

Supplemental Online Content

Eguchi N, Tantisattamo E, Chung D, et al. Outcomes among undocumented immigrant kidney transplant recipients in California. *JAMA Netw Open*. 2023;6(2):e2254660. doi:10.1001/jamanetworkopen.2022.54660

eTable 1. All-Cause Graft Loss for All Transplant (LDRT and DDRT)

eTable 2. All-Cause Graft Loss for DDRT Only

eTable 3. Dialysis After Graft Loss (DAGL) for All Transplant

eTable 4. DAGL for DDRT Only

eTable 5. All-Cause Mortality for All Transplants

eTable 6. All-Cause Mortality for DDRT Only

eTable 7. Rejection for All Transplant

eTable 8. Rejection for DDRT Only

eFigure 1. Cumulative Incidence Curve for A) Death Censored Graft Loss B) Death and Graft Loss Censored Rejection by Residency Status

eFigure 2. Conceptual Framework

This supplemental material has been provided by the authors to give readers additional information about their work.

eTable 1. All-Cause Graft Loss for All Transplant (LDRT and DDRT)

		Hazards ratio (US resident vs. Undocumented Immigrants)		
Unadjusted	Unadjusted	HR*	95% CI	P
		2.92	[1.25,6.85]	0.01
Adjusted	Adjusted variables	HR*	95% CI	P
	Demographics			
	<i>Age</i>	2.45	[1.02,5.9]	0.04
	<i>Race (AA)</i>	2.6	[1.1,6.15]	0.03
	<i>Ethnicity</i>	2.7	[1.11,6.53]	0.03
	<i>Obesity</i>	2.79	[1.19,6.55]	0.02
	Comorbidities			
	<i>CAD</i>	2.98	[1.27,7.00]	0.01
	<i>DM</i>	2.74	[1.16,6.48]	0.02
	<i>HTN</i>	2.89	[1.23,6.77]	0.01
	<i>Stroke</i>	2.83	[1.2,6.65]	0.02
	<i>HF</i>	2.93	[0.01,0.88]	0.01
	<i>Cancer</i>	2.83	[1.2,6.65]	0.02
	Transplant Characteristics			
	<i>CIT (/5 hour)</i>	3.04	[1.3,7.11]	0.01
	<i>CMV High risk</i>	2.85	[1.21,6.69]	0.02
	<i>Dialysis duration</i>	2.92	[1.25,6.85]	0.01
	<i>DGF</i>	2.52	[1.07,5.92]	0.03
	<i>High PRA</i>	2.95	[1.26,6.91]	0.01
	<i>HLA</i>	2.87	[1.22,6.73]	0.02
	<i>Living Donor</i>	2.99	[1.28,7.00]	0.01
	<i>Simulect Induction</i>	2.98	[1.27,7.00]	0.01
	<i>OMM</i>	2.9	[1.23,6.83]	0.01
	Donor Characteristics			
	<i>Age</i>	2.87	[1.23,6.74]	0.02
	<i>Dm</i>	3.01	[1.28,7.08]	0.01
	<i>Ethnicity</i>	2.95	[1.25,6.97]	0.01
	<i>Gender</i>	2.94	[1.25,6.90]	0.01
<i>HTN</i>	3.17	[1.35,7.46]	0.01	

	<i>Serum Cr</i>	2.93	[1.25,6.88]	0.01
--	-----------------	------	-------------	------

OMM, 0-human leukocyte antigen mismatch; AA, African American; CAD, coronary artery disease; CI, Confidence interval; CIT, cold ischemic time; CMV, cytomegalovirus; Cr, creatinine; DDKT, deceased donor kidney transplant; DGF, delayed graft function; DM, diabetes mellitus; HF, heart failure; HLA, human leukocyte antigen; HR, hazard ratio; HTN, hypertension; LDKT, living donor kidney transplant; PRA, panel reactive antibody; UI, undocumented immigrants; UR, US residents

