Supplemental Appendix

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Supplemental Table 1a: Donor characteristics where at least 1 kidney was discarded or not recovered, by donor HCV-NAT status between 4/1/15 and 3/31/19*

	HCV-viremic	HCV-non-viremic	p-value
Number of Donors	1249	9625	
Donor Age in years, median (IQR)	38 (30, 50)	54 (44, 62)	<0.001
Sex Female (%)	456 (36.5%)	4343 (45.1%)	<0.001
	793 (63.5%)	5282 (54.9%)	
Race Black (%)	154 (12.3%)	1951 (20.3%)	<0.001
Creatinine in mg/dL, median (IQR)	1.2 (0.8, 1.97)	1.53 (0.94, 3.16)	<0.001
Cause of Death			
Anoxia	787 (63.0%)	3685 (38.3%)	<0.001
CVA/Stroke	245 (19.6%)	4206 (43.7%)	
Head Trauma	189 (15.1%)	1482 (15.4%)	
CNS Tumor	2 (0.2%)	33 (0.3%)	
Unknown	26 (2.1%)	219 (2.3%)	
DCD (%)	168 (13.5%)	1723 (17.9%)	<0.001
History of Diabetes (%)	116 (9.3%)	2663 (27.7%)	<0.001
History of Hypertension (%)	364 (29.1%)	6121 (63.6%)	<0.001
Allocation KDPI %, median (IQR)	63 (49, 84)	82 (63, 93)	<0.001

* Data starts April 2015, the first date when UNOS mandated reporting of HCV NAT in all organ donors

CVA: Cerebrovascular accident; IQR: Interquartile range; DCD: Donation after cardiac death; KDPI: Kidney Donor Profile Index

Supplemental Table 1b: Characteristics of HCV-viremic donors where at least 1 kidney was discarded or not recovered, by year of organ donation*

	Apr – Dec 2015	Jan – Dec 2016	Jan – Dec 2017	Jan – Dec 2018	Jan – Mar 2019	p-value
Number of Donors	191	300	352	329	77	
Donor Age in years, median (IQR)	40 (30, 50)	36 (29, 48)	36 (29, 45)	40 (33, 52)	49 (34, 59)	<0.001
Sex Female (%)	82 (42.9%)	95 (31.7%)	139 (39.5%)	108 (32.8%)	32 (41.6%)	0.032
Race Black (%)	30 (15.7%)	36 (12.0%)	33 (9.4%)	38 (11.6%)	17 (22.1%)	0.019
Creatinine in mg/dL, median (IQR)	1.13 (.79, 1.9)	1.2 (.8, 1.9)	1.1 (.785, 1.8)	1.2 (0.8, 2.2)	1.35 (0.85, 2.38)	0.15
Cause of Death (%)						0.047
Anoxia	113 (59.2%)	188 (62.7%)	242 (68.8%)	201 (61.1%)	43 (55.8%)	
CVA/Stroke	40 (20.9%)	64 (21.3%)	53 (15.1%)	61 (18.5%)	27 (35.1%)	
Head Trauma	35 (18.3%)	41 (13.7%)	48 (13.6%)	59 (17.9%)	6 (7.8%)	
CNS Tumor	0 (0.0%)	1 (0.3%)	0 (0.0%)	1 (0.3%)	0 (0.0%)	
Unknown	3 (1.6%)	6 (2.0%)	9 (2.6%)	7 (2.1%)	1 (1.3%)	
DCD (%)	15 (7.9%)	28 (9.3%)	43 (12.2%)	67 (20.4%)	15 (19.5%)	<0.001
History of Diabetes (%)	21 (11.0%)	26 (8.7%)	25 (7.1%)	31 (9.4%)	13 (16.9%)	0.089
History of Hypertension (%)	66 (34.6%)	71 (23.7%)	88 (25.0%)	102 (31.0%)	37 (48.1%)	<0.001
UNOS Region						0.064
1	19 (10%)	18 (6%)	18 (5.1%)	19 (5.8%)	3 (3.9%)	
2	32 (16.8%)	63 (21%)	59 (16.8%)	55 (16.7%)	6 (7.8%)	
3	29 (15.2%)	49 (16.3%)	46 (13.1%)	50 (15.2%)	15 (19.5%)	
4	16 (8.4%)	25 (8.3%)	16 (4.6%)	27 (8.2%)	8 (10.4%)	
5	29 (15.2%)	38 (12.7%)	36 (10.2%)	34 (10.3%)	13 (16.9%)	
6	5 (2.6%)	6 (2%)	10 (2.8%)	4 (1.2%)	3 (3.9%)	
7	10 (5.2%)	10 (3.3%)	18 (5.1%)	14 (4.3%)	6 (7.8%)	
8	8 (4.2%)	15 (5%)	23 (6.5%)	27 (8.2%)	6 (7.8%)	
9	5 (2.6%)	14 (4.7%)	15 (4.3%)	11 (3.3%)	2 (2.6%)	
10	22 (11.5%)	25 (8.3%)	63 (17.9%)	43 (13.1%)	8 (10.4%)	
11	16 (8.4%)	37 (12.3%)	48 (13.6%)	45 (13.7%)	7 (9.1%)	
Allocation KDPI %, median (IQR)	63 (45, 86)	60 (45, 80)	59 (45, 75)	68 (54, 87)	86 (63, 96)	<0.001

