

Analysis Report: Update

Data Request from the OPTN Kidney Transplantation Committee: Provide KPSAM simulation data on effect of removing DSA and region from kidney/pancreas/kidney-pancreas organ allocation policy

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Timeline

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- Analysis plan due: April 15, 2019
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- Analysis report due: June 17, 2019
- Analysis report submitted: June 14, 2019
- Analysis report update submitted: June 21, 2019
- Next committee meeting: June 25, 2019

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Executive Summary

SRTR used the updated kidney-pancreas simulated allocation model (KPSAM) to assess the simulated impact of eleven allocation frameworks based on nautical miles (NM) between candidate listing program and donor hospital. In interpreting the modeling results it is important to consider that KPSAM cannot model changes in program behaviors under new allocation policies.

All KPSAM runs were performed using a donor-only acceptance model. In contrast to previously published KPSAM runs, which considered both donor and candidate factors as well as donor/candidate interactions, this model only considered donor factors and offer number when predicting the likelihood of offer acceptance.

Update: This report contains all 10 iterations of the requested models.

Description of Runs

Model Number	Model Nickname	Circle Size	Inner Circle Maximum Points	Outer Circle Maximum Points	
	KI	KP/PA			
M2	500.500.0.8	500	500	0	8
M3	500.500.4.8	500	500	4	8
M4	500.150.0.8	500	150	0	8
M5	250.250.2.4	250	250	2	4
M6	250.250.0.8	250	250	0	8
M7	250.150.0.8	250	150	0	8
M8	150.150.0.8	150	150	0	8
M9	150.150.0.20	150	150	0	20
M10	500.500.step150	500	500	4	8
M11	500.500.step250	500	500	4	8

The baseline model (referred to as “BL” in all tables and figures) was the current allocation system, but with local pediatric candidates given priority over candidates with cPRA 98 and 99 for kidneys with KDPI < 35. The committee also wanted to similarly prioritize prior living donors, but prior living donors are not currently modeled by KPSAM.

Models 2-11 are single-circle allocation systems. Proximity points within the circle were assigned linearly, starting at X points for a 0-NM distance between the donor hospital and transplant program, and tapering to 0 points at the circle edge. Likewise, proximity points outside the circle were assigned linearly, starting at Y points at the circle’s edge, and tapering to 0 points at 2500 NM.

Models 10 and 11 also contain a stepwise element, wherein a constant 4 points was awarded between 0-150 NM and 0-250 NM, respectively. This is meant to negate the effect of distance within that area. From there, proximity points taper to 0 at 500 NM. Outside the 500-NM circle, proximity points are assigned as in Models 2, e.g. starting at 8 points at 500 NM and tapering to 0 points at 2500 NM.

Main Findings

Total Transplants

The simulated total number of transplants varied by fewer than 200 across all runs. The allocation systems for kidney and kidney-pancreas/pancreas-alone transplants are highly related, with kidney-pancreas and pancreas-alone candidates receiving absolute priority over kidney-alone candidates through the first (formerly “local”) level of allocation. Additionally, kidney-pancreas candidates outnumber pancreas-alone candidates by over 3 to 1; therefore, under broader sharing schemes, kidney-pancreas candidates tend to benefit more than pancreas-alone candidates. In general, when the kidney-pancreas/pancreas-alone and kidney-alone circles are of the same size, relatively more kidney-pancreas transplants are performed, and relatively fewer pancreas-alone and kidney-alone transplants. In contrast, when the kidney-pancreas/pancreas-alone circle is smaller than the kidney-alone circle, both kidney-alone and pancreas-alone transplants decline less.

Distance Between Transplant Recipient and Donor Hospital

Distance traveled is greatest in larger circles (e.g. 500 NM) and minimized in small circles (e.g. 150 NM). Proximity points within the circle tend to reduce the distance traveled. For example, the median distance in run 500.500.0.8 for a kidney transplant was 303 NM, but in run 500.500.4.8 (which employed a maximum of 4 proximity points) the median distance for a kidney transplant was 199 NM. The effect of proximity points outside the circle was less strong, likely because relatively few transplants were predicted there (10%-20%). Kidney-pancreas transplants traveled the shortest distances, and pancreas-alone transplants traveled the farthest.

Variance in Metrics by Candidate DSA

The variance in kidney-alone transplant rate by candidate’s listing DSA was minimized in the largest distribution circles, and maximized in the smallest circles. The pattern for kidney-pancreas and pancreas-alone was less consistent. The variance in median donor-recipient distance by DSA tended to be highest in the largest distribution circles, and minimized in the smallest circles. Inversely, the variance in median years on dialysis at transplant tended to be minimized in the largest circles, and maximized in the smallest circles.

Subgroups

Kidney-alone:

In general, the largest changes in transplant rates were observed under the broadest sharing, and the smallest changes under the most conservative sharing. Transplant rates for pediatric candidates increased under all proposals; this is in addition to the increase observed from the true baseline to the baseline run with pediatric priority. Rates for adults aged ≥ 50 years, and particularly ≥ 65 years, tended to decline somewhat. Transplant rates were generally higher for African American and Latino candidates in all proposals, and slightly lower for whites and non-Latinos. Transplant rates increased for female candidates; this was maximized in the broadest sharing scenarios. Transplant rates by primary cause of disease were relatively constant across proposals, with the exception of Congenital and Rare Metabolic Disorders (CRMD), which are most common in pediatric candidates. Transplant rates were higher for candidates with >5 years of dialysis, and the increase was maximized under the broadest sharing proposals. Transplant rates for candidates with cPRA 80-99 likewise increased under broader sharing scenarios. There were small decreases in transplant rates among non-metropolitan candidates (where the rural-urban commuting area (RUCA) grouping is defined by candidate's permanent zip code). Transplant rates for candidates with EPTS $\leq 20\%$ (excluding pediatric candidates) also declined under broader sharing proposals; the decline was minimized in the smallest circles.

Kidney-Pancreas:

As with kidney-alone transplants, the largest changes in transplant rates were observed under the broadest sharing, and the smallest changes under the most conservative sharing. Kidney-pancreas transplant rates and counts increased globally. Nonetheless, some subgroups received a greater proportion of transplants under alternate sharing scenarios, as compared with baseline. In particular, African-American candidates underwent slightly more transplants under broader sharing, and white candidates slightly fewer. Non-Latino candidates underwent slightly more transplants, and Latino candidates slightly fewer. Likewise, female candidates underwent slightly more transplants, and male candidates slightly fewer. Candidates with cPRA $<80\%$ underwent relatively fewer transplants, and more highly sensitized candidates relatively more. Candidates with Medicare as primary payer underwent relatively more transplants, and those with private insurance relatively fewer. Transplants did not change by urbanicity.

Pancreas-Alone:

In contrast to kidney-alone and kidney-pancreas transplant rates, pancreas-alone transplant rates decreased globally under alternate sharing scenarios, and decreases were greatest under the broadest sharing (i.e., largest circle sizes). Because of the relatively small number of pancreas-alone transplants performed, results are more variable (i.e., much wider ranges associated with transplant rates and counts) and therefore, less certainty around changes in subgroups. Candidates aged 18-34 years underwent slightly fewer transplants under alternate sharing, and those aged 35+ slightly more. Candidates with cPRA $< 80\%$ received relatively fewer transplants, and more highly sensitized candidates relatively more. Transplants did not change by race or urbanicity.

Acceptance Model

All KPSAM runs were performed using a donor-only acceptance model. The report from data request KI2018_01, published in December 2018, was negatively received due to notable decreases in the number of transplants. This was potentially related to inclusion of a local indicator in the offer acceptance models. In response, SRTR began investigating the effect of different decisions in the offer acceptance model on KPSAM results.

The KPSAM acceptance models are always created with historical data (match run data), and by their nature, they assume that acceptance behavior will remain the same under any new allocation system. However, under different allocation systems, different types of candidates receive relatively more or less priority than under the current systems, and consequently, programs are likely to change their acceptance behavior to compensate. By removing candidate factors from the acceptance model, we no longer make assumptions about how candidate factors may influence acceptance behavior. Removing these assumptions about how candidate factors interact with acceptance means that KPSAM is less likely to predict a decrease in deceased-donor transplants. However, that means KPSAM also has less ability to predict differences in acceptance rates by candidate characteristics under different policy scenarios.

Limitations

One aspect of the simulation results strongly affected by acceptance probability is the number of projected transplants. KPSAM uses a simple model of organ discard: if an organ is offered 200 times without an acceptance, it is marked as discarded. This approach is computationally efficient but does not identify most behavioral or clinical factors for which organs are discarded, and this means that KPSAM in general is not a good tool for predicting an overall number of transplants in any given policy scenario. Specifically in this analysis, lower overall acceptance probabilities related to the removal of the local/regional/national distribution system likely affect the number of transplants across all allocation proposals. However it is not possible to determine whether proposals are affected equally. SRTR will continue to investigate potential improvements to the modeling approach.

Data Request

Using the most recently available KPSAM version and data, model the kidney, pancreas, and kidney-pancreas distribution systems outlined in the KI2019_01 Analysis Plan.

Study population

KPSAM input files were updated to include transplant candidates listed on the kidney, kidney-pancreas, or pancreas transplant waiting lists between January 1, 2017, and December 31, 2017, and donors whose kidneys or pancreata were recovered for transplant in the same time period.

Updates to KPSAM

The unacceptable antigen equivalences and antigen splits used by KPSAM have been updated to match current (September 2018) OPTN policy. In addition, all predictive models used by KPSAM have been updated to incorporate newer data and methodology, including but not limited to the acceptance models and posttransplant outcomes models.

Metrics assessed

As noted in the OPTN data request, SRTR assessed the following outcome metrics for the simulations:

- Count (%) of transplants
- Transplant rates
- Time on dialysis distribution at transplant, kidney-alone
- Time on waiting list distribution at transplant
- Organ travel distance (NM) distribution at transplant
- Percent of organs traveling over 250 NM
- Variance in transplant rates
- Variance of median time on dialysis at transplant
- Variance in median time on waiting list at transplant

Relevant DSA-level metrics are shown choropleth maps and provided in an appendix of tables:

- Transplant rates
- Median dialysis time at transplant
- Median time on waiting list at transplant
- Median cPRA at transplant, kidney-alone
- Waitlist mortality rates
- Change in count of waitlist deaths[^]

[^]In tables only

Metrics by organ should also be assessed by the following subgroup populations (including a comparison of percentage of waiting list vs. percentage of transplants where applicable):

- **Candidate/recipient age:** 0-5, 6-10, 11-17, 18-34, 35-49, 50-64, ≥ 65 years
- **Candidate/recipient race:** white, African American, Asian, other/unknown
- **Candidate/recipient sex:** male vs. female
- **Candidate/recipient ethnicity:** Latino, Not Latino
- **Candidate/recipient blood type (ABO):** A, B, AB, O
- **Candidate/Recipient cPRA:** 0-79, 80-89, 90-94, 95-97, 98, 99, 100
- **Candidate/recipient diagnosis:** diabetes, hypertension, GN, cystic kidney disease, other
- **Candidate/recipient time on dialysis:** pre-emptive transplant, 0-< 1, 1-< 3, 3-< 5, 5-< 10, ≥ 10 years
- **SES-related:**
 - **Candidate/recipient insurance status:** public vs. private
 - **Median income by recipient zip code at listing/transplant distribution:** using the ACS zip code level publically available dataset
 - **Urbanicity:** urban vs. rural, based on RUCA codes (individually, and grouped by metropolitan vs. micropolitan + small town + rural)
- **KDPI:** 0-20%, 21-34%, 35-85%, 86-100%
- **EPTS:** 0-20%, 21-100%

- **Donor type:** DCD vs DBD
- **Candidate/recipient sensitization:**
 - 0-HLA mismatch: 0 vs. non-0
 - DR mismatch level: 0, 1, 2
- **Geography:**
 - Percentage local (DSA), regional, national
 - By OPTN Region: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Additional figures by subgroup can be found in Appendix 1:

- Waitlist mortality rate
- Post-transplant graft failure rate (1 year)
- Post-transplant death rate (1 year)

Analytic approach

Each of the eleven requested changes to the allocation system was run with 10 iterations (repetitions) in KPSAM, to provide some measure of variability. Because the same donors and candidates are used in each of the simulations, and they are the actual donors and candidates from 2017 rather than independent samples from a larger population, statistical tests for comparison have no validity. Instead, the average and range of results (minimum - maximum) for the 10 iterations are provided.

Results

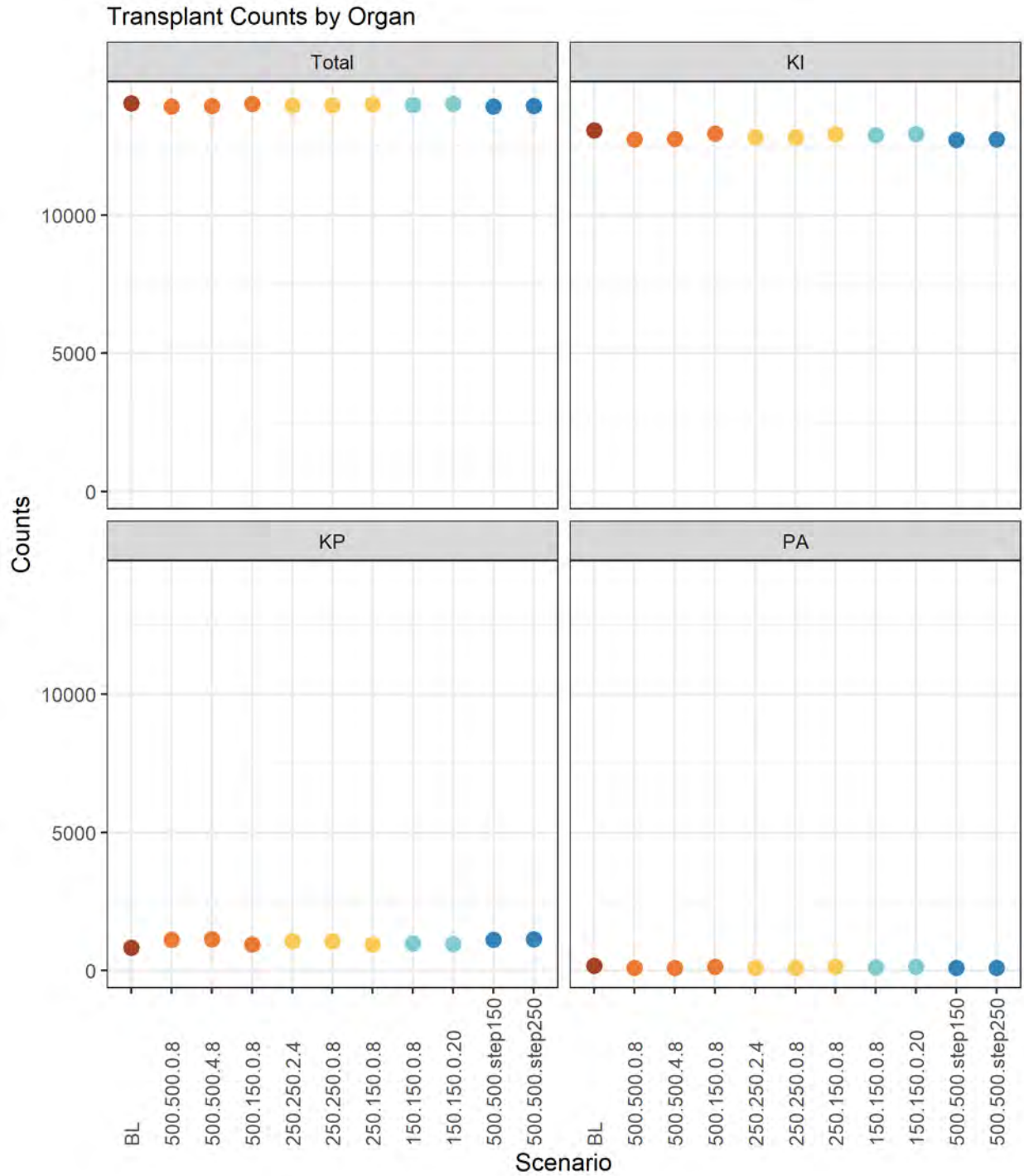
Results for the simulated scenarios are reported primarily in the form of plots, with each plot displaying the values for a given metric across the eleven scenarios simulated. In viewing these results, it is important to compare the new scenarios with the current allocation policy scenario to identify changes in outcome metrics due to the proposed policy changes. Each scenario was simulated 10 times, and the plot displays the range of results across the 10 simulations as a vertical line extending from the minimum value to the maximum value found for that metric and scenario. A point along that line marks the mean value of the metric across the 10 iterations.

Transplant Counts

Transplant Counts

Scenario	Transplant Count (N), Overall	Transplant Count (N), Kidney-Alone	Transplant Count (N), Kidney-Pancreas	Transplant Count (N), Pancreas-Alone
BL	14058 (13962,14143)	13080 (12982,13166)	815 (795,830)	163 (150,182)
500.500.0.8	13951 (13833,14059)	12748 (12633,12860)	1111 (1100,1119)	92 (85,99)
500.500.4.8	13972 (13847,14065)	12766 (12636,12859)	1122 (1109,1134)	84 (74,95)
500.150.0.8	14035 (13852,14131)	12965 (12787,13061)	937 (924,946)	133 (123,146)
250.250.2.4	13981 (13885,14064)	12830 (12730,12928)	1056 (1036,1066)	96 (84,104)
250.250.0.8	13980 (13885,14084)	12832 (12732,12938)	1052 (1030,1070)	96 (87,109)
250.150.0.8	14018 (13881,14130)	12945 (12825,13055)	945 (931,960)	129 (115,145)
150.150.0.8	14006 (13888,14150)	12915 (12800,13057)	970 (955,992)	120 (109,133)
150.150.0.20	14036 (13932,14127)	12946 (12836,13031)	966 (945,982)	125 (120,136)
500.500.step150	13941 (13883,14075)	12741 (12673,12877)	1115 (1107,1128)	85 (71,97)
500.500.step250	13965 (13853,14041)	12760 (12651,12838)	1120 (1111,1132)	85 (74,90)

Transplant Counts by Organ



Transplant Counts by Organ

Overview Data Tables

Main Metrics for Kidney-Alone

Overview of Main Metrics for Kidney

Scenario	Transplant		Waitlist		Graft Failure Rate per Patient-Year
	Rate per Patient-Year	Transplant Count (N)	Mortality Rate per Patient-Year	Waitlist Mortality Count (N)	
BL	0.118 (0.117,0.119)	13080 (12982,13166)	0.047 (0.047,0.048)	5237 (5207,5268)	0.075 (0.072,0.081)
500.500.0.8	0.115 (0.114,0.116)	12748 (12633,12860)	0.048 (0.047,0.048)	5266 (5238,5282)	0.079 (0.077,0.083)
500.500.4.8	0.115 (0.114,0.116)	12766 (12636,12859)	0.048 (0.047,0.048)	5276 (5255,5291)	0.079 (0.076,0.082)
500.150.0.8	0.117 (0.115,0.118)	12965 (12787,13061)	0.048 (0.047,0.048)	5265 (5244,5284)	0.078 (0.075,0.082)
250.250.2.4	0.116 (0.115,0.117)	12830 (12730,12928)	0.047 (0.047,0.048)	5261 (5247,5271)	0.077 (0.074,0.08)
250.250.0.8	0.116 (0.115,0.117)	12832 (12732,12938)	0.047 (0.047,0.048)	5263 (5252,5277)	0.077 (0.075,0.083)
250.150.0.8	0.117 (0.116,0.118)	12945 (12825,13055)	0.047 (0.047,0.048)	5251 (5228,5274)	0.077 (0.074,0.08)
150.150.0.8	0.117 (0.116,0.118)	12915 (12800,13057)	0.047 (0.047,0.048)	5249 (5233,5270)	0.076 (0.073,0.08)
150.150.0.20	0.117 (0.116,0.118)	12946 (12836,13031)	0.047 (0.047,0.048)	5255 (5228,5294)	0.075 (0.071,0.078)
500.500.step150	0.115 (0.114,0.116)	12741 (12673,12877)	0.048 (0.047,0.048)	5270 (5251,5280)	0.078 (0.074,0.081)
500.500.step250	0.115 (0.114,0.116)	12760 (12651,12838)	0.048 (0.047,0.048)	5268 (5243,5279)	0.077 (0.073,0.083)

Main Metrics for Kidney-Pancreas

Overview of Main Metrics for Kidney-Pancreas

Scenario	Transplant Rate per Patient-Year	Transplant Count (N)	Waitlist Mortality Rate per Patient-Year	Waitlist Mortality Count (N)	Graft Failure Rate per Patient-Year
BL	0.422 (0.412,0.432)	815 (795,830)	0.052 (0.049,0.055)	101 (94,106)	0.129 (0.114,0.161)
500.500.0.8	0.623 (0.613,0.63)	1111 (1100,1119)	0.054 (0.052,0.056)	96 (93,100)	0.141 (0.127,0.153)
500.500.4.8	0.631 (0.621,0.638)	1122 (1109,1134)	0.054 (0.051,0.056)	96 (92,100)	0.135 (0.117,0.162)
500.150.0.8	0.501 (0.488,0.511)	937 (924,946)	0.054 (0.051,0.058)	101 (95,109)	0.139 (0.124,0.154)
250.250.2.4	0.583 (0.576,0.59)	1056 (1036,1066)	0.054 (0.052,0.056)	97 (93,101)	0.138 (0.112,0.15)
250.250.0.8	0.581 (0.566,0.592)	1052 (1030,1070)	0.054 (0.052,0.057)	98 (94,103)	0.134 (0.116,0.161)
250.150.0.8	0.507 (0.497,0.517)	945 (931,960)	0.054 (0.052,0.055)	100 (96,103)	0.138 (0.122,0.163)
150.150.0.8	0.523 (0.512,0.539)	970 (955,992)	0.055 (0.052,0.057)	101 (96,107)	0.127 (0.105,0.14)
150.150.0.20	0.521 (0.504,0.536)	966 (945,982)	0.054 (0.052,0.055)	99 (97,102)	0.133 (0.115,0.149)
500.500.step150	0.626 (0.616,0.636)	1115 (1107,1128)	0.054 (0.051,0.058)	97 (92,104)	0.133 (0.121,0.149)
500.500.step250	0.63 (0.619,0.643)	1120 (1111,1132)	0.053 (0.051,0.057)	94 (91,101)	0.137 (0.123,0.162)

** Graft Failure is modeled as the earlier failure of either the kidney or pancreas allograft. Note that predictive models for posttransplant pancreas graft failure were built on data that do not yet incorporate the new pancreas graft failure definition implemented in 2018.

Main Metrics for Pancreas-Alone

Overview of Main Metrics for Pancreas

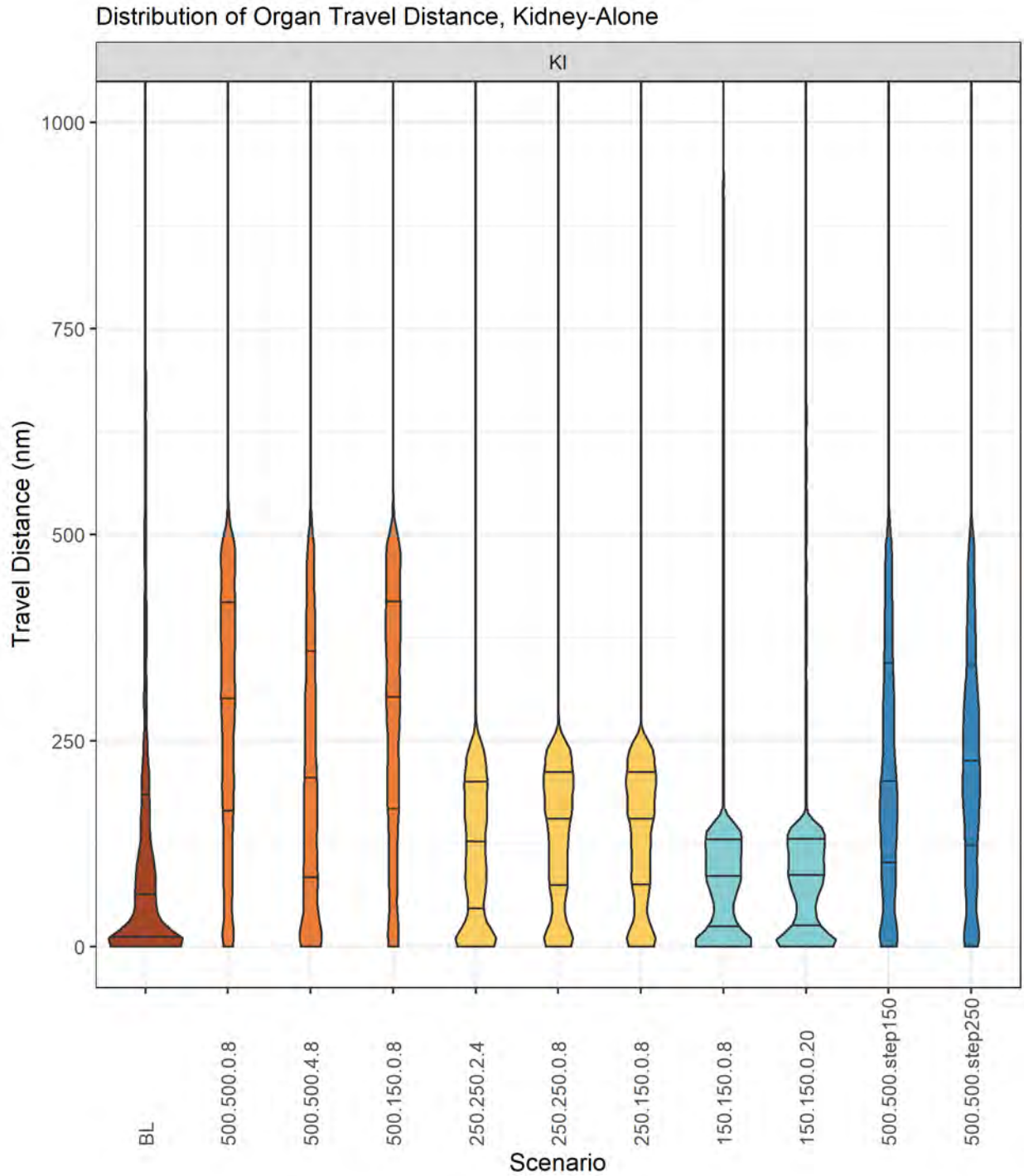
Scenario	Transplant Rate per Patient-Year (N)	Transplant Count (N)	Waitlist Mortality Rate per Patient-Year	Waitlist Mortality Count (N)	Graft Failure Rate per Patient-Year
BL	0.221 (0.203,0.249)	163 (150,182)	0.02 (0.018,0.023)	15 (13,17)	0.199 (0.144,0.259)
500.500.0.8	0.118 (0.109,0.128)	92 (85,99)	0.02 (0.018,0.022)	16 (14,17)	0.21 (0.113,0.266)
500.500.4.8	0.107 (0.094,0.123)	84 (74,95)	0.022 (0.02,0.024)	17 (16,19)	0.207 (0.117,0.297)
500.150.0.8	0.177 (0.162,0.194)	133 (123,146)	0.02 (0.019,0.023)	15 (14,17)	0.204 (0.158,0.334)
250.250.2.4	0.124 (0.108,0.135)	96 (84,104)	0.022 (0.021,0.023)	17 (16,18)	0.212 (0.122,0.286)
250.250.0.8	0.124 (0.111,0.142)	96 (87,109)	0.022 (0.018,0.023)	17 (14,18)	0.226 (0.134,0.313)
250.150.0.8	0.171 (0.151,0.193)	129 (115,145)	0.022 (0.02,0.024)	16 (15,18)	0.196 (0.135,0.242)
150.150.0.8	0.158 (0.142,0.176)	120 (109,133)	0.021 (0.018,0.024)	16 (14,18)	0.209 (0.152,0.266)
150.150.0.20	0.165 (0.158,0.181)	125 (120,136)	0.022 (0.02,0.025)	17 (15,19)	0.217 (0.173,0.267)
500.500.step150	0.109 (0.09,0.125)	85 (71,97)	0.021 (0.02,0.023)	16 (16,18)	0.219 (0.153,0.281)
500.500.step250	0.108 (0.094,0.115)	85 (74,90)	0.022 (0.019,0.024)	17 (15,19)	0.226 (0.165,0.273)

** Note that predictive models for posttransplant pancreas graft failure were built on data that do not yet incorporate the new pancreas graft failure definition implemented in 2018.

Distance from Candidate's Listing Program to Donor Hospital (Nautical Miles), Transplant Recipients Only

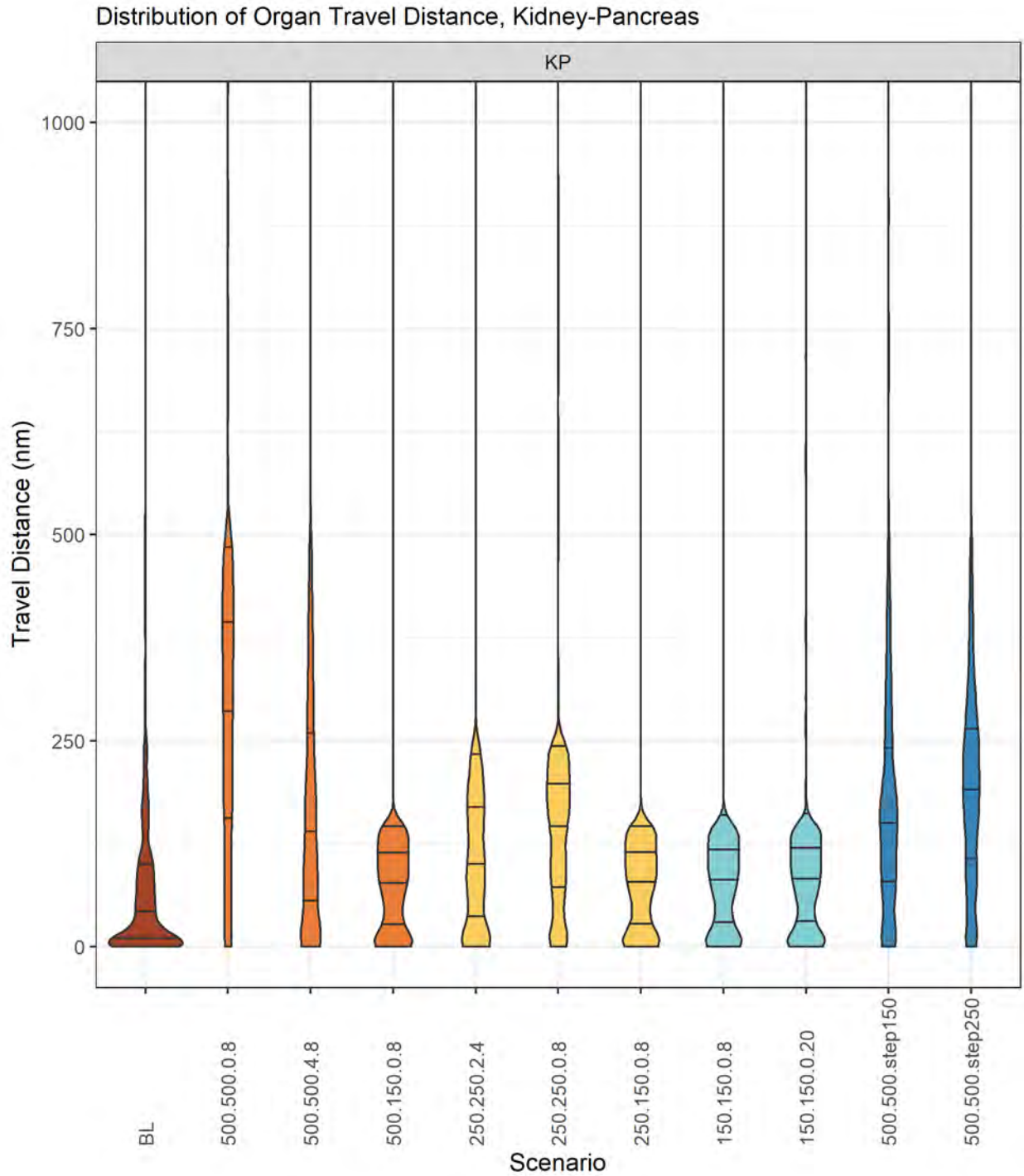
Distance is calculated as the linear distance in nautical miles between zip code centroids of the candidate's listing program and the donor hospital.

