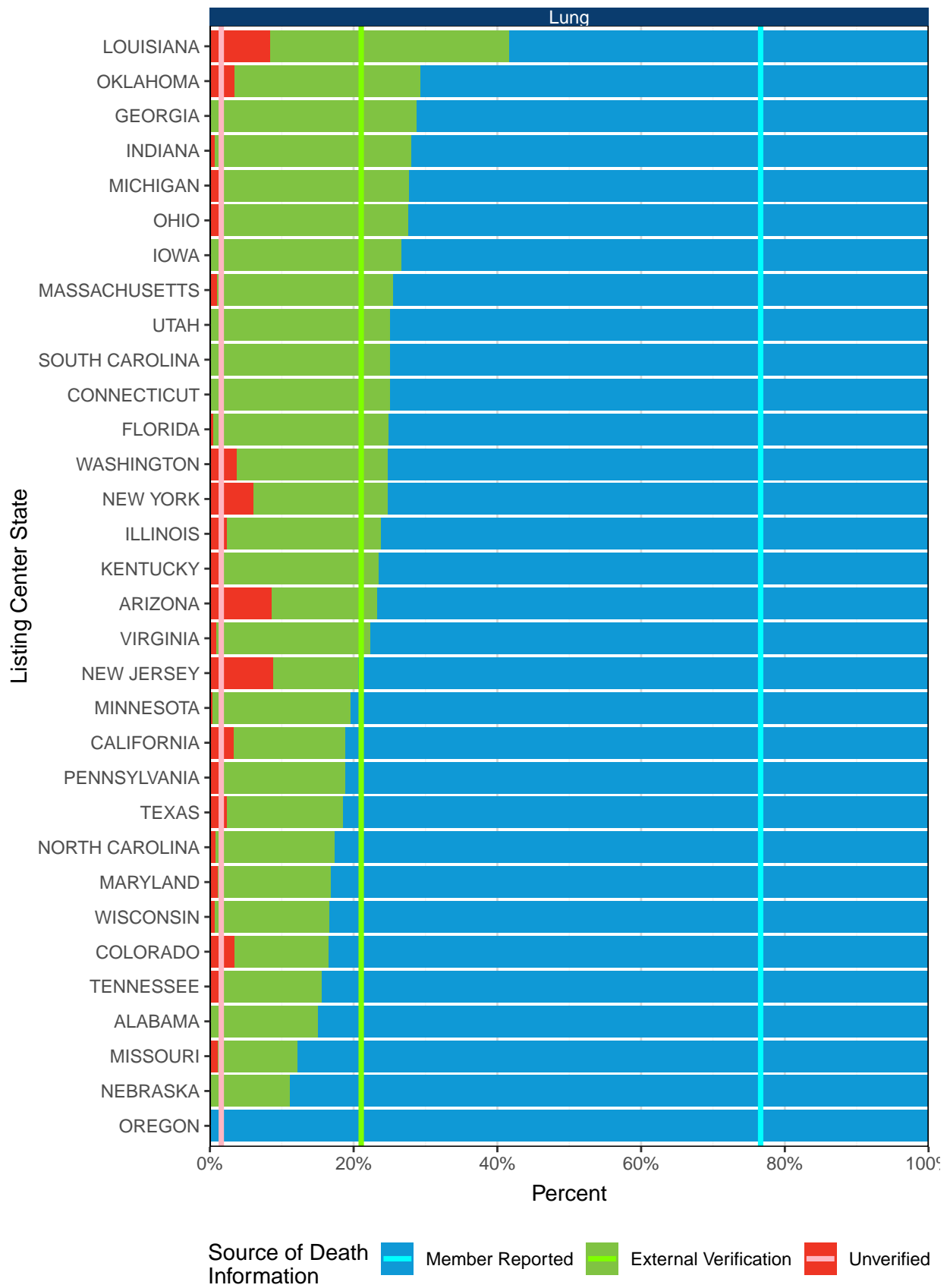
Figure 42: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, listing center state, and source of death information. Vertical lines represent medians across states.











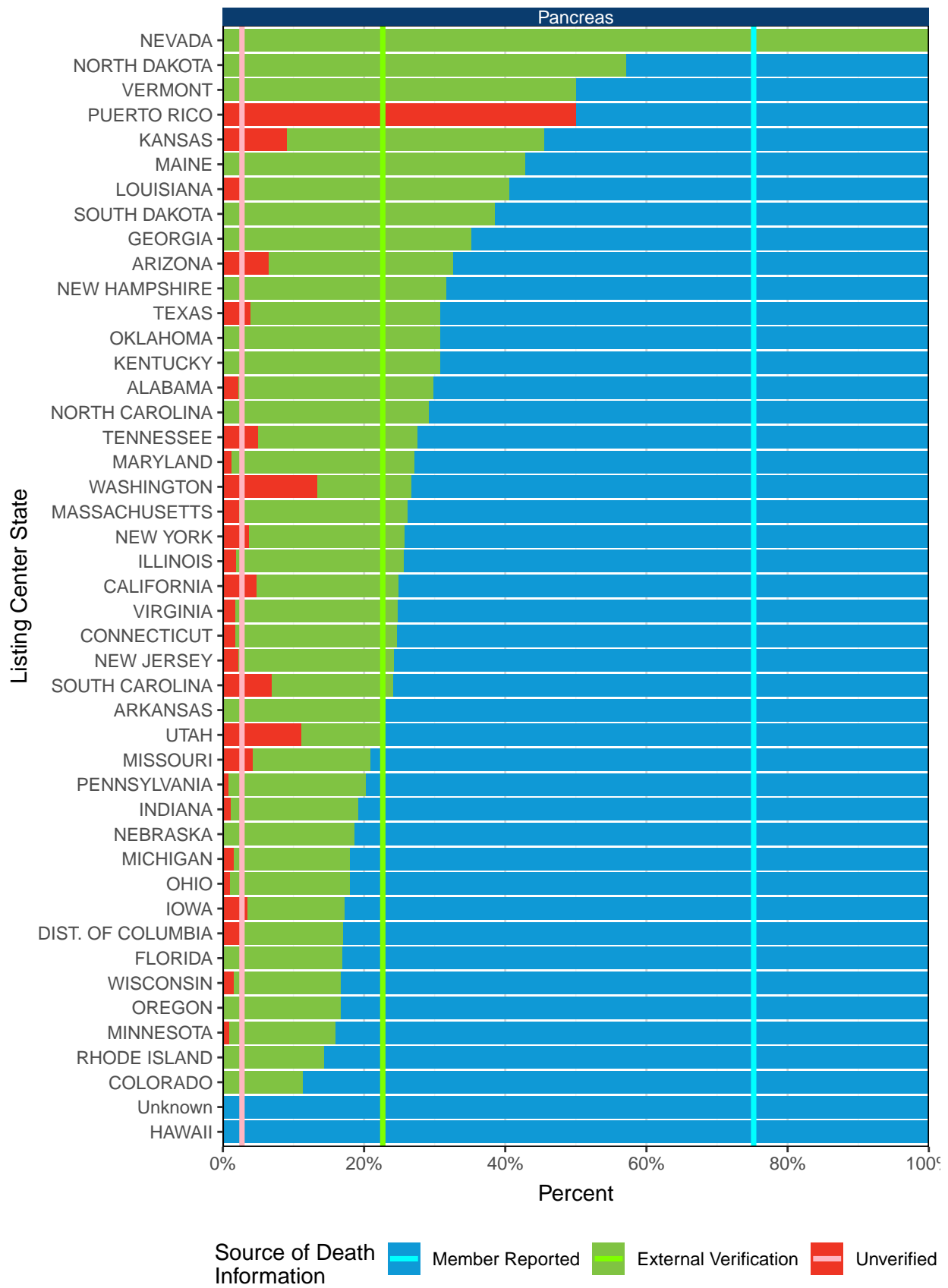


Table 47 provides a summary of the distribution of the number of deaths, from each death source, per listing center for each organ. Across organs and death sources, the number of waitlist registration deaths per center is right-skewed.

Table 47: Summary of number of deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 per listing center by organ and source of death information. Listing centers for each organ type included if at least one death.

Source of Death Information	Mimumum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	1	9.00	56.2	40.5	73.75	370
External Verification	1	4.00	20.4	16.0	29.00	95
Unverified	1	1.00	3.7	3.0	4.00	19
Organ = Kidney						
Member Reported	1	31.00	389.5	210.0	501.50	6948
External Verification	1	22.00	156.6	109.0	212.00	1477
Unverified	1	5.00	27.9	12.0	32.00	366
Organ = Kidney-Pancreas						
Member Reported	1	8.00	28.0	19.0	34.00	220
External Verification	1	3.00	7.6	6.0	10.00	57
Unverified	1	1.00	1.9	1.0	2.00	17
Organ = Liver						
Member Reported	1	25.50	265.6	166.0	398.00	1744
External Verification	1	13.00	91.6	79.0	136.00	524
Unverified	1	4.00	16.5	10.0	19.00	144
Organ = Lung						
Member Reported	1	6.75	70.5	41.0	103.25	396
External Verification	1	3.25	19.7	11.5	29.75	109
Unverified	1	1.00	3.7	3.0	4.75	22
Organ = Pancreas						
Member Reported	1	3.50	17.3	8.0	20.00	201
External Verification	1	2.00	5.6	4.0	7.00	31
Unverified	1	1.00	1.6	1.0	2.00	6
TOTAL						
Member Reported	1	46.00	576.5	202.0	785.00	8913
External Verification	1	19.00	213.5	114.0	334.00	1946
Unverified	1	4.00	37.4	16.0	44.00	472

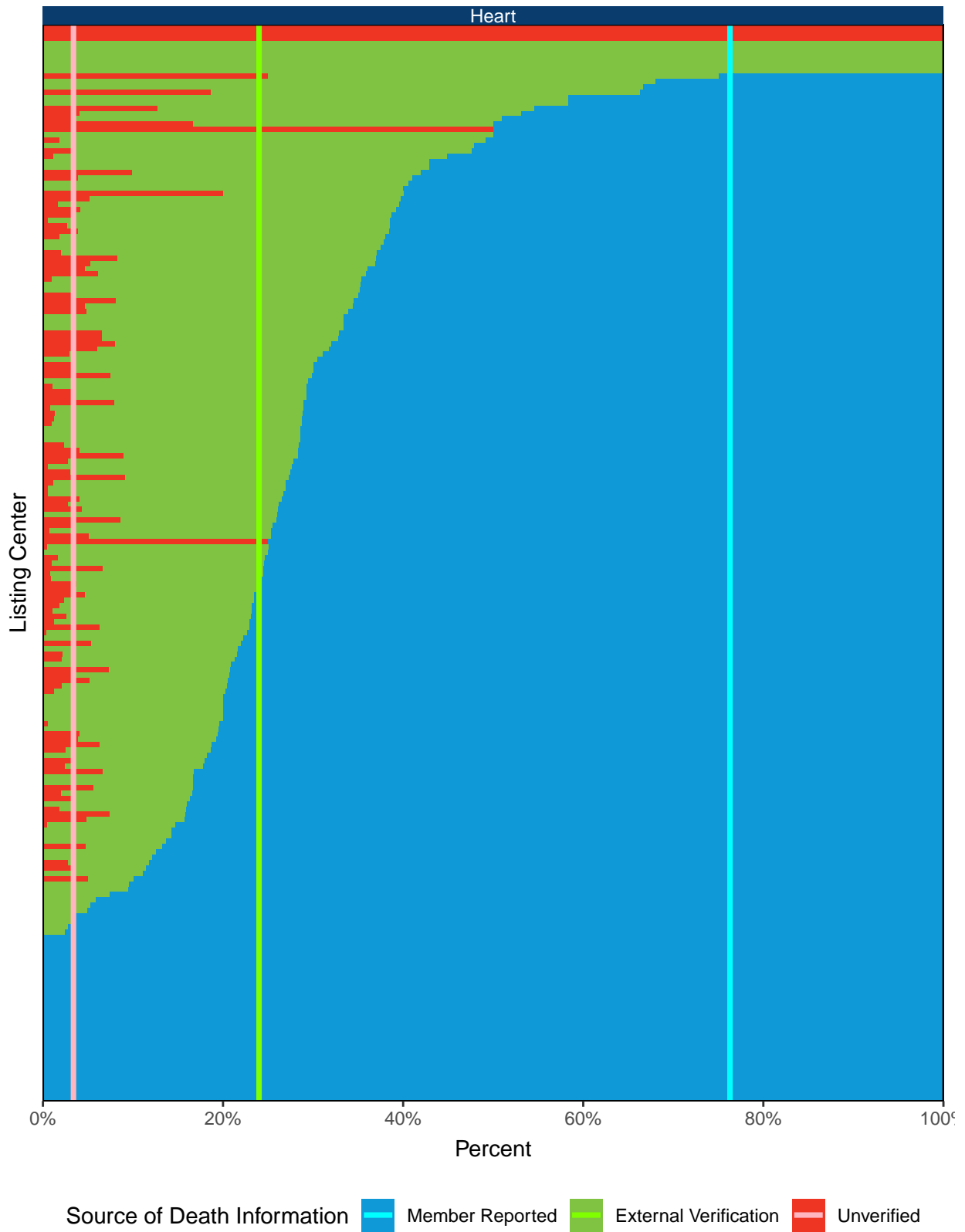
The table below provides a summary of the percentage of waitlist registration deaths per listing center from member reported, externally verified, or unverified sources of death information. This is given per center across each organ. There are much lower proportions across organs (11 - 38%) of member reported deaths per center at a minimum, compared to by center for transplant recipients. Half of all listing centers had at least 70% of waitlist registration deaths from member reported sources.

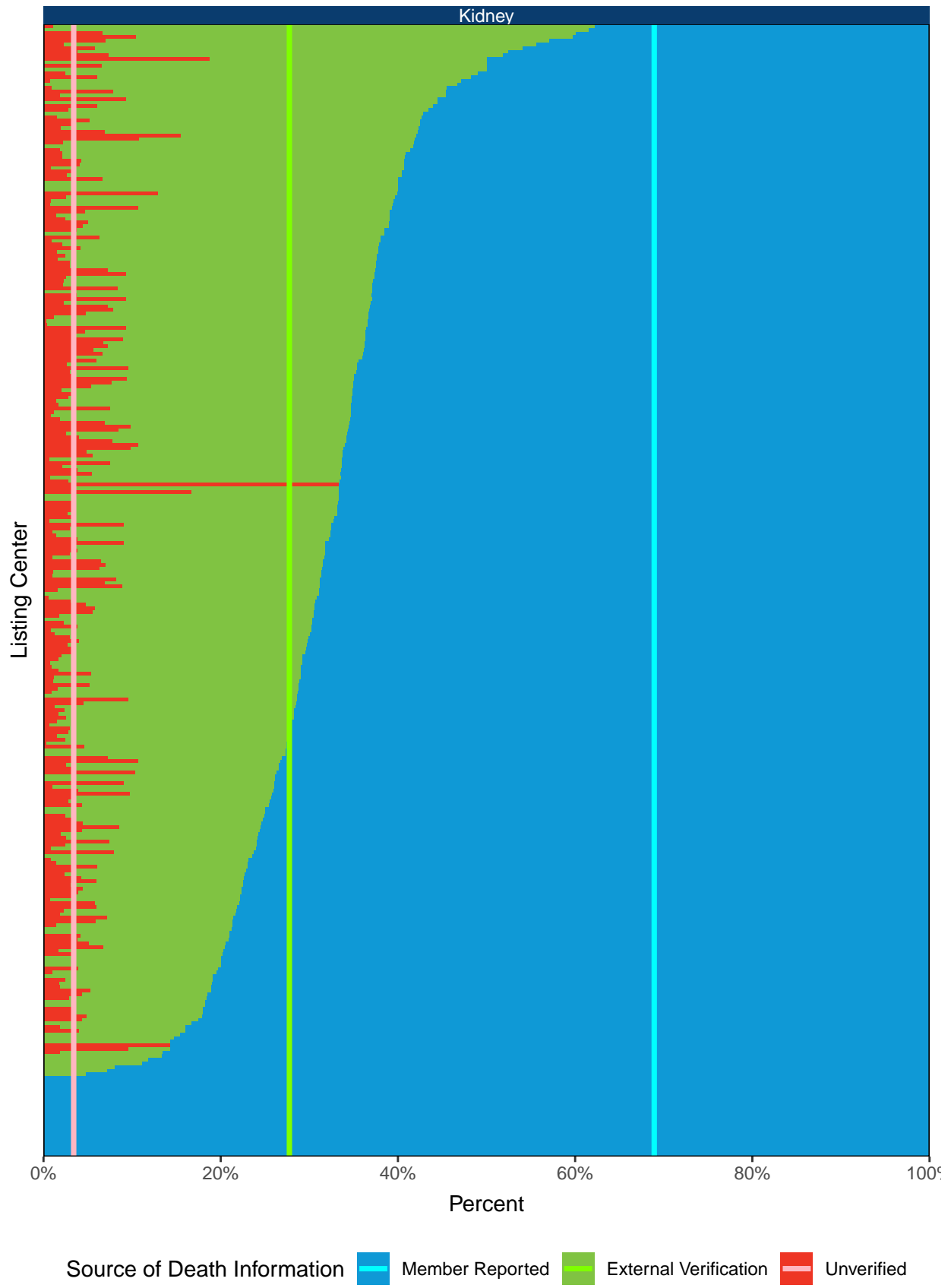
The following figures illustrate the distribution of percentages of source of death information per center for each organ.

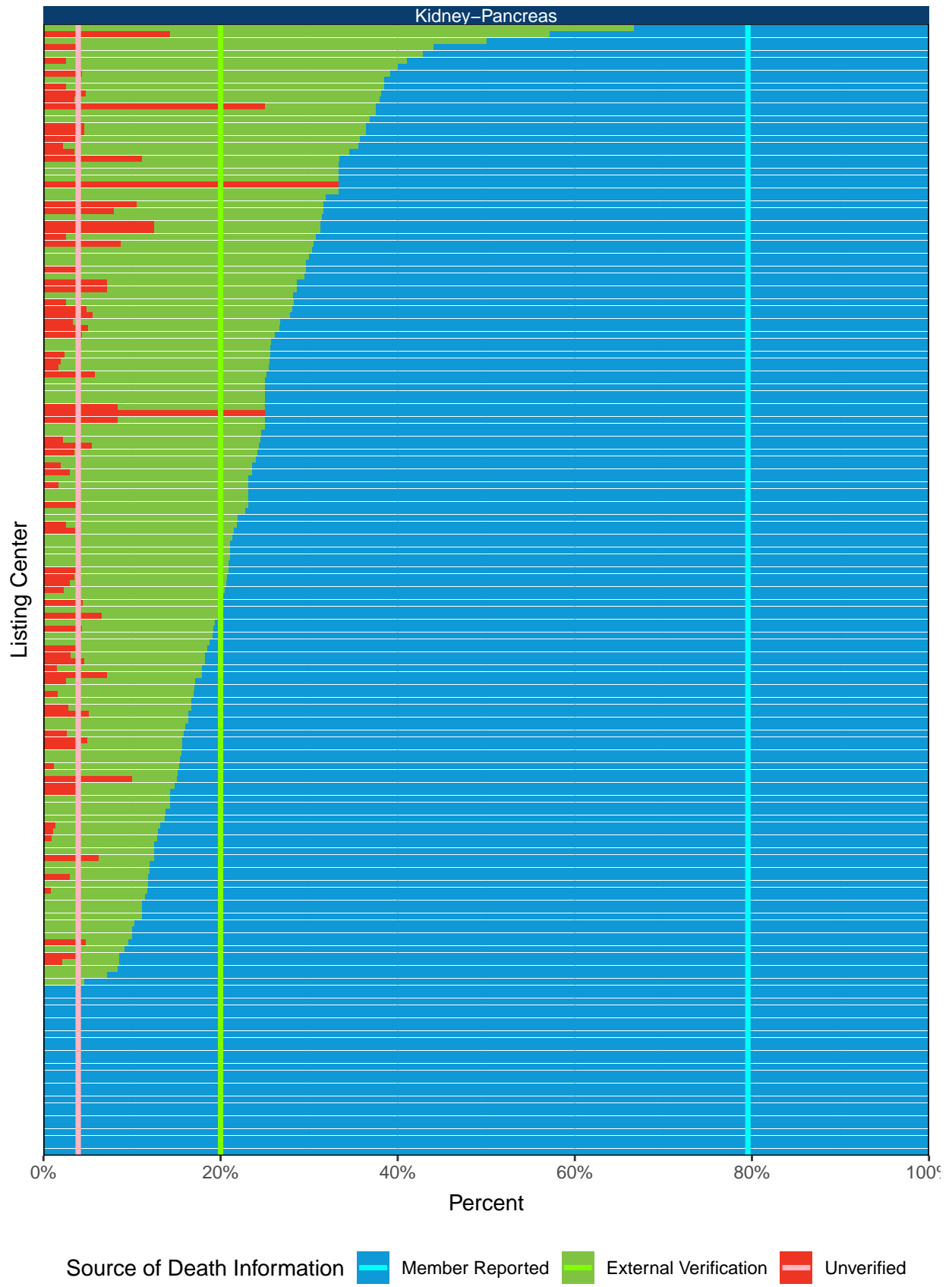
Table 48: Summary of percent of deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 per listing center by organ and source of death information. Listing centers for each organ type included if at least one death.