* Data starts April 2015, the first date when UNOS mandated reporting of HCV NAT in all organ donors

CVA: Cerebrovascular accident; CNS: Central nervous system; IQR: Interquartile range; DCD: Donation after cardiac death; KDPI: Kidney Donor Profile Index; UNOS: United Network for Organ Sharing

Supplemental Table 2: Sociodemographic characteristics of all recipients of HCV-viremic compared to HCV-non-viremic deceased donor kidneys between 4/1/15 and 3/31/19

		HCV-viremic D+/R-	HCV-viremic D+/R+	HCV-non-viremic D-/R-	p-value
N		646	1223	51294	
Age in years, median (IQR)		60 (52 - 67)	61 (56 - 65)	53 (42 - 63)	<0.001
Sex	Female	182 (28.2%)	295 (24.1%)	21084 (41.1%)	<0.001
	Male	464 (71.8%)	928 (75.9%)	30210 (58.9%)	
Race (Black)	No	384 (59.4%)	555 (45.4%)	34820 (67.9%)	<0.001
	Yes	262 (40.6%)	668 (54.6%)	16474 (32.1%)	
Education Level	Less than High School	17 (2.6%)	59 (4.8%)	3773 (7.4%)	<0.001
	High School & College	377 (58.4%)	907 (74.2%)	33763 (65.8%)	
	Bachelors and Higher	235 (36.4%)	223 (18.2%)	12436 (24.2%)	
	Unknown	17 (2.6%)	34 (2.8%)	1312 (2.6%)	
Insurance Type	Private	168 (26.0%)	315 (25.8%)	11260 (22.0%)	<0.001
	Medicaid	41 (6.3%)	120 (9.8%)	3299 (6.4%)	
	Medicare/Other	437 (67.6%)	788 (64.4%)	36735 (71.6%)	

Recipient HCV serostatus: "R-" refers to HCV-seronegative and "R+" refers to HCV-seropositive; IQR: Interquartile range

Supplemental Table 3: Characteristics of HCV-viremic deceased donors of kidneys transplanted into HCV-seropositive and HCV-seronegative recipients after matching on the KDPI*