Distribution of Organ Travel Distance, Kidney-Alone



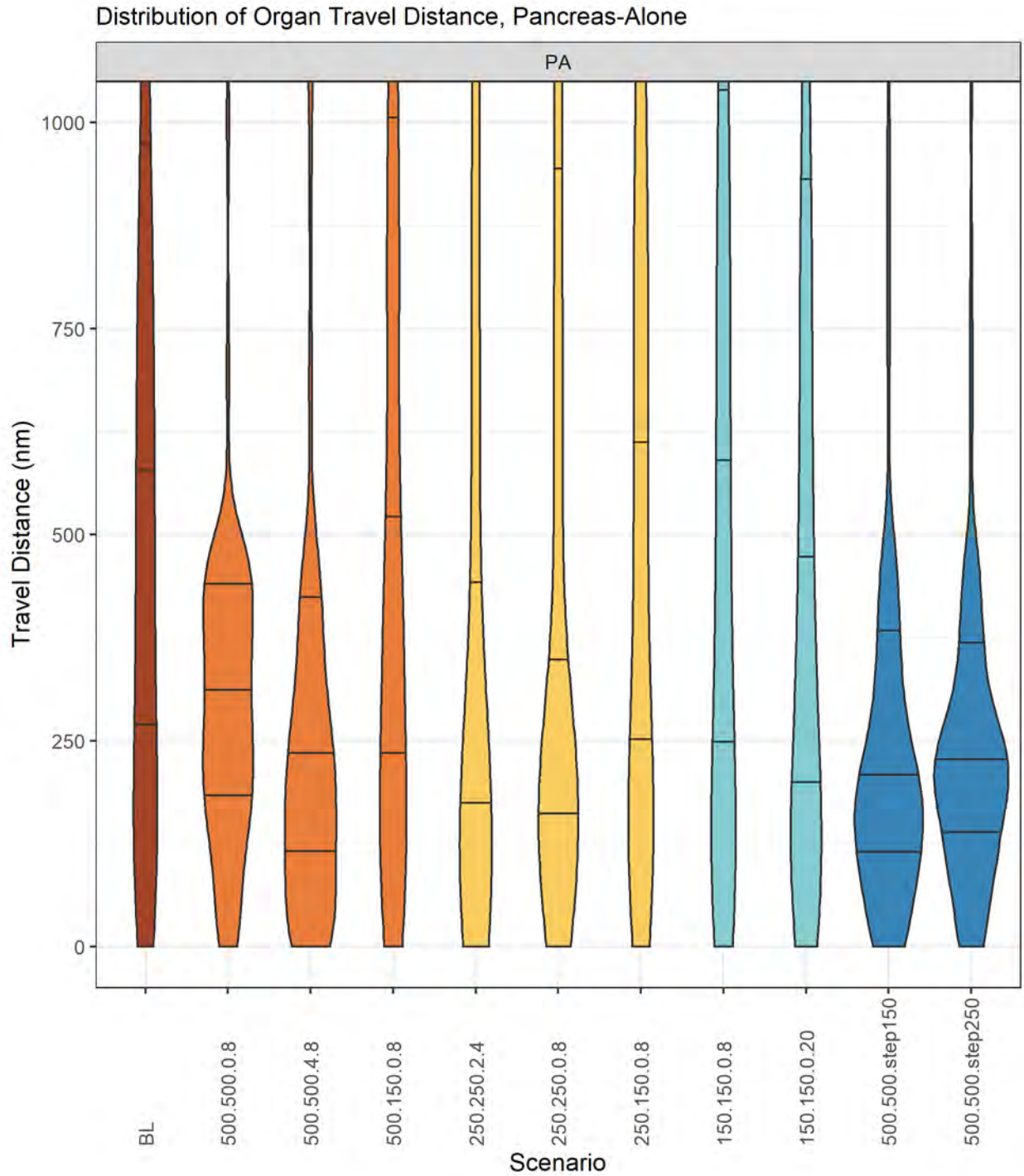
Distribution of Organ Travel Distance, Kidney-Alone

Distribution of Organ Travel Distance, Kidney-Pancreas



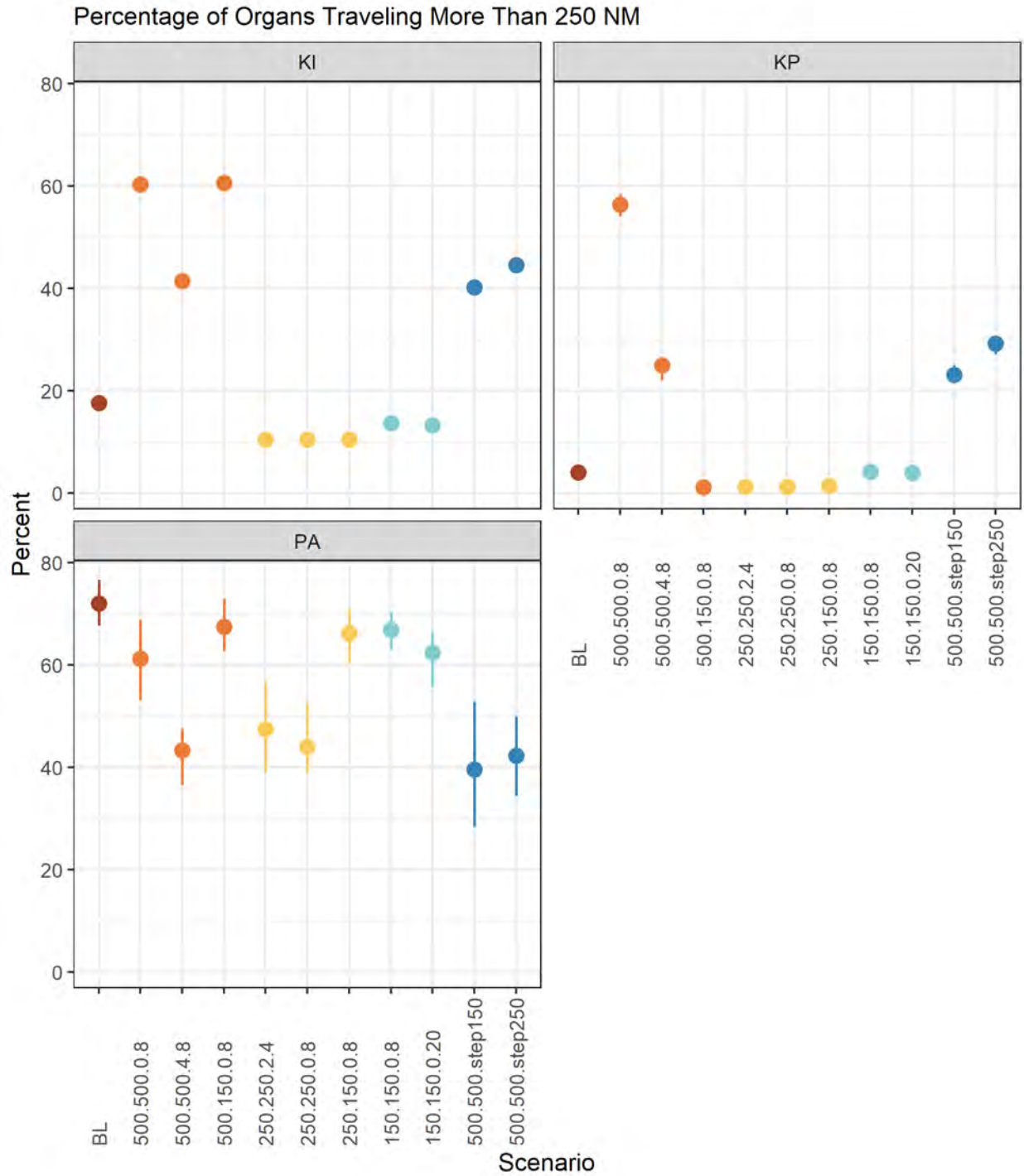
Distribution of Organ Travel Distance, Kidney-Pancreas

Distribution of Organ Travel Distance, Pancreas-Alone



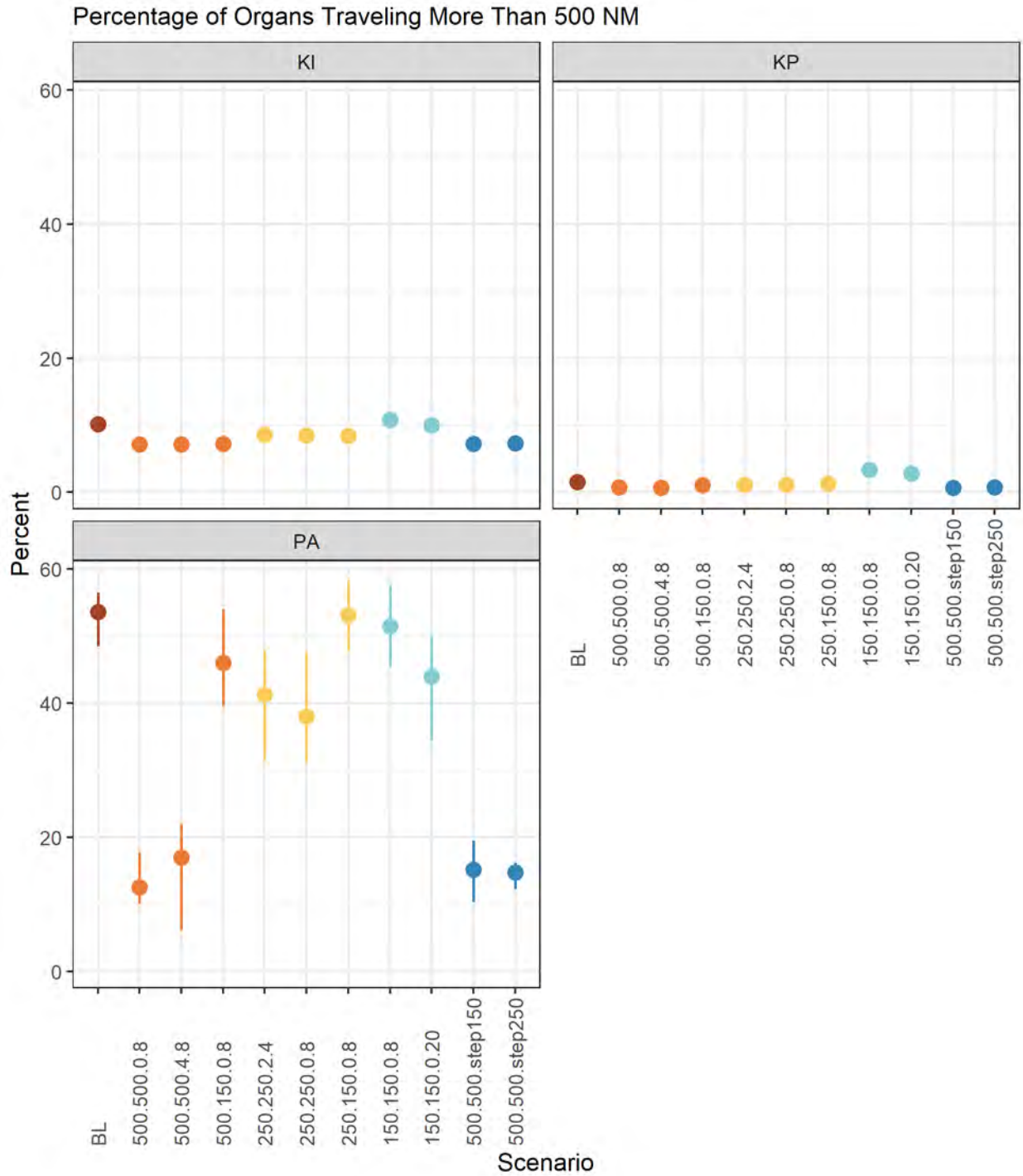
Distribution of Organ Travel Distance, Pancreas-Alone

Percentage of Organs Traveling More Than 250 NM



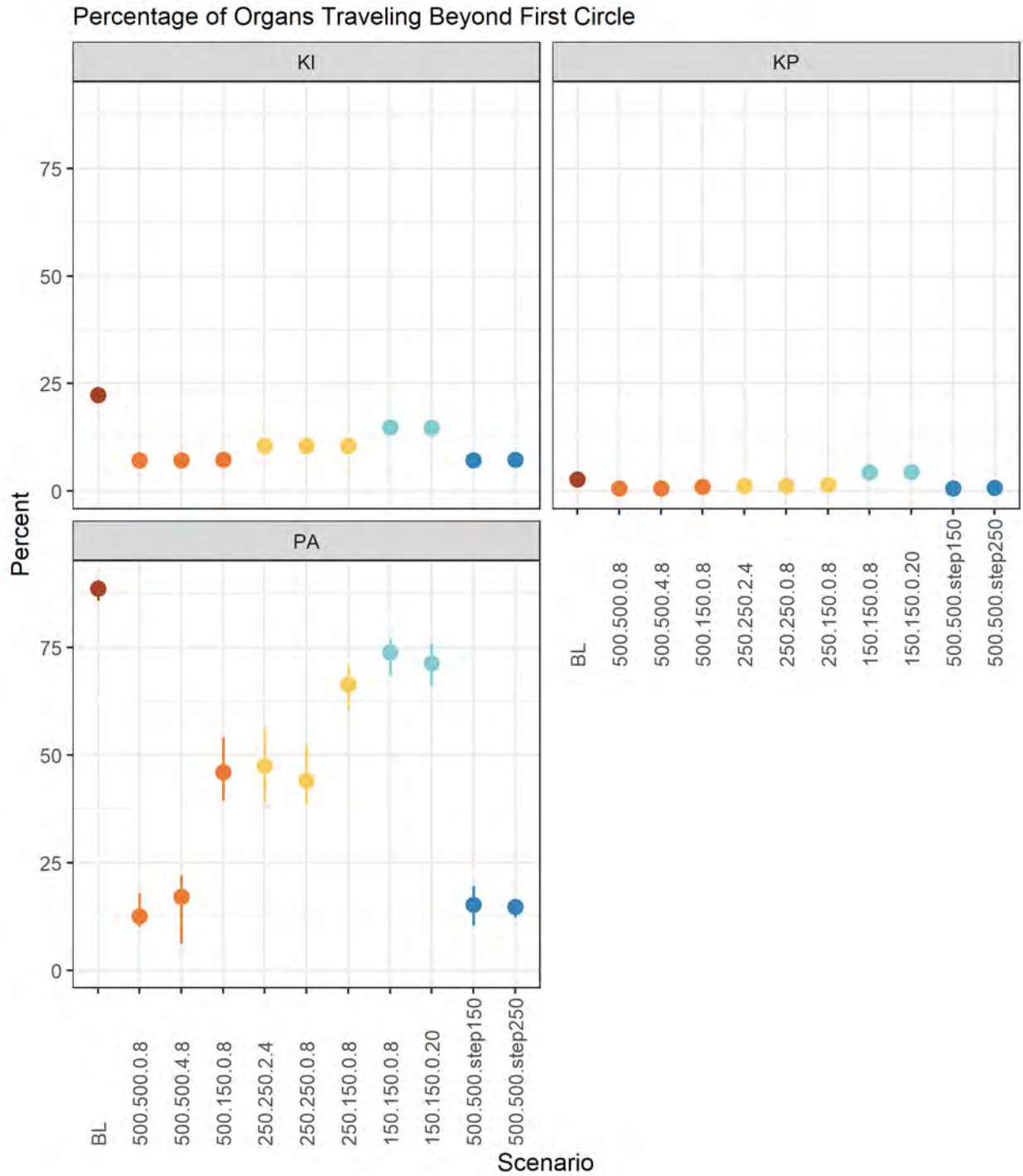
Percentage of Organs Traveling More Than 250 NM

Percentage of Organs Traveling More Than 500 NM



Percentage of Organs Traveling More Than 500 NM

Percentage of Organs Traveling Beyond First Circle



Percentage of Organs Traveling Beyond First Circle

Distribution of Travel Distance: Kidney-Alone Transplants

Recipient - Donor Distance Statistics (in NM), Kidney-Alone Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	0.00	7.41	57.08	189.51	170.55	970.88	376.15
500.500.0.8	13.47	163.48	302.88	340.14	420.15	823.13	335.76
500.500.4.8	2.86	76.09	199.34	274.65	357.62	815.16	349.56
500.150.0.8	13.56	165.36	304.86	341.25	420.99	825.06	333.33
250.250.2.4	1.31	39.16	126.15	209.85	202.02	918.99	366.57
250.250.0.8	3.11	74.32	158.45	225.97	214.51	907.22	354.58
250.150.0.8	3.14	74.62	158.37	225.73	214.92	894.72	355.64
150.150.0.8	0.00	22.48	87.47	196.11	133.22	1043.31	390.59
150.150.0.20	0.00	22.52	87.58	188.28	132.99	977.27	374.98
500.500.step150	5.47	98.47	199.68	278.27	344.33	819.57	342.89
500.500.step250	8.27	121.60	226.04	291.32	343.78	822.03	340.61

Distribution of Travel Distance: Kidney-Pancreas Transplants

Recipient - Donor Distance Statistics (in NM), Kidney-Pancreas Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	0.00	4.08	30.04	76.41	93.09	241.18	159.45
500.500.0.8	11.69	151.67	285.46	275.18	395.60	482.46	188.32
500.500.4.8	0.77	40.08	127.87	165.39	250.10	428.99	182.51
500.150.0.8	0.00	21.53	77.77	88.08	115.89	144.13	182.91
250.250.2.4	0.15	27.01	96.40	116.61	169.62	234.38	180.75
250.250.0.8	2.70	69.07	146.25	147.24	199.86	242.04	183.02
250.150.0.8	0.07	22.43	78.90	89.61	116.62	144.64	178.15
150.150.0.8	0.09	24.30	81.46	109.76	120.00	148.74	225.53
150.150.0.20	0.07	23.44	80.96	104.73	120.01	153.03	202.50
500.500.step150	3.22	75.42	149.80	174.64	238.58	408.01	178.25
500.500.step250	5.61	100.88	191.08	199.26	264.16	412.68	164.98

Distribution of Travel Distance: Pancreas Transplants

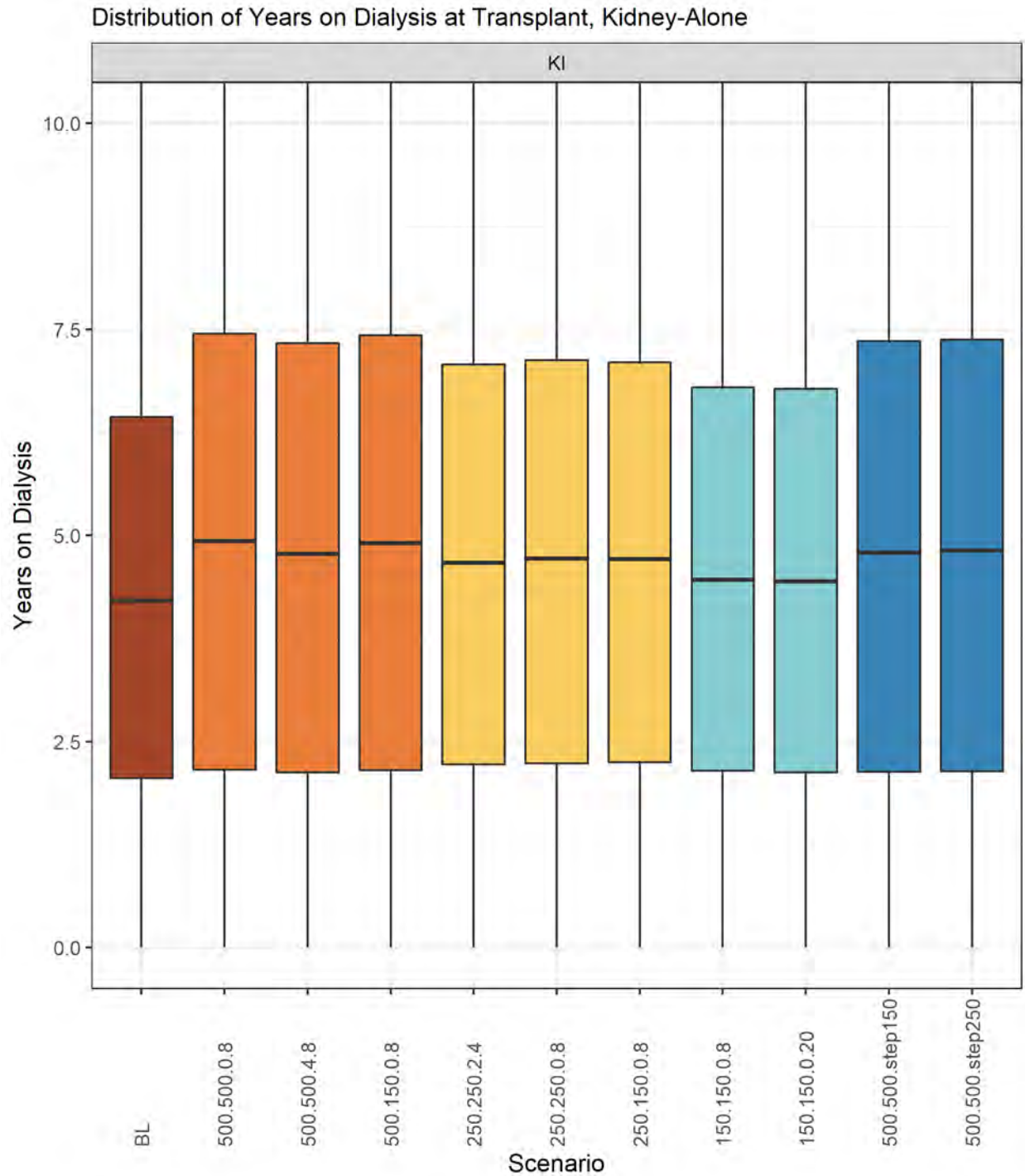
Recipient - Donor Distance Statistics (in NM), Pancreas Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	17.91	220.01	537.97	698.33	923.20	1943.86	667.90
500.500.0.8	37.27	180.20	311.34	472.80	437.78	1619.02	689.46
500.500.4.8	4.57	97.49	215.61	446.62	407.88	1555.97	724.50
500.150.0.8	29.53	173.18	457.86	650.53	959.23	1771.06	636.92
250.250.2.4	5.34	106.82	275.32	652.01	998.16	2026.56	817.61
250.250.0.8	26.10	143.27	243.20	592.68	867.24	1875.65	742.15
250.150.0.8	32.65	176.97	554.71	693.89	1003.02	1815.65	653.27
150.150.0.8	23.11	155.37	520.46	709.43	980.37	1979.17	751.25
150.150.0.20	18.92	137.06	408.00	632.37	874.05	1884.08	719.80
500.500.step150	13.37	113.01	203.60	423.90	366.68	1681.72	707.57
500.500.step250	26.20	141.12	223.09	454.55	355.87	1760.06	748.99

Time on Dialysis

Distribution of Time on Dialysis at Transplant

Distribution of Years on Dialysis at Transplant, Kidney-Along



Distribution of Years on Dialysis at Transplant, Kidney-Along

Years on Dialysis at Transplant, Kidney-Along Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	0	2.06	4.21	4.62	6.44	10.66	3.63
500.500.0.8	0	2.15	4.93	5.24	7.45	11.96	4.06
500.500.4.8	0	2.12	4.77	5.16	7.33	11.92	4.05
500.150.0.8	0	2.15	4.90	5.23	7.43	11.91	4.06
250.250.2.4	0	2.22	4.67	5.04	7.07	11.42	3.88
250.250.0.8	0	2.24	4.72	5.07	7.12	11.43	3.89
250.150.0.8	0	2.25	4.71	5.06	7.10	11.40	3.87
150.150.0.8	0	2.14	4.46	4.85	6.80	11.07	3.77
150.150.0.20	0	2.13	4.44	4.84	6.78	11.09	3.79
500.500.step150	0	2.13	4.79	5.17	7.36	11.91	4.04
500.500.step250	0	2.14	4.81	5.18	7.37	11.89	4.04

DSA Level Variability

Variance in Transplant Rates Across Listing DSAs

Variance of Transplants Rates Across Listing DSAs

Scenario	Transplant Rate, KI	Transplant Rate, KP	Transplant Rate, PA
BL	0.0072 (0.0064,0.0083)	0.11 (0.09,0.15)	20.22 (0.25,123.14)
500.500.0.8	0.002 (0.0019,0.0022)	0.11 (0.09,0.14)	0.43 (0.05,2.85)
500.500.4.8	0.0016 (0.0015,0.0017)	0.17 (0.14,0.23)	0.17 (0.02,0.36)
500.150.0.8	0.0021 (0.002,0.0022)	0.15 (0.1,0.28)	3.38 (0.05,18.73)
250.250.2.4	0.0024 (0.0022,0.0027)	0.18 (0.14,0.21)	5.5 (0.05,49.22)
250.250.0.8	0.0021 (0.002,0.0022)	0.16 (0.13,0.23)	0.42 (0.1,1.79)
250.150.0.8	0.0022 (0.002,0.0025)	0.14 (0.1,0.18)	1.69 (0.06,4.62)
150.150.0.8	0.0095 (0.0083,0.0113)	0.14 (0.12,0.18)	1.99 (0.06,11.94)
150.150.0.20	0.01 (0.0082,0.0115)	0.13 (0.11,0.17)	21.23 (0.22,193.19)
500.500.step150	0.0016 (0.0015,0.0018)	0.19 (0.15,0.25)	0.12 (0.02,0.31)
500.500.step250	0.0016 (0.0015,0.0017)	0.17 (0.14,0.2)	0.05 (0.01,0.17)

Standard Deviation in Metrics Across Listing DSAs

Standard Deviation of Metrics Across Listing DSAs For Transplant Recipients

Scenario	Median Donor-Recipient Distance	Median Time on Dialysis, KI	Median Time on Waitlist: KI	Median Time on Waitlist: KP	Median Time on Waitlist: PA
BL	54.1 (52.5,56.4)	433 (418.9,446.1)	300.3 (288.4,308.7)	215.1 (186.6,249.8)	298.9 (235.5,530.6)
500.500.0.8	90.4 (88.9,94.6)	410.9 (380.8,433.2)	328.8 (313.2,339.8)	234.3 (217.5,245.3)	461.2 (363.8,524.6)
500.500.4.8	85.1 (81,91.3)	405.8 (384.5,437.1)	323.9 (306.7,338.3)	223.3 (206.1,242.3)	468.2 (386.2,595.5)
500.150.0.8	91.1 (87.6,92.6)	414.4 (390.5,432.8)	327.7 (304.8,341.9)	217.4 (193.7,233.3)	414.2 (261.1,616.3)
250.250.2.4	55 (53.4,56.5)	416.8 (396.7,437.7)	312.5 (302.2,323.1)	206.9 (177.9,231.6)	483.1 (367.3,671.1)
250.250.0.8	59.6 (57.1,61.3)	414.8 (386.6,451.1)	324.8 (301.5,338.4)	219.9 (202.9,236.5)	418.5 (332.6,518.8)
250.150.0.8	59.4 (57.4,60.7)	413.3 (392.3,437.1)	321.9 (307,335.1)	214.9 (196.9,232)	435.7 (328.6,568.2)
150.150.0.8	39.7 (39.3,40.1)	421.6 (398.4,439.9)	311.8 (287.3,339.8)	214 (176.5,242)	407.7 (289.8,654.9)
150.150.0.20	39.6 (38.9,40.2)	416.8 (386.1,447.7)	306.3 (288.9,314.7)	210.1 (194.8,223.7)	403.2 (296.4,616)
500.500.step150	74.8 (72.3,78.3)	406.2 (379.6,437.3)	323.5 (318.7,331.9)	228.2 (196,258.7)	482.4 (397.5,679.9)
500.500.step250	72.2 (69.5,74.7)	410.7 (387.1,430.3)	325.6 (313.1,339.7)	229.4 (216.7,247.8)	439.1 (349,638.7)

Subgroup Analyses

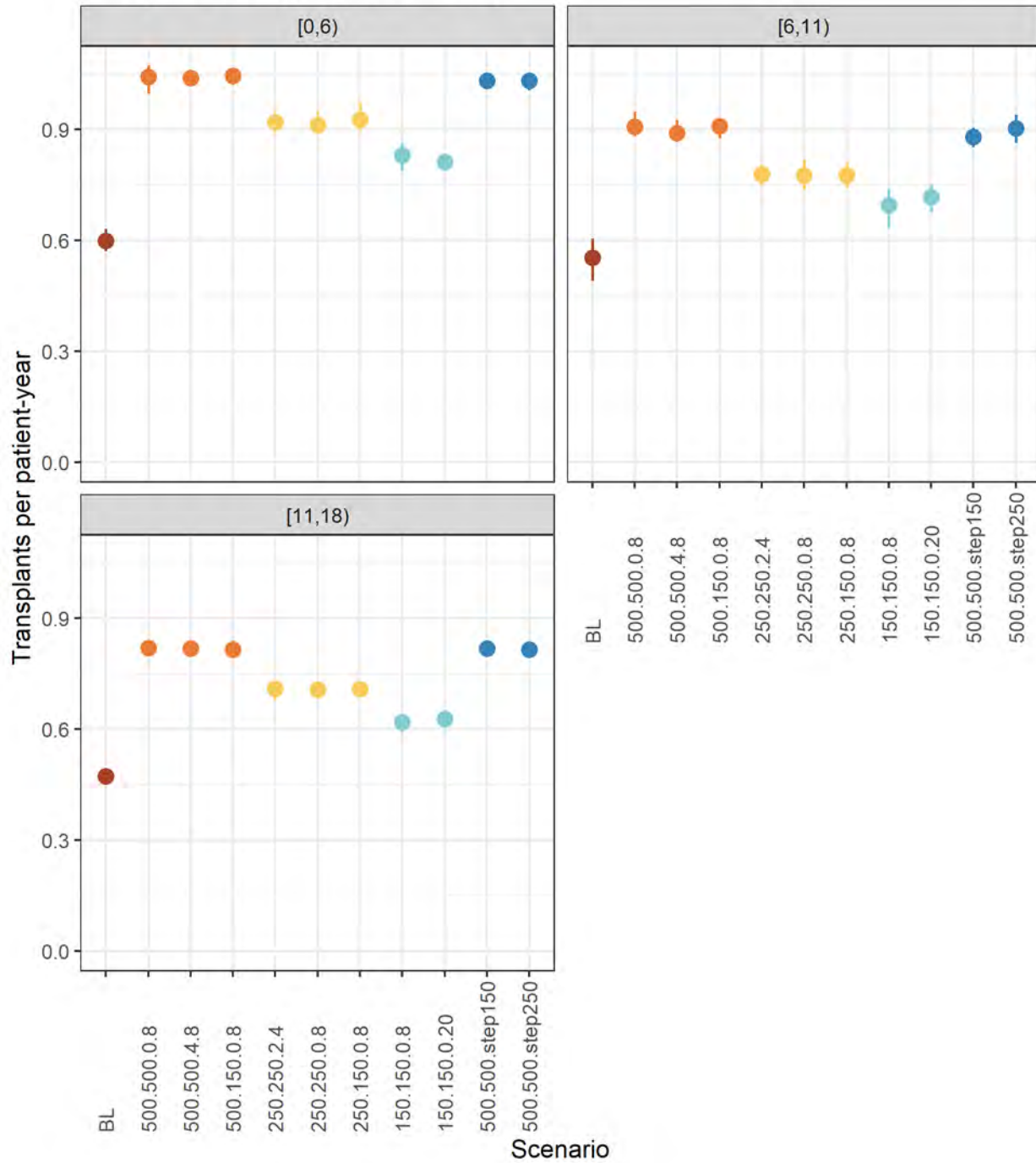
The dot plots below display the range of results across the 10 simulations as a vertical line extending from the minimum value to the maximum value found for that metric and scenario. A point along that line marks the mean value of the metric across the 10 iterations.