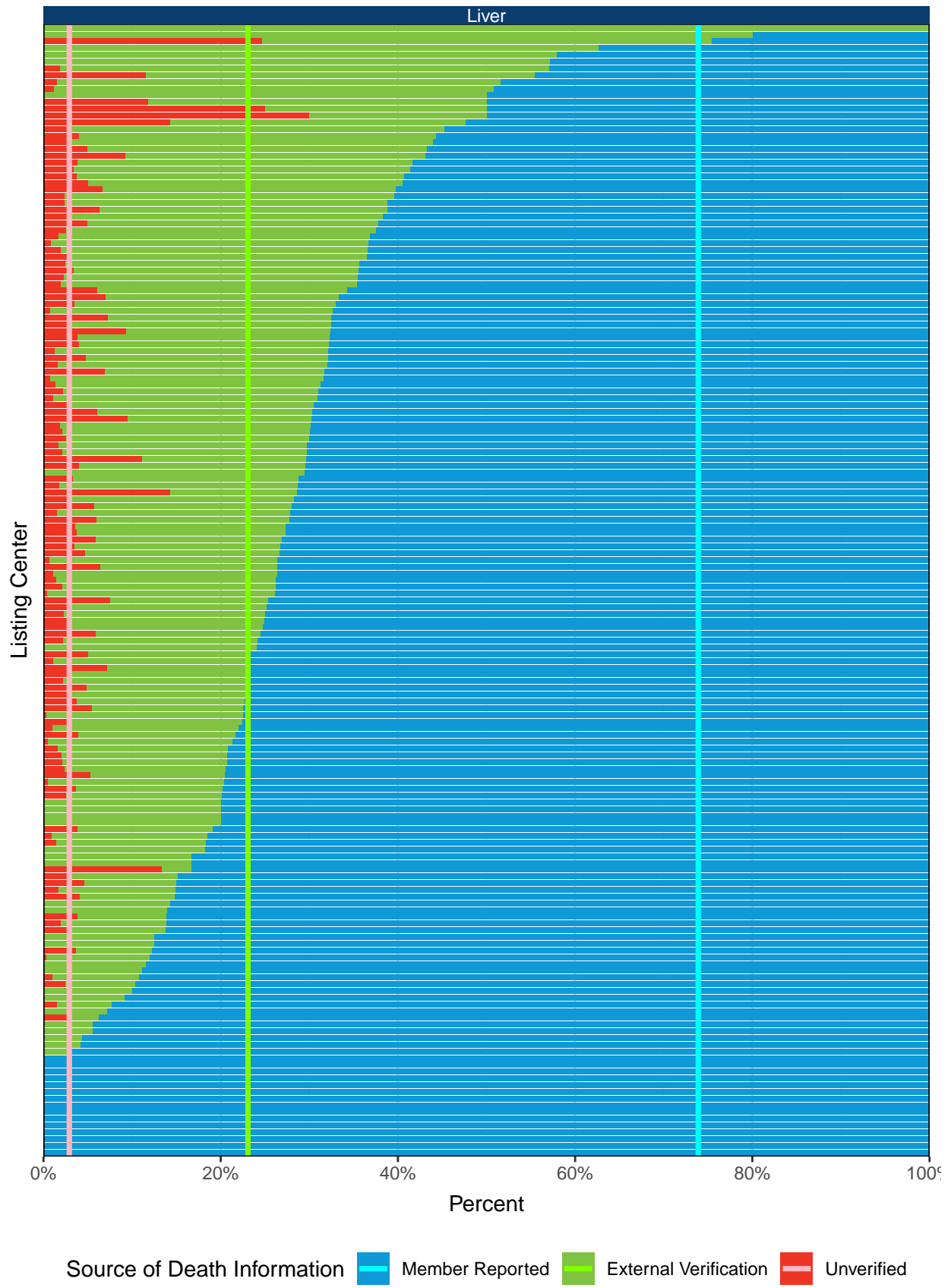
Source of Death Information	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	25.0%	67.0%	76.6%	76.3%	86.5%	100.0%
External Verification	2.4%	17.2%	27.6%	24.0%	33.3%	100.0%
Unverified	0.3%	1.8%	7.5%	3.4%	6.1%	100.0%
Organ = Kidney						
Member Reported	37.8%	63.2%	70.7%	68.9%	77.2%	100.0%
External Verification	4.8%	21.6%	28.0%	27.7%	33.3%	61.5%
Unverified	0.3%	1.9%	4.4%	3.4%	6.1%	33.3%
Organ = Kidney-Pancreas						
Member Reported	33.3%	72.0%	80.1%	79.5%	88.0%	100.0%
External Verification	4.3%	13.7%	20.8%	20.0%	25.0%	66.7%
Unverified	0.8%	2.6%	5.4%	3.9%	5.5%	33.3%
Organ = Liver						
Member Reported	20.0%	67.5%	74.4%	73.9%	84.1%	100.0%
External Verification	2.7%	17.6%	25.1%	23.1%	30.9%	100.0%
Unverified	0.3%	1.9%	4.2%	2.9%	4.9%	30.0%
Organ = Lung						
Member Reported	11.1%	72.5%	80.3%	80.6%	87.3%	100.0%
External Verification	2.9%	14.3%	22.5%	20.0%	26.5%	100.0%
Unverified	0.6%	1.4%	6.6%	2.5%	6.2%	100.0%
Organ = Pancreas						
Member Reported	20.0%	66.7%	75.9%	75.0%	85.9%	100.0%
External Verification	3.1%	16.7%	28.1%	25.0%	33.3%	100.0%
Unverified	0.9%	2.4%	8.8%	5.5%	8.5%	50.0%
TOTAL						
Member Reported	38.3%	64.6%	72.7%	70.9%	78.6%	100.0%
External Verification	2.1%	19.8%	26.6%	26.4%	32.0%	100.0%
Unverified	0.3%	1.8%	4.5%	3.2%	5.5%	100.0%

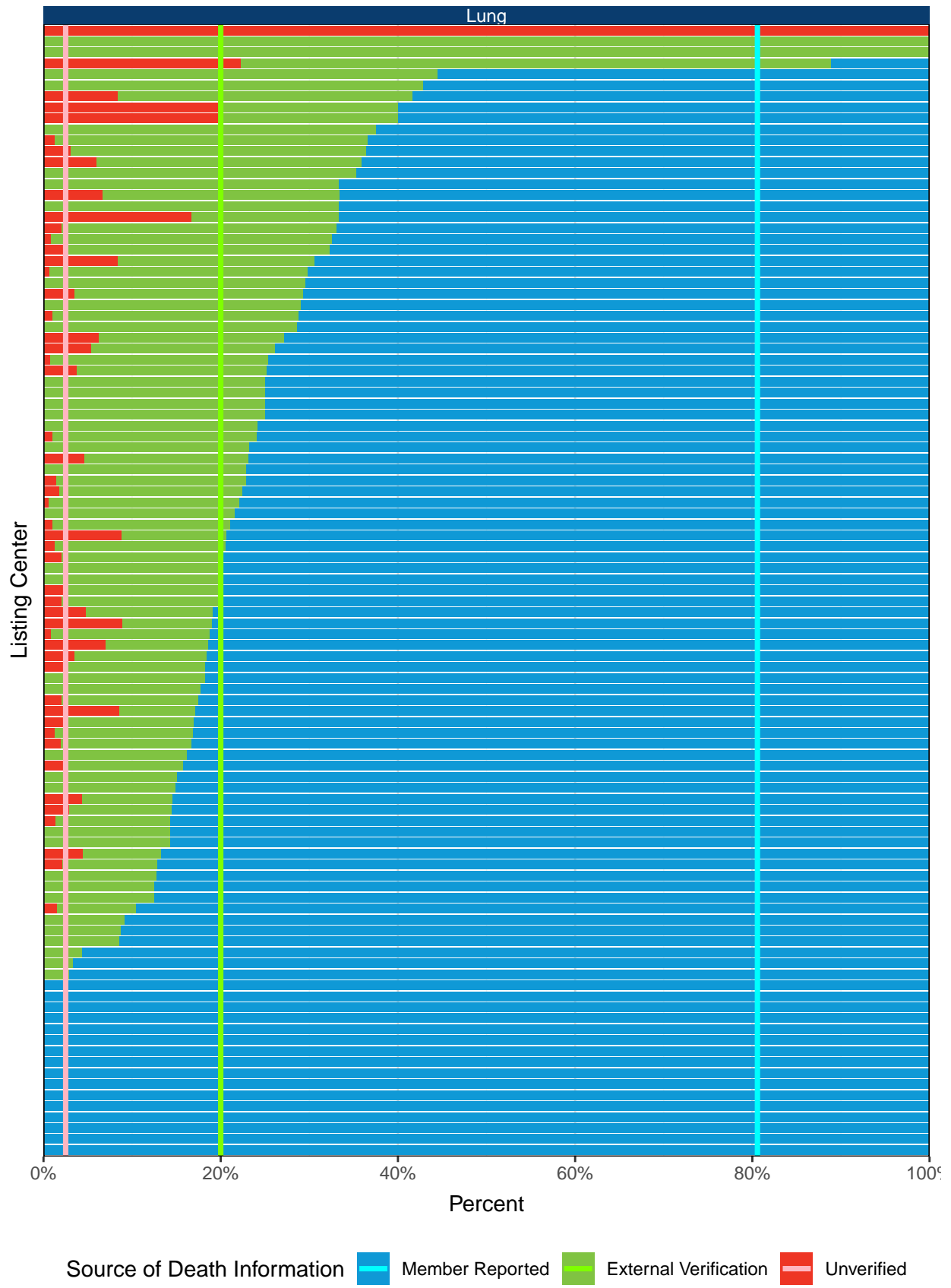
Figure 43: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, candidate listing center, and source of death information. Vertical lines represent medians across centers.

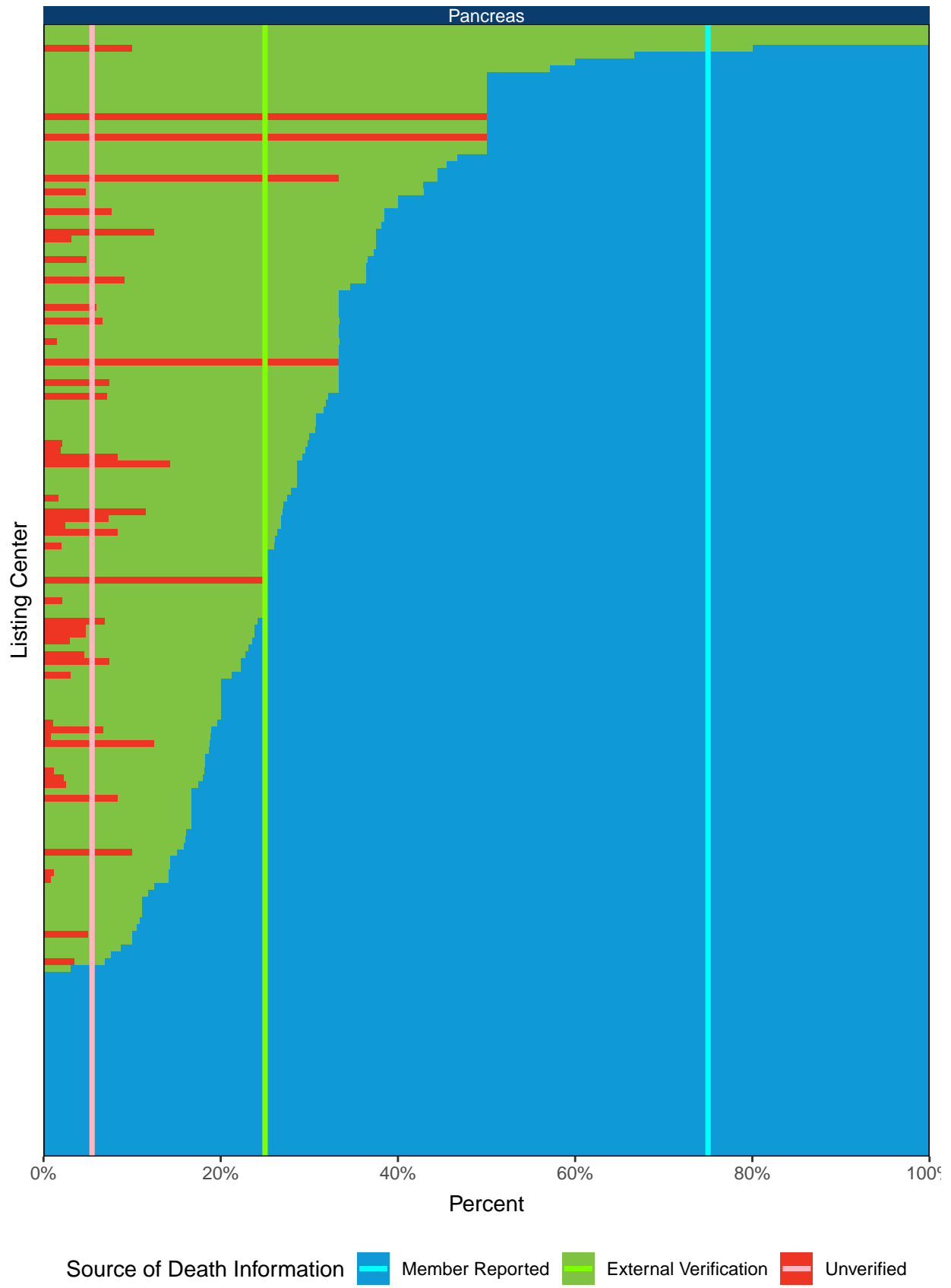












All Waitlist Registrations

Because there were few deaths for heart-lung and intestine waitlist registrations from externally verified sources or unverified, these organs will be excluded in the graphics and tables in the rest of this section.

Table 49: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ and source of death information.

Organ	Member Reported		External Verification		Unverified	
	N	%	N	%	N	%
Heart	37063	87.3%	4705	11.1%	695	1.6%
Heart-Lung	859	92.5%	62	6.7%	8	0.9%
Intestine	1902	95.7%	78	3.9%	7	0.4%
Kidney	243306	72.3%	79443	23.6%	13550	4.0%
Kidney-Pancreas	12888	78.3%	3113	18.9%	463	2.8%
Liver	99798	82.6%	17843	14.8%	3201	2.6%
Lung	28724	92.6%	2044	6.6%	258	0.8%
Pancreas	6589	79.8%	1493	18.1%	179	2.2%
TOTAL	431129	77.2%	108781	19.5%	18361	3.3%

Similar patterns for all waitlist registrations are illustrated here as there were in Figures 34 and 35; however, there is a much larger proportion of deaths that are greater than 5 years from removal which corresponds to including removals for transplant in this cohort.

Figure 44: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information.