	Case (D+/R-)	Matched Comparator (D+/R+)	p-value
N	102	204	
Age in years, median (IQR)	31 (26, 36)	30 (26, 37)	0.81
Height in cm, median (IQR)	173 (165.1, 178)	172.72 (165, 180)	0.83
Weight in kg, median (IQR)	77.05 (68, 90)	75 (68.05, 85.15)	0.45
Creatinine in mg/dL, median (IQR)	0.81 (0.69, 1.14)	0.8 (0.64, 1.06)	0.41
Race Black (%)	2 (2.0%)	9 (4.4%)	0.28
DCD (%)	7 (6.9%)	19 (9.3%)	0.47
History of Diabetes (%)	0 (0%)	0 (0%)	n/a
History of Hypertension (%)	9 (8.8%)	15 (7.4%)	0.65
Cause of Death - CVA (%)	10 (9.8%)	15 (7.4%)	0.46

CVA: Cerebrovascular accident; IQR: Interquartile range; DCD: Donation after cardiac death; cm – centimeter; kg - kilogram

* The table demonstrates that the hepatitis c-viremic and non-viremic kidneys were highly similar in all donor characteristics used to calculate the KDPI, except for hepatitis C virus

Supplemental Table 4: Secondary analysis -- Comparison of outcomes using M-statistics; matched sets are excluded where any creatinine value at the follow-up time-point for the HCV-viremic kidney recipient or either comparator was missing*

Variable	Comparing Outcomes for Seronegative Recipients of HCV Viremic against HCV Seronegative Recipients of a HCV-non-viremic Kidney 103 Cases vs 206 Comparators				Comparing Outcomes for Recipients of HCV Viremic Kidneys When Transplanted into HCV Seronegative against HCV Seropositive Recipients 102 Cases[f] vs 204 Comparators			
	HCV NAT D+/R- (N = 103)	Matched Comparators HCV NAT D-/R- (N = 206)	P-value ****	Difference between matched sets (95% CI) ****	HCV NAT D+/R- (N = 102)	Matched Comparators HCV NAT D+/R+ (N = 204)	P-value ****	Difference between matched sets (95% CI) ****
Number Analyzed**	N = 89	N = 178			N = 93	N = 186		
6-month creatinine in mg/dl, mean (SD)	1.27 (0.31)	1.28 (0.36)	1	0 (-0.1, 0.1)	1.27 (0.32)	1.2 (0.4)	0.16	-0.051 (-0.025, 0.147)
6-month eGFR in ml/min/1.73 m², mean (SD)	66.1 (17.4)	65.7 (17.3)	0.64	1.45 (-4.9, 7.01)	66.1 (17.9)	70.2 (17.7)	0.24	-3.1 (-8.4, 2.0)
Number Analyzed**	N = 80	N = 160			N = 79	N = 158		
12-month creatinine in mg/dl, mean (SD)	1.24 (0.34)	1.3 (0.51)	0.61	-0.018 (-0.125, -0.066)	1.28 (0.33)	1.21 (0.38)	0.52	0.0285 (-0.0793, 0.148)
12-month eGFR in ml/min/1.73 m², mean (SD)	66.8 (18.6)	66.5 (22.7)	0.8	0.91 (-5.31, 97.67)	65.4 (17.5)	71.1 (19.4)	0.05	-5.5 (-10.5, -0.01)

* The goal of this approach is to potentially improve the sensitivity of analyses to unmeasured bias

[f] We were only able to optimally match 102/103 cases

** Case and comparator pairs with any missing 6-month creatinine values were excluded

*** Case and comparator pairs with any missing 12-month creatinine values were excluded

**** P-values, point estimates, and 95% CI computed using m-statistics in R-package "sensitivitymw"

Supplemental Table 5: Multivariable linear regression on the outcome of post-transplant 12-month allograft estimated glomerular filtration rate (ml/min/1.73 m^2) for transplants performed between 4/1/15 and 12/31/17 (N=28,711)