Transplant

Transplant Rates

Transplant Rates: Age 0-17

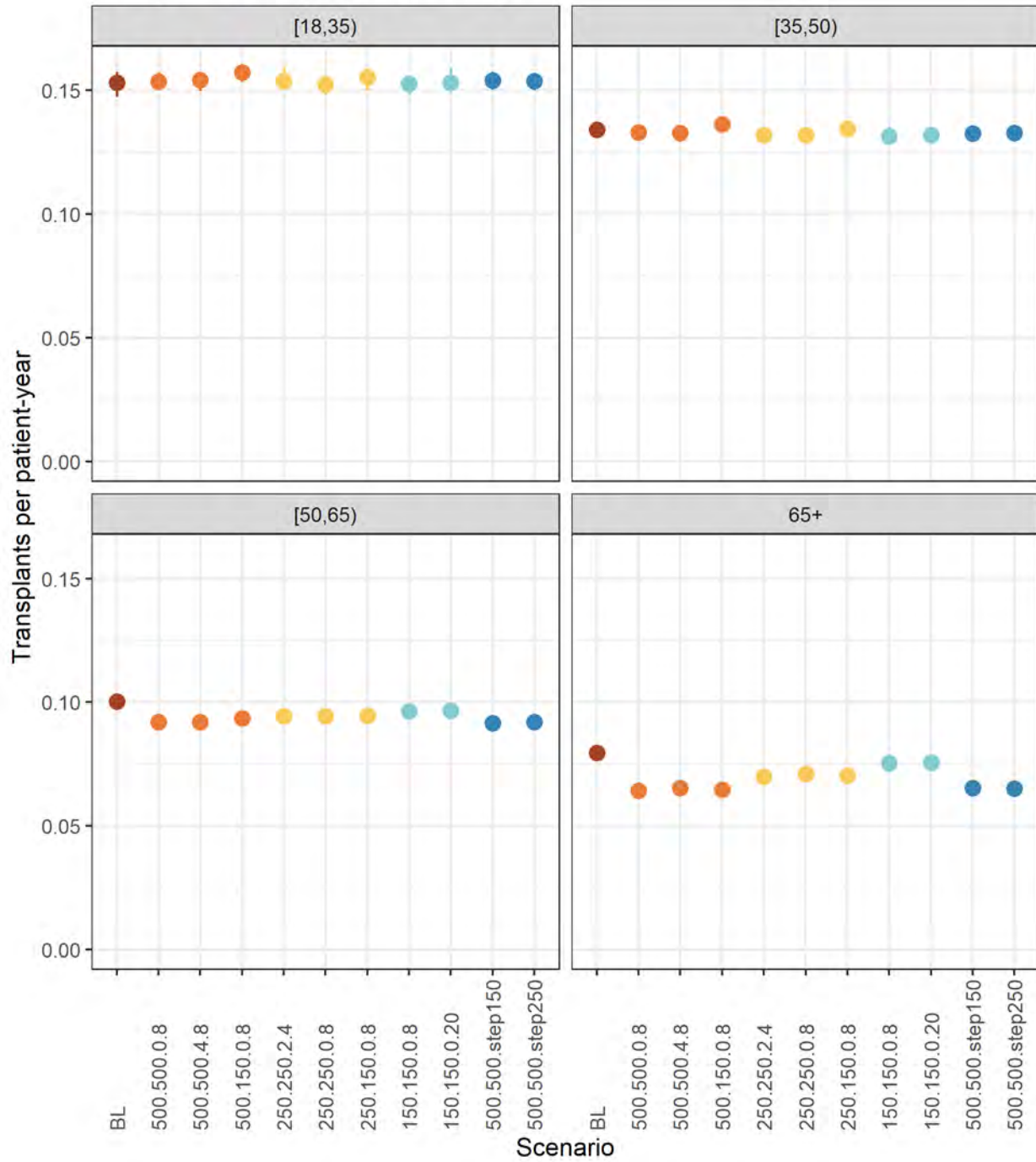
Transplant Rates by Age 0-17: Kidney



Transplant Rates by Age 0-17: Kidney

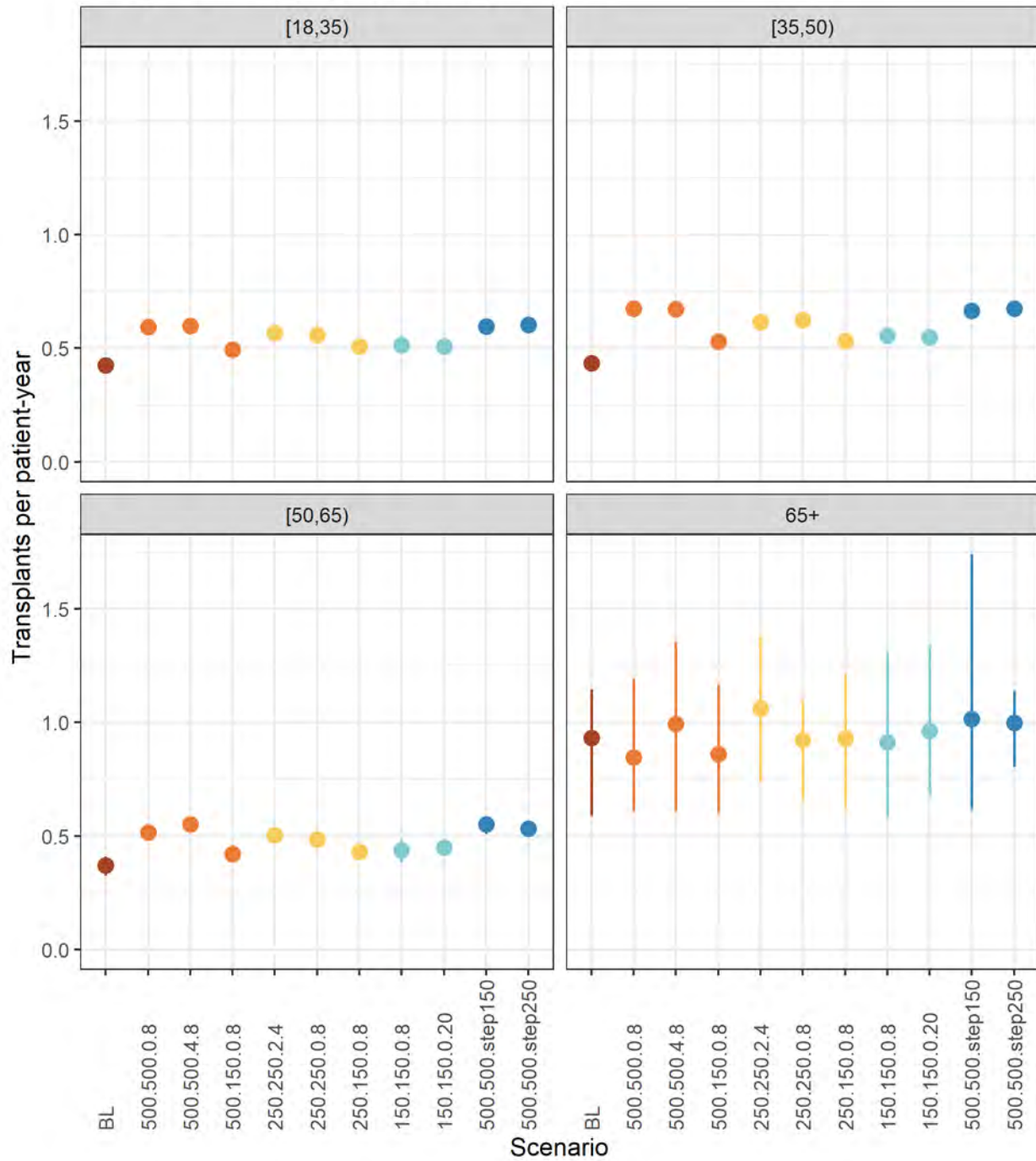
Transplant Rates: Age 18+

Transplant Rates by Age 18+: Kidney



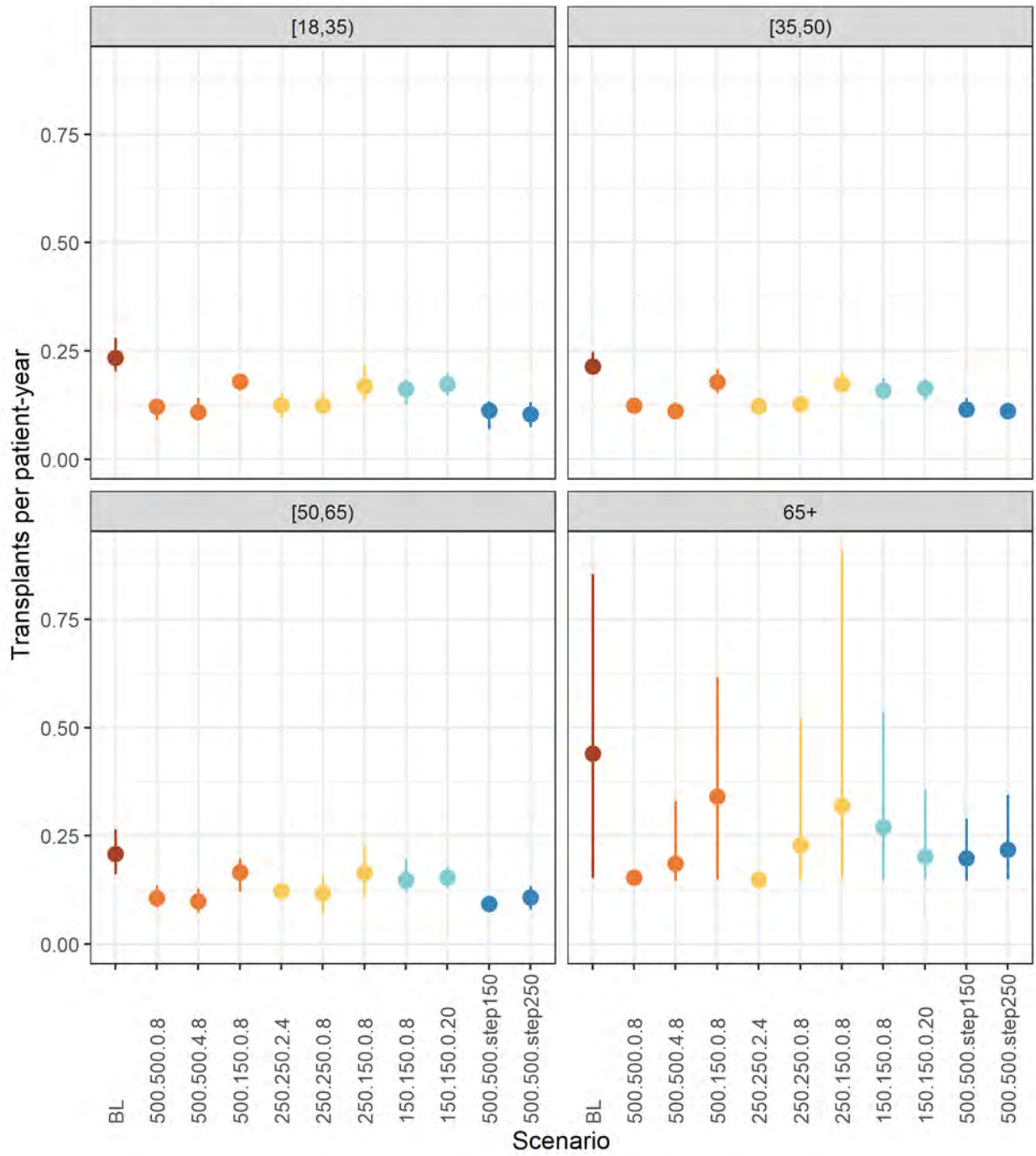
Transplant Rates by Age 18+: Kidney

Transplant Rates by Age 18+: Kidney-Pancreas



Transplant Rates by Age 18+: Kidney-Pancreas

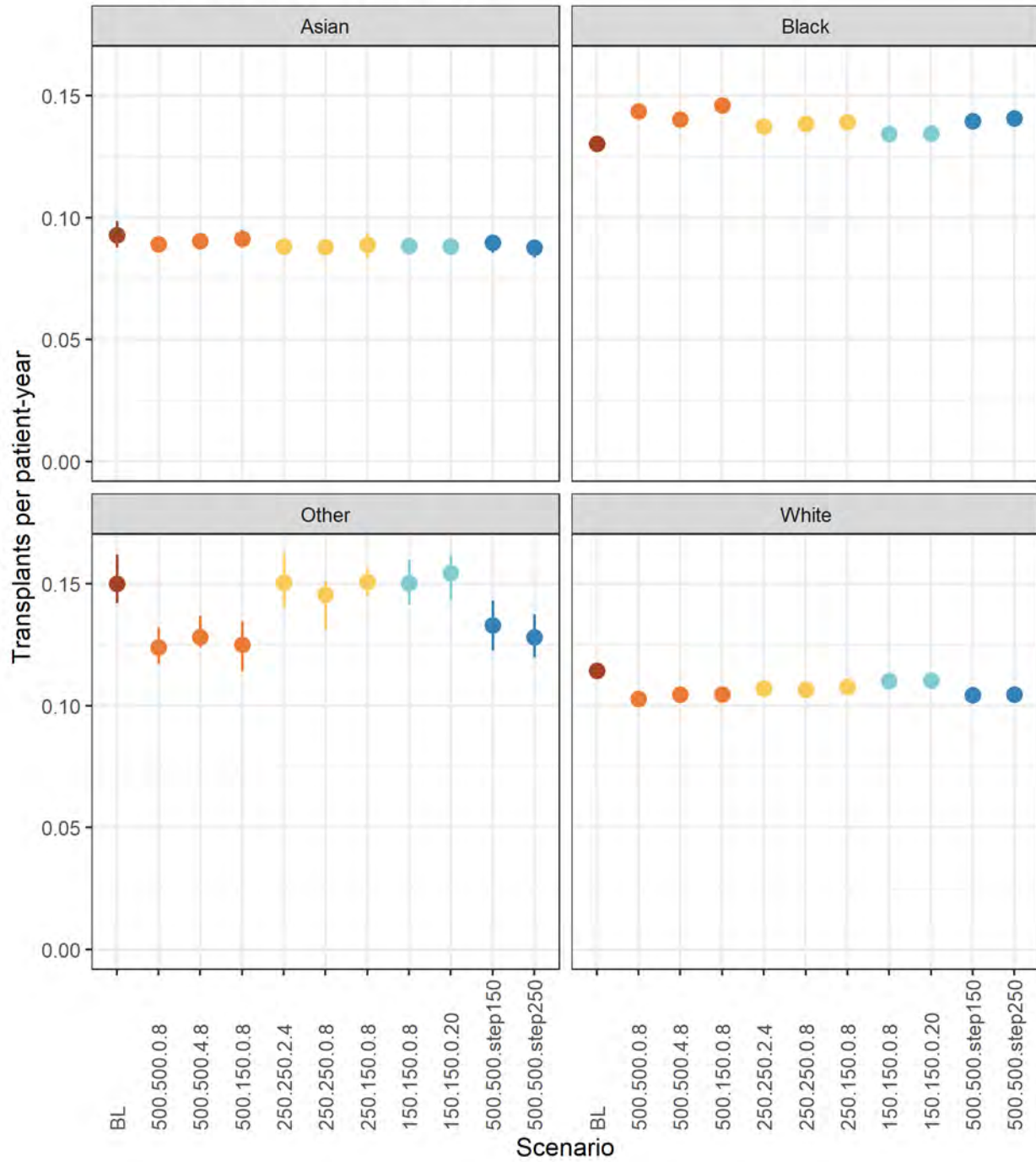
Transplant Rates by Age 18+: Pancreas



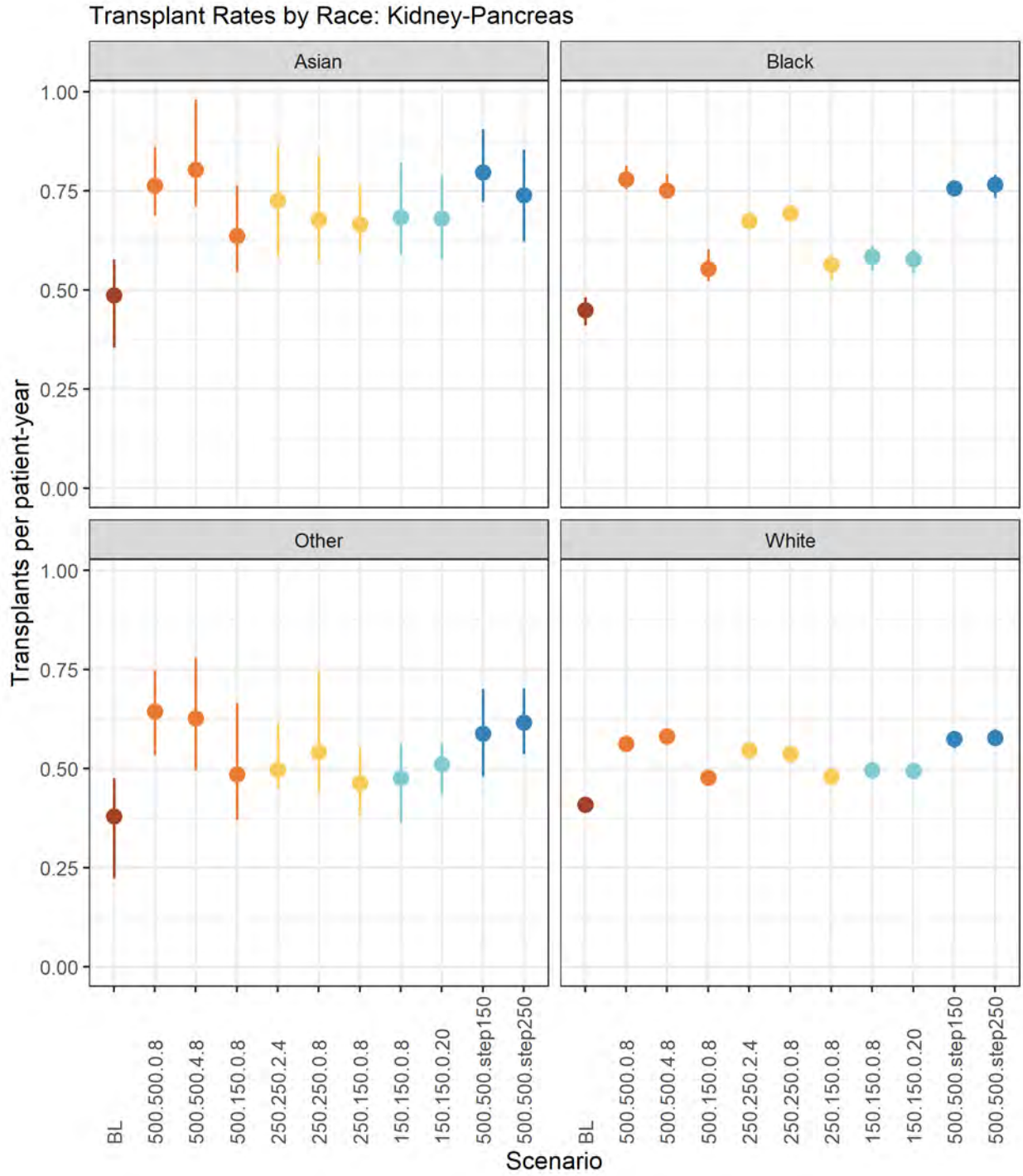
Transplant Rates by Age 18+: Pancreas

Transplant Rates: Race

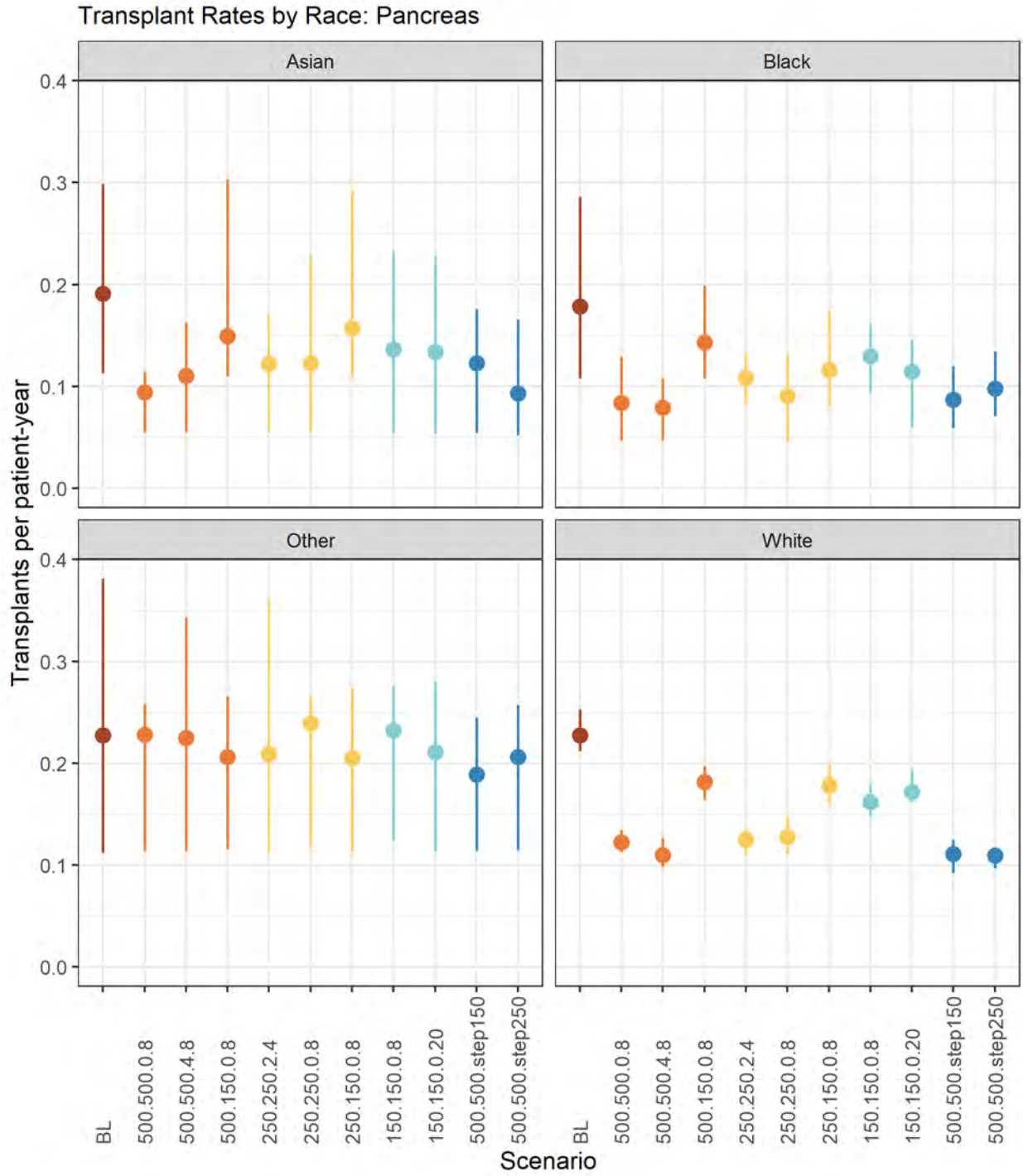
Transplant Rates by Race: Kidney



Transplant Rates by Race: Kidney



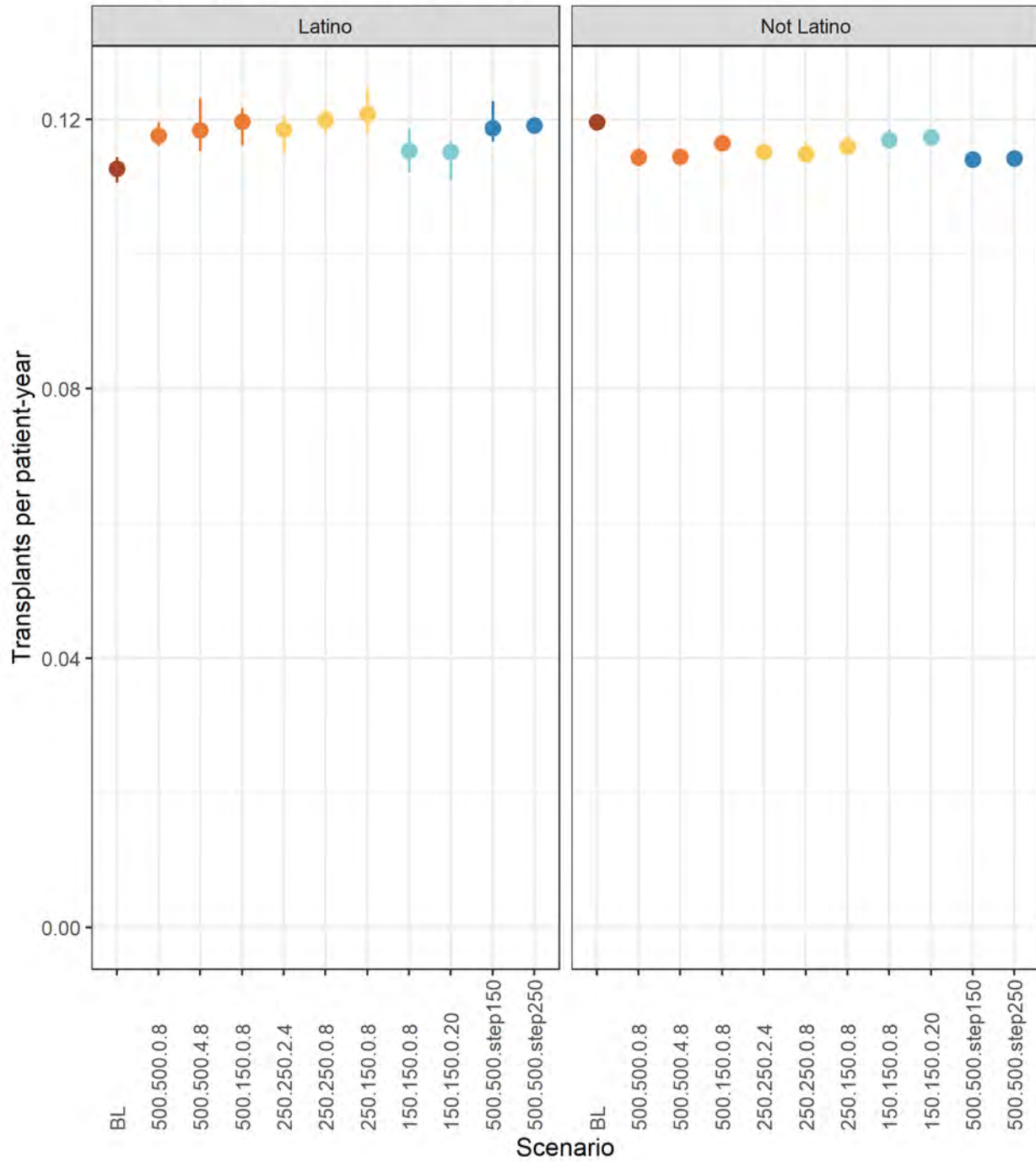
Transplant Rates by Race: Kidney-Pancreas