* UI is a reference

eTable 2. All-Cause Graft Loss for DDRT Only

		Hazards ratio (US resident vs. Undocumented Immigrants)		
Unadjusted	Unadjusted	HR*	95% CI	P
		2.84	[1.11,7.22]	0.02
Adjusted	Adjusted variables	HR*	95% CI	P
	Demographics			
	<i>Age</i>	2.53	[0.97,6.59]	0.06
	<i>Race (AA)</i>	2.94	[0.95-9.07]	0.06
	<i>Ethnicity</i>	2.23	[0.84,5.93]	0.11
	<i>Obesity</i>	2.83	[1.11,7.21]	0.03
	Comorbidities			
	<i>CAD</i>	3.13	[1.22,8.00]	0.02
	<i>DM</i>	2.71	[1.05,6.96]	0.04
	<i>HTN</i>	2.82	[1.11,7.19]	0.03
	<i>Stroke</i>	2.75	[1.08,7.02]	0.03
	<i>HF</i>	2.83	[1.11,7.22]	0.03
	<i>Cancer</i>	2.75	[1.08,7.03]	0.03
	Transplant Characteristics			
	<i>CIT (/5 hour)</i>	2.9	[1.14,7.4]	0.03
	<i>CMV High risk</i>	2.74	[1.07,7.02]	0.04
	<i>DCD</i>	2.75	[1.07,7.04]	0.03
	<i>Dialysis duration</i>	2.88	[1.13,7.33]	0.03
	<i>DGF</i>	2.28	[0.89,5.85]	0.09
	<i>High PRA</i>	2.85	[1.12,7.25]	0.03
	<i>HLA</i>	2.74	[1.07,6.99]	0.04
	<i>Simulect Induction</i>	2.81	[1.1,7.16]	0.03
	<i>OMM</i>	2.73	[1.06,6.99]	0.04
	Donor Characteristics			
	<i>Age</i>	2.79	[1.09,7.1]	0.02
	<i>Dm</i>	2.87	[1.12,7.34]	0.03
	<i>Ethnicity</i>	2.79	[1.1,7.1]	0.03
	<i>Gender</i>	2.83	[1.11,7.21]	0.03
	<i>HTN</i>	3.05	[1.19,7.82]	0.02

	<i>Serum Cr</i>	2.89	[1.13,7.37]	0.03
--	-----------------	------	-------------	------

OMM, 0-human leukocyte antigen mismatch; AA, African American; CAD, coronary artery disease; CI, Confidence interval; CIT, cold ischemic time; CMV, cytomegalovirus; Cr, creatinine; DDKT, deceased donor kidney transplant; DGF, delayed graft function; DM, diabetes mellitus; HF, heart failure; HLA, human leukocyte antigen; HR, hazard ratio; HTN, hypertension; LDKT, living donor kidney transplant; PRA, panel reactive antibody; UI, undocumented immigrants; UR, US residents

* UI is a reference

eTable 3. Dialysis After Graft Loss (DAGL) for All Transplant

		Hazards ratio (US resident vs. Undocumented Immigrants)		
Unadjusted	Unadjusted	HR*	95% CI	P
		2.27	[0.78,6.56]	0.13
Adjusted	Adjusted variables	HR*	95% CI	P
	Demographics			
	<i>Age</i>	2.52	[0.84,7.5]	0.10
	<i>Race (AA)</i>	2.94	[0.95,9.07]	0.06
	<i>Ethnicity</i>	2.52	[0.84,7.53]	0.10
	<i>Obesity</i>	2.16	[0.75,6.26]	0.16
	Comorbidities			
	<i>CAD</i>	2.31	[0.80,6.7]	0.12
	<i>DM</i>	2.24	[0.76,6.56]	0.14
	<i>HTN</i>	2.250	[0.78,6.53]	0.13
	<i>Stroke</i>	2.33	[0.80,6.77]	0.12
	<i>HF</i>	2.22	[0.77,6.45]	0.14
	<i>Cancer</i>	2.1	[0.72,6.14]	0.17
	Transplant Characteristics			
	<i>CIT (/5 hour)</i>	2.32	[0.80,6.71]	0.12
	<i>CMV High risk</i>	2.23	[0.77,6.48]	0.14
	<i>Dialysis duration</i>	2.27	[0.78,6.56]	0.13
	<i>DGF</i>	1.78	[0.61,5.23]	0.29
	<i>High PRA</i>	2.27	[0.78,6.58]	0.13
	<i>HLA</i>	2.23	[0.77,6.49]	0.14
	<i>Living Donor</i>	2.28	[0.79,6.58]	0.13
	<i>Simulect Induction</i>	2.37	[0.82,6.87]	0.11
	<i>OMM</i>	2.22	[0.76,6.49]	0.14
	Donor Characteristics			
	<i>Age</i>	2.29	[0.79,6.64]	0.13
	<i>Dm</i>	2.37	[0.8,6.77]	0.12
	<i>Ethnicity</i>	2.17	[0.74,6.41]	0.16