Variable	β-Coefficient	(95% Confidence Interval)	P-value
Donor HCV Status			
HCV Seronegative	Reference		
HCV NAT Positive (Viremic)	1.667	(-0.118, 3.453)	0.067
HCV Antibody Positive, NAT Negative	0.886	(-1.411, 3.183)	0.45
Recipient HCV Seropositive	0.877	(-0.321, 2.076)	0.151
<u>**Recipient Characteristics**</u>			
Cause of ESRD			
Diabetes	Reference		
Hypertension	0.0747	(-0.963, 1.112)	0.888
Glomerular Disease	-0.009	(-1.188, 1.169)	0.987
Cystic Disease	-0.485	(-1.758, 0.788)	0.455
Other/Missing	-0.149	(-1.24, 0.943)	0.79
History of Diabetes	-0.026	(-0.938, 0.887)	0.956
History of Prior Transplant	-0.643	(-1.512, 0.226)	0.147
PRA at Allocation	-0.011	(-0.019, -0.004)	0.003
Recipient HIV Positive	-7.632	(-9.473, -5.792)	<0.001
CMV			
Donor-/Recipient-	Reference		
Donor+/Recipient-	-0.206	(-1.102, 0.689)	0.652
Donor-/Recipient+	1.331	(0.523, 2.138)	0.001
Donor+/Recipient+	1.675	(0.883, 2.466)	<0.001
Duration on Dialysis			
<1 year	Reference		
1 to 5 years	0.888	(-0.007, 1.783)	0.052

>5 years	0.479	(-0.434, 1.392)	0.304
Pre-emptive transplant	-2.097	(-3.204, -0.991)	<0.001
Donor Characteristics			
Donor Age (years)	-0.563	(-0.584, -0.542)	<0.001
Donor Height (cm)	0.102	(0.082, 0.123)	<0.001
Donor Weight (kg)	0.058	(0.044, 0.071)	<0.001
Donor Race (Black)	-2.303	(-3.102, -1.504)	<0.001
Donor History of Hypertension	-3.233	(-3.885, -2.582)	<0.001
Donor History of Diabetes	-3.713	(-4.803, -2.623)	<0.001
Donor Cause of Death			
Anoxia	Reference		
CVA/Stroke	-2.569	(-3.277, -1.861)	<0.001
Head Trauma	0.727	(0.073, 1.381)	0.029
CNS Tumor	-0.989	(-5.909, 3.931)	0.694
Unknown	0.181	(-1.502, 1.864)	0.833
Donor Terminal Creatinine (mg/dL)	-0.984	(-1.245, -0.723)	<0.001
Donation After Cardiac Death	-5.181	(-5.838, -4.525)	<0.001

HCV: Hepatitis c virus; NAT: Nucleic acid amplification testing; ESRD: End Stage Renal Disease; CMV: Cytomegalovirus; CVA: Cerebrovascular accident; CNS: Central nervous system

Supplemental Table 6: Linear regression evaluating only the effect of donor variables on the outcome of post-transplant 12-month allograft estimated glomerular filtration rate (ml/min/1.73 m2) for transplants performed between 4/1/15 and 12/31/17 (N=28,711)

Variable	β-Coefficient	(95% Confidence Interval)	P-value
Donor HCV Status			
HCV Seronegative			
HCV NAT Positive (viremic)	2.371	(0.913, 3.83)	0.001
HCV Antibody Positive, NAT Negative	1.668	(-0.508, 3.845)	0.133
Donor Age (years)	-0.557	(-0.577, -0.537)	<0.001
Donor Height (cm)	0.099	(0.0782, 0.119)	<0.001
Donor Weight (kg)	0.056	(0.043, 0.07)	<0.001
Donor Race (Black)	-2.181	(-2.962, -1.4)	<0.001
Donor History of Hypertension	-3.134	(-3.782, -2.485)	<0.001
Donor History of Diabetes	-3.518	(-4.605, -2.431)	<0.001
Donor Cause of Death			
Anoxia	Reference		
CVA/Stroke	-2.521	(-3.226, -1.815)	0
Head Trauma	0.748	(0.099, 1.397)	0.024
CNS Tumor	-1.133	(-6.127, 3.861)	0.657
Unknown	0.214	(-1.465, 1.894)	0.803
Donor Terminal Creatinine (mg/dL)	-0.902	(-1.157, -0.647)	<0.001
Donation After Cardiac Death	-5.04	(-5.691, -4.389)	<0.001