Transplant Rates by Race: Pancreas

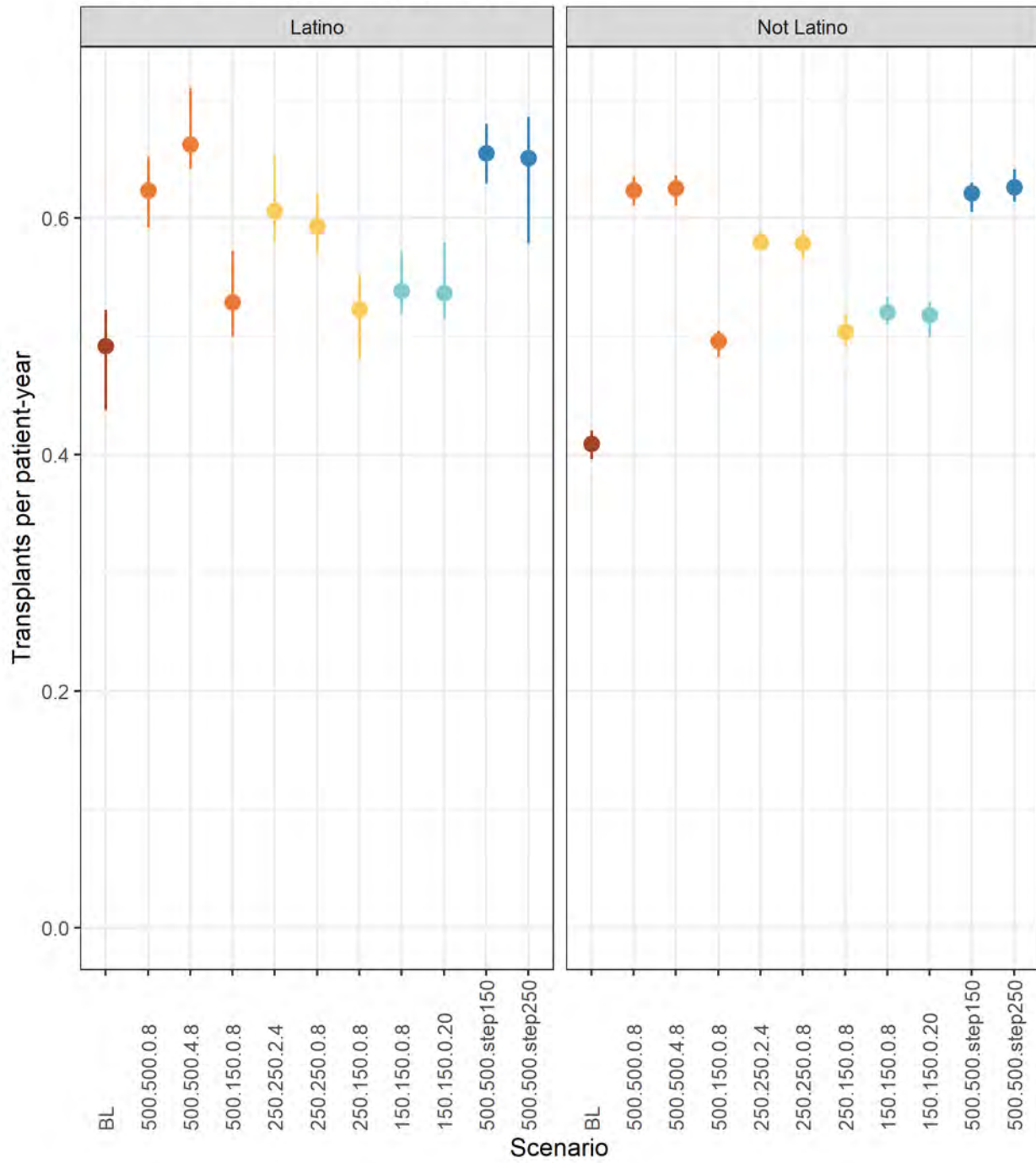
Transplant Rates: Ethnicity

Transplant Rates by Ethnicity: Kidney



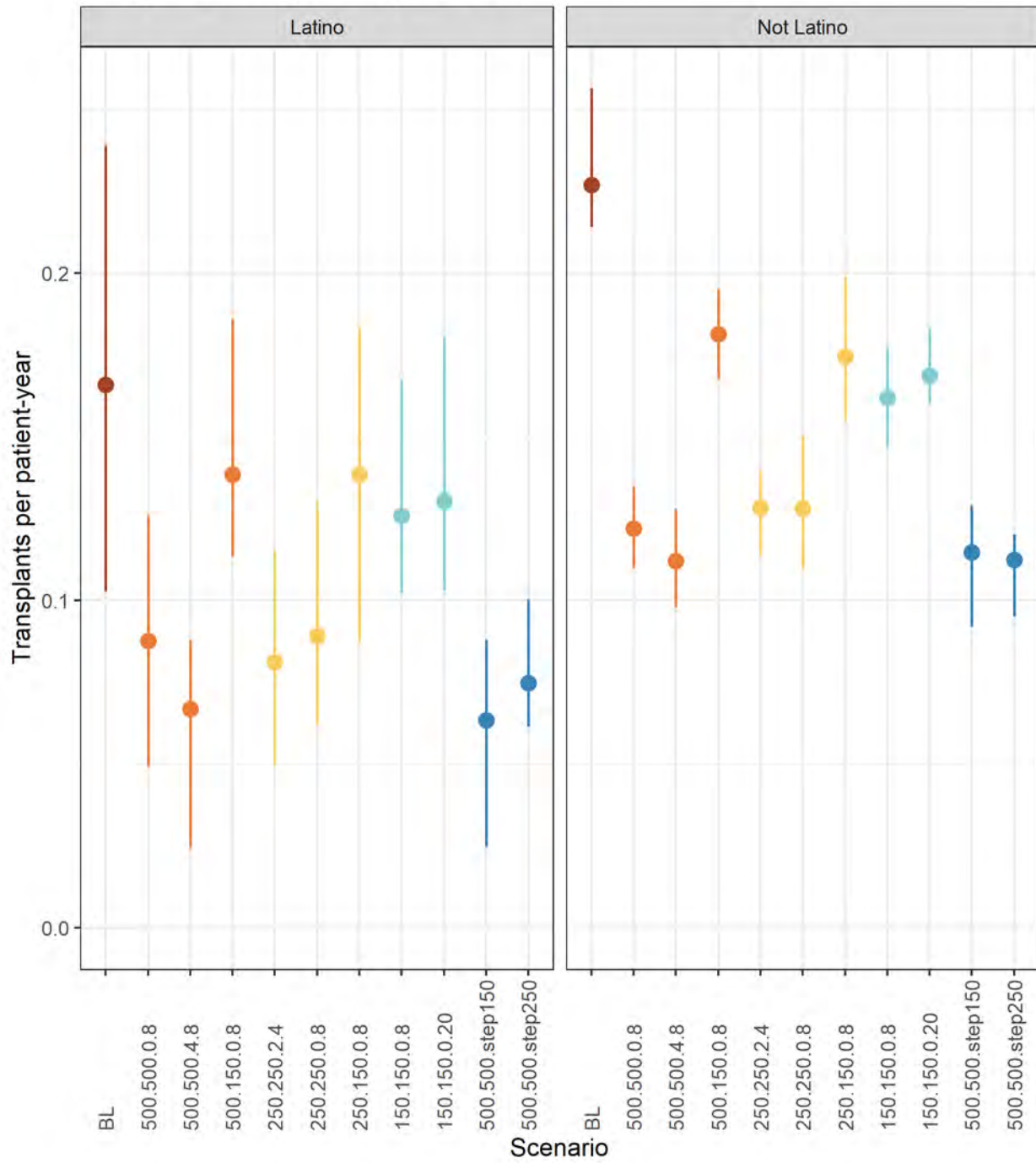
Transplant Rates by Ethnicity: Kidney

Transplant Rates by Ethnicity: Kidney-Pancreas



Transplant Rates by Ethnicity: Kidney-Pancreas

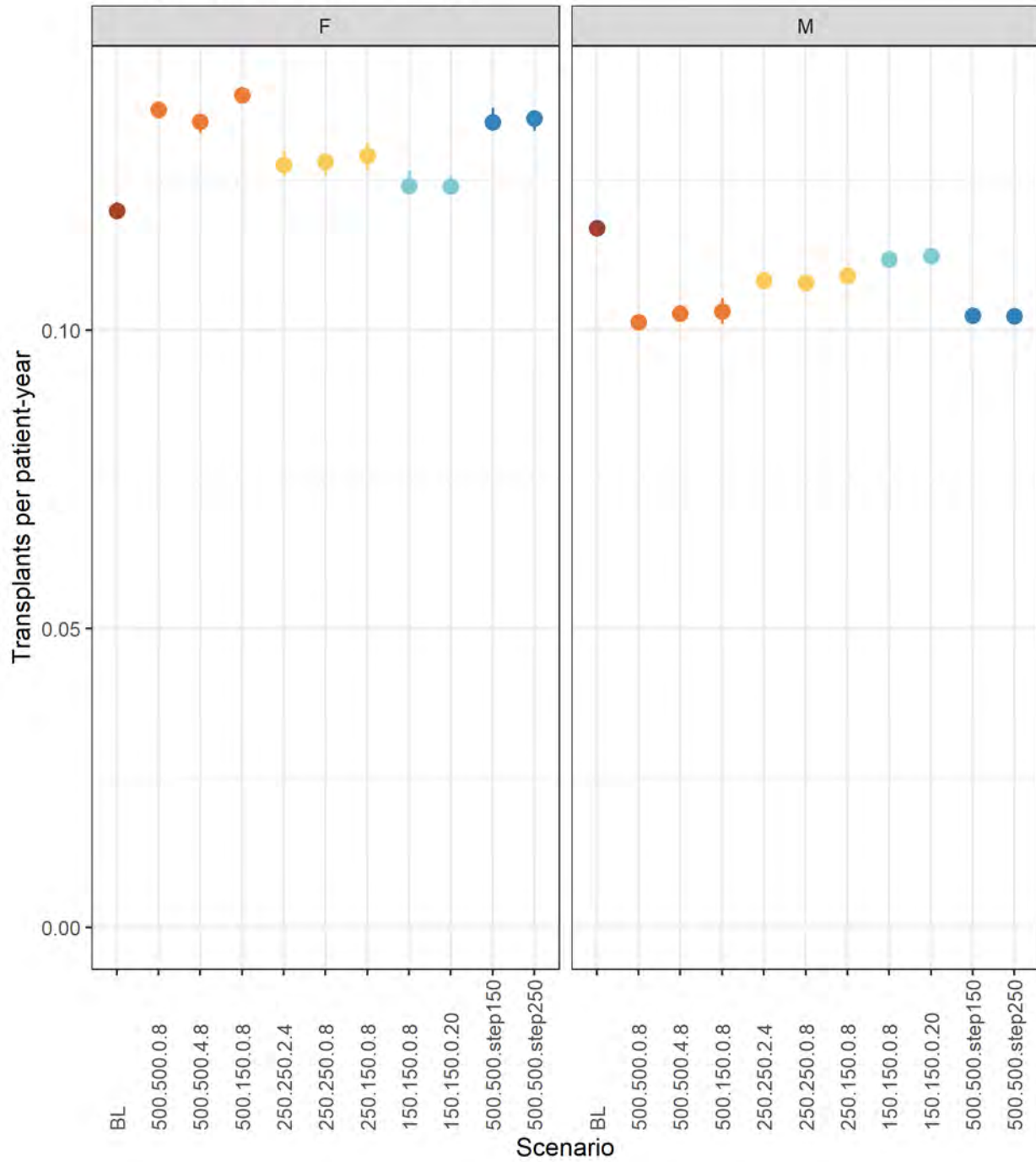
Transplant Rates by Ethnicity: Pancreas



Transplant Rates by Ethnicity: Pancreas

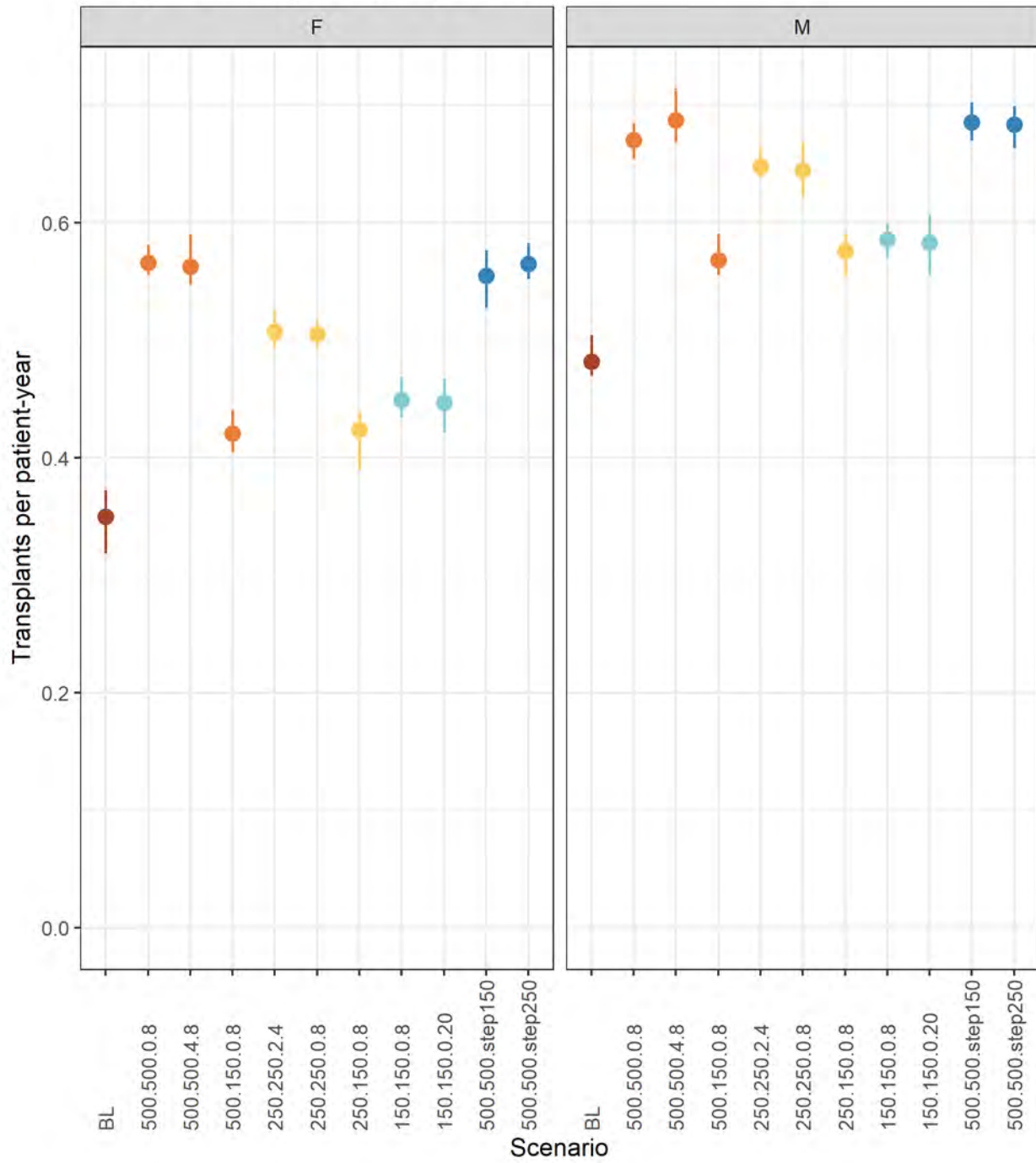
Transplant Rates: Sex

Transplant Rates by Sex: Kidney



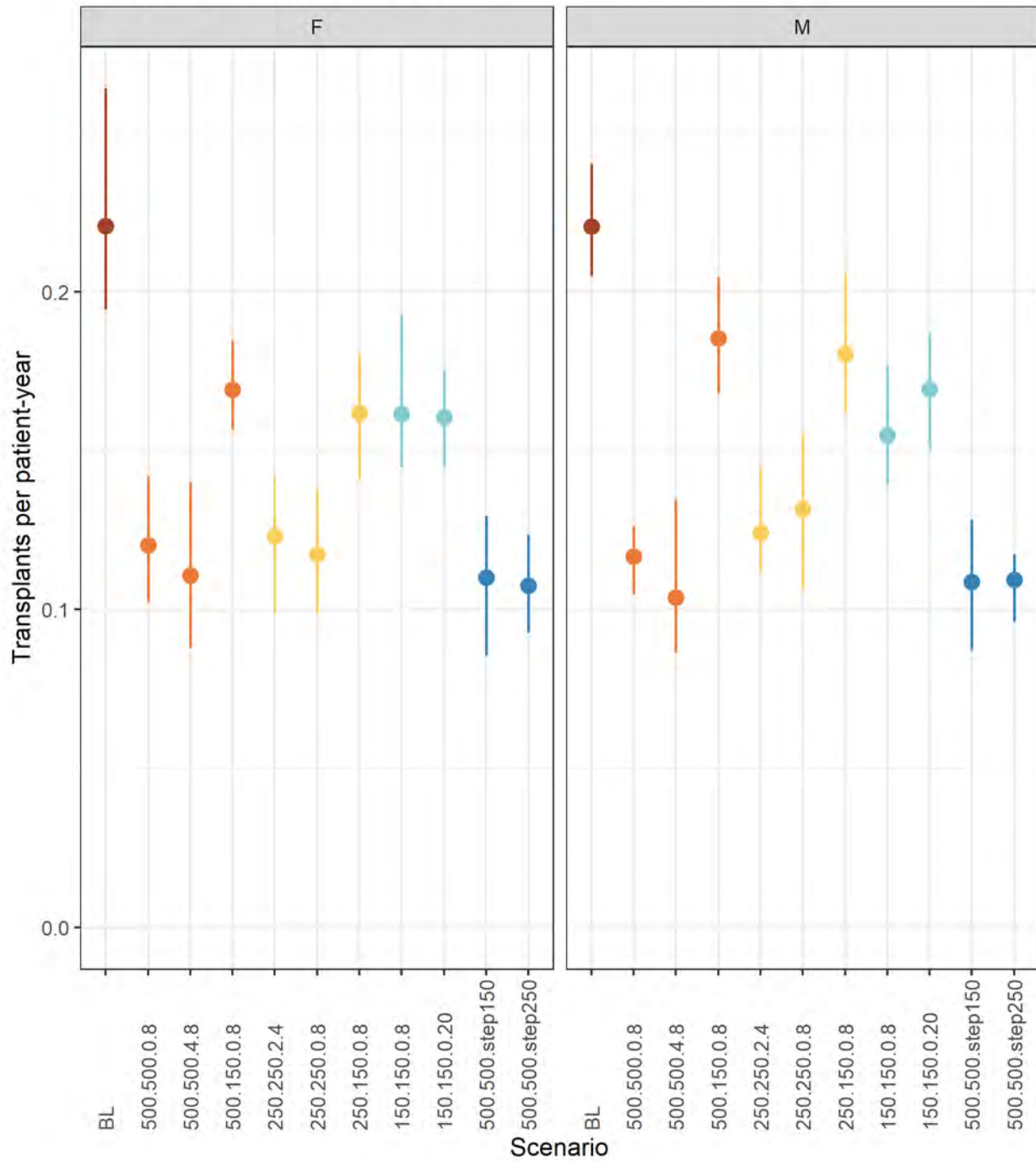
Transplant Rates by Sex: Kidney

Transplant Rates by Sex: Kidney-Pancreas



Transplant Rates by Sex: Kidney-Pancreas

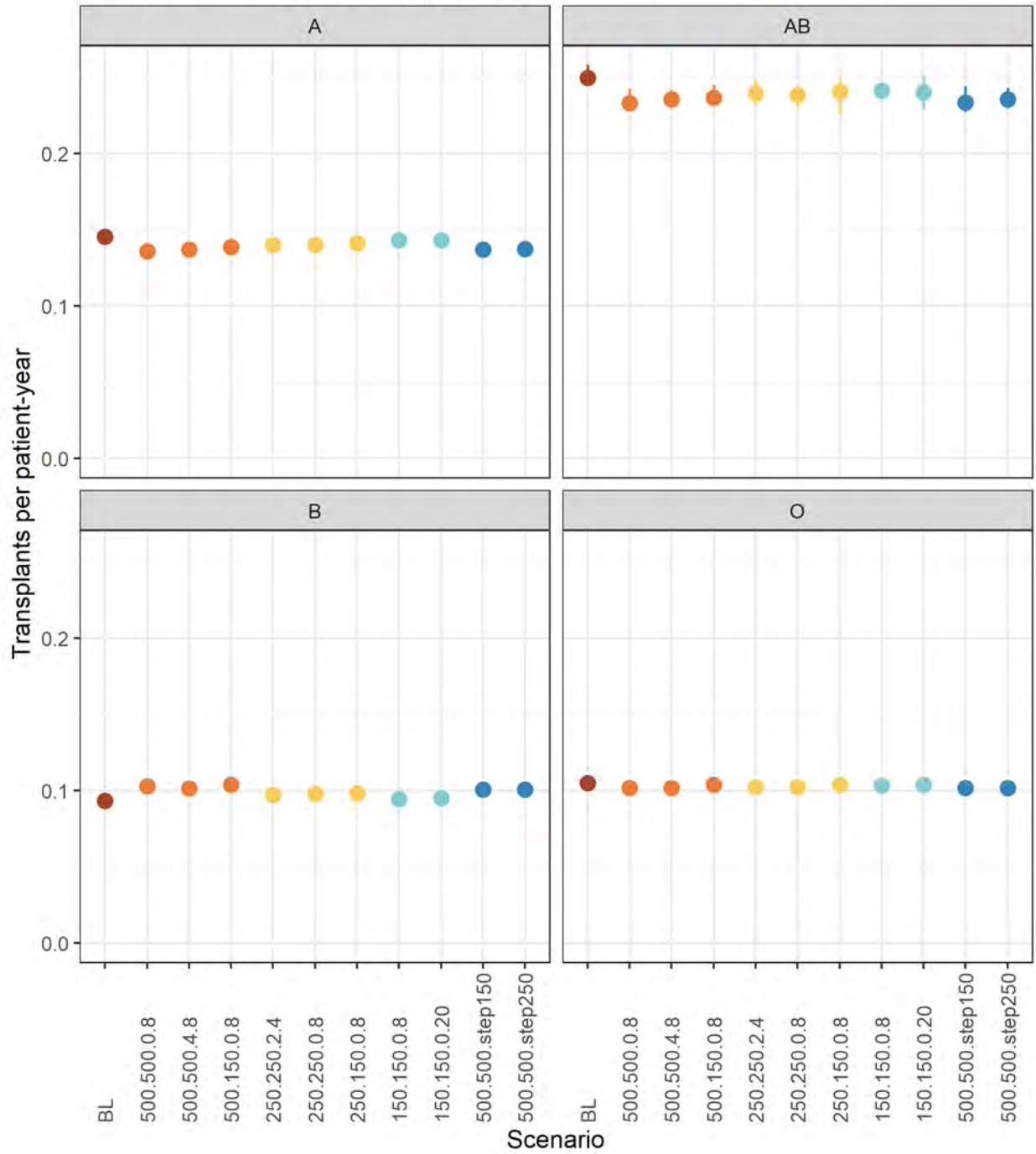
Transplant Rates by Sex: Pancreas



Transplant Rates by Sex: Pancreas

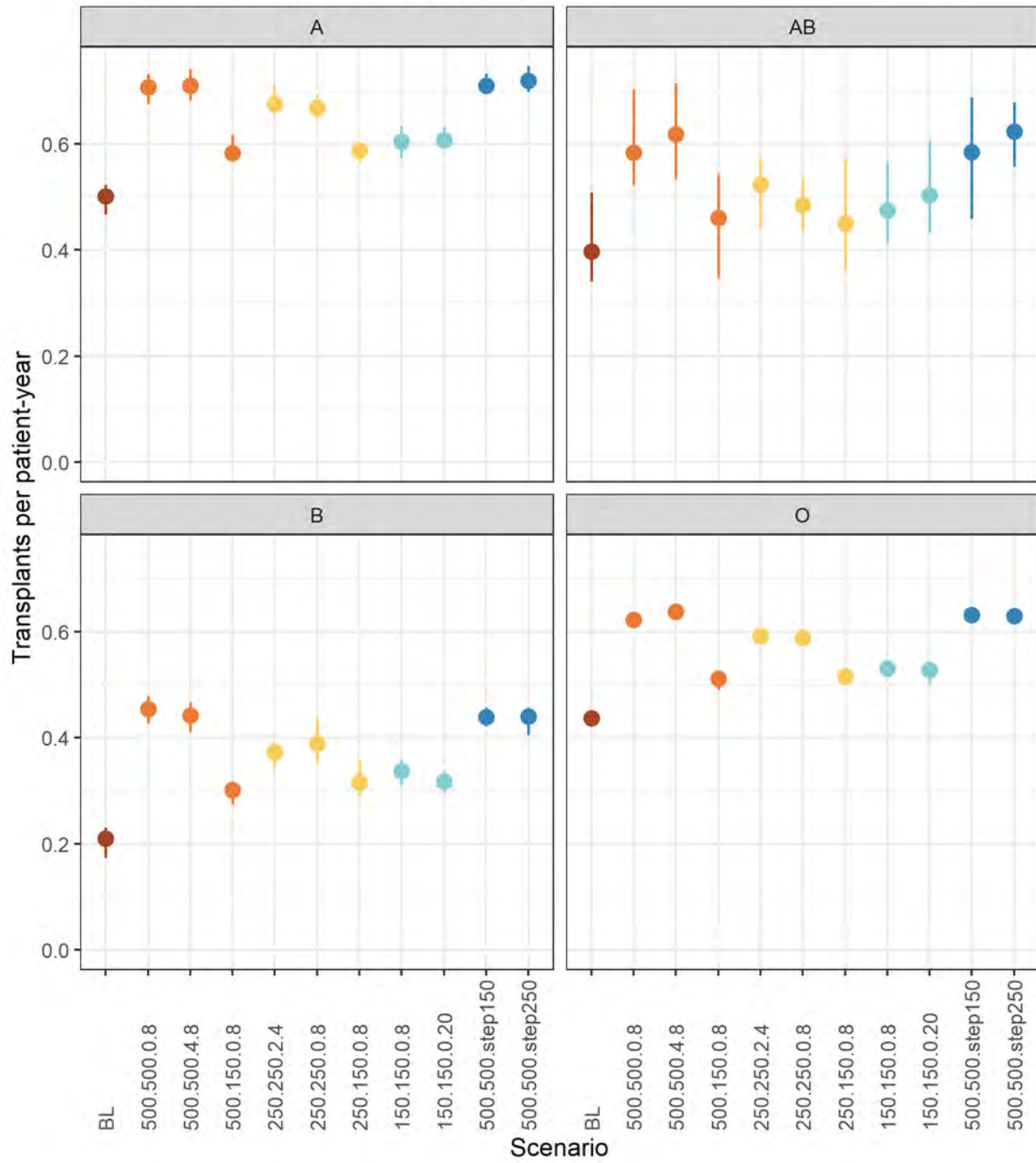
Transplant Rates: ABO Group

Transplant Rates by ABO Group: Kidney



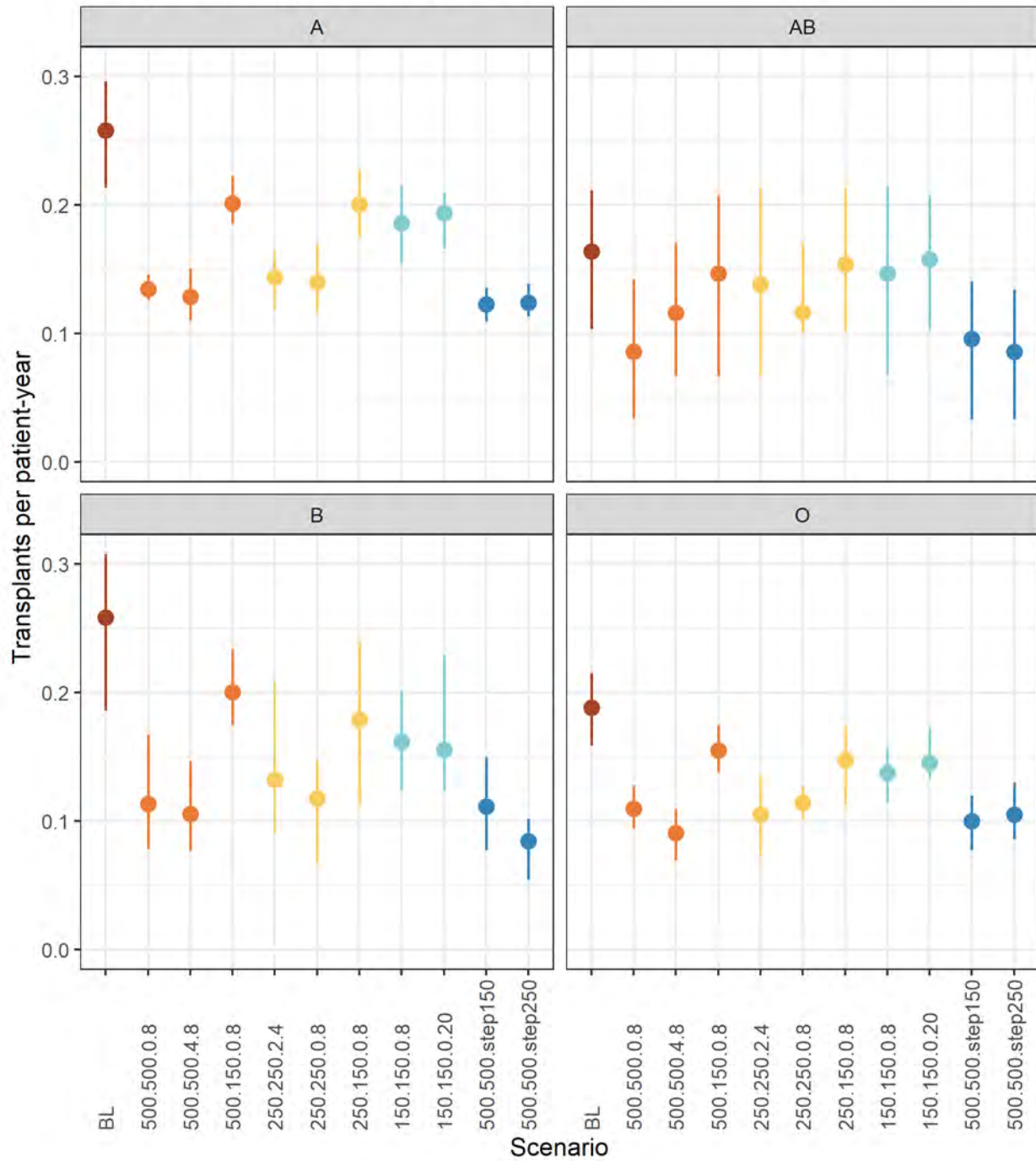
Transplant Rates by ABO Group: Kidney

Transplant Rates by ABO Group: Kidney-Pancreas



Transplant Rates by ABO Group: Kidney-Pancreas

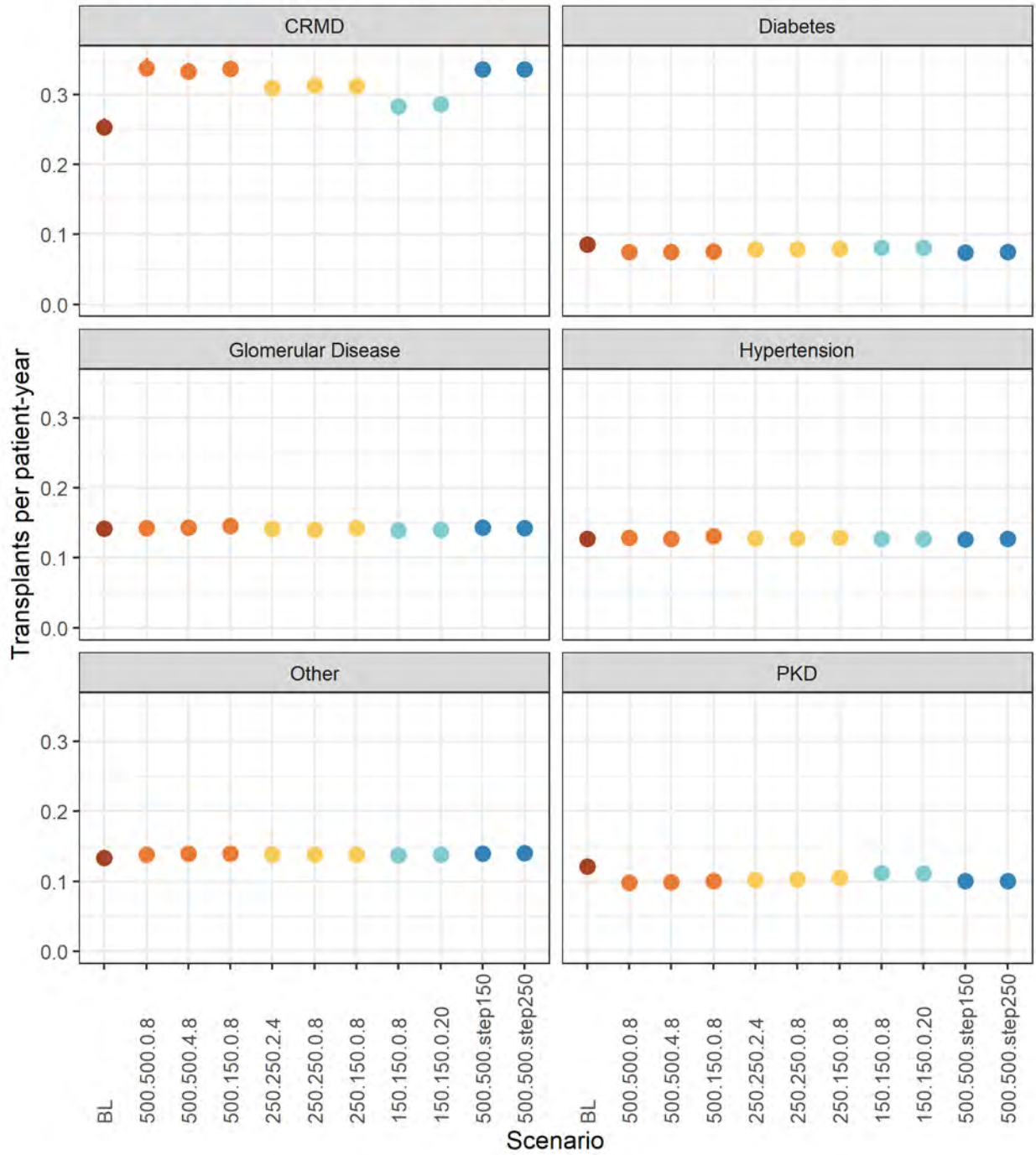