	<i>Gender</i>	2.13	[0.73,6.2]	0.17
	<i>HTN</i>	2.40	[0.83,6.99]	0.11
	<i>Serum Cr</i>	2.35	[0.81,6.8]	0.12

OMM, 0-human leukocyte antigen mismatch; AA, African American; CAD, coronary artery disease; CI, Confidence interval; CIT, cold ischemic time; CMV, cytomegalovirus; Cr, creatinine; DDKT, deceased donor kidney transplant; DGF, delayed graft function; DM, diabetes mellitus; HF, heart failure; HLA, human leukocyte antigen; HR, hazard ratio; HTN, hypertension; LDKT, living donor kidney transplant; PRA, panel reactive antibody; UI, undocumented immigrants; UR, US residents
 * UI is a reference

eTable 4. DAGL for DDRT Only

		Hazards ratio (US resident vs. Undocumented Immigrants)		
Unadjusted	Unadjusted	HR*	95% CI	P
		2.13	[0.62,7.29]	0.23
Adjusted	Adjusted variables	HR*	95% CI	P
	Demographics			
	<i>Age</i>	2.33	[0.67,8.16]	0.19
	<i>Race (AA)</i>	2.23	[0.62,8.12]	0.22
	<i>Ethnicity</i>	2.06	[0.58,7.34]	0.27
	<i>Obesity</i>	2.16	[0.63,7.40]	0.22
	Comorbidities			
	<i>CAD</i>	2.4	[0.7,8.27]	0.17
	<i>DM</i>	2.11	[0.61,7.34]	0.34
	<i>HTN</i>	2.14	[0.62,7.3]	0.23
	<i>HF</i>	2.09	[0.61,7.17]	0.24
	<i>Cancer</i>	1.99	[0.58,6.87]	0.28
	Transplant Characteristics			
	CIT (/5 hour)	2.28	[0.67,7.84]	0.19
	CMV High risk	2.08	[0.6,7.15]	0.25
	DCD	1.85	[0.53,6.44]	0.33
	Dialysis duration	2.17	[0.63,7.41]	0.22
	DGF	1.47	[0.42,5.14]	0.55
	High PRA	2.18	[0.64,7.45]	0.21
	HLA	2.13	[0.62,7.32]	0.23
	Simulect Induction	2.09	[0.61,7.15]	0.24
	<i>OMM</i>	3.98	[0.93,17]	0.05
	Donor Characteristics			
	<i>Age</i>	2.17	[0.63,7.42]	0.22
	<i>Dm</i>	2.13	[0.62,7.32]	0.23
	<i>Ethnicity</i>	2.04	[0.60,6.98]	0.26
	<i>Gender</i>	2.09	[0.61,7.16]	0.24
	<i>HTN</i>	2.30	[0.66,7.94]	0.19
	<i>Serum Cr</i>	2.24	[0.66,7.69]	0.20

--	--	--	--	--

OMM, 0-human leukocyte antigen mismatch; AA, African American; CAD, coronary artery disease; CI, Confidence interval; CIT, cold ischemic time; CMV, cytomegalovirus; Cr, creatinine; DDKT, deceased donor kidney transplant; DGF, delayed graft function; DM, diabetes mellitus; HF, heart failure; HLA, human leukocyte antigen; HR, hazard ratio; HTN, hypertension; LDKT, living donor kidney transplant; PRA, panel reactive antibody; UI, undocumented immigrants; UR, US residents