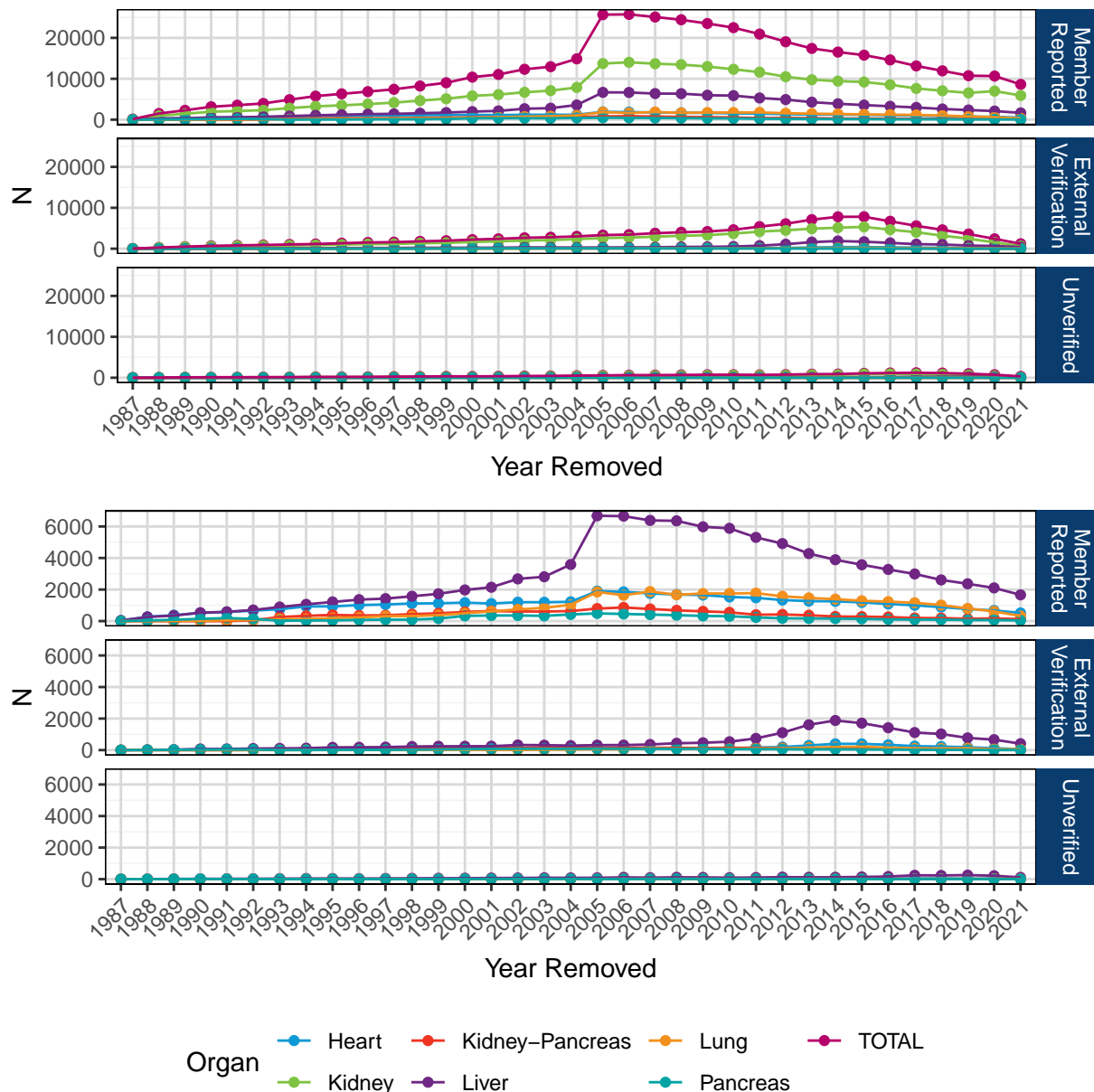
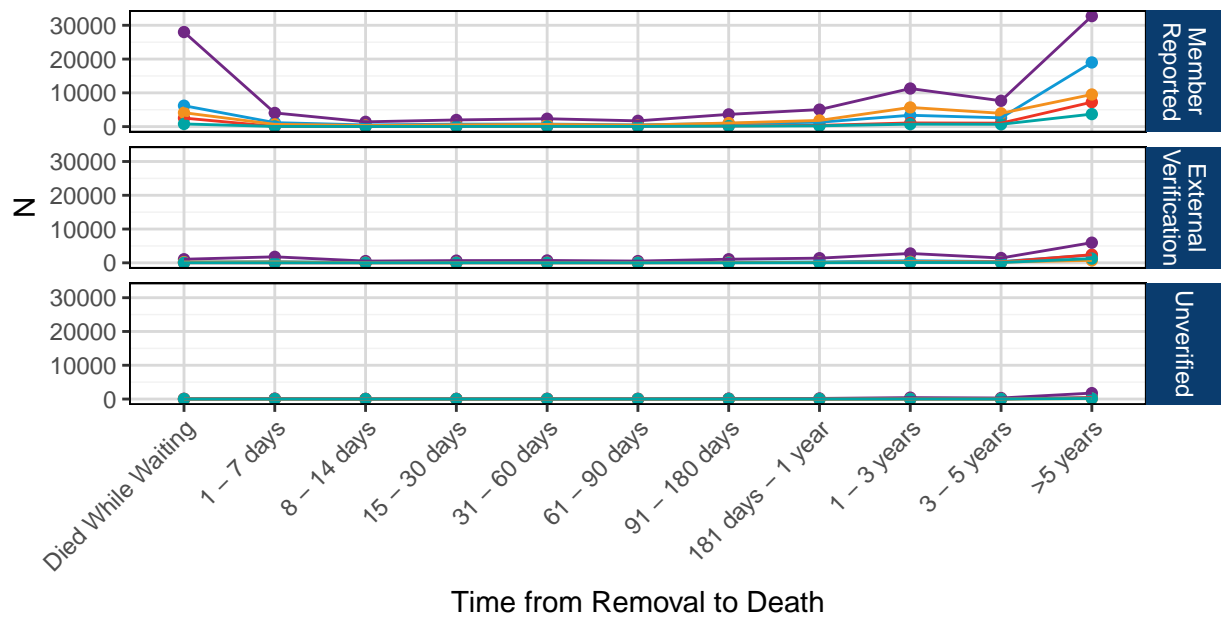
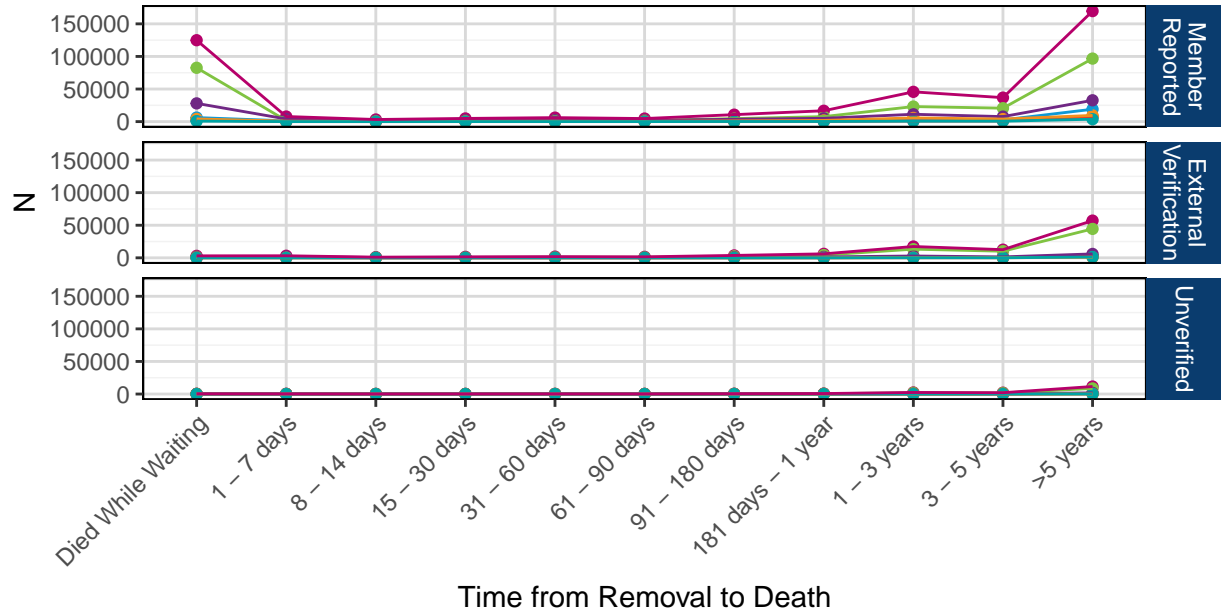


Figure 45: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, time from removal to death, and source of death information.



Organ

- Heart
- Kidney-Pancreas
- Lung
- TOTAL
- Kidney
- Liver
- Pancreas

Table 50: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, time from removal to death, and source of death information.

Time from Removal to Death	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Died While Waiting	6196	16.7%	238	5.1%	11	1.6%
1 - 7 days	1178	3.2%	358	7.6%	33	4.7%
8 - 14 days	497	1.3%	98	2.1%	*	*
15 - 30 days	727	2.0%	112	2.4%	11	1.6%
31 - 60 days	742	2.0%	115	2.4%	11	1.6%
61 - 90 days	517	1.4%	78	1.7%	*	*
91 - 180 days	945	2.5%	175	3.7%	16	2.3%
181 days - 1 year	1296	3.5%	252	5.4%	31	4.5%
1 - 3 years	3355	9.1%	613	13.0%	72	10.4%
3 - 5 years	2610	7.0%	371	7.9%	47	6.8%
>5 years	19000	51.3%	2295	48.8%	449	64.6%
Organ = Kidney						
Died While Waiting	82602	33.9%	1456	1.8%	259	1.9%
1 - 7 days	1696	0.7%	765	1.0%	68	0.5%
8 - 14 days	896	0.4%	342	0.4%	49	0.4%
15 - 30 days	1466	0.6%	653	0.8%	71	0.5%
31 - 60 days	2140	0.9%	954	1.2%	100	0.7%
61 - 90 days	1832	0.8%	853	1.1%	89	0.7%
91 - 180 days	4552	1.9%	2308	2.9%	268	2.0%
181 days - 1 year	7668	3.2%	4247	5.3%	517	3.8%
1 - 3 years	23099	9.5%	13296	16.7%	1870	13.8%
3 - 5 years	20638	8.5%	10172	12.8%	1650	12.2%
>5 years	96717	39.8%	44397	55.9%	8609	63.5%
Organ = Kidney-Pancreas						
Died While Waiting	2530	19.6%	27	0.9%	*	*
1 - 7 days	65	0.5%	12	0.4%	*	*
8 - 14 days	43	0.3%	*	*	*	*
15 - 30 days	92	0.7%	*	*	*	*
31 - 60 days	114	0.9%	11	0.4%	*	*
61 - 90 days	103	0.8%	18	0.6%	*	*
91 - 180 days	201	1.6%	54	1.7%	*	*
181 days - 1 year	367	2.8%	79	2.5%	*	*
1 - 3 years	1091	8.5%	261	8.4%	21	4.5%
3 - 5 years	1041	8.1%	239	7.7%	26	5.6%
>5 years	7241	56.2%	2399	77.1%	398	86.0%
Organ = Liver						
Died While Waiting	27997	28.1%	1060	5.9%	62	1.9%
1 - 7 days	4050	4.1%	1777	10.0%	125	3.9%
8 - 14 days	1417	1.4%	521	2.9%	43	1.3%
15 - 30 days	1975	2.0%	656	3.7%	55	1.7%
31 - 60 days	2335	2.3%	698	3.9%	73	2.3%
61 - 90 days	1709	1.7%	522	2.9%	61	1.9%
91 - 180 days	3626	3.6%	1069	6.0%	129	4.0%
181 days - 1 year	5040	5.1%	1379	7.7%	177	5.5%
1 - 3 years	11277	11.3%	2772	15.5%	416	13.0%
3 - 5 years	7649	7.7%	1423	8.0%	305	9.5%

Table 50: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, time from removal to death, and source of death information. (continued)

Time from Removal to Death	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
>5 years	32723	32.8%	5966	33.4%	1755	54.8%
Organ = Lung						
Died While Waiting	4125	14.4%	212	10.4%	12	4.7%
1 - 7 days	671	2.3%	234	11.4%	20	7.8%
8 - 14 days	327	1.1%	42	2.1%	*	*
15 - 30 days	509	1.8%	46	2.3%	*	*
31 - 60 days	632	2.2%	35	1.7%	*	*
61 - 90 days	430	1.5%	31	1.5%	*	*
91 - 180 days	1060	3.7%	87	4.3%	*	*
181 days - 1 year	1835	6.4%	116	5.7%	*	*
1 - 3 years	5678	19.8%	287	14.0%	34	13.2%
3 - 5 years	3943	13.7%	224	11.0%	24	9.3%
>5 years	9514	33.1%	730	35.7%	134	51.9%
Organ = Pancreas						
Died While Waiting	796	12.1%	14	0.9%	*	*
1 - 7 days	58	0.9%	*	*	*	*
8 - 14 days	33	0.5%	*	*	*	*
15 - 30 days	46	0.7%	*	*	*	*
31 - 60 days	77	1.2%	*	*	*	*
61 - 90 days	54	0.8%	*	*	*	*
91 - 180 days	164	2.5%	*	*	*	*
181 days - 1 year	237	3.6%	23	1.5%	*	*
1 - 3 years	731	11.1%	91	6.1%	*	*
3 - 5 years	687	10.4%	87	5.8%	*	*
>5 years	3706	56.2%	1252	83.9%	164	91.6%
TOTAL						
Died While Waiting	124897	29.0%	3023	2.8%	349	1.9%
1 - 7 days	7813	1.8%	3167	2.9%	247	1.3%
8 - 14 days	3259	0.8%	1010	0.9%	109	0.6%
15 - 30 days	4869	1.1%	1486	1.4%	142	0.8%
31 - 60 days	6126	1.4%	1821	1.7%	188	1.0%
61 - 90 days	4715	1.1%	1505	1.4%	162	0.9%
91 - 180 days	10695	2.5%	3703	3.4%	426	2.3%
181 days - 1 year	16662	3.9%	6103	5.6%	740	4.0%
1 - 3 years	45688	10.6%	17337	15.9%	2423	13.2%
3 - 5 years	36807	8.5%	12525	11.5%	2057	11.2%
>5 years	169598	39.3%	57101	52.5%	11518	62.7%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

For all waitlist registrations, member-reported deaths most often occurred with removal reasons “Transplanted” followed by “Died”. Externally verified deaths for all waitlist registrations occurred with removal reasons “Candidate condition deteriorated, too sick to transplant” followed by “Other” or “Transplanted” for heart, liver, and lung waitlist registrations. For kidney, kidney-pancreas, and pancreas waitlist registrations, most externally verified deaths occurred with removal reason “Transplanted” followed by “Other” or “Candidate condition deteriorated, too sick to transplant”. Lastly, unverified deaths for all waitlist registrations across organs occurred most often with the removal reason “Transplanted” followed by “Other”.

Figure 46: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, removal reason, and source of death information.

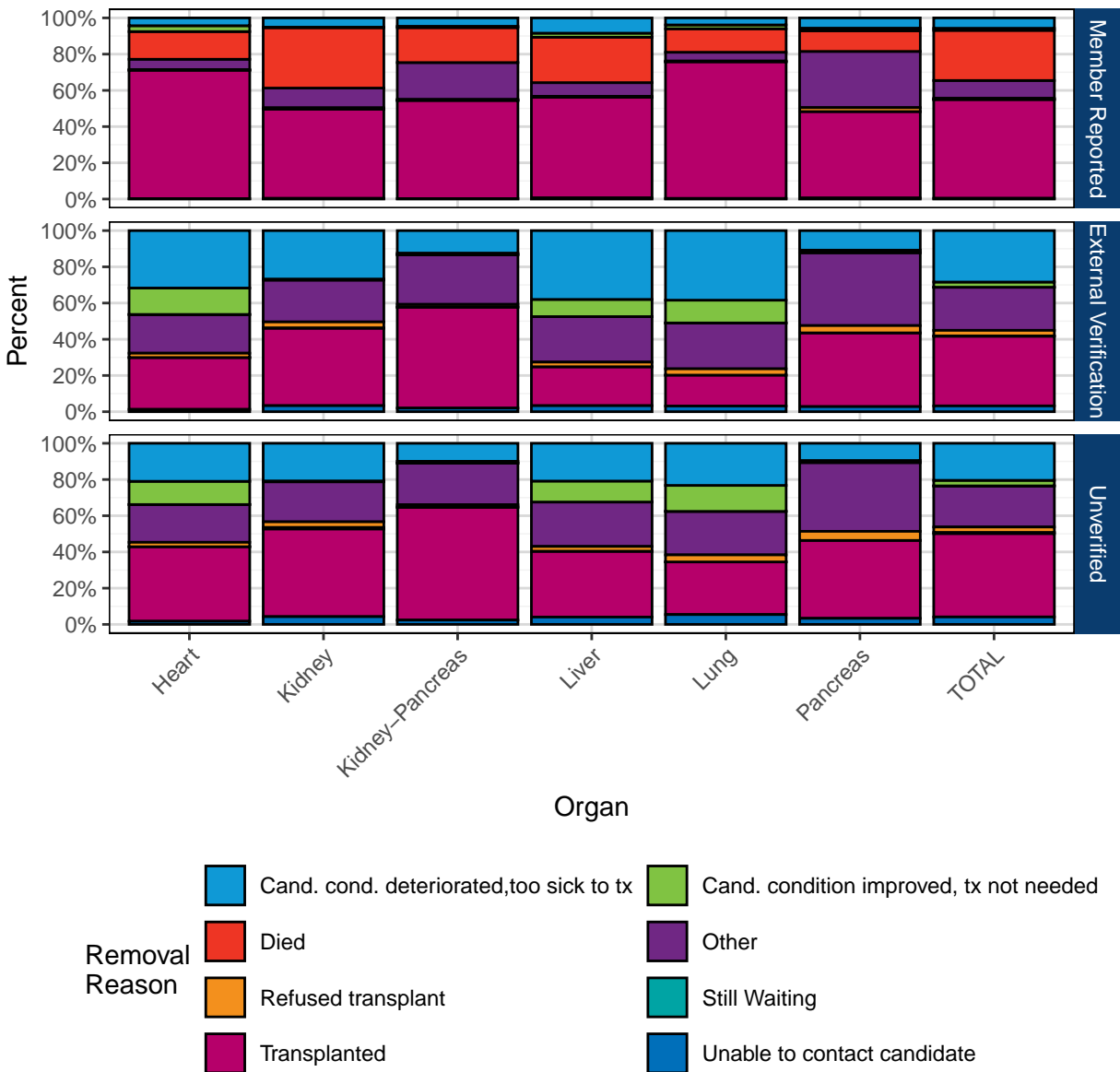


Table 51: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, removal reason, and source of death information.

Removal Reason	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
Cand. cond. deteriorated,too sick to tx	1594	4.3%	1492	31.7%	146	21.0%
Cand. condition improved, tx not needed	1199	3.2%	686	14.6%	89	12.8%
Died	5665	15.3%	*	*	*	*
Other	2102	5.7%	1003	21.3%	145	20.9%
Refused transplant	155	0.4%	112	2.4%	17	2.4%
Still Waiting	*	*	*	*	*	*
Transplanted	26282	70.9%	1345	28.6%	286	41.2%
Unable to contact candidate	65	0.2%	60	1.3%	12	1.7%
Organ = Kidney						
Cand. cond. deteriorated,too sick to tx	12411	5.1%	21242	26.7%	2817	20.8%
Cand. condition improved, tx not needed	733	0.3%	411	0.5%	54	0.4%
Died	81082	33.3%	14	0.0%	*	*
Other	26545	10.9%	18390	23.1%	2994	22.1%
Refused transplant	1855	0.8%	2578	3.2%	418	3.1%
Still Waiting	77	0.0%	273	0.3%	129	1.0%
Transplanted	119731	49.2%	33883	42.7%	6549	48.3%
Unable to contact candidate	872	0.4%	2652	3.3%	580	4.3%
Organ = Kidney-Pancreas						
Cand. cond. deteriorated,too sick to tx	594	4.6%	386	12.4%	46	9.9%
Cand. condition improved, tx not needed	97	0.8%	28	0.9%	*	*
Died	2485	19.3%	*	*	*	*
Other	2625	20.4%	853	27.4%	106	22.9%
Refused transplant	72	0.6%	46	1.5%	*	*
Still Waiting	*	*	*	*	*	*
Transplanted	6985	54.2%	1733	55.7%	288	62.2%
Unable to contact candidate	28	0.2%	62	2.0%	11	2.4%
Organ = Liver						
Cand. cond. deteriorated,too sick to tx	8401	8.4%	6781	38.0%	668	20.9%
Cand. condition improved, tx not needed	2227	2.2%	1692	9.5%	370	11.6%
Died	25038	25.1%	*	*	*	*
Other	7532	7.5%	4481	25.1%	785	24.5%
Refused transplant	556	0.6%	455	2.6%	84	2.6%
Still Waiting	*	*	16	0.1%	*	*
Transplanted	55451	55.6%	3821	21.4%	1159	36.2%
Unable to contact candidate	593	0.6%	594	3.3%	130	4.1%
Organ = Lung						
Cand. cond. deteriorated,too sick to tx	1114	3.9%	785	38.4%	60	23.3%
Cand. condition improved, tx not needed	610	2.1%	257	12.6%	37	14.3%
Died	3717	12.9%	*	*	*	*
Other	1398	4.9%	516	25.2%	62	24.0%
Refused transplant	117	0.4%	71	3.5%	10	3.9%
Still Waiting	*	*	*	*	*	*
Transplanted	21675	75.5%	349	17.1%	75	29.1%
Unable to contact candidate	91	0.3%	64	3.1%	14	5.4%
Organ = Pancreas						

Table 51: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, removal reason, and source of death information. (continued)

Removal Reason	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Cand. cond. deteriorated,too sick to tx	372	5.6%	161	10.8%	17	9.5%
Cand. condition improved, tx not needed	96	1.5%	21	1.4%	*	*
Died	750	11.4%	*	*	*	*
Other	2046	31.1%	601	40.3%	68	38.0%
Refused transplant	143	2.2%	60	4.0%	*	*
Still Waiting	*	*	*	*	*	*
Transplanted	3146	47.7%	607	40.7%	77	43.0%
Unable to contact candidate	36	0.5%	42	2.8%	*	*
TOTAL						
Cand. cond. deteriorated,too sick to tx	24623	5.7%	30895	28.4%	3757	20.5%
Cand. condition improved, tx not needed	5044	1.2%	3112	2.9%	559	3.0%
Died	119311	27.7%	24	0.0%	*	*
Other	42421	9.8%	25873	23.8%	4162	22.7%
Refused transplant	2914	0.7%	3329	3.1%	544	3.0%
Still Waiting	82	0.0%	297	0.3%	135	0.7%
Transplanted	235047	54.5%	41771	38.4%	8441	46.0%
Unable to contact candidate	1687	0.4%	3480	3.2%	754	4.1%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

The table below provides a summary of the distribution of the number of deaths, from each death source, per listing center state for each organ. Across organs and death sources, the number of waitlist registration deaths per state is right-skewed.