Transplant Rates by ABO Group: Pancreas



Transplant Rates by ABO Group: Pancreas

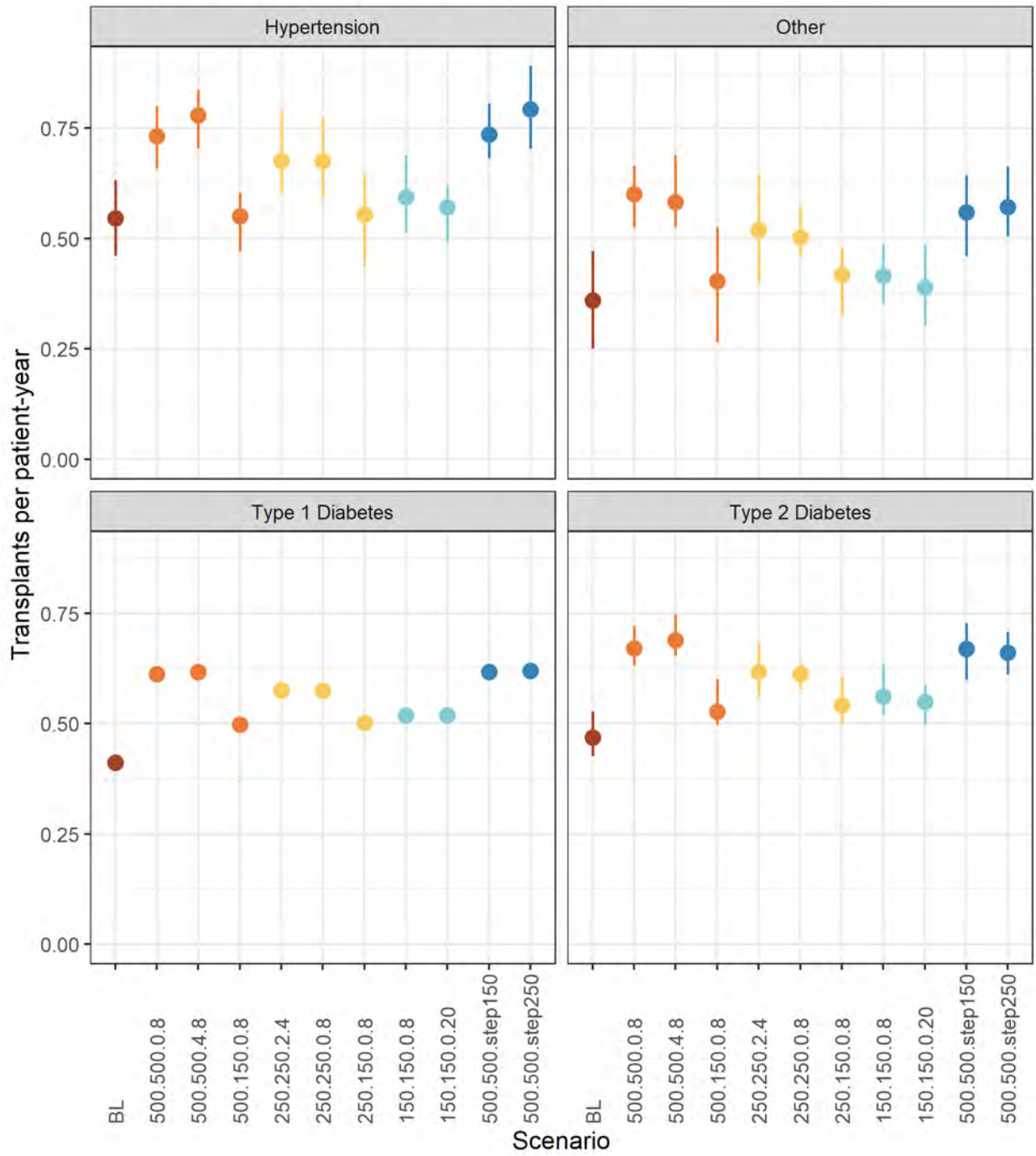
Transplant Rates: Diagnosis

Transplant Rates by Diagnosis: Kidney

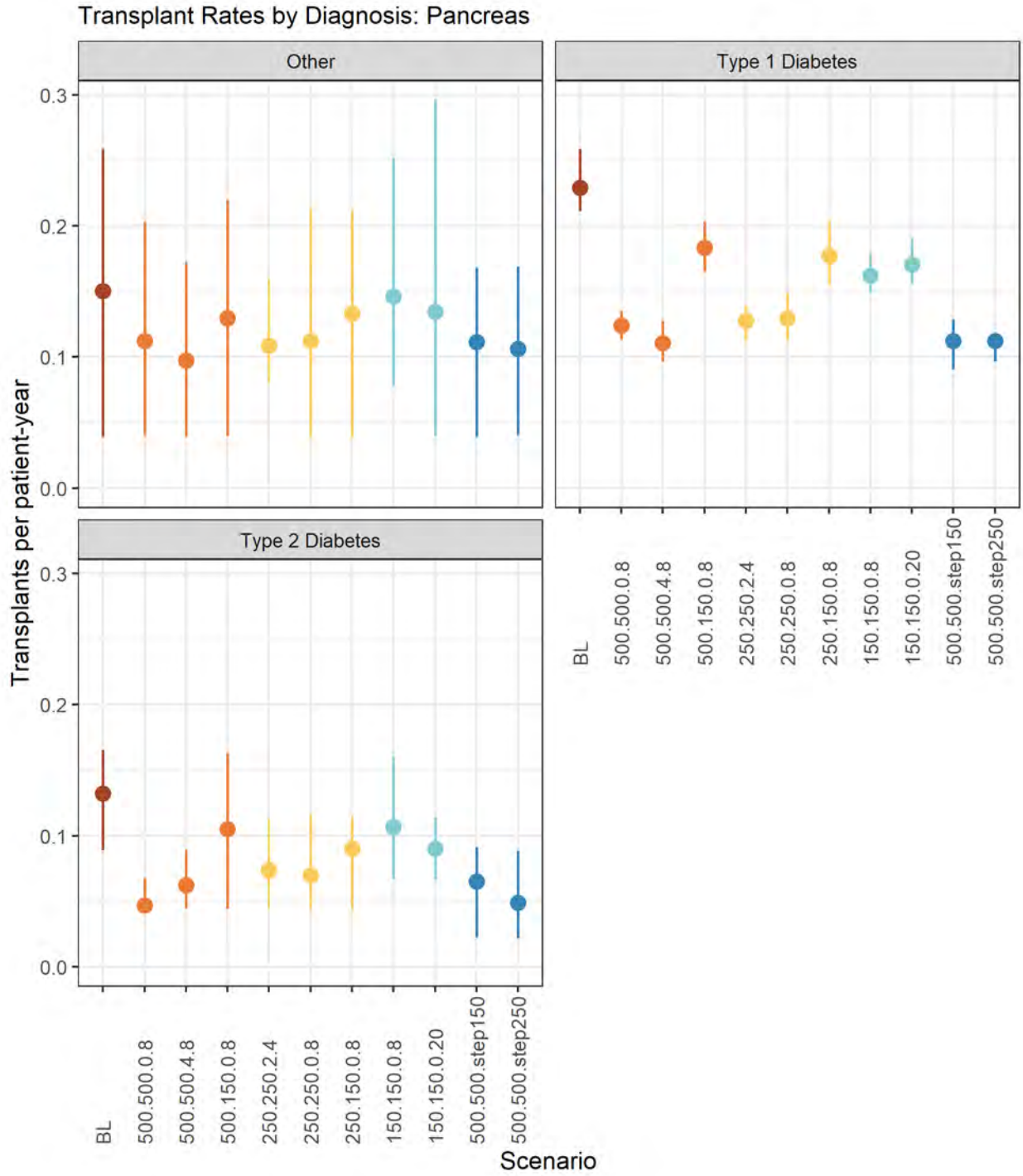


Transplant Rates by Diagnosis: Kidney

Transplant Rates by Diagnosis: Kidney-Pancreas

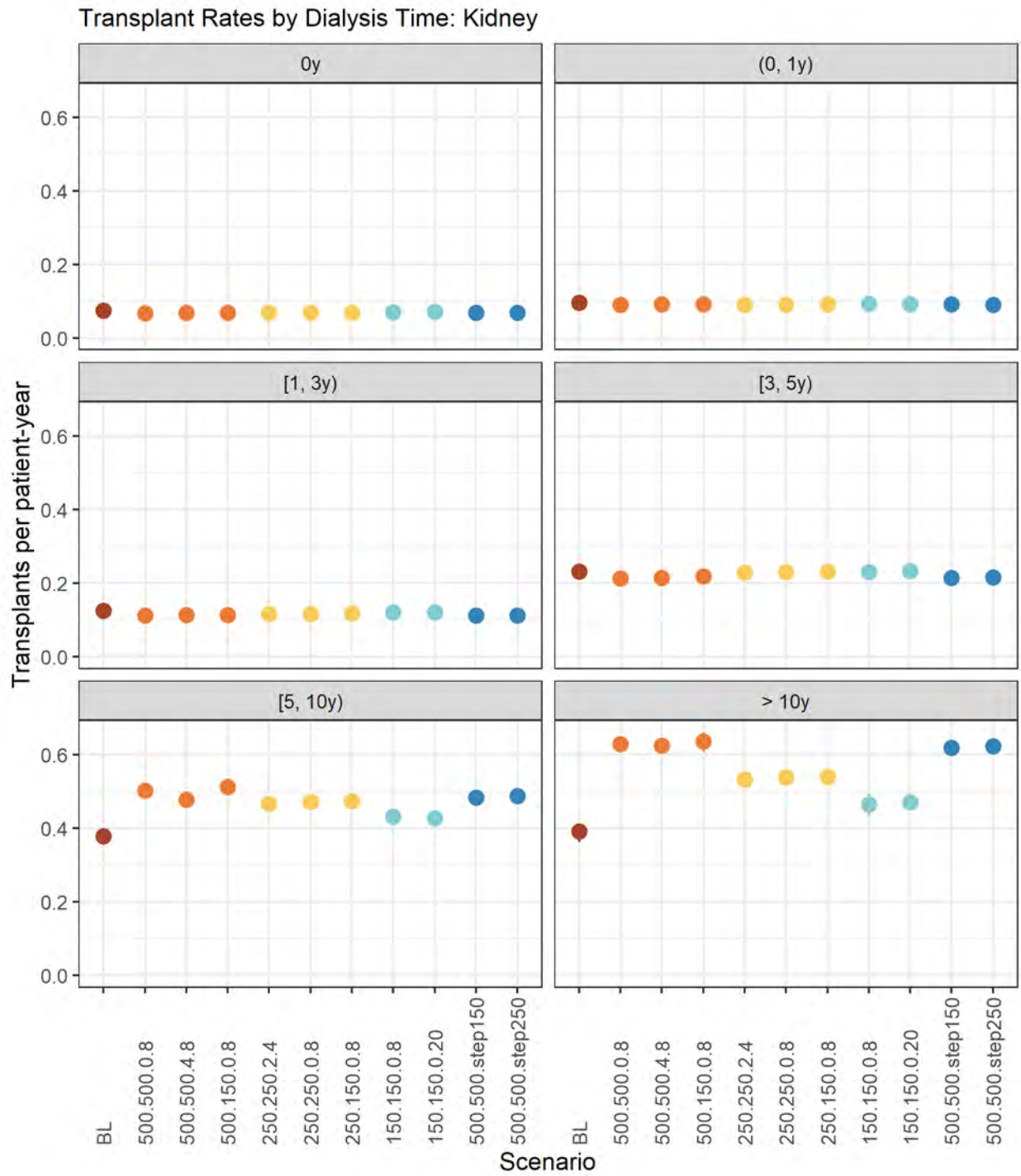


Transplant Rates by Diagnosis: Kidney-Pancreas



Transplant Rates by Diagnosis: Pancreas

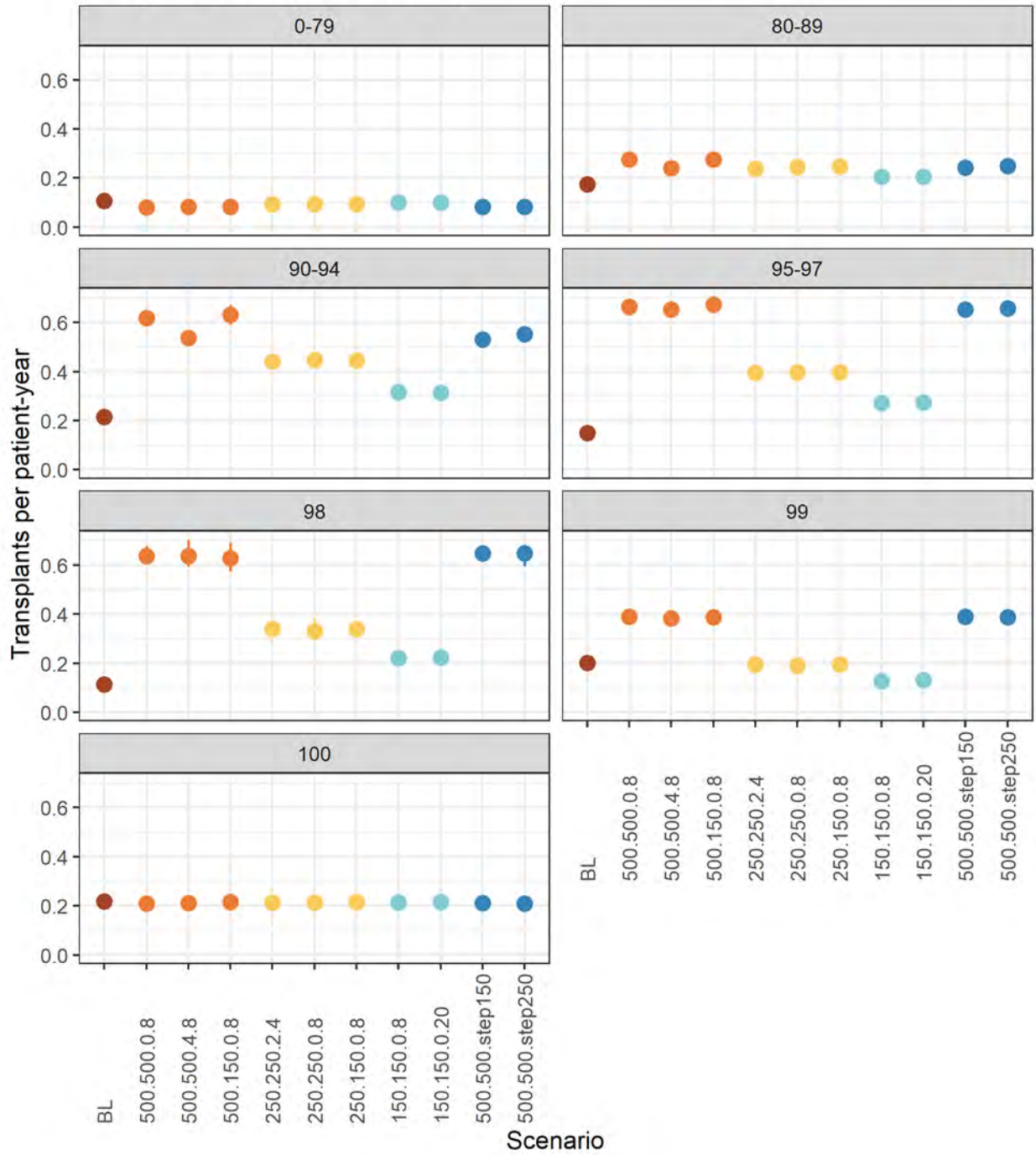
Transplant Rates: Dialysis Time



Transplant Rates by Dialysis Time: Kidney

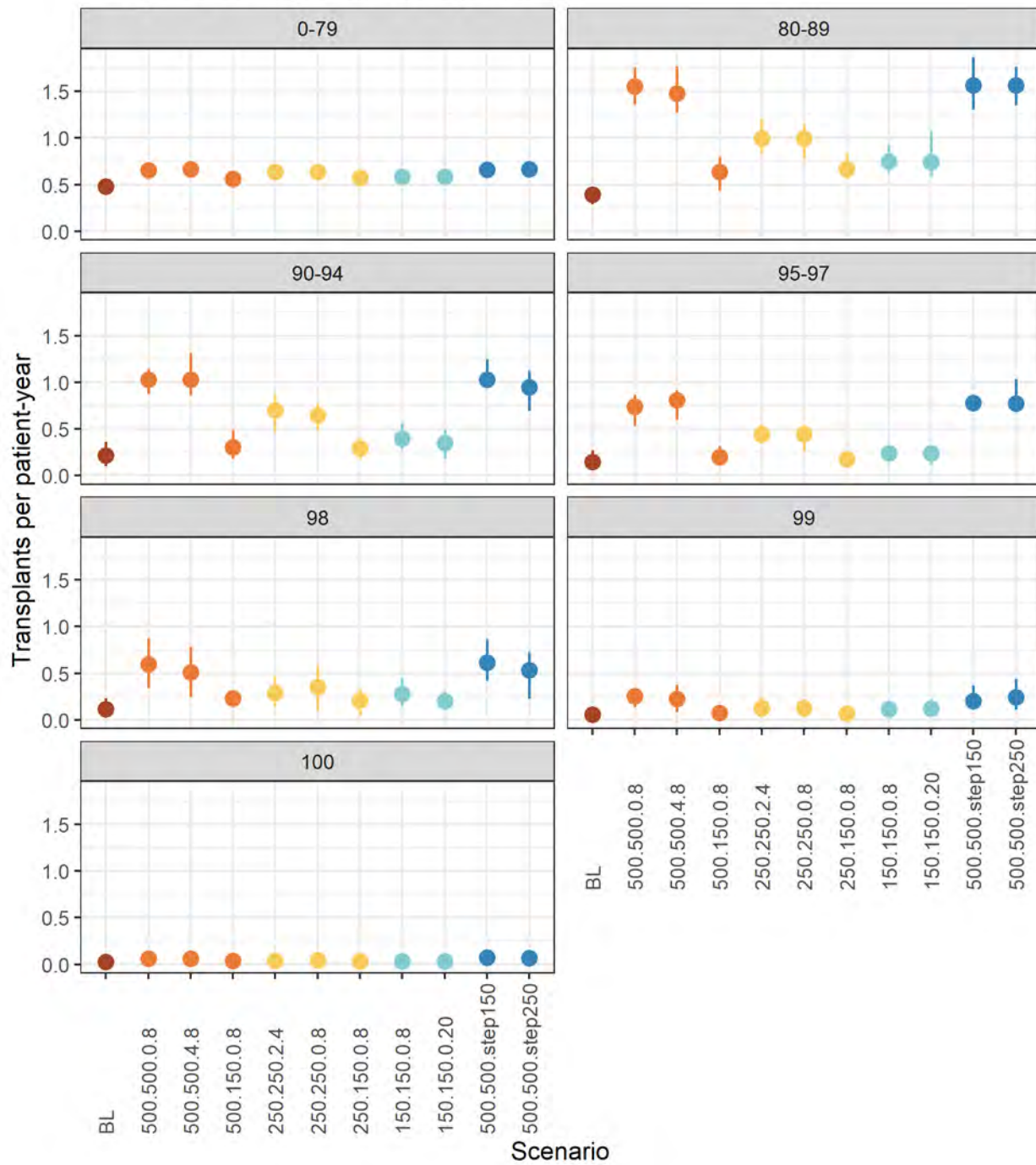
Transplant Rates: cPRA

Transplant Rates by cPRA: Kidney

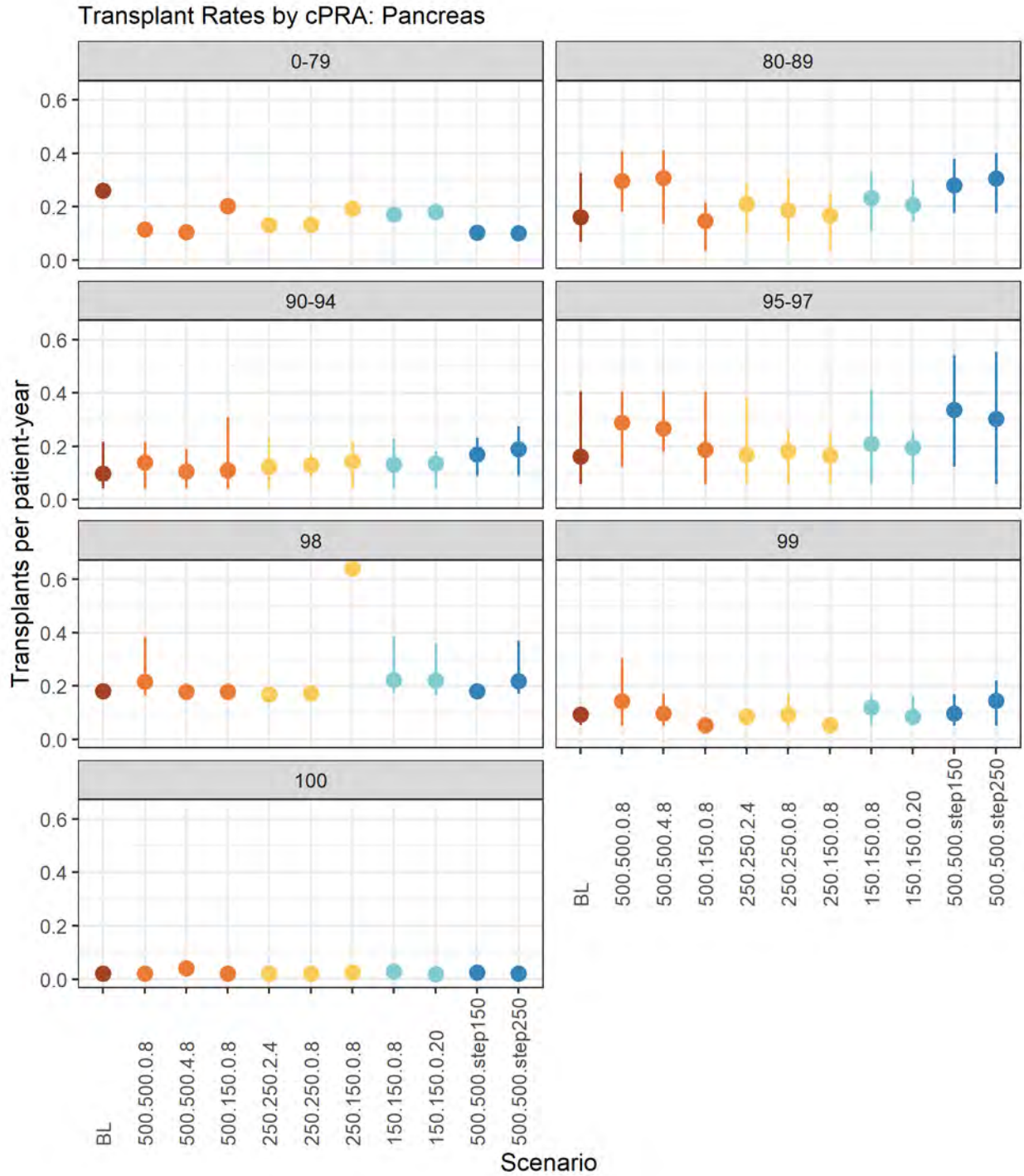


Transplant Rates by cPRA: Kidney

Transplant Rates by cPRA: Kidney-Pancreas



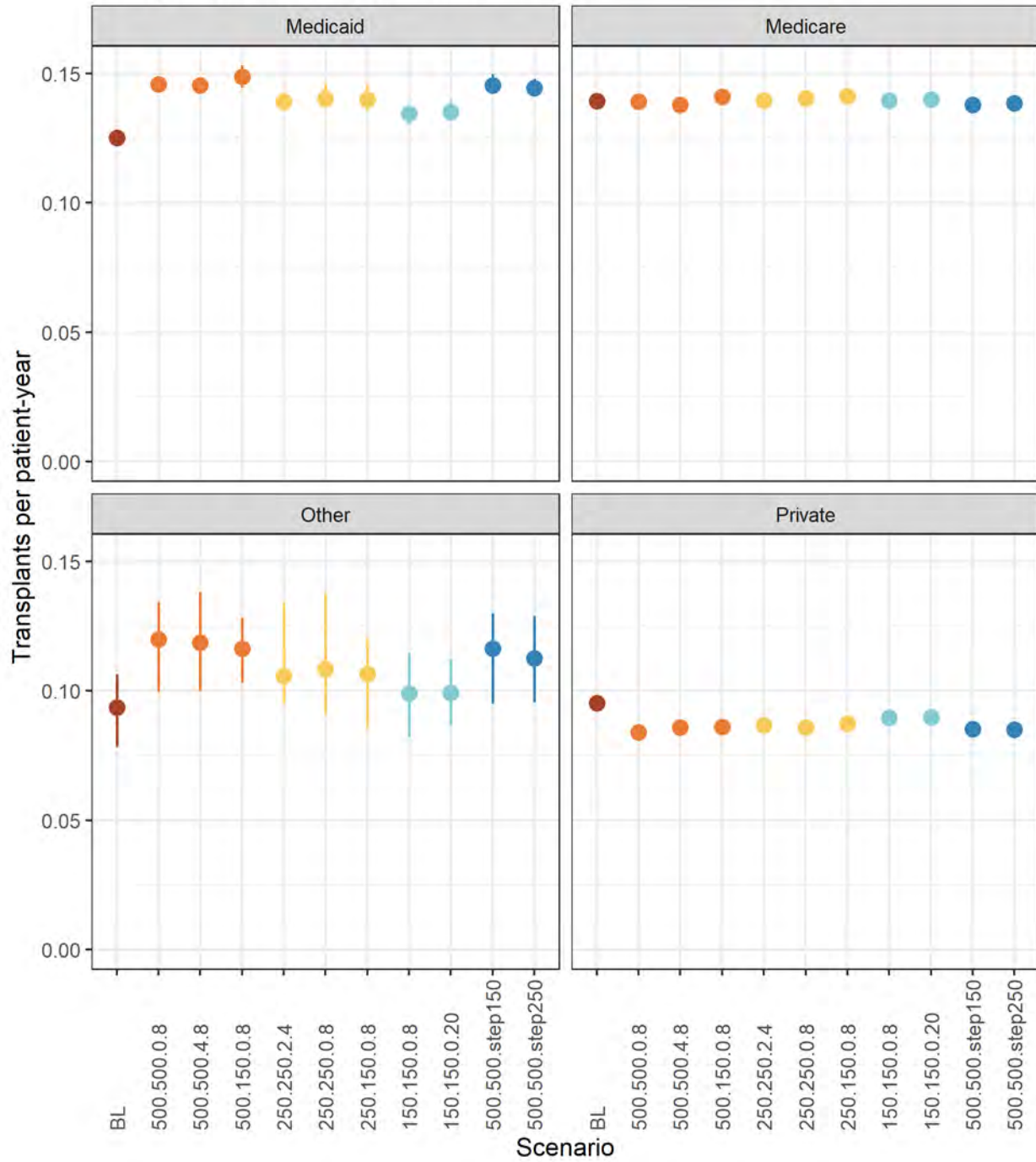
Transplant Rates by cPRA: Kidney-Pancreas



Transplant Rates by cPRA: Pancreas

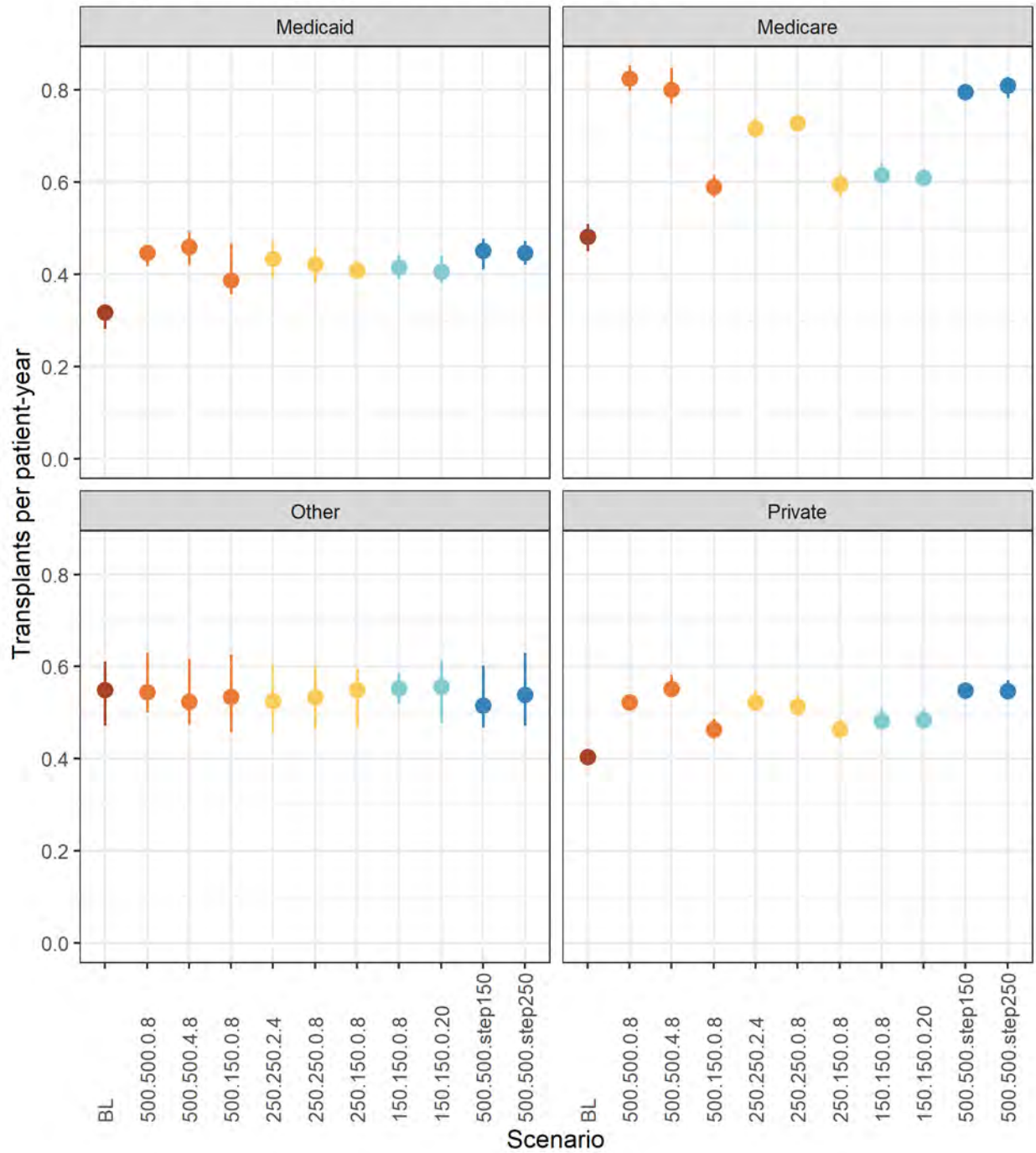
Transplant Rates: Payment Status

Transplant Rates by Payment Status: Kidney



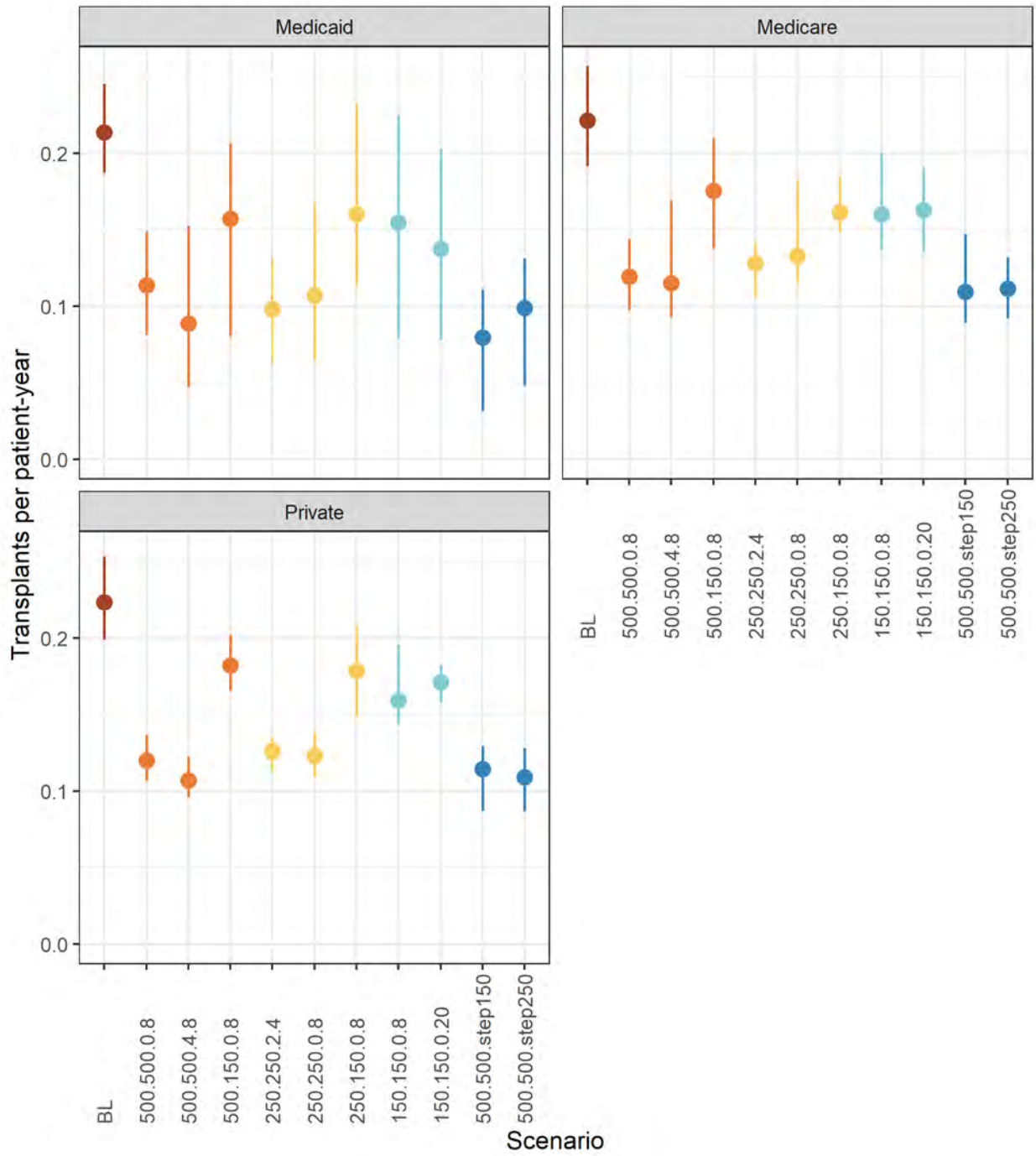
Transplant Rates by Payment Status: Kidney