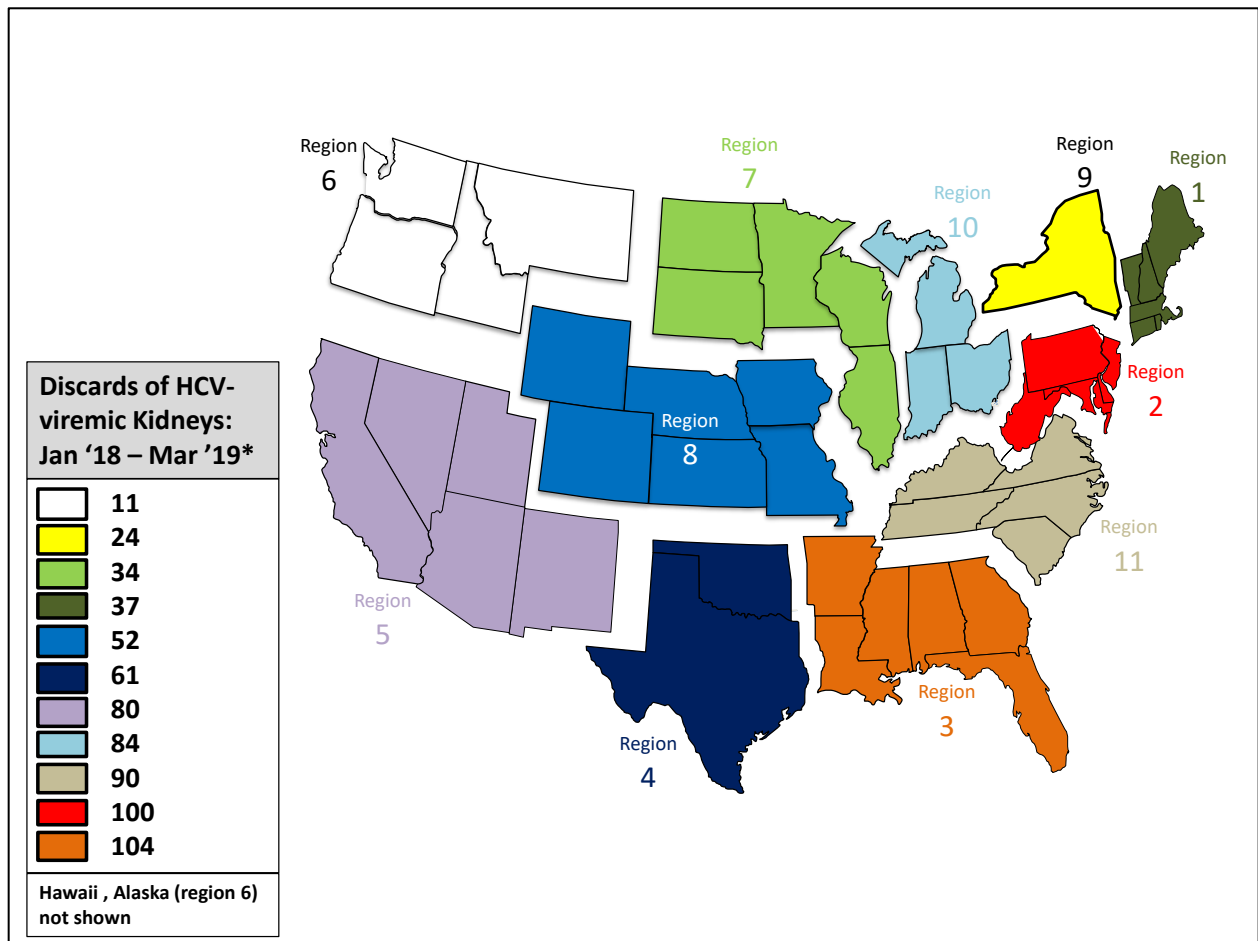HCV: Hepatitis c virus; NAT: Nucleic acid amplification testing; CVA: Cerebrovascular accident; CNS: Central nervous system