Table 52: Summary of number of deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 per listing center state by organ and source of death information. Listing center states for each organ type included if at least one death.

Source of Death Information	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	1	265.50	882.5	592.0	1153.75	4045
External Verification	2	44.00	120.6	80.0	164.00	443
Unverified	1	5.00	18.8	10.0	16.00	146
Organ = Kidney						
Member Reported	11	976.00	4965.4	3037.0	6686.00	34897
External Verification	6	295.00	1621.3	1004.0	2126.00	10281
Unverified	1	35.00	276.5	107.0	205.00	3348
Organ = Kidney-Pancreas						
Member Reported	1	67.25	280.2	186.5	326.50	1548
External Verification	1	19.00	69.2	52.0	95.00	382
Unverified	1	3.00	12.2	7.5	10.75	129
Organ = Liver						
Member Reported	7	783.00	2376.1	1531.5	2563.00	13869
External Verification	2	109.75	424.8	246.5	395.75	2910
Unverified	1	12.00	80.0	35.5	59.00	958
Organ = Lung						
Member Reported	1	223.00	870.4	672.0	943.00	3494
External Verification	1	17.00	65.9	47.0	85.00	252
Unverified	1	2.50	9.6	6.0	8.50	61
Organ = Pancreas						
Member Reported	1	28.25	149.8	68.0	213.00	902
External Verification	1	9.00	34.7	22.0	38.50	170
Unverified	1	2.00	5.4	4.0	8.00	27
TOTAL						
Member Reported	27	1167.00	8798.6	5064.0	10856.00	58262
External Verification	8	322.00	2220.0	1277.0	2693.00	14341
Unverified	1	51.00	374.7	114.0	314.00	4673

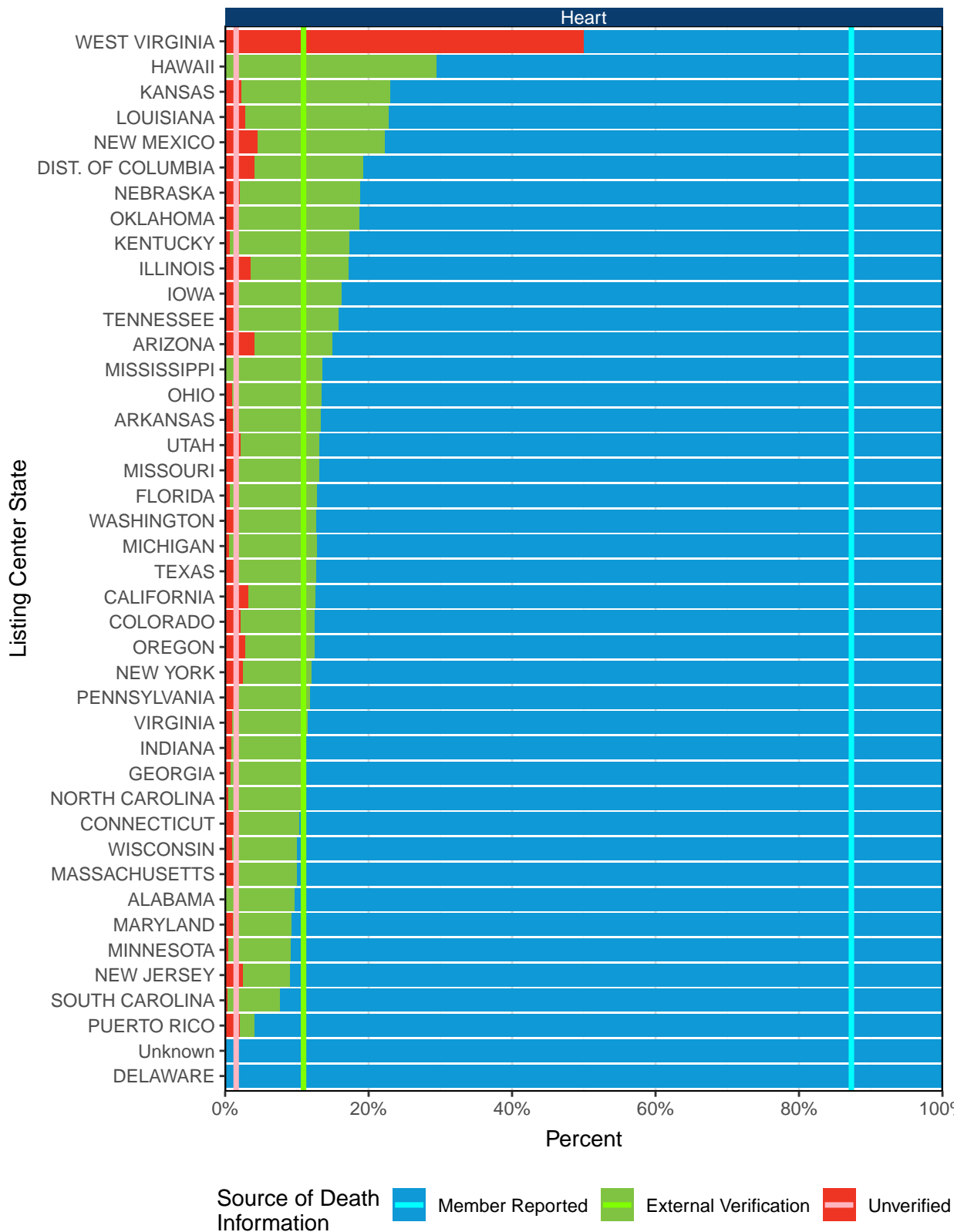
Similarly, Table 53 provides a summary of the percentage of waitlist registration deaths per listing center state from member reported, externally verified, or unverified sources of death information. This is given per state across each organ. For lung and liver waitlist registrations, a minimum of 80% and 73%, respectively, of deaths are member reported across all states. However, there were no states with 100% of kidney or liver waitlist registrations as member reported.

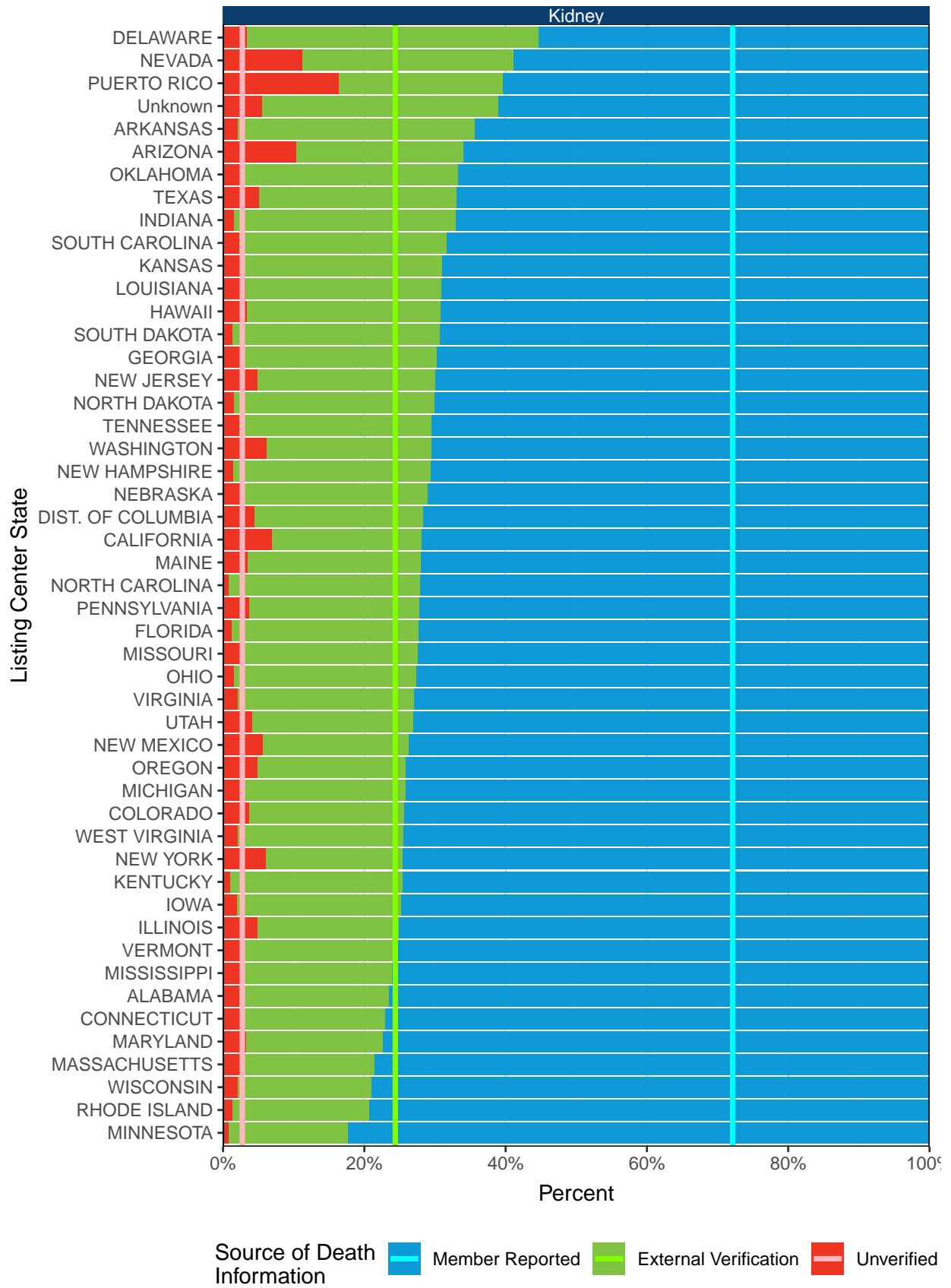
The following figures illustrate the distribution of percentages of source of death information per state for each organ.

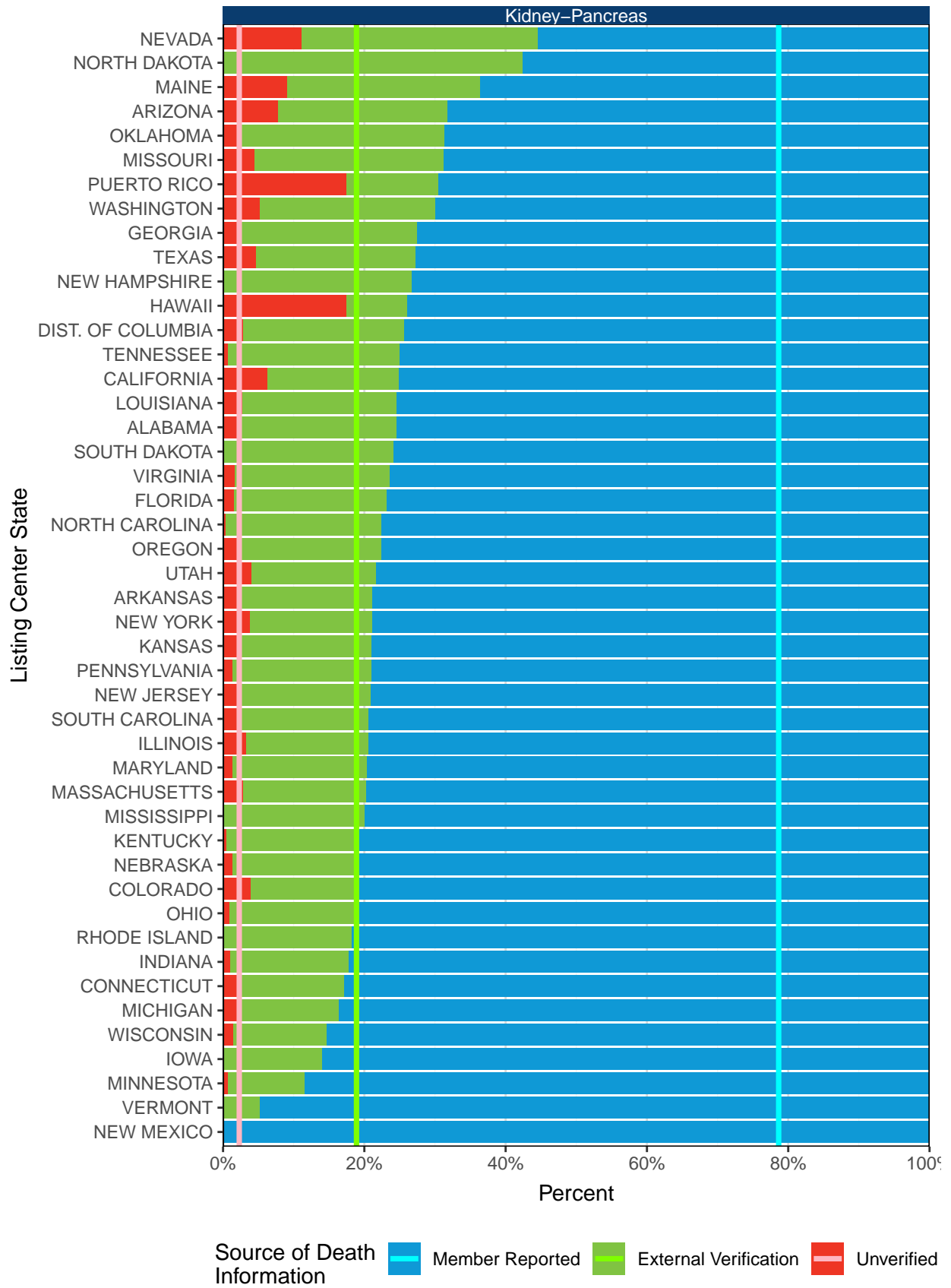
Table 53: Summary of percent of deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 per listing center state by organ and source of death information. Listing center states for each organ type included if at least one death.

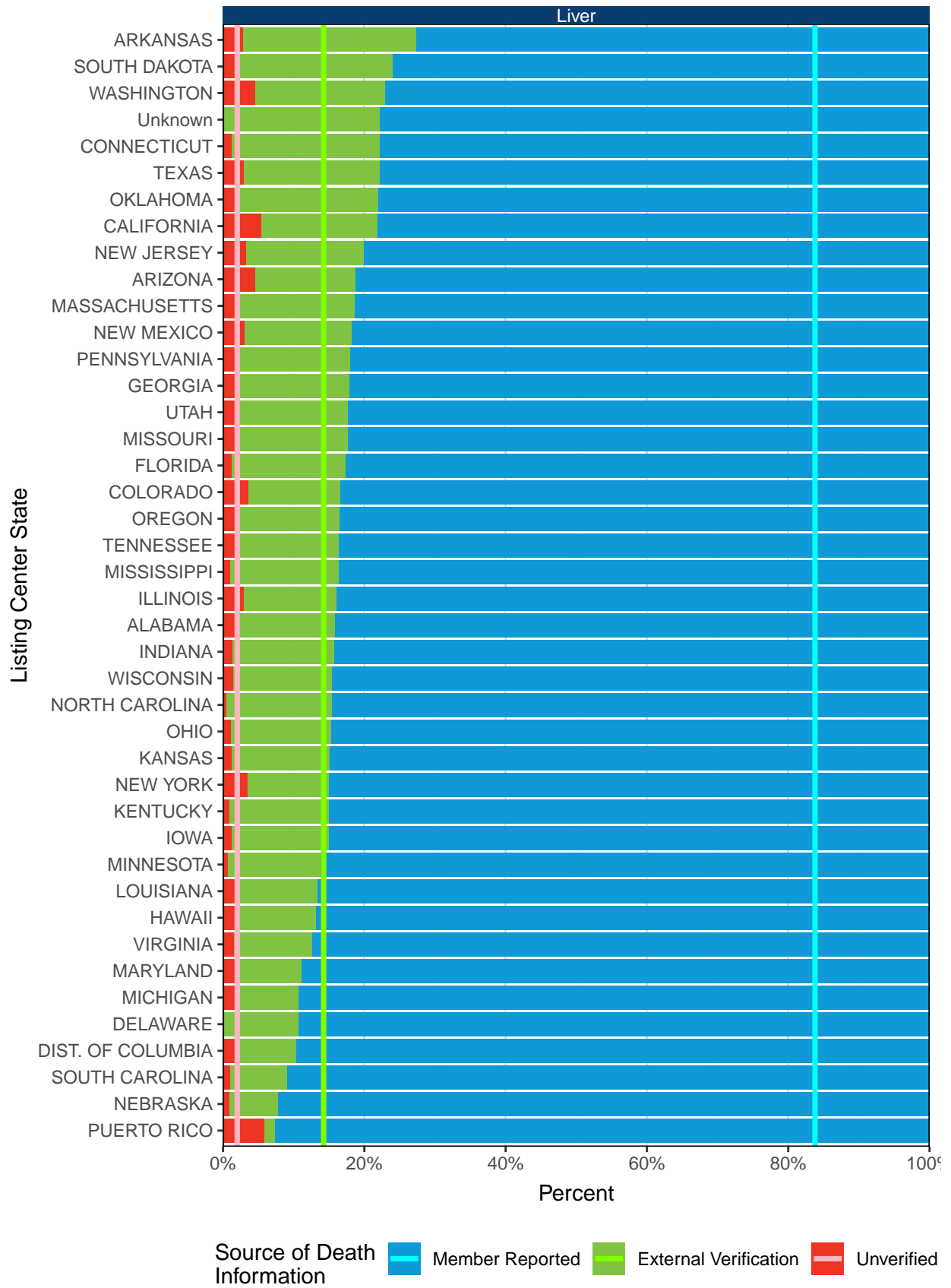
Source of Death Information	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	50.0%	84.0%	86.0%	87.3%	89.6%	100.0%
External Verification	2.0%	9.6%	12.2%	10.9%	14.1%	29.4%
Unverified	0.3%	0.9%	3.0%	1.5%	2.4%	50.0%
Organ = Kidney						
Member Reported	55.4%	69.3%	71.4%	72.1%	74.6%	82.3%
External Verification	17.0%	21.6%	25.0%	24.4%	27.7%	41.3%
Unverified	0.7%	2.0%	3.6%	2.7%	4.5%	16.4%
Organ = Kidney-Pancreas						
Member Reported	55.6%	74.0%	77.3%	78.6%	81.1%	100.0%
External Verification	5.1%	17.3%	20.0%	18.9%	22.8%	42.4%
Unverified	0.4%	1.4%	3.7%	2.3%	4.0%	17.4%
Organ = Liver						
Member Reported	72.6%	81.5%	83.6%	83.8%	86.0%	92.7%
External Verification	1.5%	11.9%	14.3%	14.2%	16.0%	24.6%
Unverified	0.5%	1.2%	2.2%	2.0%	2.8%	5.8%
Organ = Lung						
Member Reported	80.0%	92.0%	93.0%	93.3%	94.2%	100.0%
External Verification	3.2%	5.0%	6.7%	6.2%	7.3%	20.0%
Unverified	0.1%	0.4%	0.8%	0.6%	1.1%	3.0%
Organ = Pancreas						
Member Reported	50.0%	69.5%	76.5%	77.3%	82.3%	100.0%
External Verification	6.9%	16.8%	22.7%	20.7%	26.0%	100.0%
Unverified	0.3%	1.6%	4.8%	2.8%	4.3%	50.0%
TOTAL						
Member Reported	58.9%	73.3%	75.7%	76.9%	78.9%	85.2%
External Verification	14.2%	18.9%	21.2%	20.1%	22.8%	37.7%
Unverified	0.6%	1.7%	3.1%	2.3%	3.5%	14.9%