Transplant Rates by Payment Status: Kidney-Pancreas



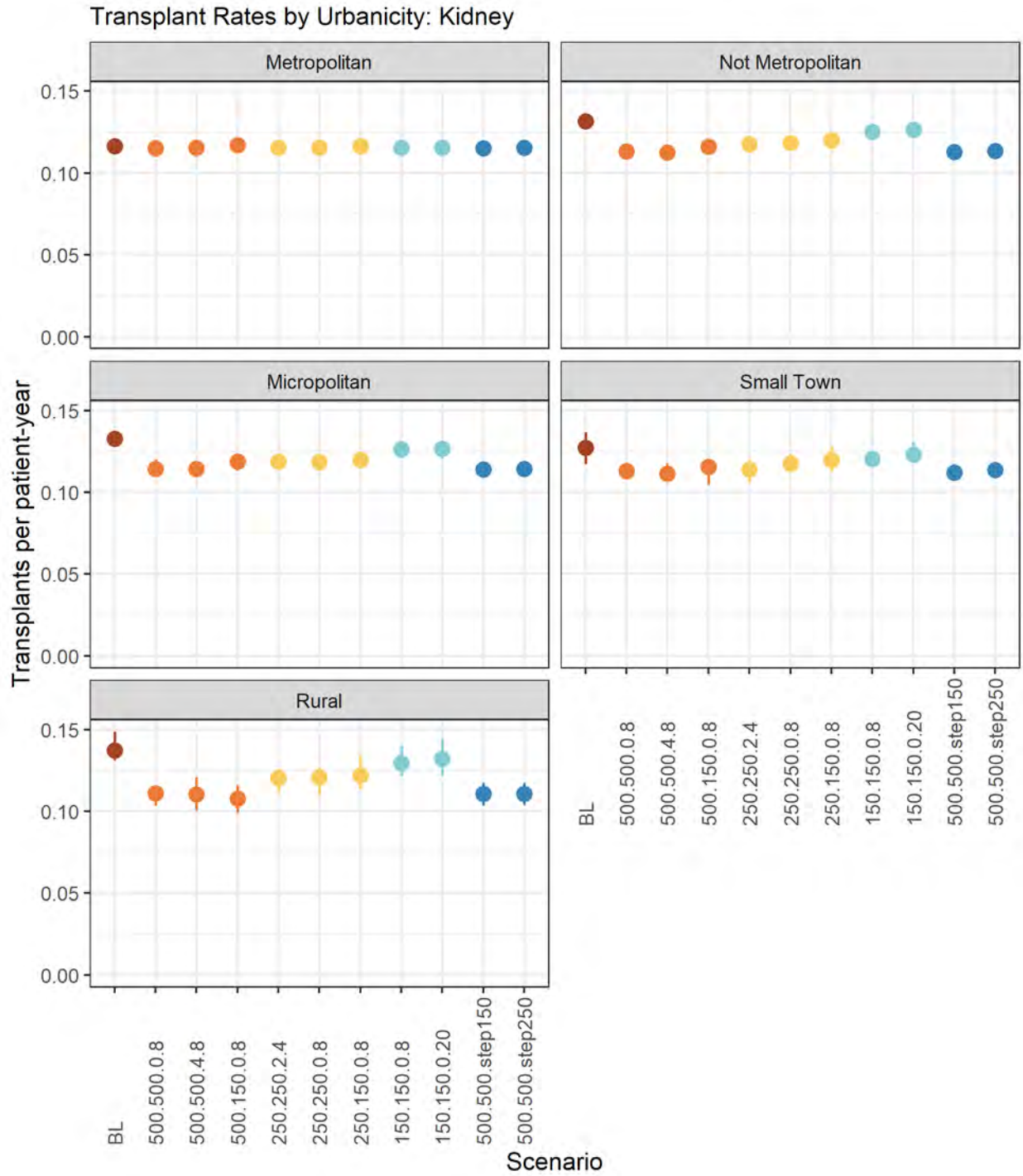
Transplant Rates by Payment Status: Kidney-Pancreas

Transplant Rates by Payment Status: Pancreas



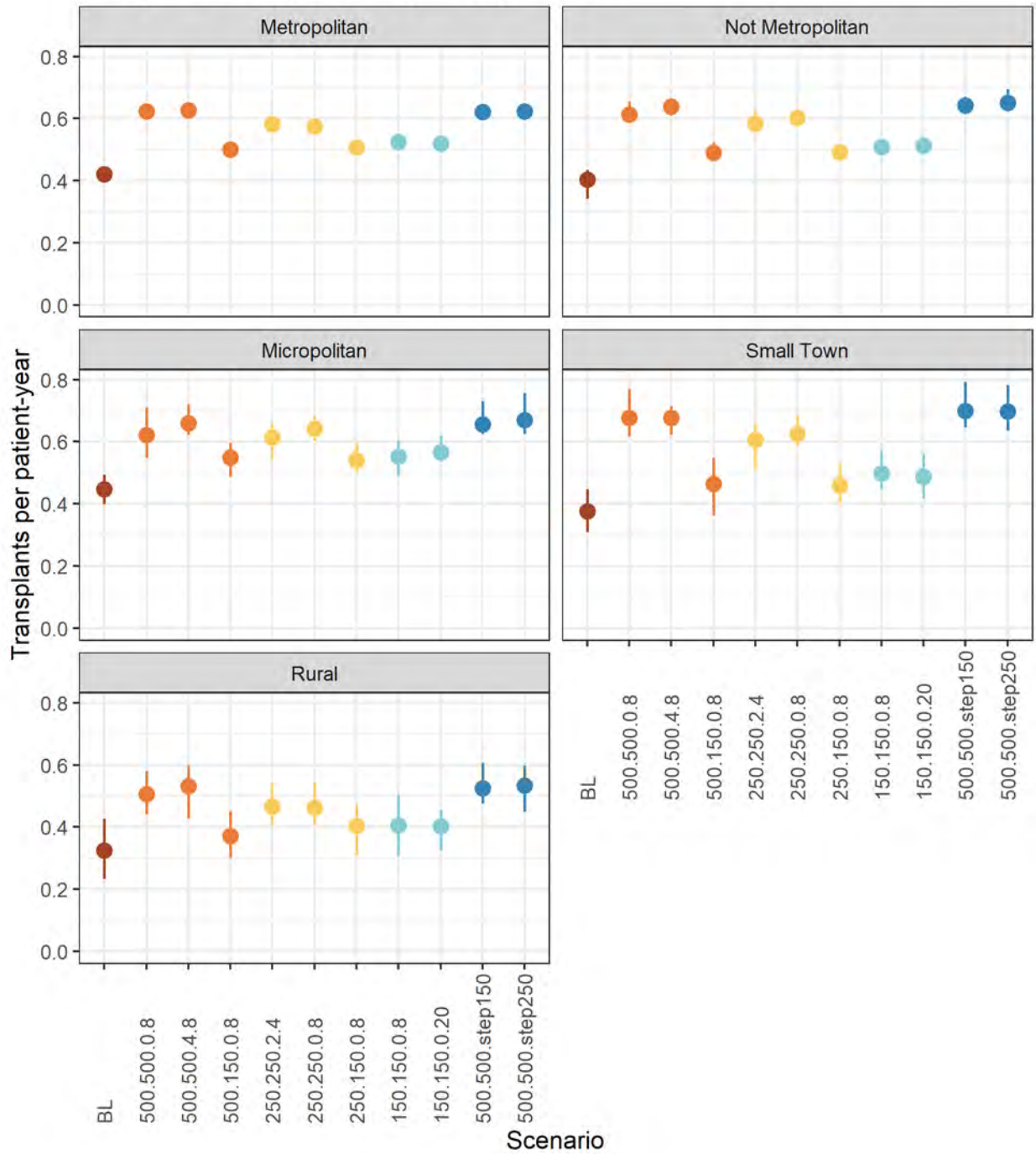
Transplant Rates by Payment Status: Pancreas

Transplant Rates: Urbanicity

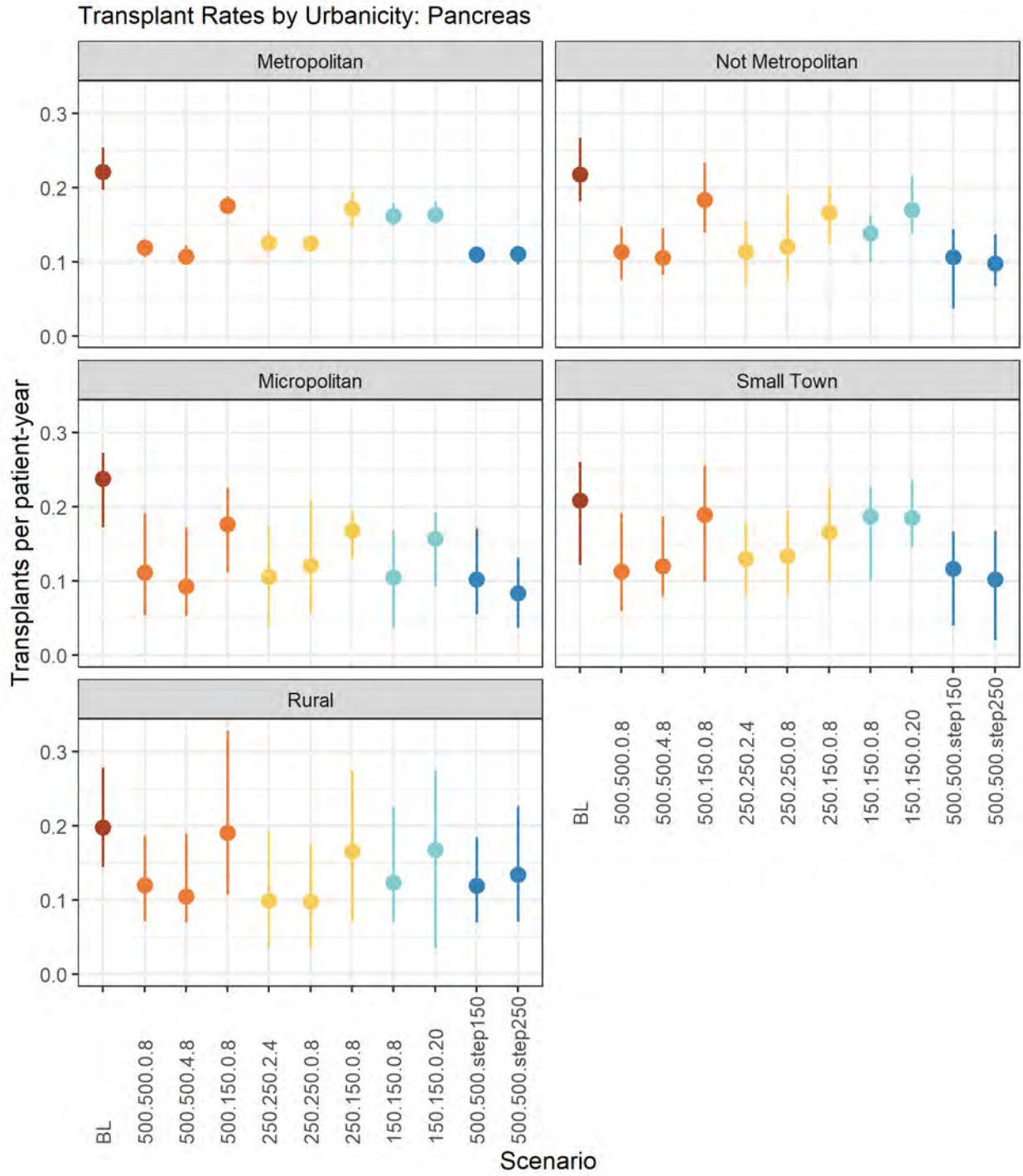


Transplant Rates by Urbanicity: Kidney

Transplant Rates by Urbanicity: Kidney-Pancreas



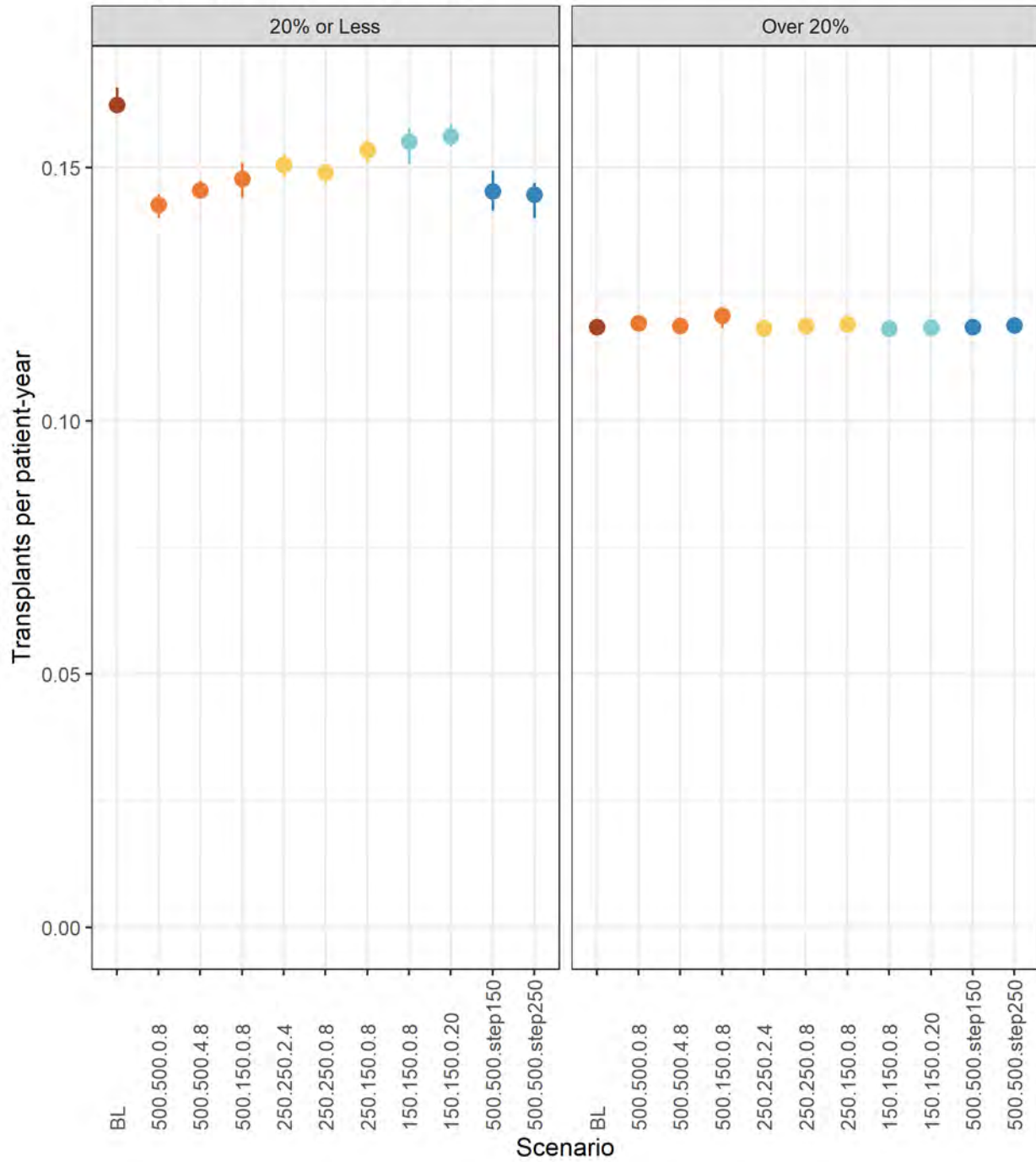
Transplant Rates by Urbanicity: Kidney-Pancreas



Transplant Rates by Urbanicity: Pancreas

Transplant Rates: EPTS

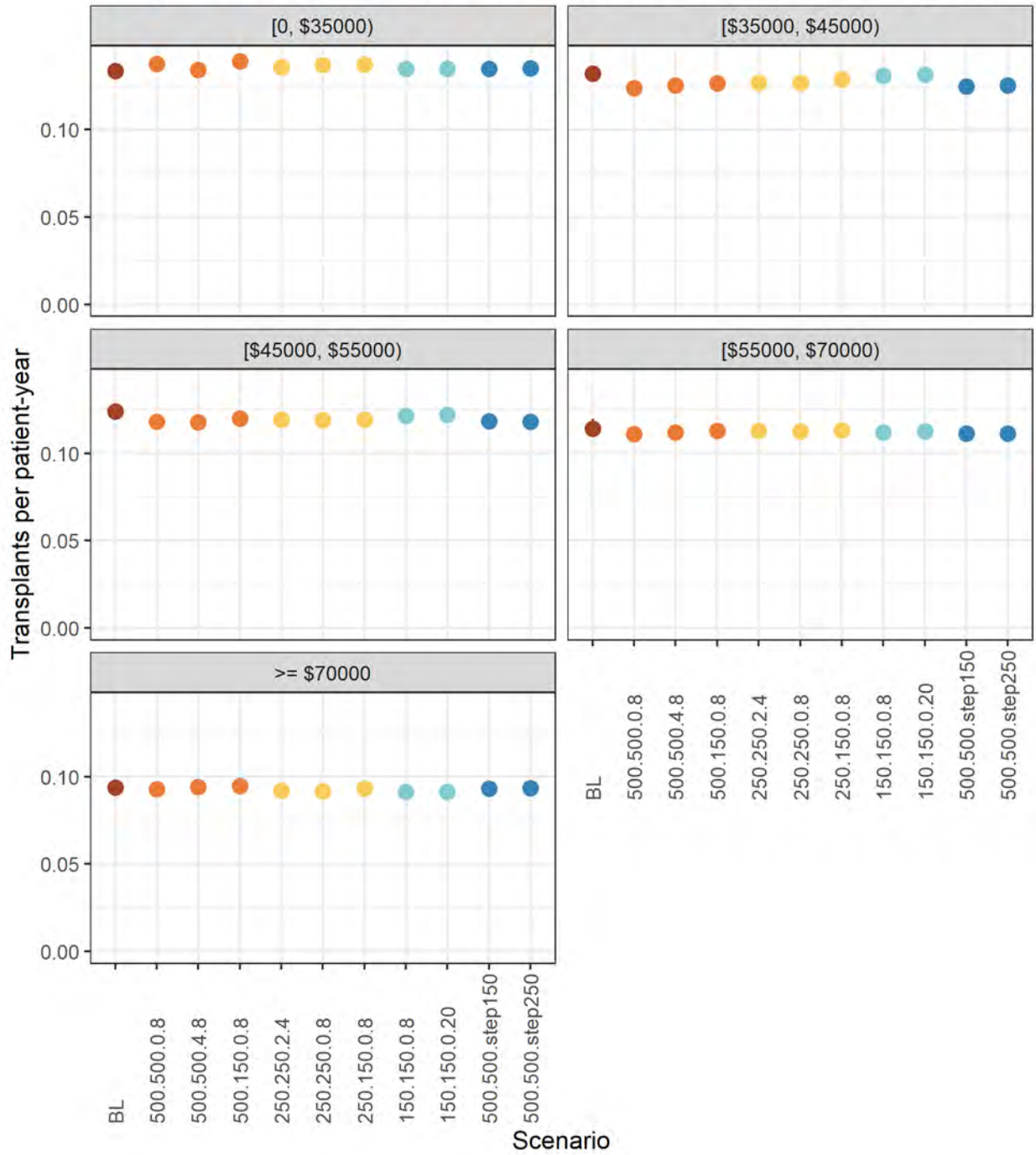
Transplant Rates by EPTS: Kidney



Transplant Rates by EPTS: Kidney

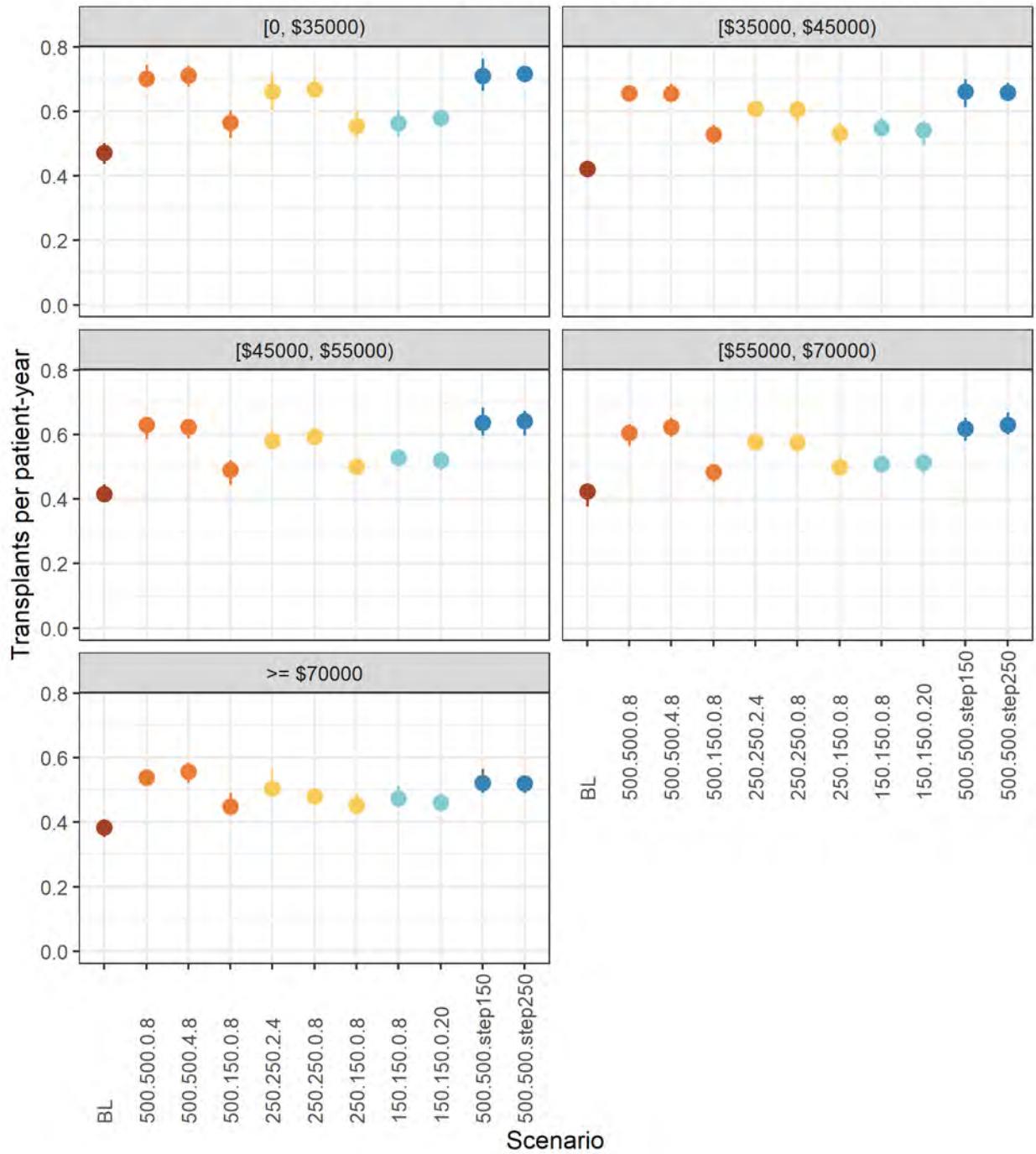
Transplant Rates: Median Household Income of Candidate Permanent Zip Code

Transplant Rates by Median Household Income of Candidate Permanent Zip Code: Kid



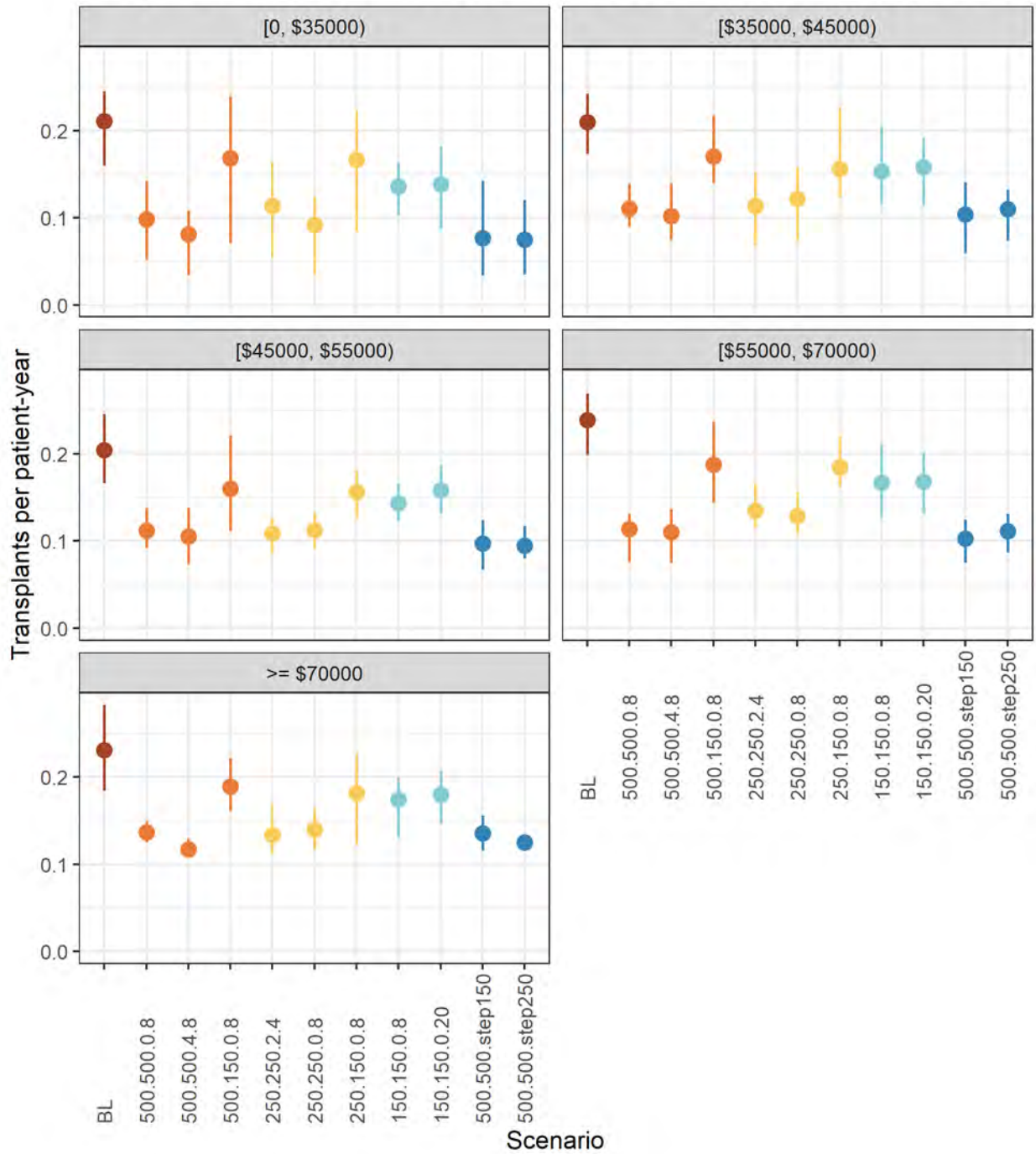
Transplant Rates by Median Household Income of Candidate Permanent Zip Code: Kidney

Transplant Rates by Median Household Income of Candidate Permanent Zip Code: Kidney



Transplant Rates by Median Household Income of Candidate Permanent Zip Code: Kidney-Pancreas

Transplant Rates by Median Household Income of Candidate Permanent Zip Code: Par

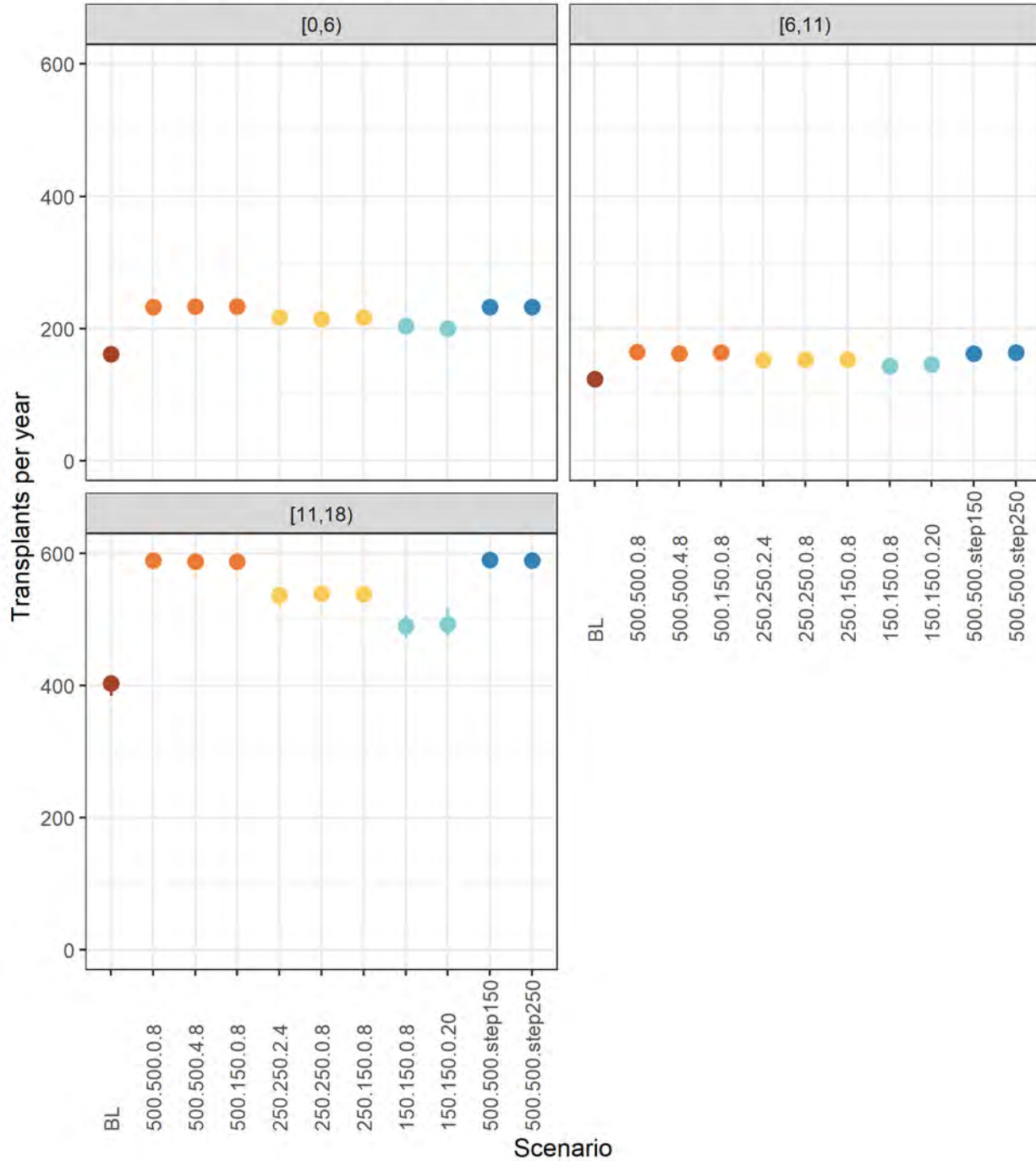


Transplant Rates by Median Household Income of Candidate Permanent Zip Code: Pancreas