* UI is a reference

eTable 5. All-Cause Mortality for All Transplants

		Hazards ratio (US resident vs. Undocumented Immigrants)		
Unadjusted	Unadjusted	HR*	95% CI	P
		4.43	[1.05,18.69]	0.0424
Adjusted	Adjusted variables	HR*	95% CI	P
	Demographics			
	<i>Age</i>	2.57	[0.59,11.23]	0.21
	<i>Race (AA)</i>	3.62	[0.28,0.83]	0.087
	<i>Ethnicity</i>	3.28	[0.74,14.54]	0.12
	<i>Obesity</i>	4.28	[0.73,1.98]	0.048
	Comorbidities			
	<i>CAD</i>	4.51	[1.07,19.03]	0.04
	<i>DM</i>	3.87	[0.91,16.43]	0.07
	<i>HTN</i>	4.28	[1.02,18.07]	<0.05
	<i>Stroke</i>	4.11	[0.97,17.39]	0.06
	<i>HF</i>	4.44	[1.05,18.71]	0.04
	<i>Cancer</i>	4.33	[1.02,18.28]	<0.05
	Transplant Characteristics			
	<i>CIT (/5 hour)</i>	4.73	[1.12, 20]	0.03
	<i>CMV High risk</i>	4.21	[1, 17.83]	0.05
	<i>Dialysis duration</i>	4.43	[1.05,18.69]	0.04
	<i>DGF</i>	4.10	[0.97,17.32]	0.06
	<i>High PRA</i>	4.46	[1.06,18.79]	0.04
	<i>HLA</i>	4.30	[1.02,18.16]	<0.05
	<i>Living Donor</i>	4.75	[1.13,20.04]	0.03
	<i>Simulect Induction</i>	4.42	[1.05,18.66]	0.04
	<i>OMM</i>	4.41	[1.04,18.69]	0.04
	Donor Characteristics			
	<i>Age</i>	4.27	[1.01,18.03]	<0.05
	<i>Dm</i>	4.65	[1.09,19.75]	0.04
	<i>Ethnicity</i>	4.63	[1.09,19.61]	0.04
	<i>Gender</i>	4.66	[1.11,19.67]	0.04
	<i>HTN</i>	4.99	[1.17,21.26]	0.03

	<i>Serum Cr</i>	4.41	[1.05,18.57]	0.04
--	-----------------	------	--------------	------

OMM, 0-human leukocyte antigen mismatch; AA, African American; CAD, coronary artery disease; CI, Confidence interval; CIT, cold ischemic time; CMV, cytomegalovirus; Cr, creatinine; DDKT, deceased donor kidney transplant; DGF, delayed graft function; DM, diabetes mellitus; HF, heart failure; HLA, human leukocyte antigen; HR, hazard ratio; HTN, hypertension; LDKT, living donor kidney transplant; PRA, panel reactive antibody; UI, undocumented immigrants; UR, US residents