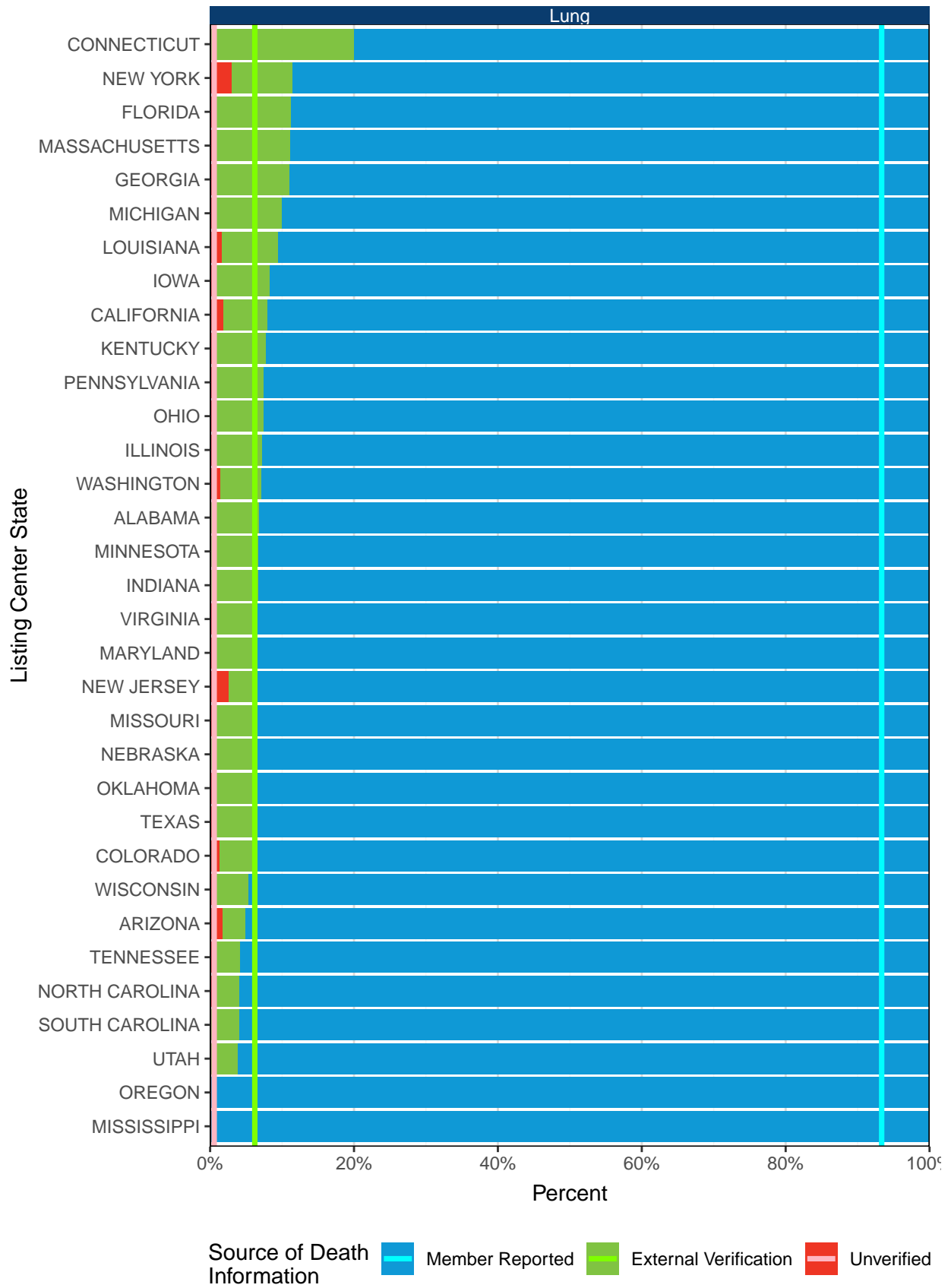
Figure 47: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, listing center state, and source of death information. Vertical lines represent medians across states.











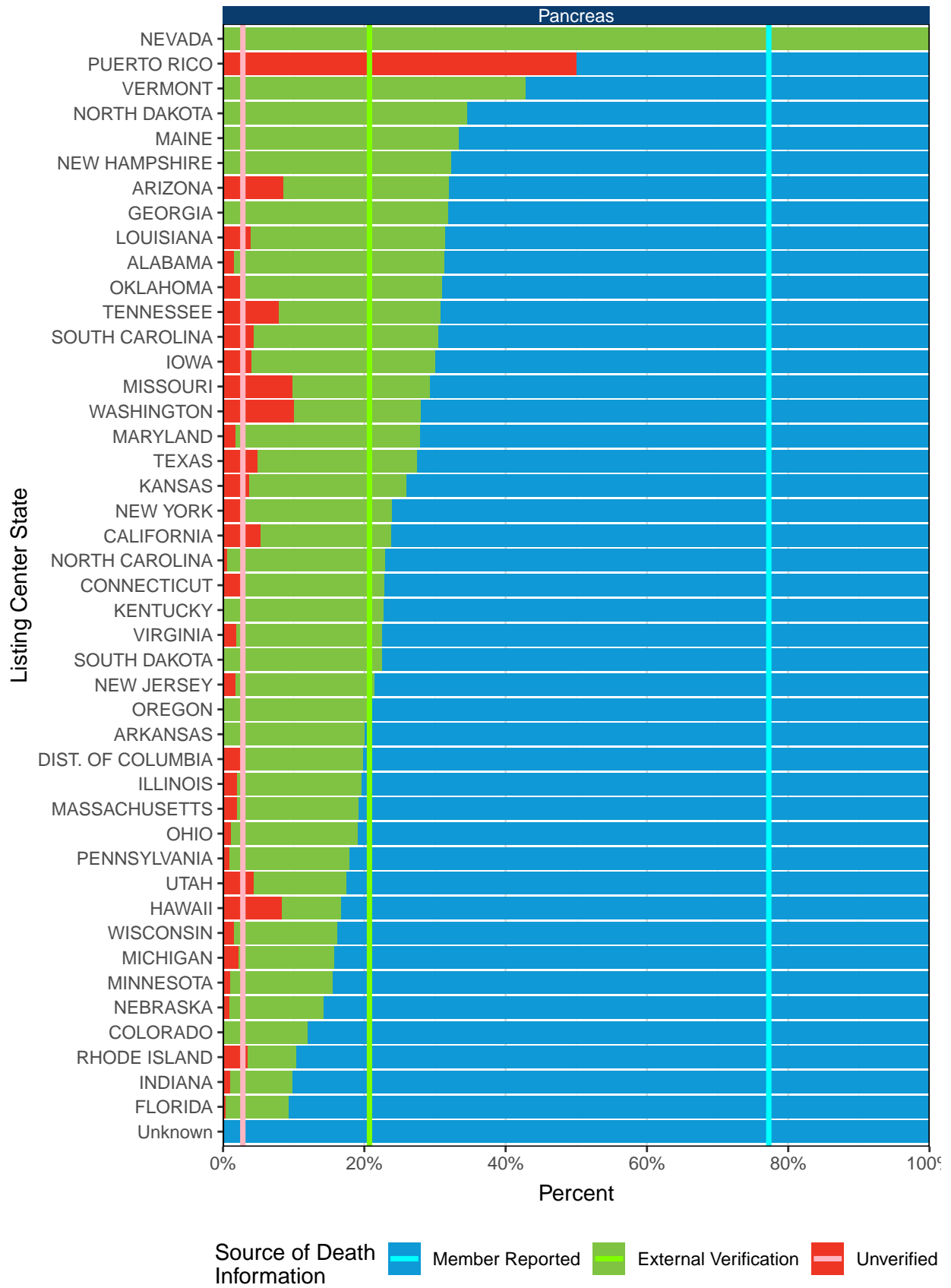


Table 54 provides a summary of the distribution of the number of deaths, from each death source, per listing center state for each organ. Across organs and death sources, the number of waitlist registration deaths per state is right-skewed.

Table 54: Summary of number of deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 per listing center by organ and source of death information. Listing centers for each organ type included if at least one death.

Source of Death Information	Mimimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	1	15.50	175.7	104.0	247.00	1227
External Verification	1	4.25	26.4	22.0	38.75	134
Unverified	1	2.00	5.5	4.0	7.00	47
Organ = Kidney						
Member Reported	1	83.25	774.9	461.0	1086.50	9206
External Verification	1	42.00	263.1	180.0	349.75	2116
Unverified	1	7.25	48.7	20.0	57.50	596
Organ = Kidney-Pancreas						
Member Reported	1	18.25	72.4	48.5	91.50	625
External Verification	1	6.00	19.1	14.0	26.50	83
Unverified	1	1.00	3.9	3.0	5.00	31
Organ = Liver						
Member Reported	1	58.75	580.2	350.5	901.75	3393
External Verification	1	15.00	112.9	95.0	156.75	762
Unverified	1	6.00	23.5	15.0	29.00	257
Organ = Lung						
Member Reported	1	14.25	271.0	109.0	436.00	1508
External Verification	1	4.00	23.5	12.0	36.50	113
Unverified	1	1.75	4.6	3.0	6.00	26
Organ = Pancreas						
Member Reported	1	8.00	39.2	18.0	40.50	710
External Verification	1	2.00	9.9	5.0	11.50	112
Unverified	1	1.00	2.3	2.0	3.00	9
TOTAL						
Member Reported	1	98.00	1264.3	516.0	1765.00	12936
External Verification	1	30.00	336.8	187.0	499.00	2734
Unverified	1	7.00	62.7	27.0	72.00	947

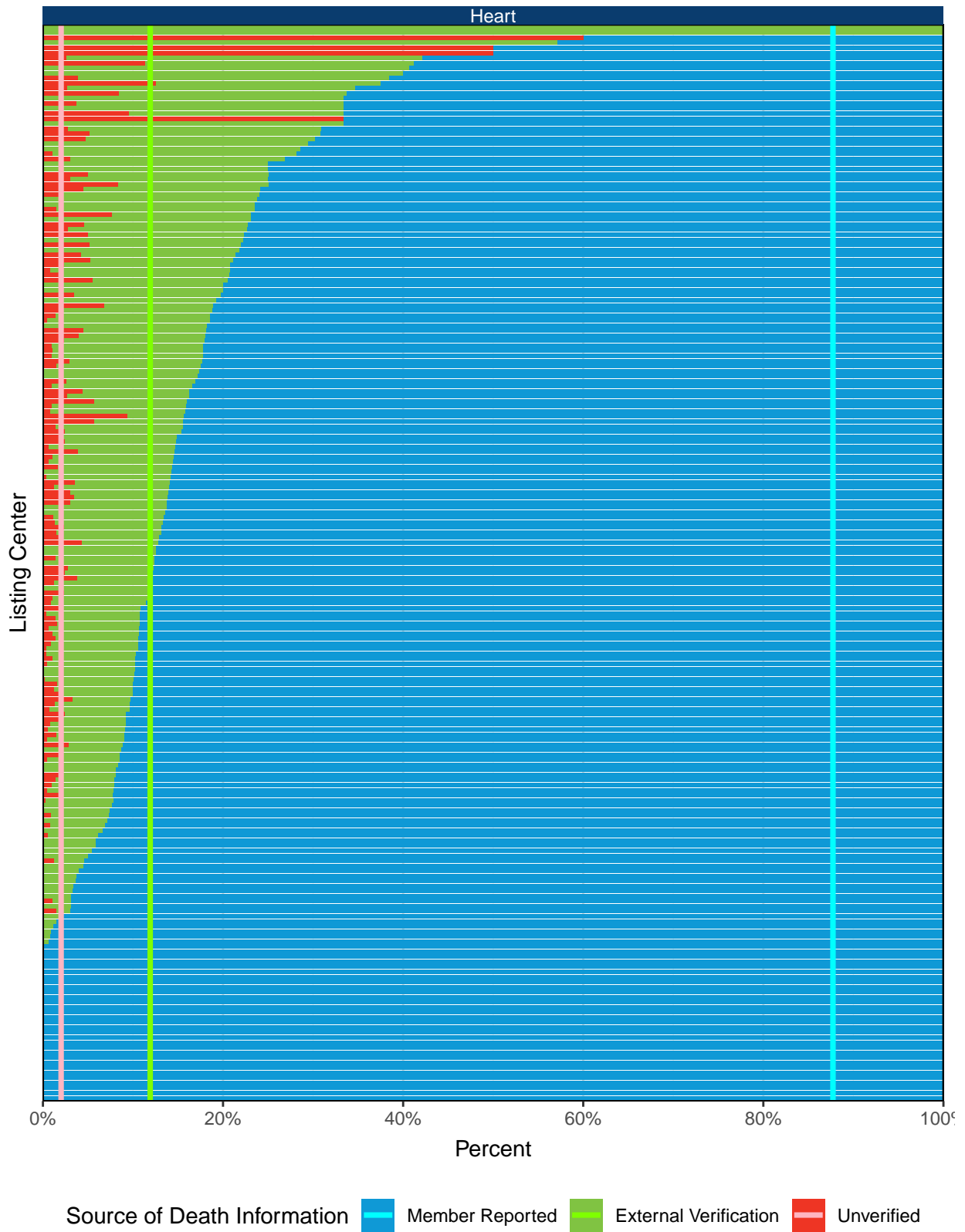
The table below provides a summary of the percentage of waitlist registration deaths per listing center from member reported, externally verified, or unverified sources of death information. This is given per center across each organ. Half of all listing centers had at least 75% of all waitlist registration deaths as member reported.

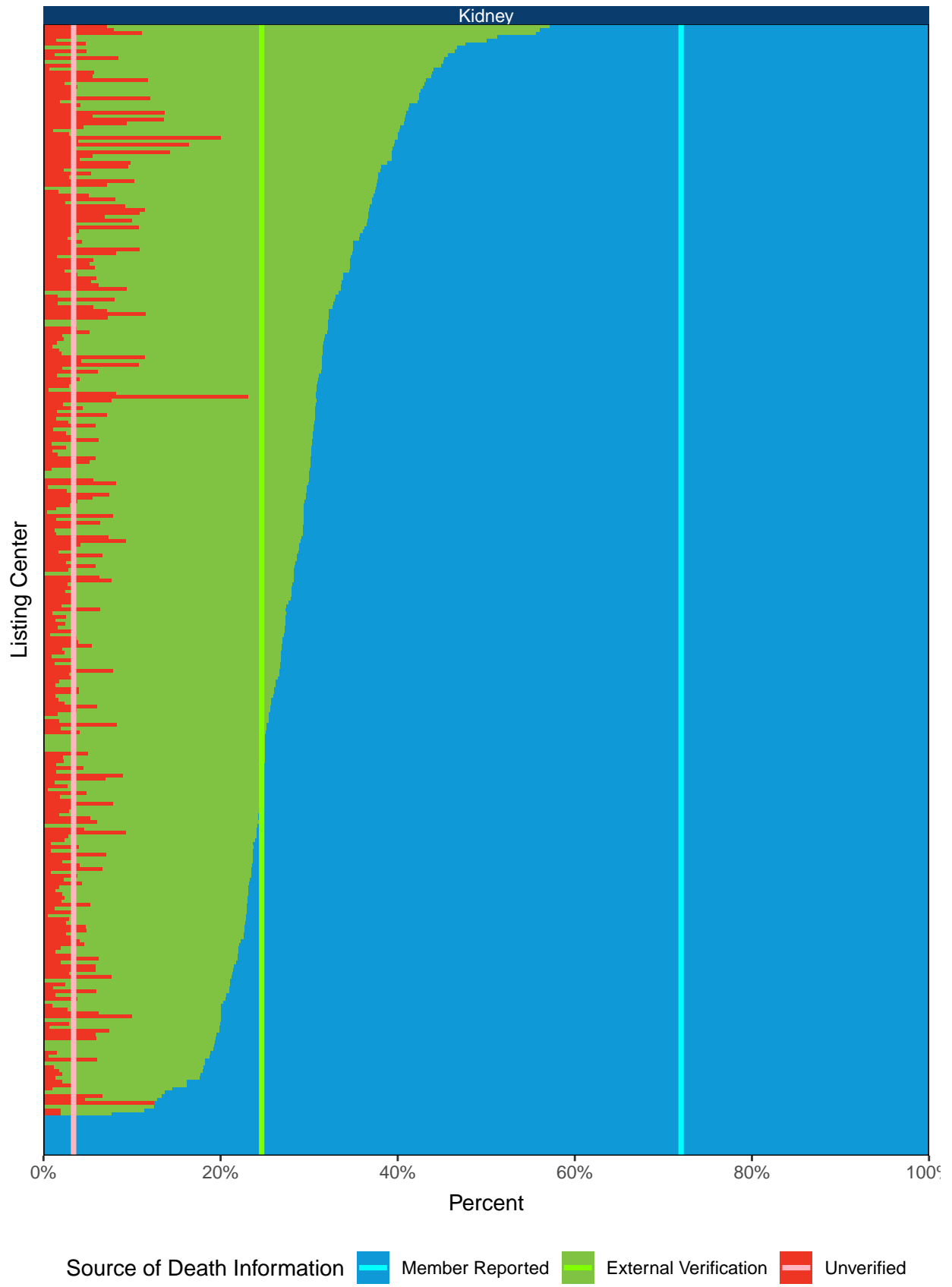
The following figures illustrate the distribution of percentages of source of death information per center for each organ.