Supplemental Table 7: Regional variation in the utilization of HCV-viremic kidneys into uninfected recipients by year

| UNOS Region	Apr – Dec 2015	Jan – Dec 2016	Jan – Dec 2017	Jan – Dec 2018	Jan – Mar 2019	Total
1	1	4	2	10	9	26
2	5	27	30	20	21	103
3	5	2	2	79	29	117
4	0	2	2	2	3	9
5	1	5	8	12	8	34
6	1	0	0	0	2	3
7	0	0	1	0	0	1
8	0	0	1	0	1	2
9	0	0	9	64	41	114
10	2	2	0	36	29	69
11	0	0	7	104	57	168
Total	15	42	62	327	200	646

UNOS: United Network for Organ Sharing

Supplemental Figure 1: Total number of HCV-viremic kidney discards in the 15-month period between 1/1/2018 through 3/31/2019, by UNOS region

Discards of HCV-viremic Kidneys: Jan '18 – Mar '19*	
⬜	11
🟨	24
🟩	34
🟩	37
🟦	52
🟦	61
🟪	80
🟦	84
⬜	90
🟥	100
🟧	104

Hawaii , Alaska (region 6) not shown

*A total of 677 HCV-viremic kidneys were discarded between 1/1/18 and 3/31/19

Supplemental Figure 2: Number of transplant centers utilizing a kidney from a deceased donor who was either HCV-viremic or HCV-seropositive*
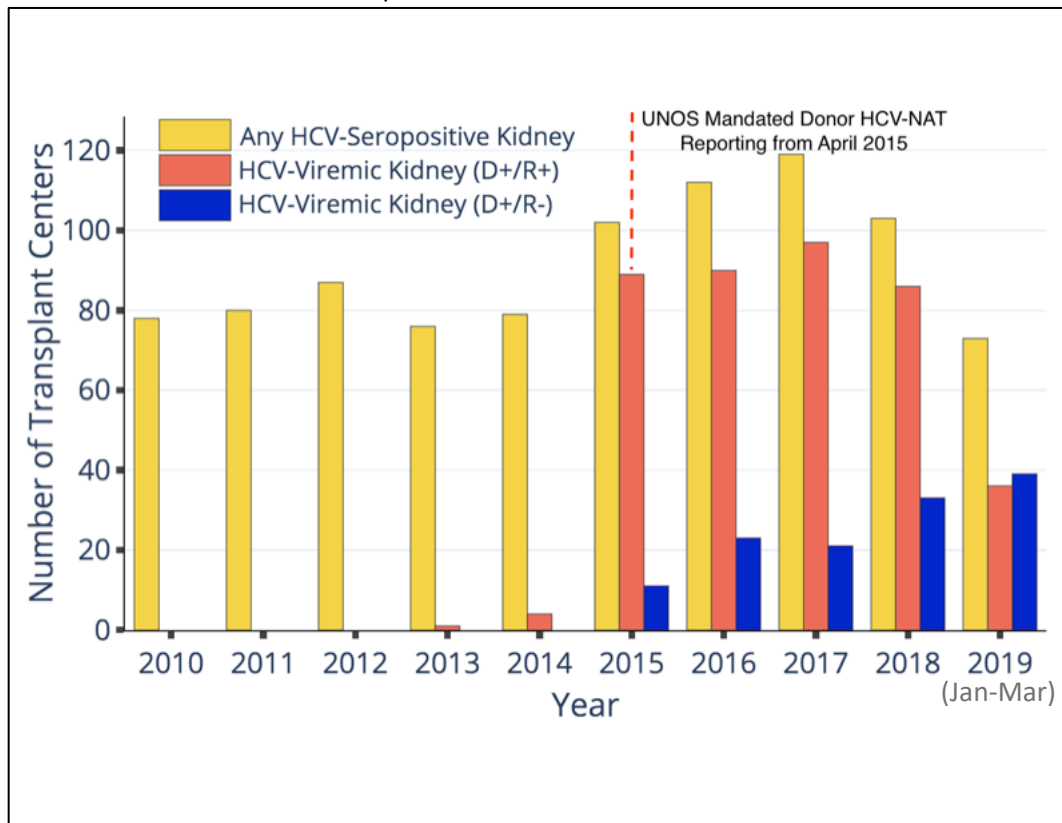
Vertical red dotted line indicates the month and year (April 2015) when UNOS mandated transplant centers report donor HCV-NAT (viremia) status