* UI is a reference

eTable 6. All-Cause Mortality for DDRT Only

	Hazards ratio (US resident vs. Undocumented Immigrants)			
Unadjusted	Unadjusted	HR*	95% CI	P
		4.21	[0.99, 17.91]	0.05
Adjusted	Adjusted variables	HR*	95% CI	P
	Demographics			
	<i>Age</i>	2.45	[1.02,5.9]	0.04
	<i>Race (AA)</i>	3.46	[0.79,15.21]	0.1
	<i>Ethnicity</i>	2.66	[0.58,12.14]	0.21
	<i>Obesity</i>	4.15	[0.97,17.69]	0.05
	Comorbidities			
	<i>CAD</i>	5.59	[1.07,19.65]	0.04
	<i>DM</i>	3.75	[0.87,16.11]	0.08
	<i>HTN</i>	4.12	[0.97,17.56]	0.05
	<i>Stroke</i>	3.87	[0.91,16.56]	0.07
	<i>HF</i>	4.21	[0.99,17.91]	0.05
	<i>Cancer</i>	4.06	[0.95,17.36]	0.05
	Transplant Characteristics			
	<i>CIT (/5 hour)</i>	4.19	[0.98,17.87]	0.05
	<i>CMV High risk</i>	3.99	[0.93,17.04]	0.06
	<i>DCD</i>	1.85	[0.53,6.44]	0.33
	<i>Dialysis duration</i>	4.24	[1,18.06]	0.05
	<i>DGF</i>	3.68	[0.89,16.24]	0.07
	<i>High PRA</i>	4.33	[0.99,1796]	0.05
	<i>HLA</i>	3.95	[0.93,16.84]	0.06
	<i>Simulect Induction</i>	4.17	[0.98,17.81]	0.05
	<i>OMM</i>	3.98	[0.93,17]	0.05
	Donor Characteristics			
	<i>Age</i>	4.03	[0.95,17.19]	0.06
	<i>Dm</i>	4.31	[1,18.54]	0.049
	<i>Ethnicity</i>	4.17	[0.98,17.74]	0.05
	<i>Gender</i>	4.19	[0.98,17.86]	0.05

	<i>HTN</i>	4.53	[1.06,19.45]	0.04
	<i>Serum Cr</i>	4.15	[0.97,17.68]	0.05

OMM, 0-human leukocyte antigen mismatch; AA, African American; CAD, coronary artery disease; CI, Confidence interval; CIT, cold ischemic time; CMV, cytomegalovirus; Cr, creatinine; DDKT, deceased donor kidney transplant; DGF, delayed graft function; DM, diabetes mellitus; HF, heart failure; HLA, human leukocyte antigen; HR, hazard ratio; HTN, hypertension; LDKT, living donor kidney transplant; PRA, panel reactive antibody; UI, undocumented immigrants; UR, US residents
 * UI is a reference

eTable 7. Rejection for All Transplant

	Hazards ratio (US resident vs. Undocumented Immigrants)			
Unadjusted	Unadjusted	HR*	95% CI	P
		1.44	[0.69,2.99]	0.33
Adjusted	Adjusted variables	HR*	95% CI	P
	Demographics			
	<i>Age</i>	1.67	[0.79,3.53]	0.18
	<i>Race (AA)</i>	1.73	[0.81,3.71]	0.16
	<i>Ethnicity</i>	1.85	[0.87,3.91]	0.11
	<i>Obesity</i>	1.42	[0.68,2.95]	0.35
	Comorbidities			
	<i>CAD</i>	1.44	[0.69,2.99]	0.33
	<i>DM</i>	1.45	[0.69,3.03]	0.33
	<i>HTN</i>	1.48	[0.71,3.07]	0.30
	<i>Stroke</i>	1.43	[0.69,2.99]	0.34
	<i>HF</i>	1.46	[0.7, 3.04]	0.31
	<i>Cancer</i>	1.40	[0.69,2.91]	0.38
	Transplant Characteristics			
	<i>CIT (/5 hour)</i>	1.47	[0.71,3.06]	0.3
	<i>CMV High risk</i>	1.42	[0.68,2.97]	0.35
	<i>Dialysis duration</i>	1.44	[0.69,2.99]	0.33
	<i>DGF</i>	1.34	[0.64,2.79]	0.44
	<i>High PRA</i>	1.43	[0.69,2.98]	0.34
	<i>HLA</i>	1.50	[0.72,3.13]	0.28
	<i>Living Donor</i>	1.44	[0.69,3]	0.33
	<i>Simulect Induction</i>	1.46	[0.7,3.03]	0.32
	<i>OMM</i>	1.46	[0.7,3.05]	0.32
	Donor Characteristics			
	<i>Age</i>	1.43	[0.69,2.98]	0.34
	<i>Dm</i>	1.51	[0.72,3.16]	0.29
	<i>Ethnicity</i>	1.58	[0.75,3.32]	0.23

	<i>Gender</i>	1.39	[0.67,2.89]	0.38
	<i>HTN</i>	1.48	[0.71,3.1]	0.30
	<i>Serum Cr</i>	1.48	[0.71,3.08]	0.29