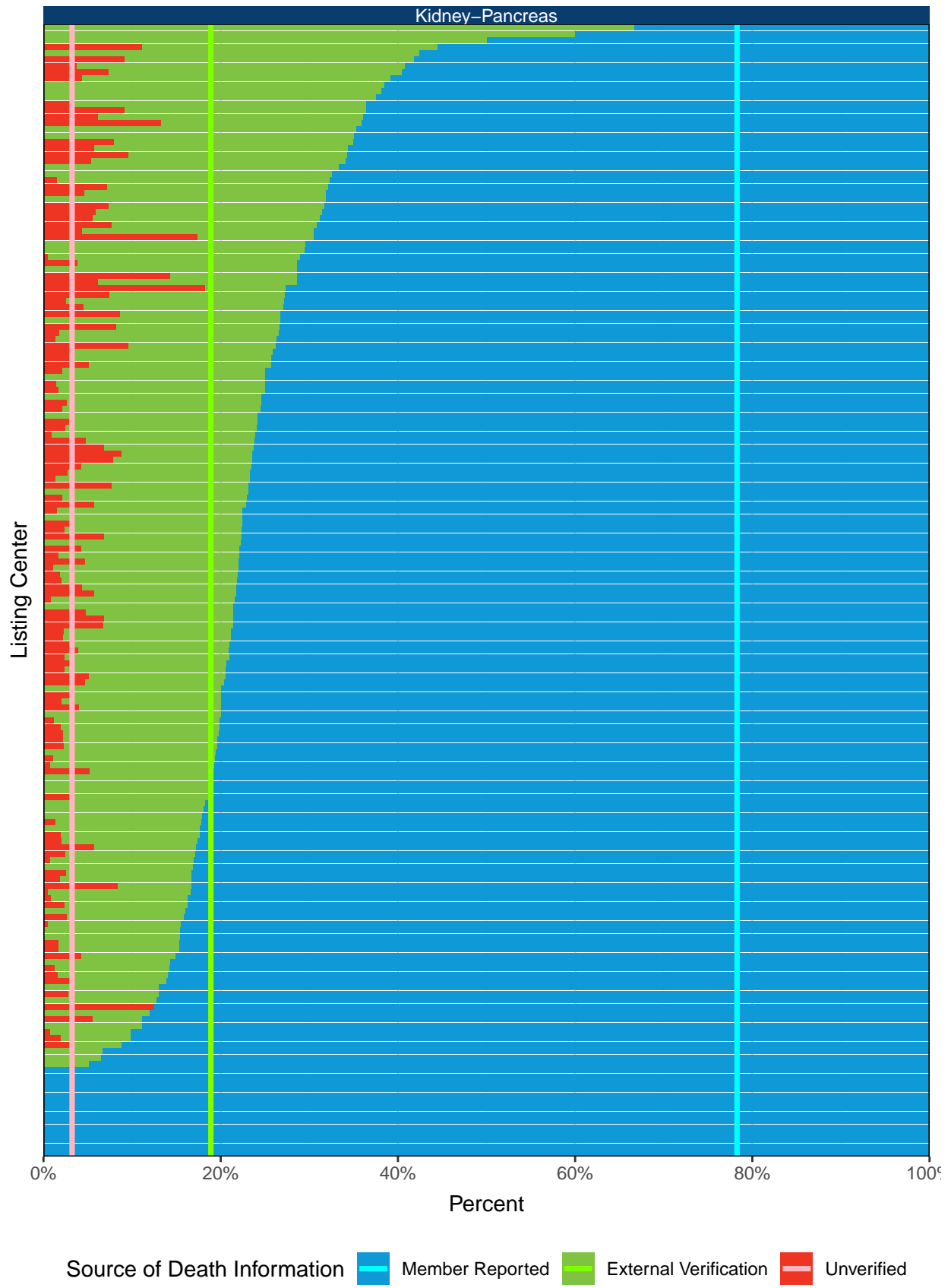
Table 55: Summary of percent of deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 per listing center by organ and source of death information. Listing centers for each organ type included if at least one death.

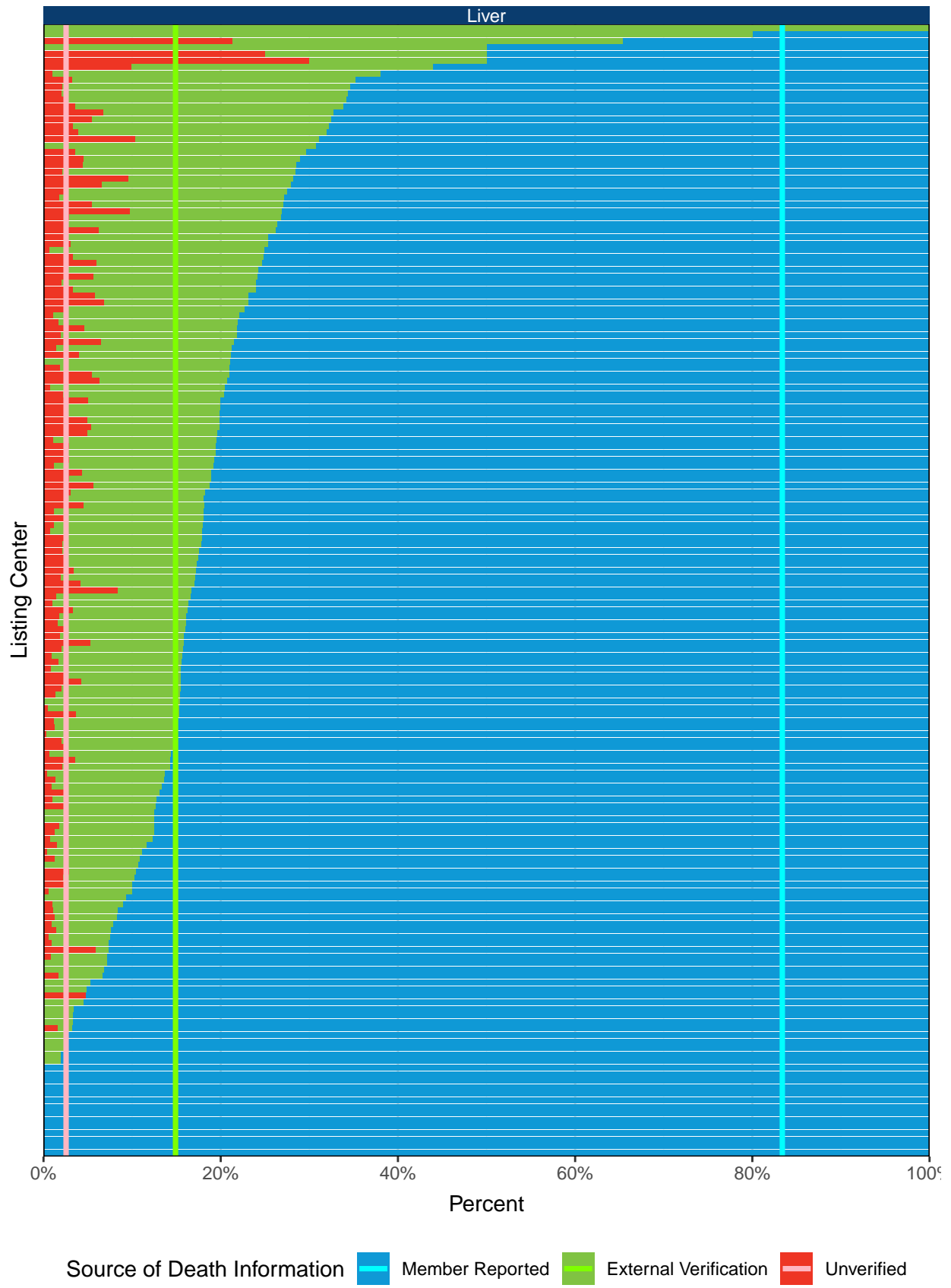
Source of Death Information	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum
Organ = Heart						
Member Reported	40.0%	80.9%	86.1%	87.7%	93.7%	100.0%
External Verification	0.7%	8.2%	14.8%	11.9%	17.9%	100.0%
Unverified	0.1%	1.0%	4.0%	2.0%	3.7%	60.0%
Organ = Kidney						
Member Reported	42.9%	67.5%	71.9%	72.0%	76.5%	100.0%
External Verification	5.8%	20.3%	25.2%	24.6%	29.0%	50.0%
Unverified	0.4%	2.0%	4.4%	3.4%	6.0%	23.1%
Organ = Kidney-Pancreas						
Member Reported	33.3%	73.0%	78.1%	78.3%	83.3%	100.0%
External Verification	5.1%	15.5%	20.8%	18.9%	24.4%	66.7%
Unverified	0.5%	2.0%	4.3%	3.2%	5.7%	18.2%
Organ = Liver						
Member Reported	20.0%	77.8%	82.5%	83.4%	89.6%	100.0%
External Verification	1.5%	11.2%	16.7%	14.9%	20.0%	100.0%
Unverified	0.3%	1.4%	3.4%	2.5%	4.2%	30.0%
Organ = Lung						
Member Reported	61.9%	89.6%	92.2%	93.1%	96.4%	100.0%
External Verification	0.7%	5.2%	8.3%	6.8%	9.9%	28.6%
Unverified	0.1%	0.5%	3.5%	1.0%	1.6%	100.0%
Organ = Pancreas						
Member Reported	33.3%	70.0%	76.9%	78.1%	84.7%	100.0%
External Verification	2.1%	13.9%	22.7%	20.4%	27.0%	100.0%
Unverified	0.3%	2.1%	6.9%	4.5%	7.4%	50.0%
TOTAL						
Member Reported	44.0%	70.1%	76.3%	75.8%	81.8%	100.0%
External Verification	1.8%	16.6%	21.8%	21.1%	25.9%	100.0%
Unverified	0.4%	1.5%	3.9%	2.9%	5.1%	33.3%

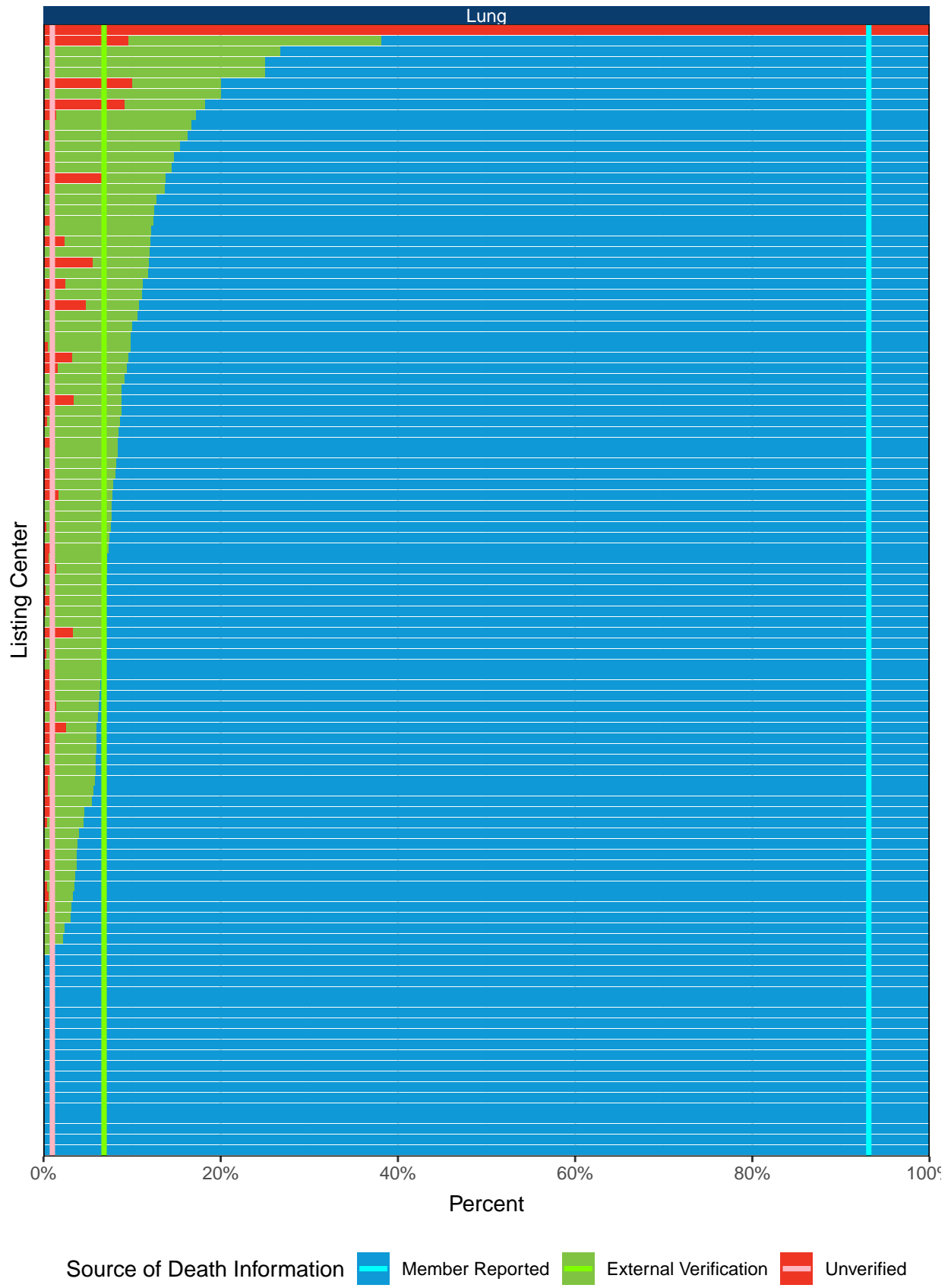
Figure 48: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, candidate listing center, and source of death information. Vertical lines represent medians across centers.

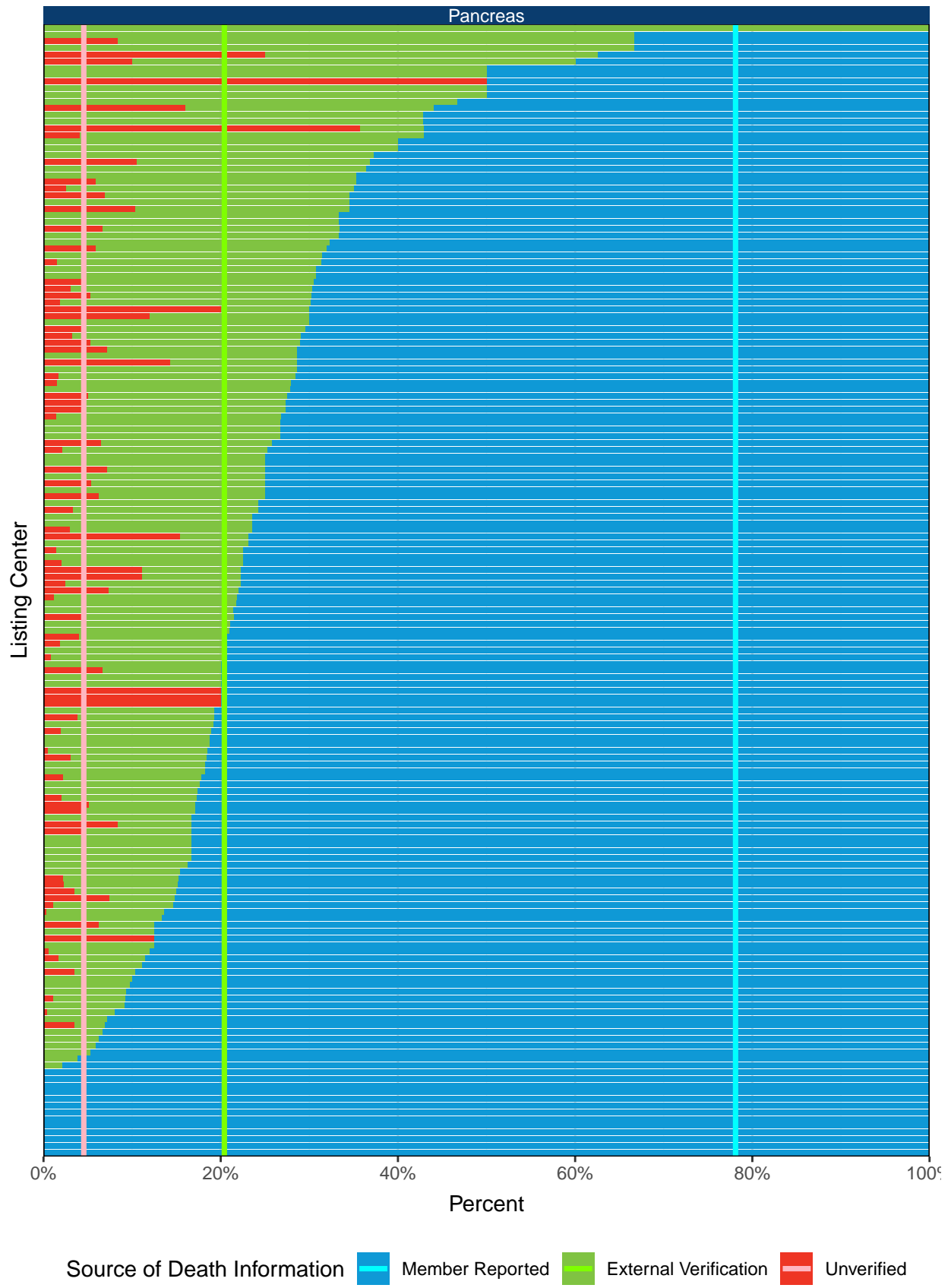












Appendix

Table 56: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, year transplanted, and source of death information.

Year Transplanted	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
1987	51	0.2%	*	*	*	*
1988	251	1.0%	12	0.9%	*	*
1989	320	1.3%	17	1.3%	*	*
1990	441	1.7%	33	2.5%	10	3.5%
1991	488	1.9%	33	2.5%	*	*
1992	547	2.1%	41	3.1%	*	*
1993	624	2.5%	54	4.0%	*	*
1994	790	3.1%	40	3.0%	*	*
1995	788	3.1%	61	4.6%	15	5.3%
1996	875	3.4%	68	5.1%	*	*
1997	917	3.6%	72	5.4%	16	5.6%
1998	972	3.8%	81	6.1%	16	5.6%
1999	937	3.7%	77	5.8%	14	4.9%
2000	1008	4.0%	73	5.5%	12	4.2%
2001	949	3.7%	90	6.7%	17	6.0%
2002	974	3.8%	63	4.7%	20	7.0%
2003	973	3.8%	61	4.6%	12	4.2%
2004	964	3.8%	60	4.5%	17	6.0%
2005	1199	4.7%	49	3.7%	14	4.9%
2006	1150	4.5%	59	4.4%	11	3.9%
2007	1087	4.3%	52	3.9%	15	5.3%
2008	962	3.8%	39	2.9%	*	*
2009	953	3.7%	34	2.5%	10	3.5%
2010	892	3.5%	37	2.8%	*	*
2011	802	3.1%	28	2.1%	*	*
2012	738	2.9%	26	1.9%	*	*
2013	728	2.9%	20	1.5%	*	*
2014	719	2.8%	12	0.9%	*	*
2015	610	2.4%	12	0.9%	*	*
2016	623	2.4%	*	*	*	*
2017	570	2.2%	*	*	*	*
2018	488	1.9%	*	*	*	*
2019	454	1.8%	*	*	*	*
2020	380	1.5%	*	*	*	*
2021	240	0.9%	*	*	*	*
Organ = Kidney						
1987	198	0.2%	65	0.2%	12	0.2%
1988	960	0.9%	294	0.9%	56	0.9%
1989	1100	1.0%	341	1.1%	54	0.9%
1990	1336	1.2%	409	1.3%	61	1.0%
1991	1521	1.4%	476	1.5%	72	1.2%
1992	1680	1.5%	501	1.6%	72	1.2%
1993	2025	1.8%	569	1.8%	69	1.2%
1994	2379	2.1%	639	2.0%	104	1.8%

Table 56: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, year transplanted, and source of death information. (continued)