Transplant Counts

Transplant Counts: Age at Transplant 0-17

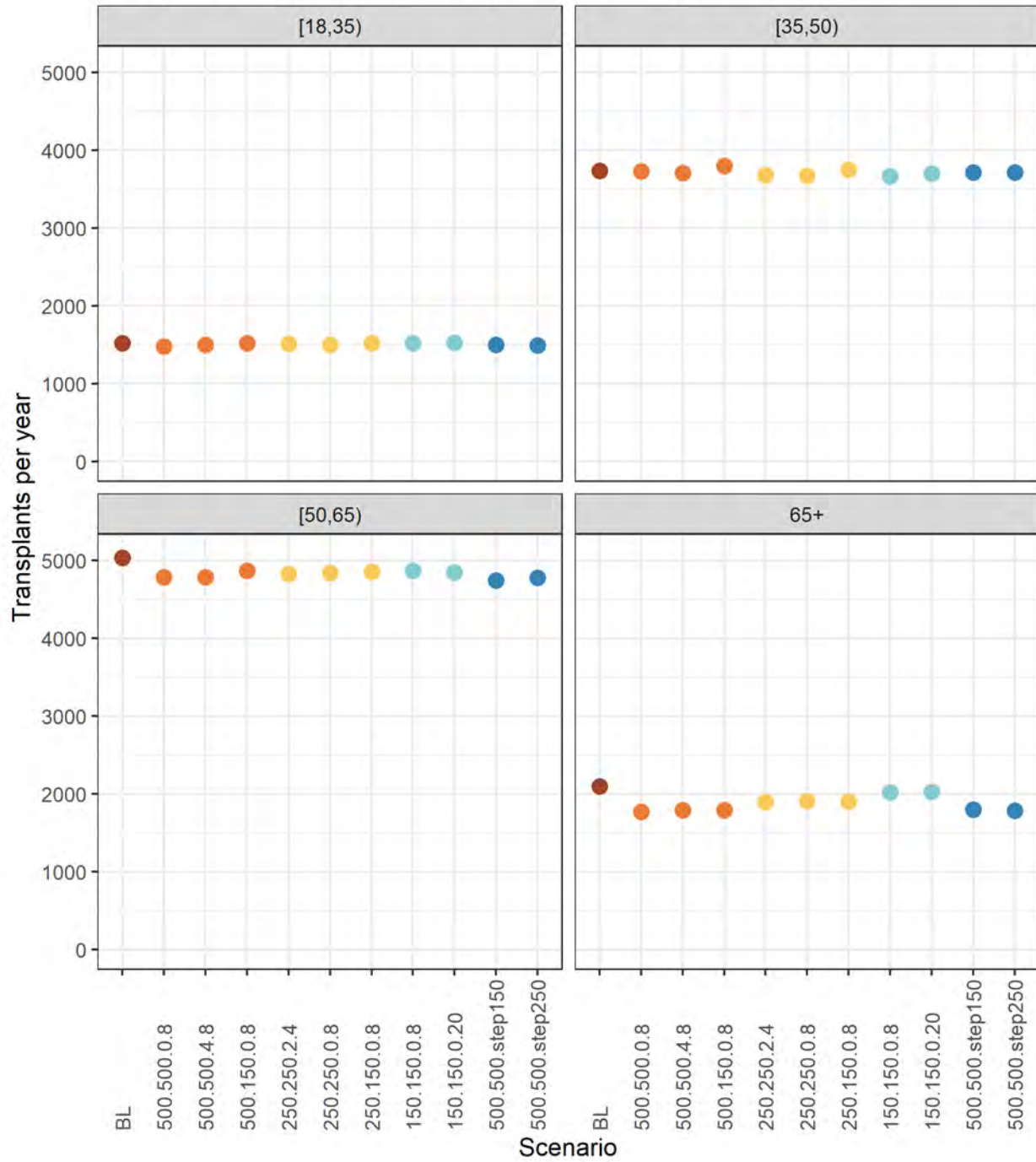
Transplant Counts by Age at Transplant 0-17: Kidney



Transplant Counts by Age at Transplant 0-17: Kidney

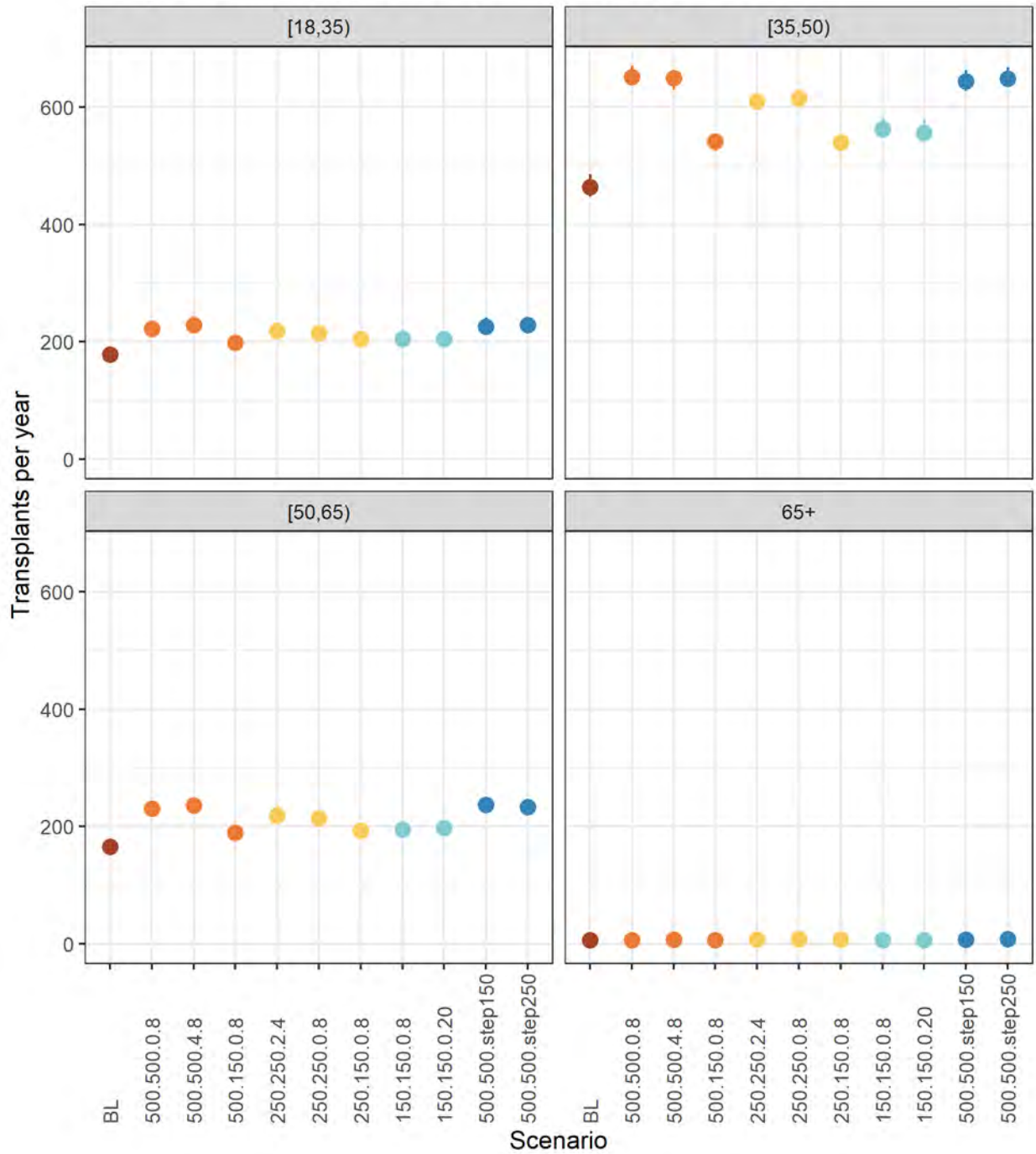
Transplant Counts: Age at Transplant 18+

Transplant Counts by Age at Transplant 18+: Kidney



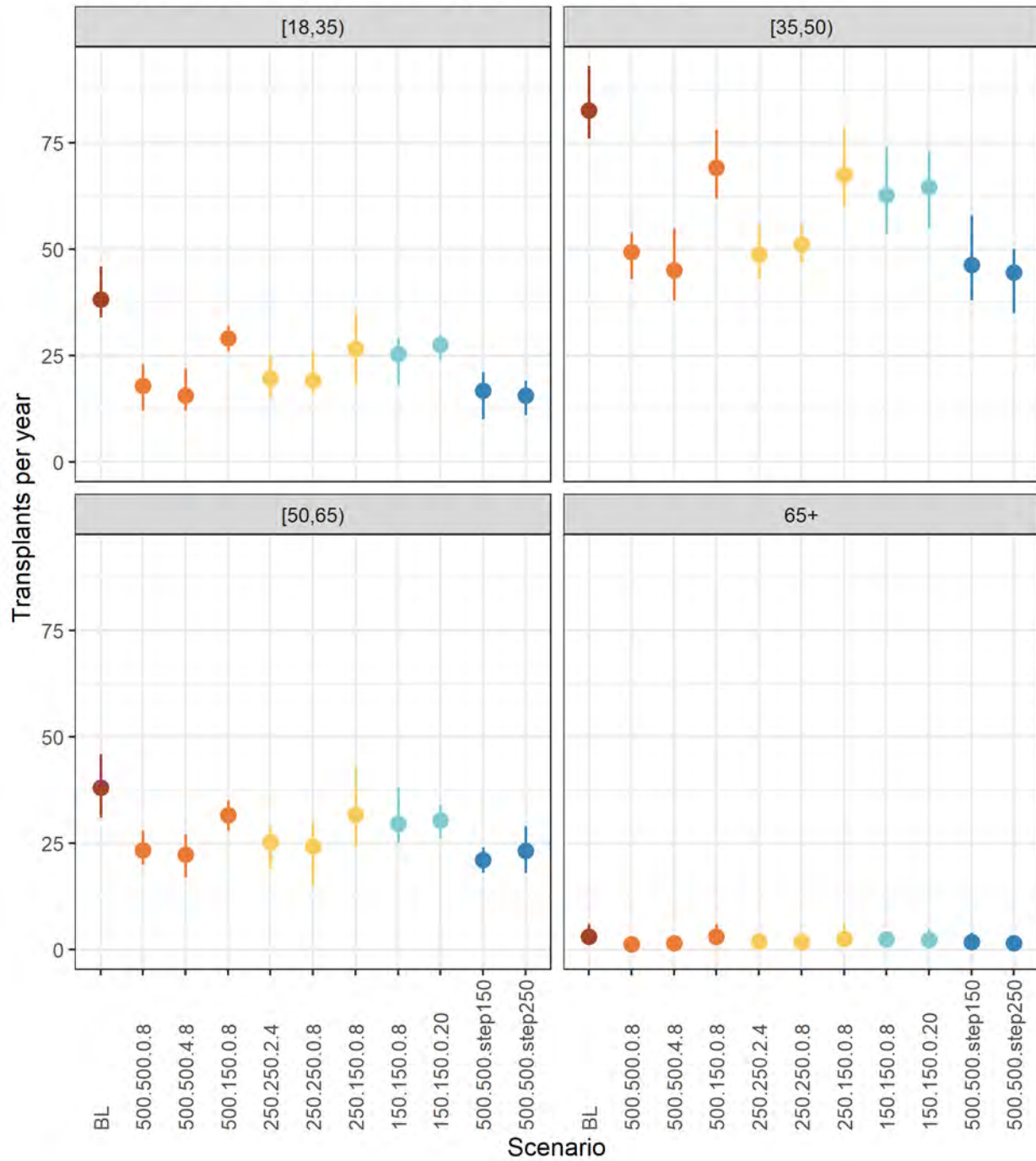
Transplant Counts by Age at Transplant 18+: Kidney

Transplant Counts by Age at Transplant 18+: Kidney-Pancreas



Transplant Counts by Age at Transplant 18+: Kidney-Pancreas

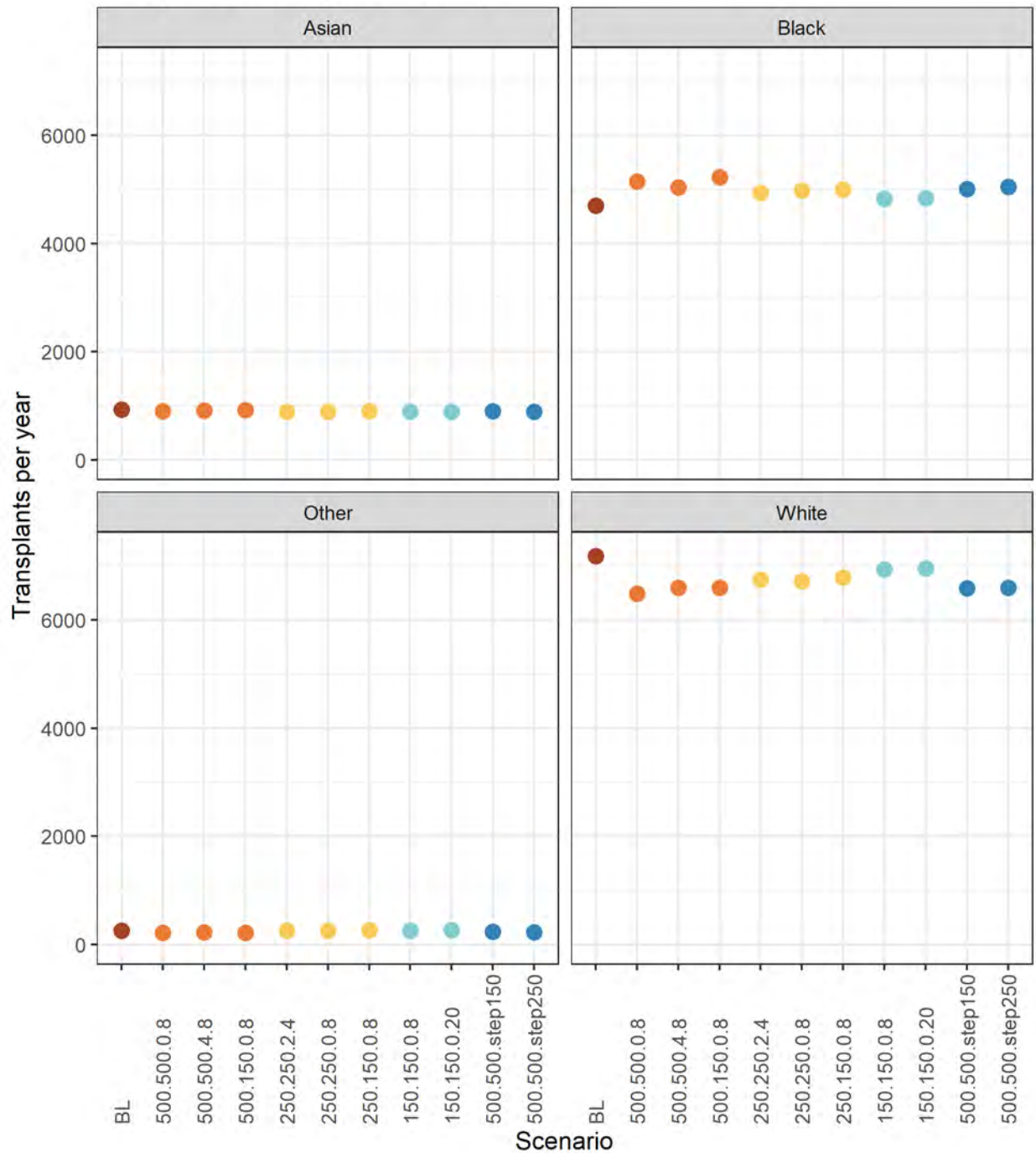
Transplant Counts by Age at Transplant 18+: Pancreas