OMM, 0-human leukocyte antigen mismatch; AA, African American; CAD, coronary artery disease; CI, Confidence interval; CIT, cold ischemic time; CMV, cytomegalovirus; Cr, creatinine; DDKT, deceased donor kidney transplant; DGF, delayed graft function; DM, diabetes mellitus; HF, heart failure; HLA, human leukocyte antigen; HR, hazard ratio; HTN, hypertension; LDKT, living donor kidney transplant; PRA, panel reactive antibody; UI, undocumented immigrants; UR, US residents

* UI is a reference

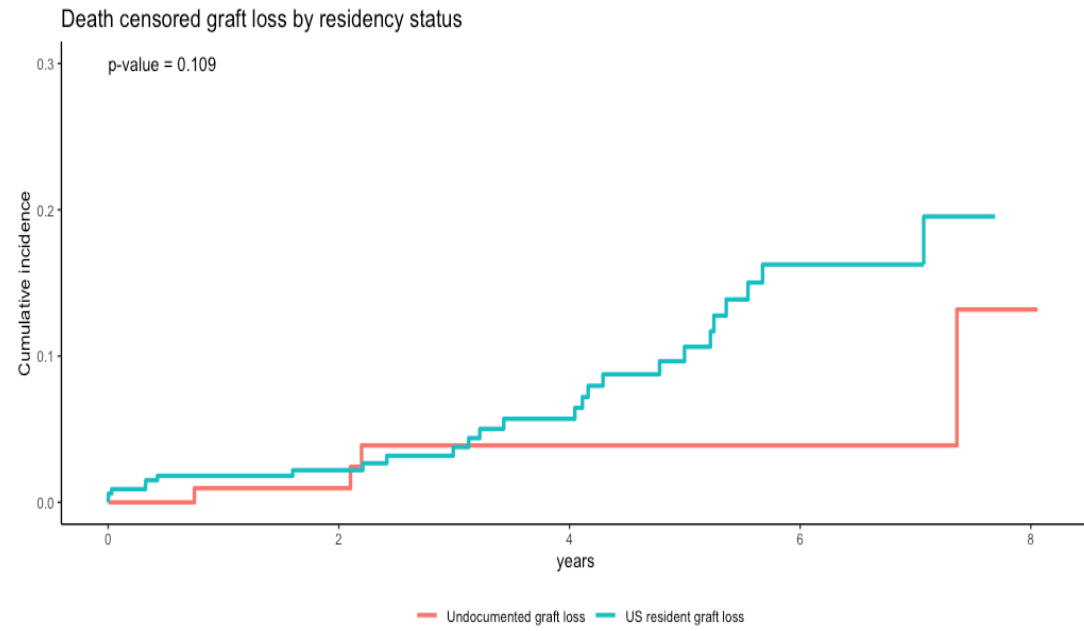
eTable 8. Rejection for DDRT Only

	Hazards ratio (US resident vs. Undocumented Immigrants)			
Unadjusted	Unadjusted	HR*	95% CI	P
		1.06	[0.47,2.37]	0.90
Adjusted	Adjusted variables	HR*	95% CI	P
	Demographics			
	<i>Age</i>	1.22	[0.53,2.77]	0.64
	<i>Race (AA)</i>	1.14	[0.49,2.66]	0.77
	<i>Ethnicity</i>	1.23	[0.54,2.82]	0.62
	<i>Obesity</i>	1.05	[0.47,2.36]	0.91
	Comorbidities			
	<i>CAD</i>	1.05	[0.47,2.36]	0.91
	<i>DM</i>	1.05	[0.47,2.39]	0.9
	<i>HTN</i>	1.09	[0.49,2.46]	0.83
	<i>Stroke</i>	1.06	[0.47,2.38]	0.9
	<i>HF</i>	1.06	[0.47,2.38]	0.89
	<i>Cancer</i>	1.06	[0.47,2.4]	0.88
	Transplant Characteristics			
	CIT (/5 hour)	1.11	[0.49,2.5]	0.81
	CMV High risk	1.04	[0.46,2.34]	0.93
	DCD	1.02	[0.45,2.3]	0.97
	Dialysis duration	1.06	[0.47,2.38]	0.9
	DGF	0.89	[0.39,2.03]	0.78
	High PRA	1.05	[0.47,2.36]	0.9
	HLA	1.15	[0.51,2.61]	0.73
	<i>Simulect Induction</i>	1.09	[0.48,2.47]	0.83
	<i>OMM</i>	1.07	[0.47,2.42]	0.88
	Donor Characteristics			
	<i>Age</i>	1.05	[0.47,2.37]	0.9