Year Transplanted	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
1995	2607	2.3%	769	2.5%	106	1.8%
1996	3042	2.7%	853	2.7%	112	1.9%
1997	3342	3.0%	940	3.0%	136	2.3%
1998	3788	3.4%	1091	3.5%	174	2.9%
1999	4110	3.7%	1157	3.7%	182	3.1%
2000	4514	4.1%	1304	4.2%	189	3.2%
2001	4903	4.4%	1456	4.6%	195	3.3%
2002	5280	4.7%	1603	5.1%	232	3.9%
2003	5444	4.9%	1643	5.2%	245	4.1%
2004	5835	5.2%	1776	5.7%	298	5.0%
2005	6066	5.4%	1838	5.9%	311	5.2%
2006	5945	5.3%	1909	6.1%	343	5.8%
2007	5377	4.8%	1755	5.6%	355	6.0%
2008	4995	4.5%	1616	5.2%	306	5.2%
2009	4786	4.3%	1526	4.9%	338	5.7%
2010	4423	4.0%	1441	4.6%	334	5.6%
2011	4080	3.7%	1215	3.9%	291	4.9%
2012	3529	3.2%	1019	3.2%	236	4.0%
2013	3184	2.9%	883	2.8%	259	4.4%
2014	2928	2.6%	662	2.1%	175	2.9%
2015	2596	2.3%	541	1.7%	200	3.4%
2016	2269	2.0%	388	1.2%	139	2.3%
2017	1893	1.7%	288	0.9%	117	2.0%
2018	1791	1.6%	192	0.6%	84	1.4%
2019	1658	1.5%	121	0.4%	47	0.8%
2020	1317	1.2%	63	0.2%	25	0.4%
2021	548	0.5%	13	0.0%	*	*
Organ = Kidney-Pancreas						
1987	*	*	*	*	*	*
1988	43	0.6%	*	*	*	*
1989	90	1.3%	22	1.3%	*	*
1990	115	1.7%	24	1.5%	*	*
1991	127	1.9%	27	1.7%	*	*
1992	145	2.2%	31	1.9%	*	*
1993	216	3.2%	42	2.6%	*	*
1994	263	3.9%	52	3.2%	*	*
1995	323	4.8%	70	4.3%	*	*
1996	290	4.3%	74	4.5%	*	*
1997	292	4.3%	85	5.2%	*	*
1998	360	5.3%	82	5.0%	16	5.7%
1999	360	5.3%	79	4.8%	17	6.1%
2000	345	5.1%	103	6.3%	12	4.3%
2001	360	5.3%	92	5.6%	11	3.9%
2002	340	5.1%	84	5.2%	15	5.4%
2003	324	4.8%	97	5.9%	12	4.3%
2004	325	4.8%	73	4.5%	13	4.7%
2005	309	4.6%	74	4.5%	14	5.0%
2006	329	4.9%	85	5.2%	15	5.4%

Table 56: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, year transplanted, and source of death information. (continued)

Year Transplanted	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2007	271	4.0%	71	4.4%	12	4.3%
2008	251	3.7%	69	4.2%	14	5.0%
2009	225	3.3%	66	4.0%	10	3.6%
2010	191	2.8%	69	4.2%	14	5.0%
2011	152	2.3%	40	2.5%	*	*
2012	129	1.9%	39	2.4%	15	5.4%
2013	121	1.8%	17	1.0%	*	*
2014	82	1.2%	19	1.2%	*	*
2015	70	1.0%	11	0.7%	*	*
2016	82	1.2%	10	0.6%	*	*
2017	49	0.7%	*	*	*	*
2018	47	0.7%	*	*	*	*
2019	35	0.5%	*	*	*	*
2020	45	0.7%	*	*	*	*
2021	17	0.3%	*	*	*	*
Organ = Liver						
1987	29	0.1%	*	*	*	*
1988	217	0.4%	21	0.6%	*	*
1989	279	0.6%	25	0.7%	11	1.0%
1990	423	0.9%	52	1.5%	11	1.0%
1991	483	1.0%	58	1.7%	17	1.6%
1992	567	1.1%	81	2.3%	18	1.7%
1993	700	1.4%	82	2.3%	18	1.7%
1994	847	1.7%	99	2.8%	26	2.4%
1995	958	1.9%	144	4.1%	28	2.6%
1996	1042	2.1%	135	3.9%	28	2.6%
1997	1093	2.2%	154	4.4%	32	3.0%
1998	1261	2.6%	178	5.1%	36	3.4%
1999	1353	2.7%	177	5.1%	43	4.0%
2000	1479	3.0%	180	5.1%	43	4.0%
2001	1605	3.2%	172	4.9%	57	5.3%
2002	1717	3.5%	178	5.1%	50	4.7%
2003	1955	4.0%	199	5.7%	57	5.3%
2004	2490	5.0%	167	4.8%	54	5.0%
2005	3039	6.2%	189	5.4%	52	4.9%
2006	3047	6.2%	176	5.0%	72	6.7%
2007	2814	5.7%	154	4.4%	49	4.6%
2008	2626	5.3%	147	4.2%	60	5.6%
2009	2489	5.0%	131	3.7%	59	5.5%
2010	2318	4.7%	118	3.4%	34	3.2%
2011	2039	4.1%	102	2.9%	36	3.4%
2012	1813	3.7%	101	2.9%	31	2.9%
2013	1725	3.5%	52	1.5%	34	3.2%
2014	1562	3.2%	59	1.7%	28	2.6%
2015	1447	2.9%	51	1.5%	30	2.8%
2016	1414	2.9%	39	1.1%	16	1.5%
2017	1339	2.7%	34	1.0%	14	1.3%
2018	1112	2.3%	18	0.5%	12	1.1%

Table 56: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, year transplanted, and source of death information. (continued)

Year Transplanted	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2019	915	1.9%	15	0.4%	*	*
2020	789	1.6%	12	0.3%	*	*
2021	423	0.9%	*	*	*	*
Organ = Lung						
1987	*	*	*	*	*	*
1988	*	*	*	*	*	*
1989	*	*	*	*	*	*
1990	12	0.1%	*	*	*	*
1991	31	0.2%	*	*	*	*
1992	60	0.3%	*	*	*	*
1993	100	0.5%	*	*	*	*
1994	112	0.6%	*	*	*	*
1995	143	0.7%	*	*	*	*
1996	166	0.8%	*	*	*	*
1997	237	1.2%	*	*	*	*
1998	254	1.2%	*	*	*	*
1999	299	1.5%	12	3.6%	*	*
2000	388	1.9%	*	*	*	*
2001	493	2.4%	10	3.0%	*	*
2002	577	2.8%	*	*	*	*
2003	651	3.2%	11	3.3%	*	*
2004	820	4.0%	21	6.2%	*	*
2005	1113	5.5%	16	4.7%	*	*
2006	1101	5.4%	13	3.9%	*	*
2007	1137	5.6%	19	5.6%	*	*
2008	1111	5.5%	22	6.5%	*	*
2009	1168	5.7%	24	7.1%	*	*
2010	1218	6.0%	16	4.7%	*	*
2011	1216	6.0%	18	5.3%	*	*
2012	1077	5.3%	23	6.8%	*	*
2013	1105	5.4%	19	5.6%	*	*
2014	1018	5.0%	*	*	*	*
2015	947	4.7%	15	4.5%	*	*
2016	947	4.7%	12	3.6%	*	*
2017	867	4.3%	*	*	*	*
2018	737	3.6%	*	*	*	*
2019	616	3.0%	*	*	*	*
2020	425	2.1%	*	*	*	*
2021	181	0.9%	*	*	*	*
Organ = Pancreas						
1987	*	*	*	*	*	*
1988	12	0.5%	*	*	*	*
1989	12	0.5%	*	*	*	*
1990	13	0.5%	*	*	*	*
1991	10	0.4%	*	*	*	*
1992	*	*	*	*	*	*
1993	18	0.7%	*	*	*	*
1994	16	0.6%	*	*	*	*

Table 56: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, year transplanted, and source of death information. (continued)

Year Transplanted	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
1995	25	0.9%	*	*	*	*
1996	41	1.5%	11	2.3%	*	*
1997	57	2.1%	10	2.1%	*	*
1998	69	2.6%	21	4.3%	*	*
1999	105	3.9%	26	5.4%	*	*
2000	163	6.1%	24	5.0%	*	*
2001	172	6.5%	37	7.6%	*	*
2002	205	7.7%	49	10.1%	*	*
2003	179	6.7%	46	9.5%	*	*
2004	231	8.7%	43	8.9%	*	*
2005	208	7.8%	47	9.7%	*	*
2006	171	6.4%	31	6.4%	*	*
2007	165	6.2%	20	4.1%	*	*
2008	129	4.8%	13	2.7%	*	*
2009	124	4.7%	25	5.2%	*	*
2010	107	4.0%	12	2.5%	*	*
2011	70	2.6%	11	2.3%	*	*
2012	53	2.0%	*	*	*	*
2013	52	2.0%	*	*	*	*
2014	47	1.8%	10	2.1%	*	*
2015	50	1.9%	*	*	*	*
2016	41	1.5%	*	*	*	*
2017	28	1.1%	*	*	*	*
2018	33	1.2%	*	*	*	*
2019	21	0.8%	*	*	*	*
2020	17	0.6%	*	*	*	*
2021	10	0.4%	*	*	*	*
TOTAL						
1987	285	0.1%	71	0.2%	12	0.2%
1988	1488	0.7%	335	0.9%	67	0.9%
1989	1812	0.8%	405	1.0%	71	0.9%
1990	2350	1.1%	520	1.3%	89	1.2%
1991	2671	1.2%	601	1.6%	94	1.2%
1992	3015	1.4%	664	1.7%	99	1.3%
1993	3692	1.7%	751	1.9%	99	1.3%
1994	4417	2.0%	839	2.2%	143	1.9%
1995	4864	2.2%	1055	2.7%	160	2.1%
1996	5466	2.5%	1148	3.0%	158	2.1%
1997	5952	2.7%	1270	3.3%	194	2.5%
1998	6720	3.1%	1456	3.8%	242	3.1%
1999	7178	3.3%	1530	4.0%	262	3.4%
2000	7925	3.6%	1689	4.4%	261	3.4%
2001	8509	3.9%	1858	4.8%	285	3.7%
2002	9125	4.2%	1987	5.1%	328	4.3%
2003	9568	4.4%	2057	5.3%	333	4.3%
2004	10741	4.9%	2141	5.5%	392	5.1%
2005	12056	5.5%	2214	5.7%	397	5.2%
2006	11865	5.5%	2274	5.9%	450	5.8%

Table 56: Deaths for transplant recipients during January 1, 2005 - December 31, 2021 by organ, year transplanted, and source of death information. (continued)

Year Transplanted	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2007	10970	5.0%	2073	5.4%	437	5.7%
2008	10189	4.7%	1908	4.9%	397	5.2%
2009	9862	4.5%	1806	4.7%	427	5.5%
2010	9253	4.3%	1696	4.4%	395	5.1%
2011	8435	3.9%	1416	3.7%	348	4.5%
2012	7402	3.4%	1215	3.1%	291	3.8%
2013	6973	3.2%	1000	2.6%	312	4.0%
2014	6420	2.9%	773	2.0%	223	2.9%
2015	5783	2.7%	633	1.6%	239	3.1%
2016	5436	2.5%	460	1.2%	165	2.1%
2017	4784	2.2%	348	0.9%	143	1.9%
2018	4252	2.0%	226	0.6%	101	1.3%
2019	3735	1.7%	151	0.4%	56	0.7%
2020	3005	1.4%	88	0.2%	31	0.4%
2021	1434	0.7%	14	0.0%	*	*

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Table 57: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information.

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
1987	*	*	*	*	*	*
1988	37	0.3%	*	*	*	*
1989	56	0.5%	*	*	*	*
1990	68	0.6%	14	0.4%	*	*
1991	60	0.6%	14	0.4%	*	*
1992	70	0.6%	12	0.4%	*	*
1993	80	0.7%	11	0.3%	*	*
1994	80	0.7%	23	0.7%	*	*
1995	104	1.0%	15	0.4%	*	*
1996	106	1.0%	22	0.7%	*	*
1997	84	0.8%	31	0.9%	*	*
1998	110	1.0%	28	0.8%	*	*
1999	169	1.6%	33	1.0%	*	*
2000	128	1.2%	42	1.3%	*	*
2001	140	1.3%	32	1.0%	*	*
2002	187	1.7%	39	1.2%	*	*
2003	177	1.6%	46	1.4%	*	*
2004	216	2.0%	59	1.8%	10	2.4%
2005	679	6.3%	51	1.5%	*	*
2006	673	6.2%	59	1.8%	*	*
2007	637	5.9%	83	2.5%	*	*
2008	699	6.5%	89	2.7%	20	4.9%

Table 57: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2009	674	6.3%	72	2.1%	*	*
2010	611	5.7%	74	2.2%	*	*
2011	650	6.0%	136	4.1%	*	*
2012	577	5.4%	168	5.0%	11	2.7%
2013	517	4.8%	275	8.2%	12	2.9%
2014	524	4.9%	385	11.5%	25	6.1%
2015	556	5.2%	386	11.5%	22	5.4%
2016	446	4.1%	330	9.8%	27	6.6%
2017	418	3.9%	244	7.3%	37	9.0%
2018	387	3.6%	221	6.6%	46	11.2%
2019	300	2.8%	178	5.3%	33	8.1%
2020	286	2.7%	117	3.5%	41	10.0%
2021	269	2.5%	58	1.7%	20	4.9%
Organ = Kidney						
1987	12	0.0%	*	*	*	*
1988	102	0.1%	35	0.1%	*	*
1989	166	0.1%	53	0.1%	12	0.2%
1990	227	0.2%	63	0.1%	*	*
1991	223	0.2%	65	0.1%	*	*
1992	276	0.2%	89	0.2%	19	0.3%
1993	492	0.4%	146	0.3%	20	0.3%
1994	591	0.5%	138	0.3%	25	0.4%
1995	637	0.5%	152	0.3%	24	0.4%
1996	576	0.5%	189	0.4%	31	0.5%
1997	615	0.5%	207	0.5%	36	0.5%
1998	741	0.6%	207	0.5%	37	0.5%
1999	845	0.7%	232	0.5%	41	0.6%
2000	994	0.8%	230	0.5%	22	0.3%
2001	1067	0.9%	239	0.5%	35	0.5%
2002	1232	1.0%	310	0.7%	45	0.7%
2003	1510	1.2%	363	0.8%	46	0.7%
2004	1792	1.5%	388	0.9%	49	0.7%
2005	7227	6.0%	636	1.4%	88	1.3%
2006	7550	6.2%	659	1.5%	92	1.4%
2007	7705	6.4%	982	2.2%	82	1.2%
2008	7912	6.5%	1364	3.1%	144	2.1%
2009	7613	6.3%	1546	3.5%	157	2.3%
2010	7338	6.1%	2055	4.6%	195	2.9%
2011	6970	5.8%	2762	6.2%	213	3.2%
2012	6503	5.4%	3351	7.5%	306	4.5%
2013	6105	5.0%	3871	8.7%	406	6.0%
2014	6111	5.0%	4354	9.8%	498	7.4%
2015	6218	5.1%	4710	10.5%	646	9.6%
2016	5927	4.9%	4216	9.4%	755	11.2%
2017	5454	4.5%	3680	8.2%	769	11.4%
2018	4998	4.1%	2941	6.6%	721	10.7%
2019	4598	3.8%	2306	5.2%	615	9.1%
2020	5457	4.5%	1466	3.3%	426	6.3%

Table 57: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2021	5286	4.4%	641	1.4%	180	2.7%
Organ = Kidney-Pancreas						
1987	*	*	*	*	*	*
1988	*	*	*	*	*	*
1989	*	*	*	*	*	*
1990	*	*	*	*	*	*
1991	*	*	*	*	*	*
1992	12	0.2%	*	*	*	*
1993	32	0.7%	*	*	*	*
1994	45	0.9%	*	*	*	*
1995	49	1.0%	*	*	*	*
1996	47	1.0%	*	*	*	*
1997	61	1.3%	16	1.5%	*	*
1998	61	1.3%	*	*	*	*
1999	88	1.8%	15	1.4%	*	*
2000	85	1.8%	11	1.0%	*	*
2001	93	1.9%	19	1.7%	*	*
2002	107	2.2%	17	1.5%	*	*
2003	110	2.3%	22	2.0%	*	*
2004	128	2.6%	20	1.8%	*	*
2005	351	7.3%	26	2.4%	*	*
2006	402	8.3%	33	3.0%	*	*
2007	390	8.1%	52	4.7%	*	*
2008	346	7.2%	41	3.7%	*	*
2009	309	6.4%	46	4.2%	*	*
2010	307	6.3%	58	5.3%	*	*
2011	214	4.4%	87	7.9%	*	*
2012	249	5.1%	79	7.2%	*	*
2013	207	4.3%	75	6.8%	*	*
2014	182	3.8%	100	9.1%	13	8.7%
2015	198	4.1%	93	8.5%	*	*
2016	164	3.4%	71	6.5%	13	8.7%
2017	132	2.7%	53	4.8%	*	*
2018	134	2.8%	51	4.6%	*	*
2019	107	2.2%	39	3.6%	*	*
2020	122	2.5%	19	1.7%	*	*
2021	104	2.2%	14	1.3%	*	*
Organ = Liver						
1987	*	*	*	*	*	*
1988	18	0.0%	*	*	*	*
1989	22	0.0%	*	*	*	*
1990	43	0.1%	*	*	*	*
1991	30	0.1%	*	*	*	*
1992	52	0.1%	17	0.1%	*	*
1993	76	0.2%	14	0.1%	*	*
1994	82	0.2%	14	0.1%	*	*
1995	127	0.3%	22	0.2%	*	*
1996	157	0.4%	28	0.2%	*	*

Table 57: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
1997	170	0.4%	31	0.2%	*	*
1998	148	0.3%	33	0.2%	11	0.5%
1999	219	0.5%	48	0.3%	*	*
2000	311	0.7%	49	0.3%	14	0.7%
2001	334	0.8%	62	0.4%	10	0.5%
2002	706	1.6%	125	0.9%	24	1.2%
2003	583	1.3%	102	0.7%	28	1.4%
2004	702	1.6%	91	0.6%	25	1.2%
2005	3158	7.1%	112	0.8%	24	1.2%
2006	3199	7.2%	131	0.9%	36	1.8%
2007	3240	7.3%	189	1.3%	42	2.1%
2008	3429	7.7%	272	1.9%	54	2.7%
2009	3201	7.2%	328	2.3%	50	2.5%
2010	3317	7.5%	408	2.9%	55	2.7%
2011	3070	6.9%	632	4.5%	64	3.1%
2012	2911	6.6%	994	7.1%	95	4.7%
2013	2378	5.4%	1550	11.1%	81	4.0%
2014	2166	4.9%	1814	13.0%	89	4.4%
2015	1991	4.5%	1651	11.8%	108	5.3%
2016	1737	3.9%	1374	9.8%	148	7.3%
2017	1547	3.5%	1077	7.7%	224	11.0%
2018	1396	3.1%	1003	7.2%	223	11.0%
2019	1373	3.1%	755	5.4%	250	12.3%
2020	1235	2.8%	650	4.6%	213	10.5%
2021	1214	2.7%	408	2.9%	110	5.4%
Organ = Lung						
1987	*	*	*	*	*	*
1988	*	*	*	*	*	*
1989	*	*	*	*	*	*
1990	*	*	*	*	*	*
1991	11	0.2%	*	*	*	*
1992	*	*	*	*	*	*
1993	12	0.2%	*	*	*	*
1994	13	0.2%	*	*	*	*
1995	37	0.5%	*	*	*	*
1996	37	0.5%	*	*	*	*
1997	34	0.5%	*	*	*	*
1998	47	0.7%	*	*	*	*
1999	55	0.8%	*	*	*	*
2000	69	1.0%	14	0.8%	*	*
2001	87	1.2%	*	*	*	*
2002	106	1.5%	*	*	*	*
2003	115	1.6%	13	0.8%	*	*
2004	138	2.0%	17	1.0%	*	*
2005	651	9.2%	41	2.4%	*	*
2006	466	6.6%	36	2.1%	*	*
2007	663	9.4%	92	5.4%	15	8.2%
2008	487	6.9%	56	3.3%	*	*