*Seropositive refers to either HCV-viremic, HCV-Ab-positive, or both

Supplemental Figure 3a: Distribution of estimated glomerular filtration rate at 12 months after kidney transplantation between highly similar pairs of HCV-seronegative recipients of HCV-viremic kidneys versus HCV-non-viremic kidneys
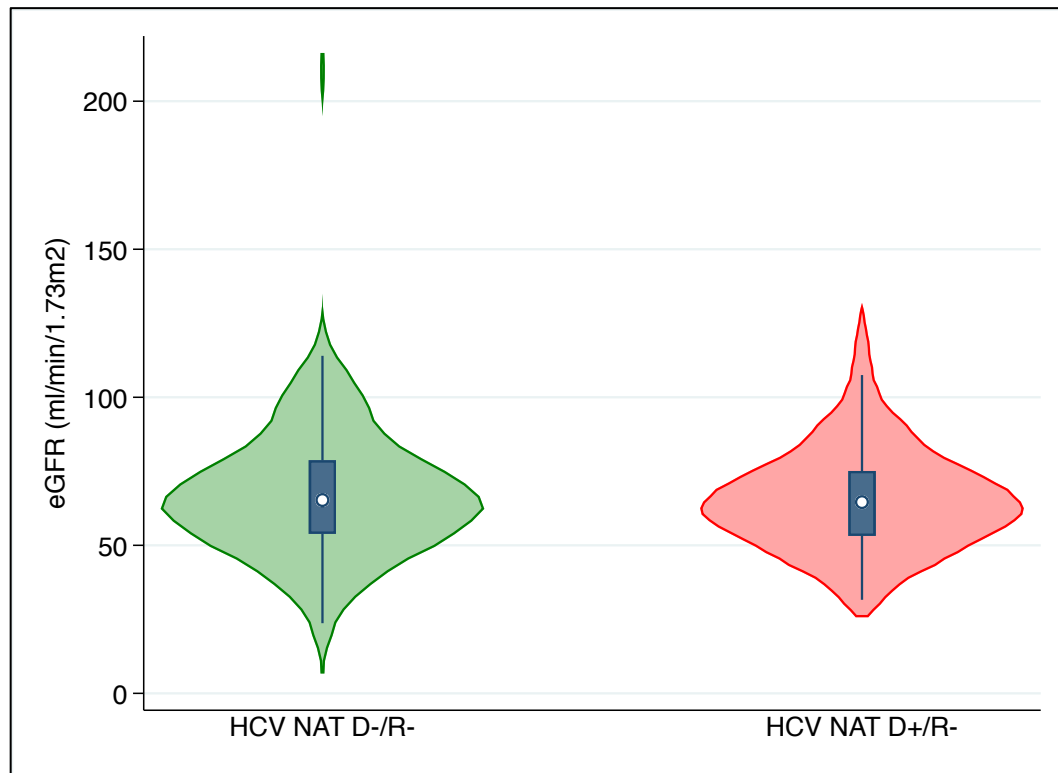
Supplemental Figure 3b: Distribution of estimated glomerular filtration rate at 12 months after transplantation with HCV-viremic kidneys into highly similar pairs of HCV-seropositive recipients versus HCV-seronegative recipients