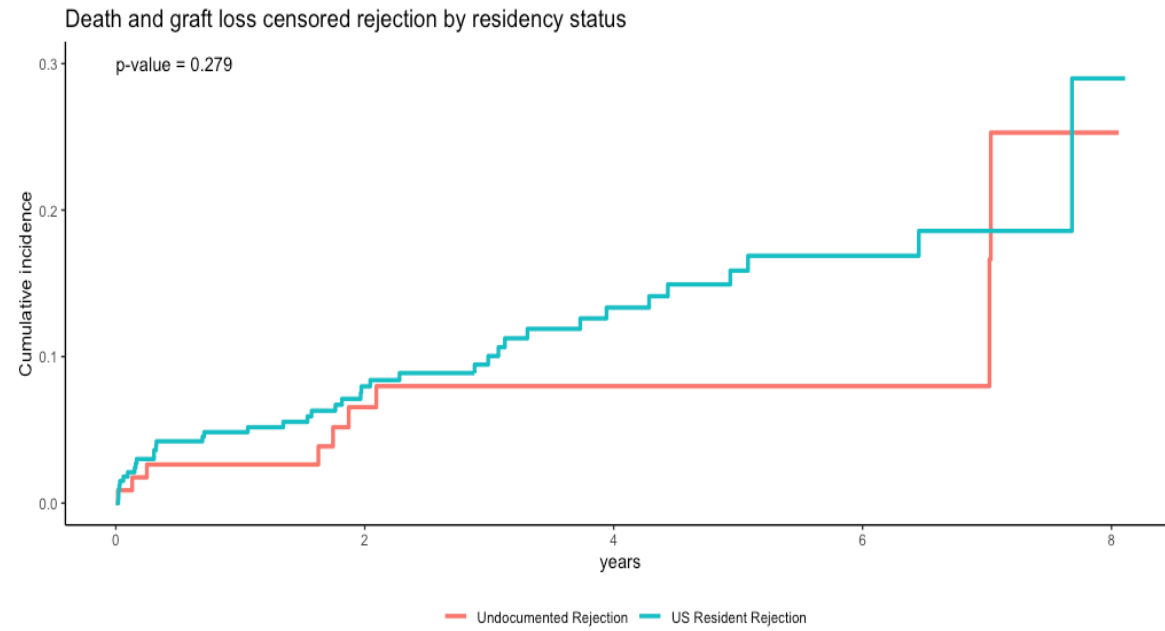
	<i>Dm</i>	1.11	[0.49,2.54]	0.8
	<i>Ethnicity</i>	1.05	[0.47,2.37]	0.9
	<i>Gender</i>	1.06	[0.47,2.39]	0.89
	<i>HTN</i>	1.09	[0.48,2.47]	0.83
	<i>Serum Cr</i>	1.11	[0.49,2.5]	0.8

OMM, 0-human leukocyte antigen mismatch; AA, African American; CAD, coronary artery disease; CI, Confidence interval; CIT, cold ischemic time; CMV, cytomegalovirus; Cr, creatinine; DDKT, deceased donor kidney transplant; DGF, delayed graft function; DM, diabetes mellitus; HF, heart failure; HLA, human leukocyte antigen; HR, hazard ratio; HTN, hypertension; LDKT, living donor kidney transplant; PRA, panel reactive antibody; UI, undocumented immigrants; UR, US residents
 * UI is a reference

A)



B)



eFigure 1. Cumulative Incidence Curve for A) Death Censored Graft Loss B) Death and Graft Loss Censored Rejection by Residency Status

eFigure 2. Conceptual Framework

Conceptual Framework