Table 57: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2009	484	6.9%	69	4.1%	*	*
2010	464	6.6%	65	3.8%	*	*
2011	471	6.7%	80	4.7%	*	*
2012	437	6.2%	86	5.1%	*	*
2013	304	4.3%	140	8.3%	*	*
2014	310	4.4%	182	10.7%	*	*
2015	292	4.1%	197	11.6%	12	6.6%
2016	242	3.4%	144	8.5%	*	*
2017	250	3.5%	107	6.3%	13	7.1%
2018	251	3.6%	99	5.8%	17	9.3%
2019	179	2.5%	109	6.4%	18	9.8%
2020	183	2.6%	52	3.1%	20	10.9%
2021	139	2.0%	52	3.1%	12	6.6%
Organ = Pancreas						
1987	*	*	*	*	*	*
1988	17	0.6%	*	*	*	*
1989	45	1.6%	*	*	*	*
1990	84	3.0%	11	1.5%	*	*
1991	123	4.4%	26	3.4%	*	*
1992	117	4.2%	22	2.9%	*	*
1993	*	*	*	*	*	*
1994	16	0.6%	*	*	*	*
1995	*	*	*	*	*	*
1996	18	0.6%	*	*	*	*
1997	23	0.8%	*	*	*	*
1998	12	0.4%	*	*	*	*
1999	31	1.1%	12	1.6%	*	*
2000	64	2.3%	*	*	*	*
2001	59	2.1%	19	2.5%	*	*
2002	72	2.6%	19	2.5%	*	*
2003	84	3.0%	24	3.2%	*	*
2004	111	3.9%	27	3.6%	*	*
2005	203	7.2%	34	4.5%	*	*
2006	202	7.2%	40	5.3%	*	*
2007	196	7.0%	57	7.5%	*	*
2008	207	7.4%	47	6.2%	*	*
2009	168	6.0%	52	6.9%	*	*
2010	165	5.9%	39	5.2%	*	*
2011	139	4.9%	48	6.3%	*	*
2012	105	3.7%	49	6.5%	*	*
2013	97	3.4%	33	4.4%	*	*
2014	94	3.3%	40	5.3%	*	*
2015	77	2.7%	35	4.6%	*	*
2016	54	1.9%	30	4.0%	*	*
2017	60	2.1%	18	2.4%	*	*
2018	50	1.8%	12	1.6%	*	*
2019	37	1.3%	11	1.5%	*	*
2020	42	1.5%	*	*	*	*

Table 57: Deaths for waitlist registrations not removed for transplant during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2021	28	1.0%	*	*	*	*
TOTAL						
1987	22	0.0%	*	*	*	*
1988	177	0.1%	46	0.1%	*	*
1989	295	0.2%	69	0.1%	16	0.2%
1990	435	0.2%	95	0.1%	23	0.2%
1991	453	0.2%	113	0.2%	16	0.2%
1992	539	0.3%	140	0.2%	31	0.3%
1993	703	0.4%	181	0.3%	31	0.3%
1994	835	0.4%	188	0.3%	40	0.4%
1995	964	0.5%	210	0.3%	36	0.4%
1996	947	0.5%	252	0.4%	46	0.5%
1997	991	0.5%	292	0.4%	49	0.5%
1998	1127	0.6%	287	0.4%	55	0.6%
1999	1411	0.7%	350	0.5%	63	0.7%
2000	1660	0.9%	356	0.5%	43	0.4%
2001	1789	0.9%	379	0.6%	59	0.6%
2002	2419	1.3%	520	0.8%	81	0.8%
2003	2596	1.4%	572	0.9%	86	0.9%
2004	3100	1.6%	604	0.9%	90	0.9%
2005	12383	6.5%	901	1.4%	132	1.4%
2006	12601	6.6%	962	1.5%	150	1.6%
2007	12922	6.7%	1458	2.2%	154	1.6%
2008	13151	6.9%	1873	2.9%	232	2.4%
2009	12516	6.5%	2118	3.2%	235	2.4%
2010	12248	6.4%	2701	4.1%	274	2.8%
2011	11555	6.0%	3750	5.7%	303	3.2%
2012	10835	5.6%	4728	7.2%	429	4.5%
2013	9646	5.0%	5955	9.1%	515	5.4%
2014	9432	4.9%	6892	10.5%	632	6.6%
2015	9368	4.9%	7081	10.8%	799	8.3%
2016	8598	4.5%	6175	9.4%	954	9.9%
2017	7888	4.1%	5183	7.9%	1052	10.9%
2018	7249	3.8%	4331	6.6%	1022	10.6%
2019	6615	3.4%	3405	5.2%	924	9.6%
2020	7343	3.8%	2311	3.5%	707	7.4%
2021	7063	3.7%	1182	1.8%	328	3.4%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.

Table 58: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information.

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
Organ = Heart						
1987	39	0.1%	*	*	*	*
1988	269	0.7%	14	0.3%	*	*
1989	378	1.0%	21	0.4%	*	*
1990	514	1.4%	44	0.9%	17	2.4%
1991	577	1.6%	48	1.0%	*	*
1992	660	1.8%	53	1.1%	*	*
1993	751	2.0%	67	1.4%	*	*
1994	930	2.5%	63	1.3%	11	1.6%
1995	933	2.5%	78	1.7%	18	2.6%
1996	1012	2.7%	92	2.0%	12	1.7%
1997	1050	2.8%	103	2.2%	18	2.6%
1998	1114	3.0%	111	2.4%	20	2.9%
1999	1127	3.0%	113	2.4%	21	3.0%
2000	1168	3.2%	117	2.5%	18	2.6%
2001	1111	3.0%	122	2.6%	24	3.5%
2002	1197	3.2%	102	2.2%	27	3.9%
2003	1194	3.2%	109	2.3%	17	2.4%
2004	1221	3.3%	119	2.5%	27	3.9%
2005	1902	5.1%	102	2.2%	24	3.5%
2006	1853	5.0%	118	2.5%	15	2.2%
2007	1756	4.7%	135	2.9%	21	3.0%
2008	1683	4.5%	128	2.7%	26	3.7%
2009	1651	4.5%	106	2.3%	18	2.6%
2010	1529	4.1%	111	2.4%	12	1.7%
2011	1477	4.0%	164	3.5%	14	2.0%
2012	1333	3.6%	194	4.1%	15	2.2%
2013	1266	3.4%	295	6.3%	18	2.6%
2014	1254	3.4%	397	8.4%	32	4.6%
2015	1183	3.2%	398	8.5%	25	3.6%
2016	1086	2.9%	339	7.2%	31	4.5%
2017	1000	2.7%	250	5.3%	41	5.9%
2018	888	2.4%	226	4.8%	48	6.9%
2019	765	2.1%	182	3.9%	33	4.7%
2020	674	1.8%	121	2.6%	41	5.9%
2021	517	1.4%	58	1.2%	20	2.9%
Organ = Kidney						
1987	72	0.0%	25	0.0%	*	*
1988	940	0.4%	254	0.3%	42	0.3%
1989	1452	0.6%	429	0.5%	78	0.6%
1990	1937	0.8%	560	0.7%	83	0.6%
1991	2124	0.9%	643	0.8%	91	0.7%
1992	2325	1.0%	708	0.9%	108	0.8%
1993	2826	1.2%	797	1.0%	108	0.8%
1994	3250	1.3%	882	1.1%	153	1.1%
1995	3512	1.4%	983	1.2%	142	1.1%
1996	3809	1.6%	1132	1.4%	153	1.1%

Table 58: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
1997	4162	1.7%	1163	1.5%	196	1.5%
1998	4663	1.9%	1327	1.7%	215	1.6%
1999	5118	2.1%	1429	1.8%	231	1.7%
2000	5816	2.4%	1640	2.1%	232	1.7%
2001	6139	2.5%	1789	2.3%	232	1.7%
2002	6691	2.8%	1994	2.5%	284	2.1%
2003	7103	2.9%	2098	2.7%	320	2.4%
2004	7875	3.2%	2338	3.0%	369	2.8%
2005	13720	5.6%	2606	3.3%	428	3.2%
2006	14032	5.8%	2717	3.4%	462	3.4%
2007	13683	5.6%	2939	3.7%	481	3.6%
2008	13462	5.5%	3160	4.0%	492	3.7%
2009	12993	5.3%	3302	4.2%	555	4.1%
2010	12313	5.1%	3696	4.7%	592	4.4%
2011	11610	4.8%	4182	5.3%	537	4.0%
2012	10502	4.3%	4500	5.7%	579	4.3%
2013	9762	4.0%	4888	6.2%	708	5.3%
2014	9429	3.9%	5134	6.5%	710	5.3%
2015	9208	3.8%	5328	6.7%	878	6.5%
2016	8550	3.5%	4658	5.9%	930	6.9%
2017	7636	3.1%	4022	5.1%	898	6.7%
2018	7066	2.9%	3182	4.0%	815	6.1%
2019	6546	2.7%	2454	3.1%	666	5.0%
2020	6981	2.9%	1539	1.9%	455	3.4%
2021	5917	2.4%	658	0.8%	185	1.4%
Organ = Kidney-Pancreas						
1987	*	*	*	*	*	*
1988	*	*	*	*	*	*
1989	*	*	*	*	*	*
1990	*	*	*	*	*	*
1991	*	*	*	*	*	*
1992	54	0.4%	*	*	*	*
1993	258	2.0%	53	1.7%	*	*
1994	332	2.6%	64	2.1%	*	*
1995	391	3.0%	82	2.6%	12	2.6%
1996	356	2.8%	89	2.9%	12	2.6%
1997	368	2.9%	112	3.6%	12	2.6%
1998	438	3.4%	92	3.0%	19	4.1%
1999	494	3.8%	100	3.2%	22	4.8%
2000	579	4.5%	146	4.7%	14	3.0%
2001	636	4.9%	154	5.0%	20	4.3%
2002	607	4.7%	138	4.4%	23	5.0%
2003	605	4.7%	171	5.5%	17	3.7%
2004	636	4.9%	146	4.7%	17	3.7%
2005	793	6.2%	150	4.8%	24	5.2%
2006	862	6.7%	156	5.0%	24	5.2%
2007	769	6.0%	151	4.9%	19	4.1%
2008	681	5.3%	142	4.6%	22	4.8%

Table 58: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2009	617	4.8%	137	4.4%	21	4.5%
2010	556	4.3%	147	4.7%	24	5.2%
2011	403	3.1%	142	4.6%	22	4.8%
2012	419	3.3%	126	4.1%	22	4.8%
2013	369	2.9%	96	3.1%	13	2.8%
2014	291	2.3%	123	4.0%	21	4.5%
2015	280	2.2%	106	3.4%	13	2.8%
2016	259	2.0%	85	2.7%	15	3.2%
2017	195	1.5%	64	2.1%	12	2.6%
2018	190	1.5%	55	1.8%	10	2.2%
2019	150	1.2%	41	1.3%	*	*
2020	173	1.3%	19	0.6%	*	*
2021	124	1.0%	14	0.5%	*	*
Organ = Liver						
1987	32	0.0%	*	*	*	*
1988	261	0.3%	22	0.1%	*	*
1989	347	0.3%	28	0.2%	11	0.3%
1990	533	0.5%	71	0.4%	13	0.4%
1991	587	0.6%	73	0.4%	23	0.7%
1992	703	0.7%	100	0.6%	25	0.8%
1993	892	0.9%	109	0.6%	32	1.0%
1994	1061	1.1%	123	0.7%	37	1.2%
1995	1214	1.2%	174	1.0%	38	1.2%
1996	1359	1.4%	181	1.0%	35	1.1%
1997	1424	1.4%	190	1.1%	40	1.3%
1998	1573	1.6%	228	1.3%	50	1.6%
1999	1729	1.7%	243	1.4%	57	1.8%
2000	1974	2.0%	243	1.4%	60	1.9%
2001	2145	2.1%	249	1.4%	72	2.3%
2002	2676	2.7%	325	1.8%	75	2.3%
2003	2810	2.8%	312	1.8%	87	2.7%
2004	3588	3.6%	286	1.6%	82	2.6%
2005	6676	6.7%	316	1.8%	86	2.7%
2006	6654	6.7%	320	1.8%	113	3.5%
2007	6383	6.4%	358	2.0%	95	3.0%
2008	6357	6.4%	435	2.4%	117	3.7%
2009	5977	6.0%	465	2.6%	110	3.4%
2010	5882	5.9%	531	3.0%	94	2.9%
2011	5307	5.3%	742	4.2%	102	3.2%
2012	4914	4.9%	1104	6.2%	129	4.0%
2013	4279	4.3%	1608	9.0%	118	3.7%
2014	3889	3.9%	1878	10.5%	118	3.7%
2015	3572	3.6%	1709	9.6%	141	4.4%
2016	3273	3.3%	1417	8.0%	165	5.2%
2017	2988	3.0%	1115	6.3%	243	7.6%
2018	2610	2.6%	1024	5.7%	235	7.4%
2019	2365	2.4%	773	4.3%	256	8.0%
2020	2102	2.1%	663	3.7%	217	6.8%

Table 58: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2021	1662	1.7%	408	2.3%	110	3.4%
Organ = Lung						
1987	*	*	*	*	*	*
1988	*	*	*	*	*	*
1989	*	*	*	*	*	*
1990	19	0.1%	*	*	*	*
1991	52	0.2%	*	*	*	*
1992	74	0.3%	*	*	*	*
1993	121	0.4%	*	*	*	*
1994	134	0.5%	*	*	*	*
1995	198	0.7%	*	*	*	*
1996	231	0.8%	11	0.5%	*	*
1997	311	1.1%	10	0.5%	*	*
1998	320	1.1%	*	*	*	*
1999	374	1.3%	20	1.0%	*	*
2000	495	1.7%	19	0.9%	*	*
2001	618	2.2%	18	0.9%	*	*
2002	738	2.6%	16	0.8%	*	*
2003	838	2.9%	24	1.2%	*	*
2004	1033	3.6%	38	1.9%	*	*
2005	1849	6.4%	57	2.8%	*	*
2006	1638	5.7%	49	2.4%	15	5.8%
2007	1872	6.5%	111	5.4%	15	5.8%
2008	1669	5.8%	79	3.9%	13	5.0%
2009	1745	6.1%	93	4.5%	14	5.4%
2010	1751	6.1%	81	4.0%	11	4.3%
2011	1772	6.2%	100	4.9%	11	4.3%
2012	1572	5.5%	112	5.5%	*	*
2013	1468	5.1%	159	7.8%	14	5.4%
2014	1391	4.8%	191	9.3%	12	4.7%
2015	1287	4.5%	213	10.4%	13	5.0%
2016	1234	4.3%	156	7.6%	11	4.3%
2017	1159	4.0%	115	5.6%	14	5.4%
2018	1015	3.5%	105	5.1%	19	7.4%
2019	801	2.8%	116	5.7%	20	7.8%
2020	615	2.1%	60	2.9%	23	8.9%
2021	322	1.1%	53	2.6%	13	5.0%
Organ = Pancreas						
1987	*	*	*	*	*	*
1988	32	0.5%	*	*	*	*
1989	88	1.3%	18	1.2%	*	*
1990	140	2.1%	25	1.7%	*	*
1991	189	2.9%	39	2.6%	*	*
1992	140	2.1%	34	2.3%	*	*
1993	24	0.4%	*	*	*	*
1994	36	0.5%	*	*	*	*
1995	41	0.6%	16	1.1%	*	*
1996	75	1.1%	16	1.1%	*	*

Table 58: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. (continued)

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
1997	90	1.4%	18	1.2%	*	*
1998	94	1.4%	26	1.7%	*	*
1999	159	2.4%	46	3.1%	*	*
2000	329	5.0%	62	4.2%	*	*
2001	354	5.4%	80	5.4%	10	5.6%
2002	354	5.4%	86	5.8%	14	7.8%
2003	331	5.0%	85	5.7%	*	*
2004	420	6.4%	86	5.8%	10	5.6%
2005	485	7.4%	96	6.4%	*	*
2006	452	6.9%	85	5.7%	*	*
2007	414	6.3%	88	5.9%	12	6.7%
2008	373	5.7%	72	4.8%	13	7.3%
2009	327	5.0%	90	6.0%	10	5.6%
2010	305	4.6%	59	4.0%	*	*
2011	233	3.5%	62	4.2%	*	*
2012	175	2.7%	57	3.8%	11	6.1%
2013	167	2.5%	45	3.0%	*	*
2014	156	2.4%	52	3.5%	*	*
2015	142	2.2%	42	2.8%	*	*
2016	108	1.6%	31	2.1%	*	*
2017	93	1.4%	21	1.4%	*	*
2018	90	1.4%	12	0.8%	*	*
2019	66	1.0%	13	0.9%	*	*
2020	66	1.0%	*	*	*	*
2021	41	0.6%	*	*	*	*
TOTAL						
1987	144	0.0%	27	0.0%	*	*
1988	1507	0.3%	296	0.3%	54	0.3%
1989	2284	0.5%	496	0.5%	97	0.5%
1990	3161	0.7%	701	0.6%	122	0.7%
1991	3546	0.8%	808	0.7%	121	0.7%
1992	3967	0.9%	908	0.8%	148	0.8%
1993	4887	1.1%	1035	1.0%	154	0.8%
1994	5761	1.3%	1148	1.1%	211	1.2%
1995	6314	1.5%	1343	1.2%	213	1.2%
1996	6859	1.6%	1522	1.4%	216	1.2%
1997	7425	1.7%	1599	1.5%	271	1.5%
1998	8233	1.9%	1794	1.7%	304	1.7%
1999	9024	2.1%	1956	1.8%	340	1.9%
2000	10405	2.4%	2228	2.1%	335	1.8%
2001	11050	2.6%	2413	2.2%	362	2.0%
2002	12320	2.9%	2665	2.5%	426	2.3%
2003	12948	3.0%	2802	2.6%	453	2.5%
2004	14868	3.4%	3016	2.8%	510	2.8%
2005	25681	6.0%	3329	3.1%	577	3.2%
2006	25737	6.0%	3450	3.2%	634	3.5%
2007	25095	5.8%	3787	3.5%	643	3.5%
2008	24421	5.7%	4022	3.7%	683	3.7%

Table 58: Deaths for all waitlist registrations during January 1, 2005 - December 31, 2021 by organ, year removed, and source of death information. *(continued)*

Year Removed	Member Reported		External Verification		Unverified	
	N	col %	N	col %	N	col %
2009	23506	5.5%	4198	3.9%	729	4.0%
2010	22496	5.2%	4630	4.3%	743	4.1%
2011	20923	4.9%	5399	5.0%	693	3.8%
2012	19039	4.4%	6095	5.6%	764	4.2%
2013	17415	4.0%	7104	6.5%	875	4.8%
2014	16526	3.8%	7795	7.2%	894	4.9%
2015	15780	3.7%	7805	7.2%	1074	5.9%
2016	14603	3.4%	6697	6.2%	1156	6.3%
2017	13140	3.0%	5591	5.2%	1212	6.7%
2018	11941	2.8%	4609	4.2%	1134	6.2%
2019	10751	2.5%	3587	3.3%	984	5.4%
2020	10663	2.5%	2410	2.2%	744	4.1%
2021	8622	2.0%	1200	1.1%	334	1.8%

* Counts less than 10 not shown. Column percentages add to 100% within each organ.