Transplant Counts by Age at Transplant 18+: Pancreas

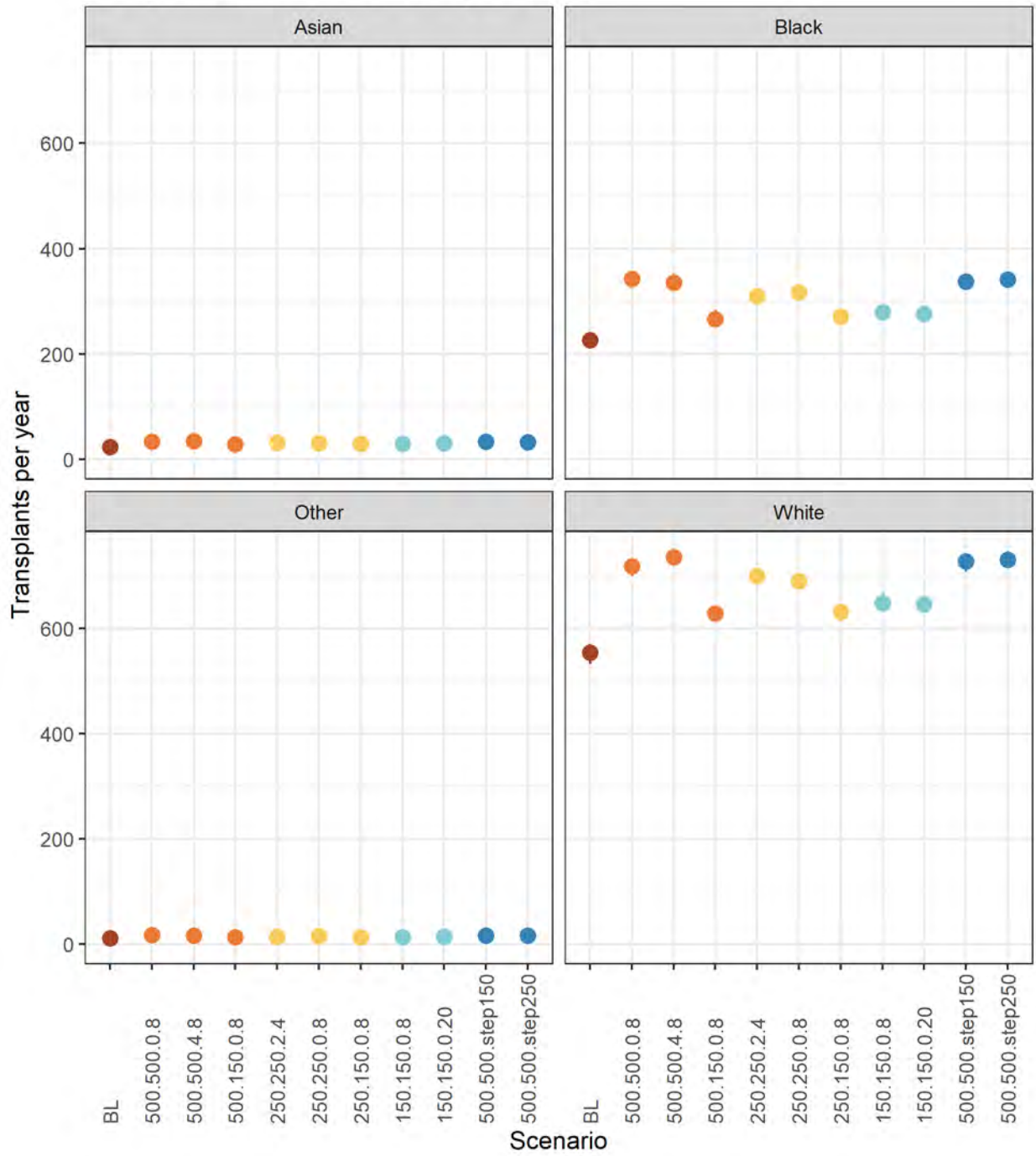
Transplant Counts: Race

Transplant Counts by Race: Kidney



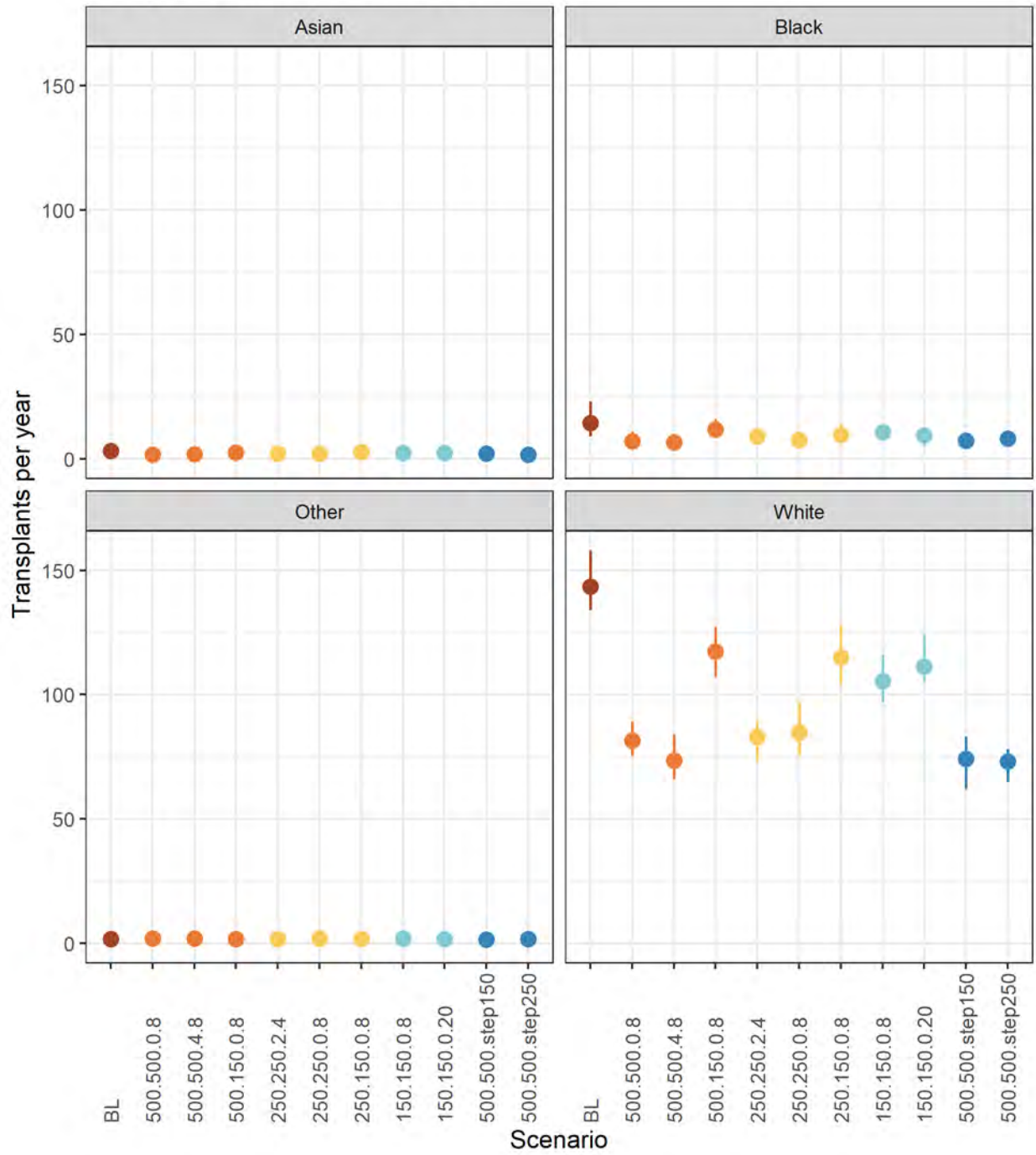
Transplant Counts by Race: Kidney

Transplant Counts by Race: Kidney-Pancreas



Transplant Counts by Race: Kidney-Pancreas

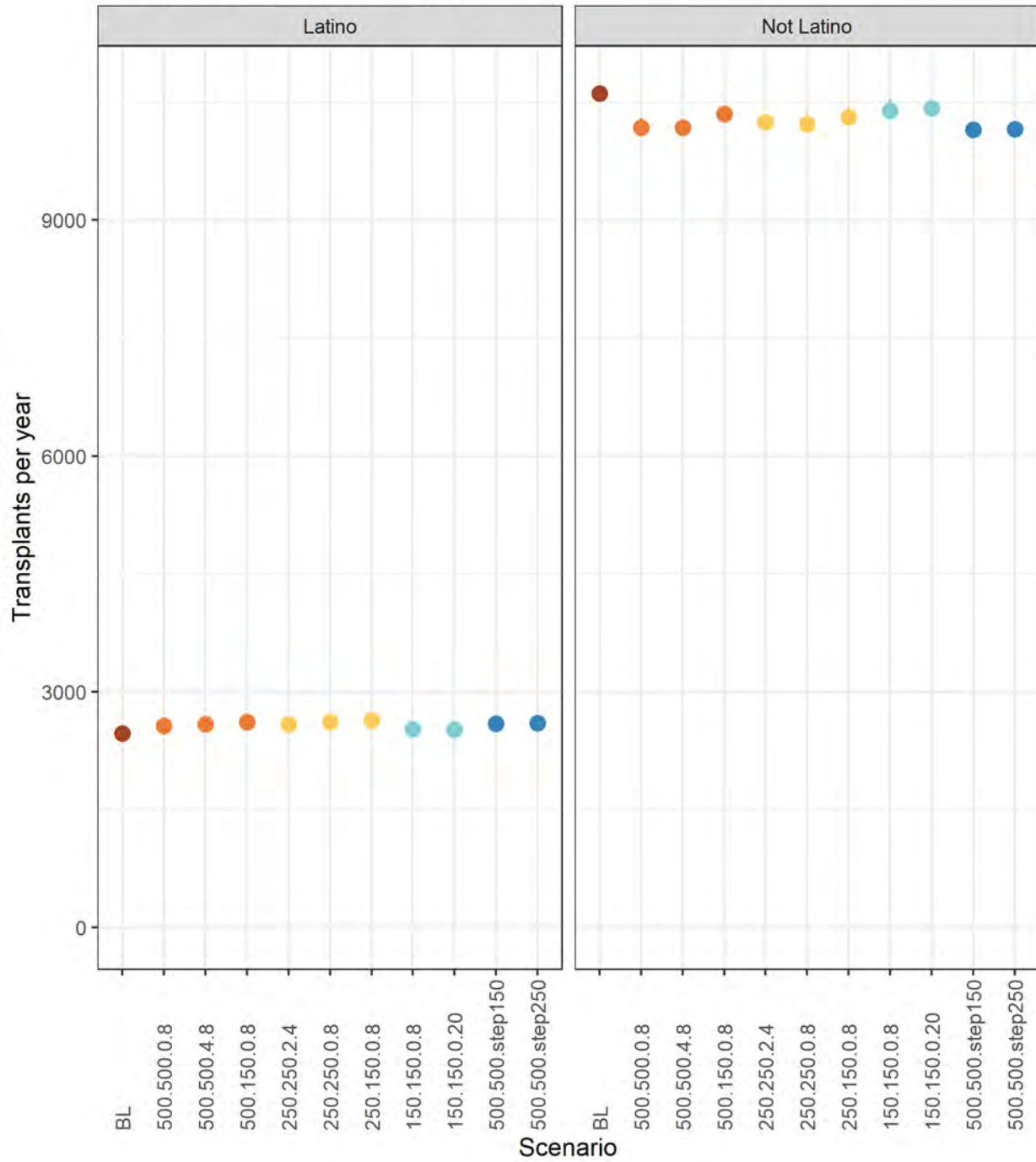
Transplant Counts by Race: Pancreas



Transplant Counts by Race: Pancreas

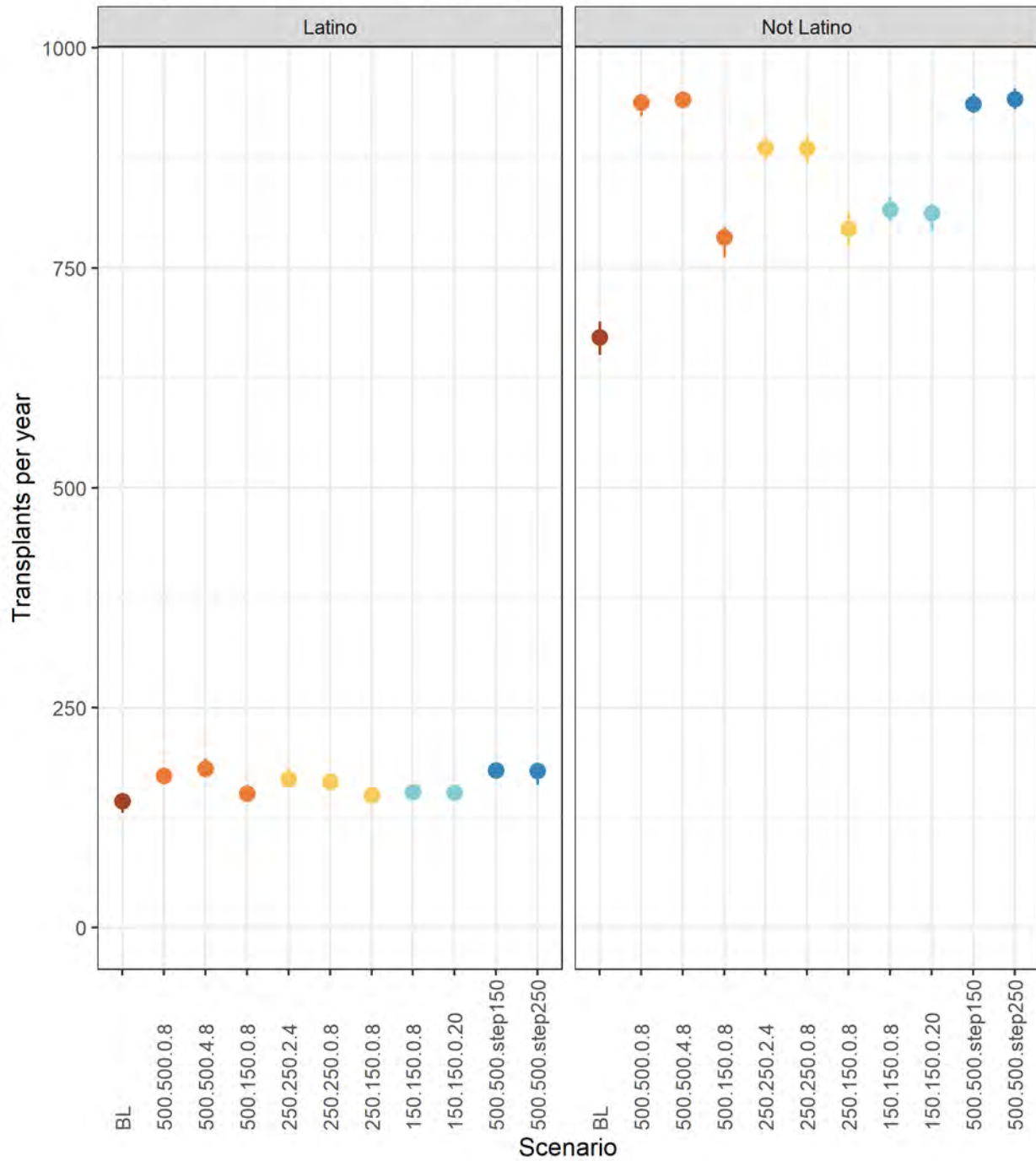
Transplant Counts: Ethnicity

Transplant Counts by Ethnicity: Kidney



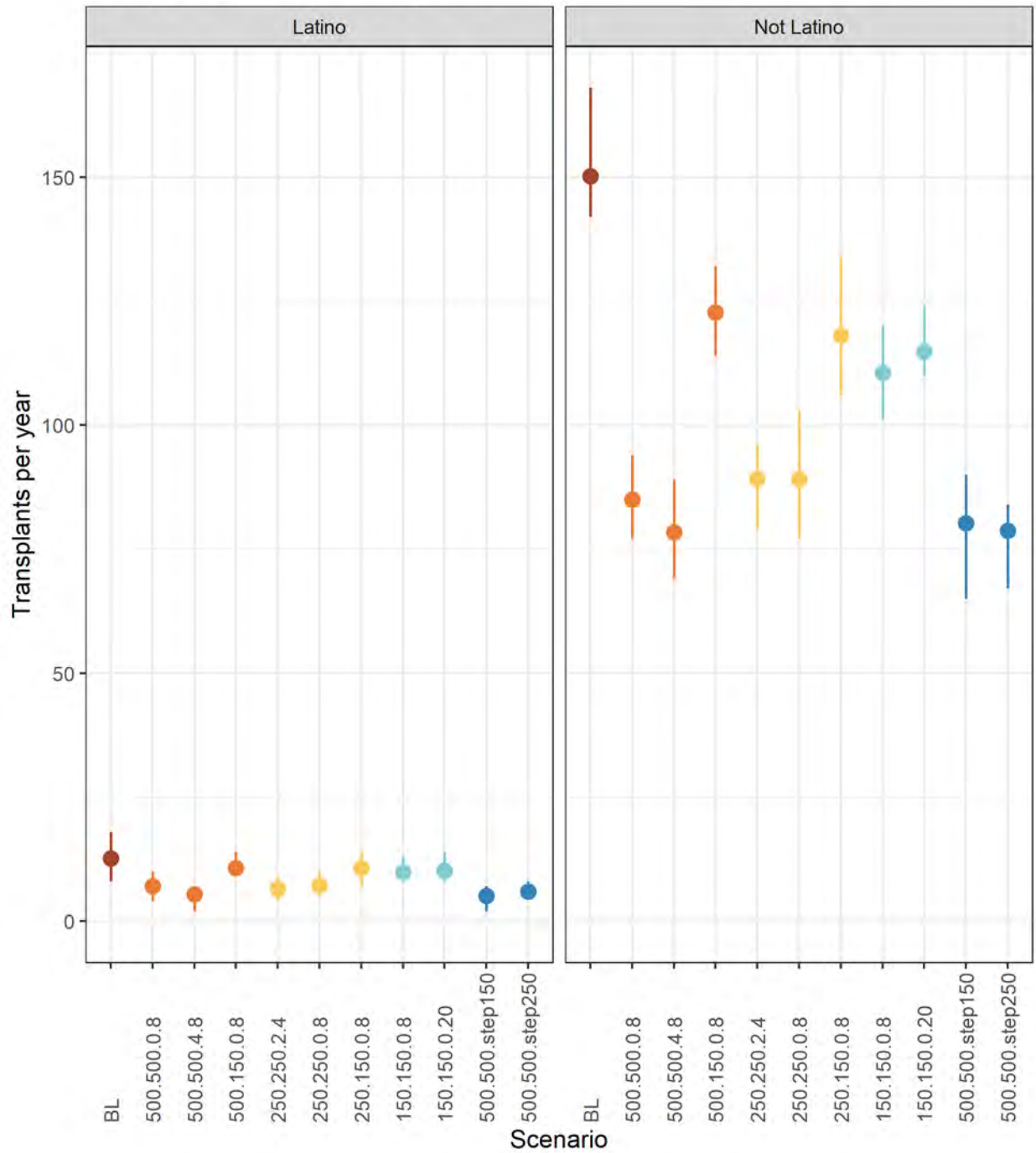
Transplant Counts by Ethnicity: Kidney

Transplant Counts by Ethnicity: Kidney-Pancreas



Transplant Counts by Ethnicity: Kidney-Pancreas

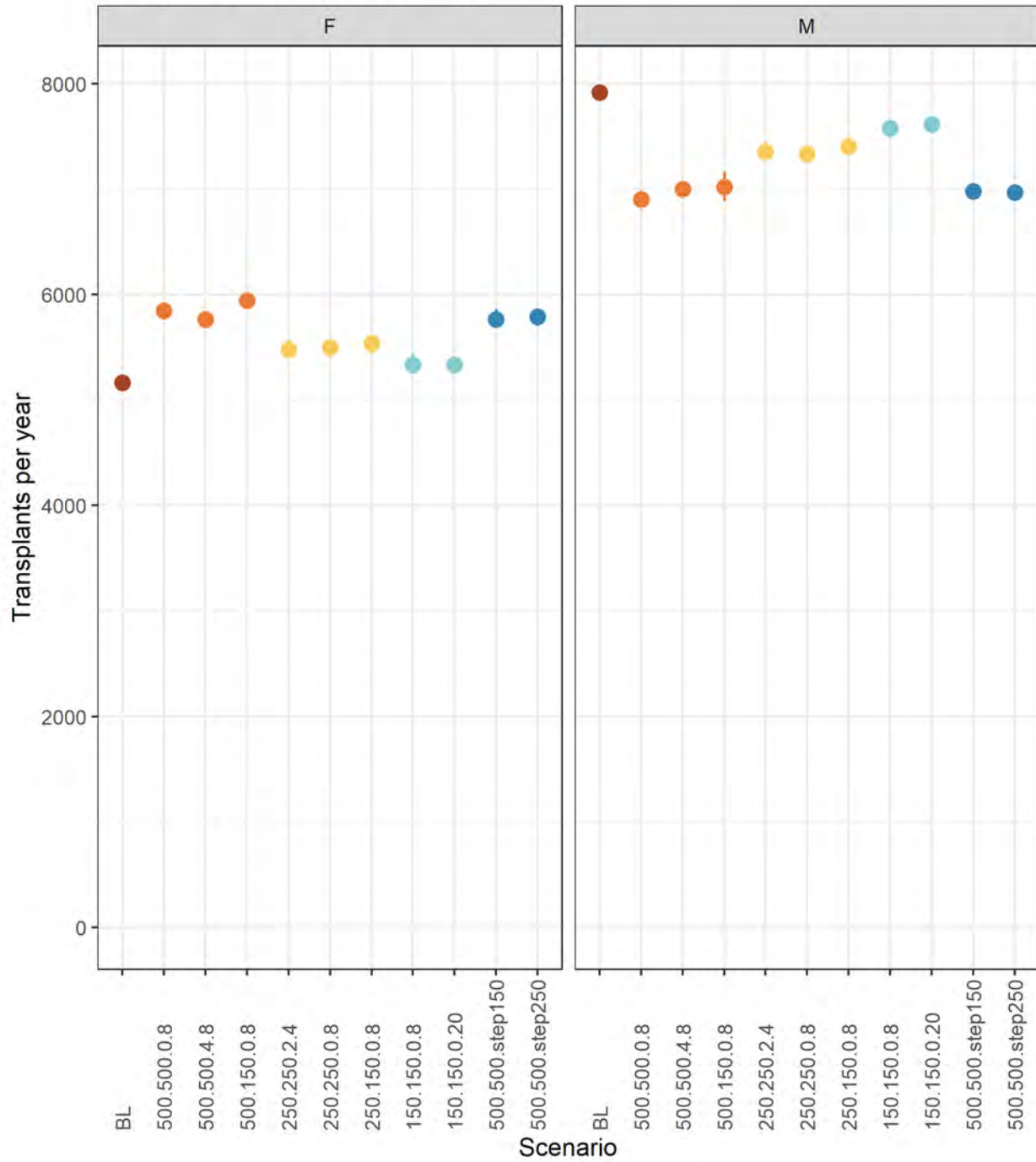
Transplant Counts by Ethnicity: Pancreas



Transplant Counts by Ethnicity: Pancreas

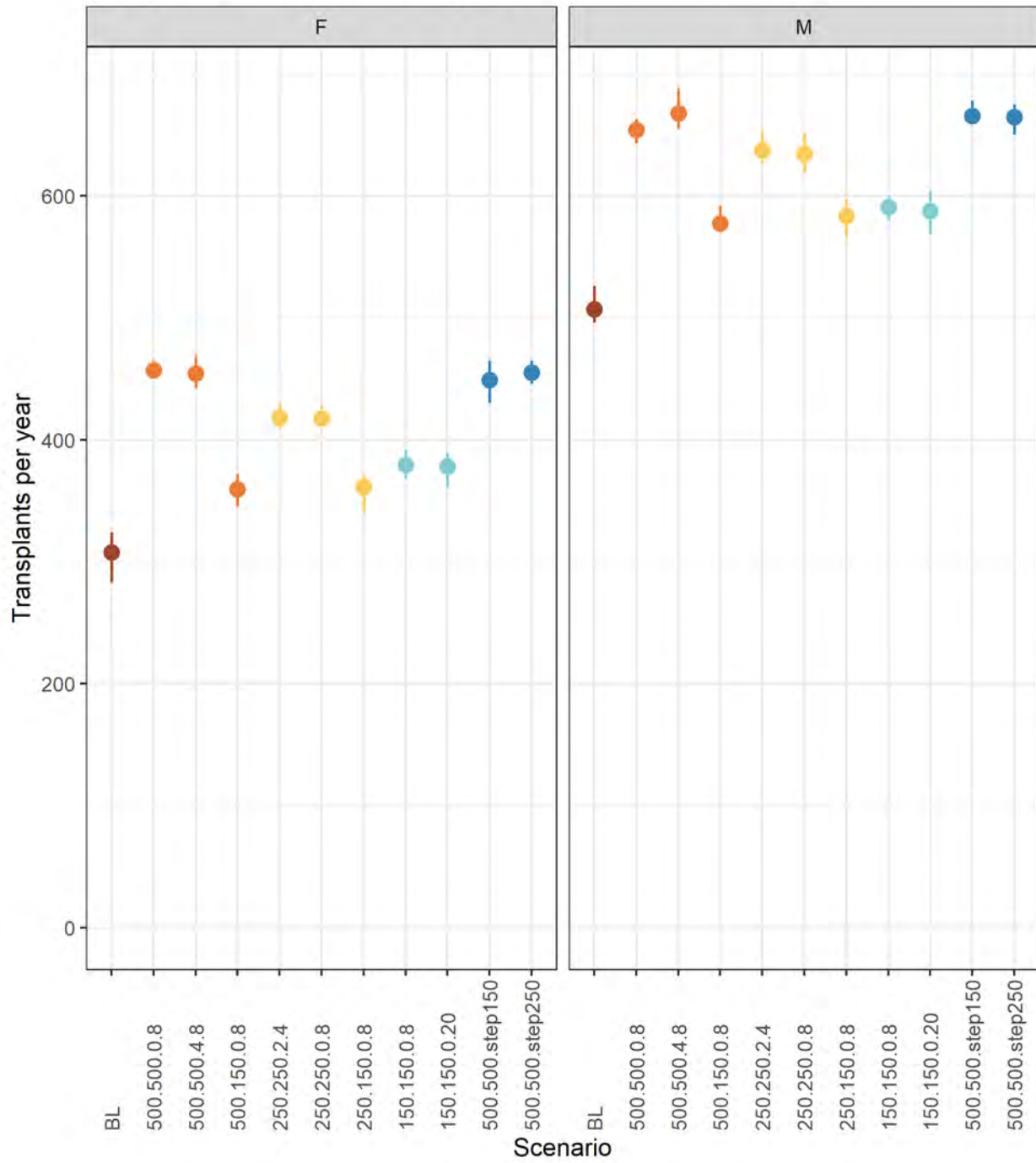
Transplant Counts: Sex

Transplant Counts by Sex: Kidney



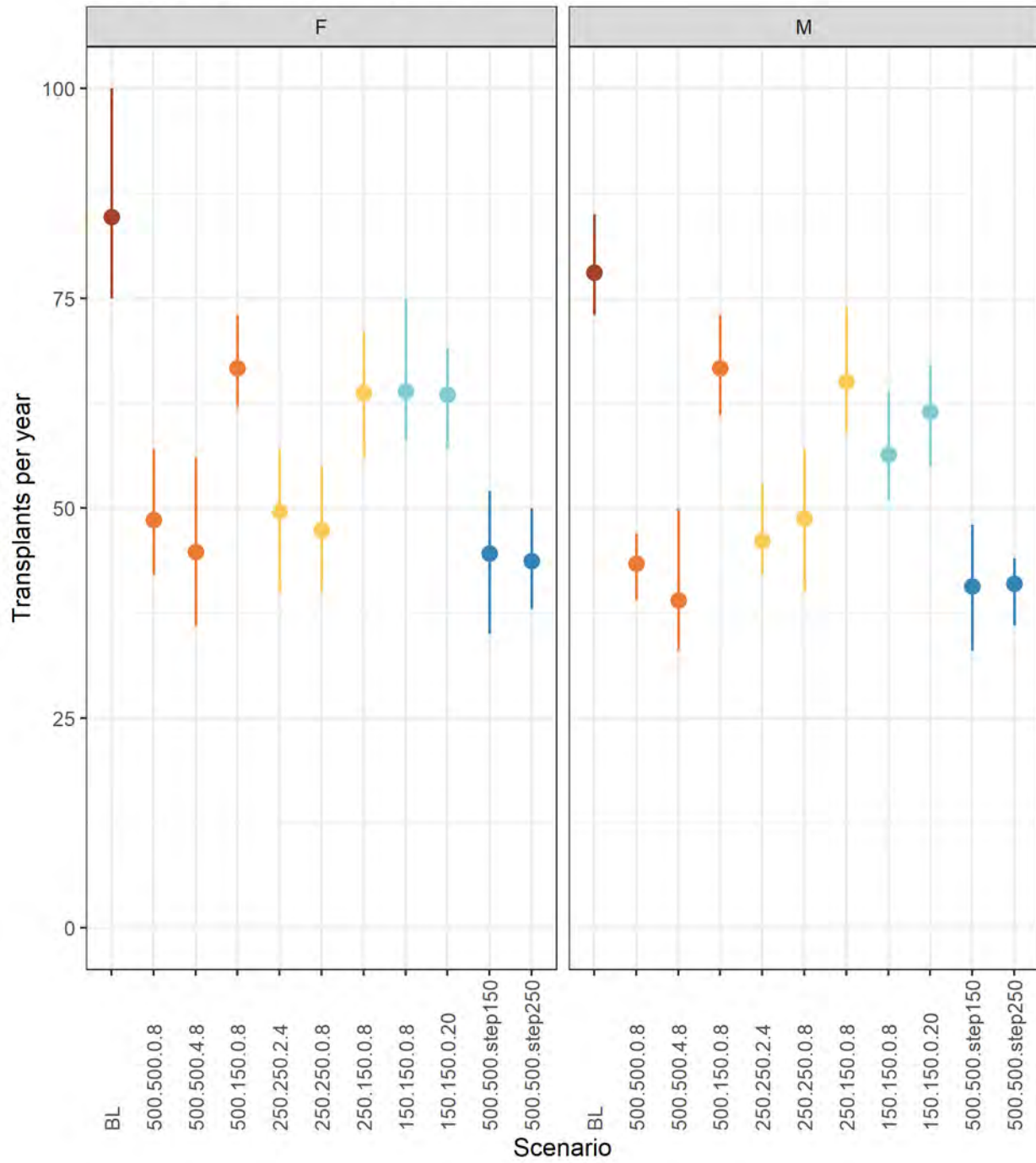
Transplant Counts by Sex: Kidney

Transplant Counts by Sex: Kidney-Pancreas



Transplant Counts by Sex: Kidney-Pancreas

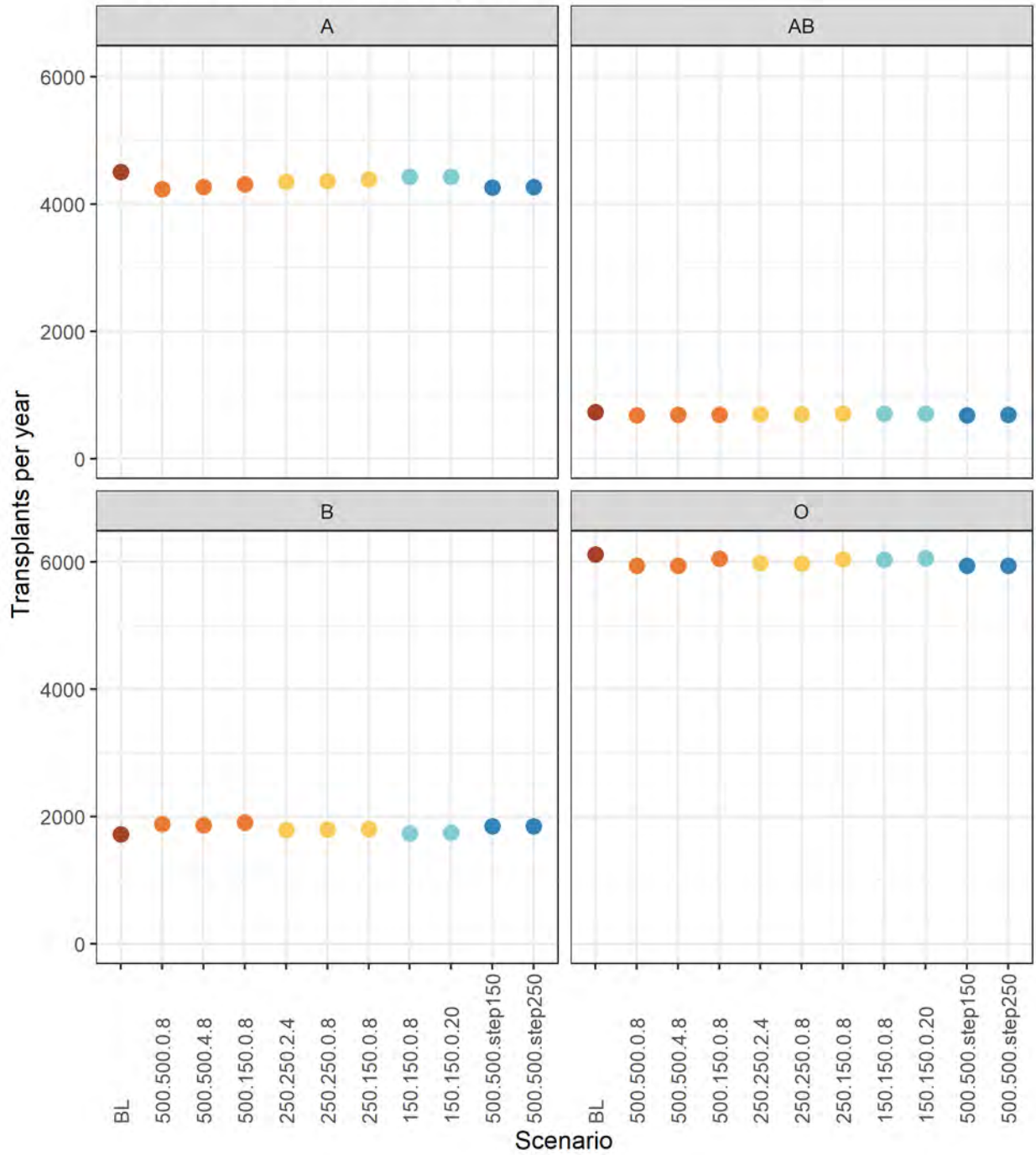
Transplant Counts by Sex: Pancreas



Transplant Counts by Sex: Pancreas

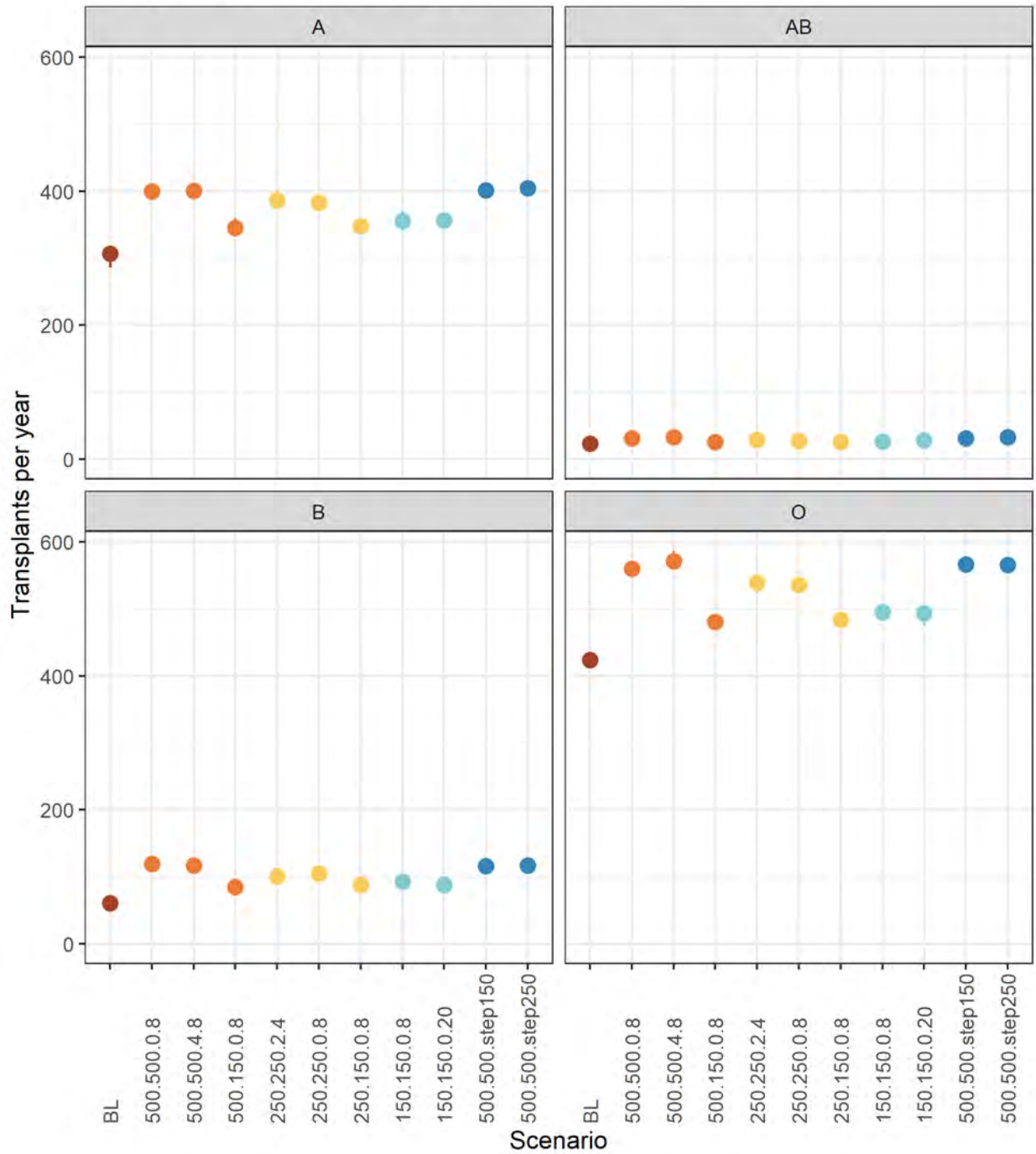
Transplant Counts: ABO Group

Transplant Counts by ABO Group: Kidney



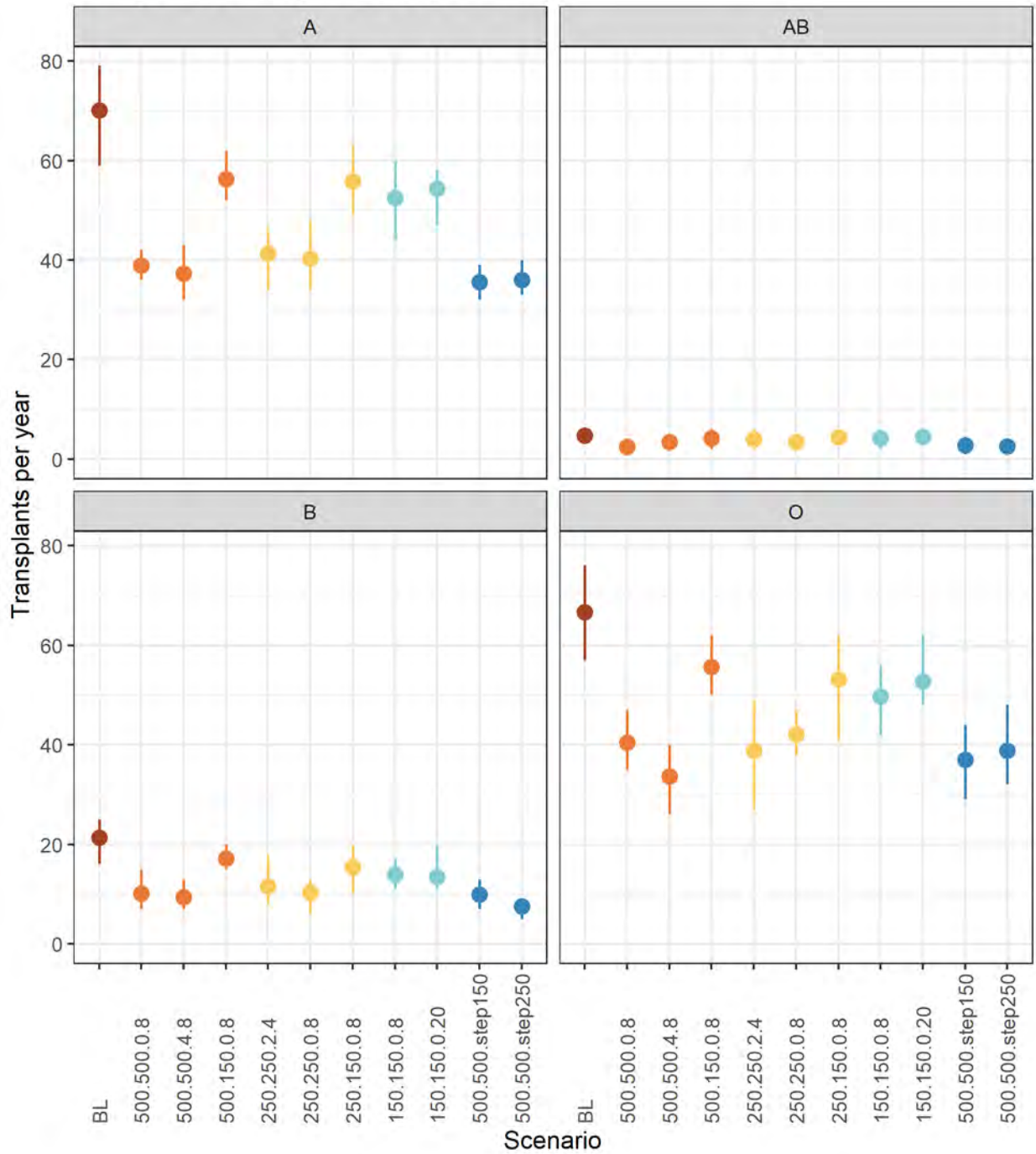
Transplant Counts by ABO Group: Kidney

Transplant Counts by ABO Group: Kidney-Pancreas



Transplant Counts by ABO Group: Kidney-Pancreas

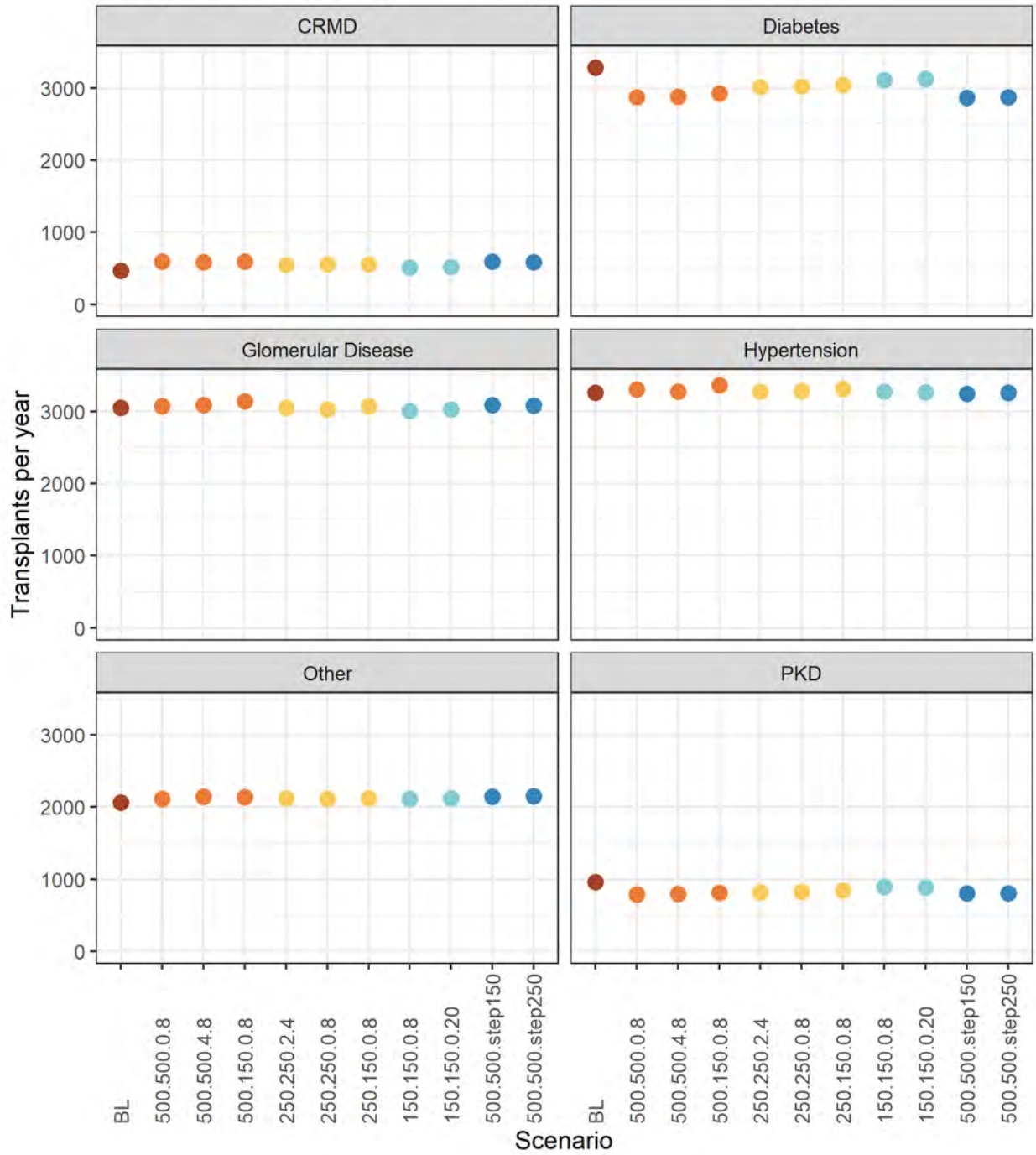
Transplant Counts by ABO Group: Pancreas



Transplant Counts by ABO Group: Pancreas

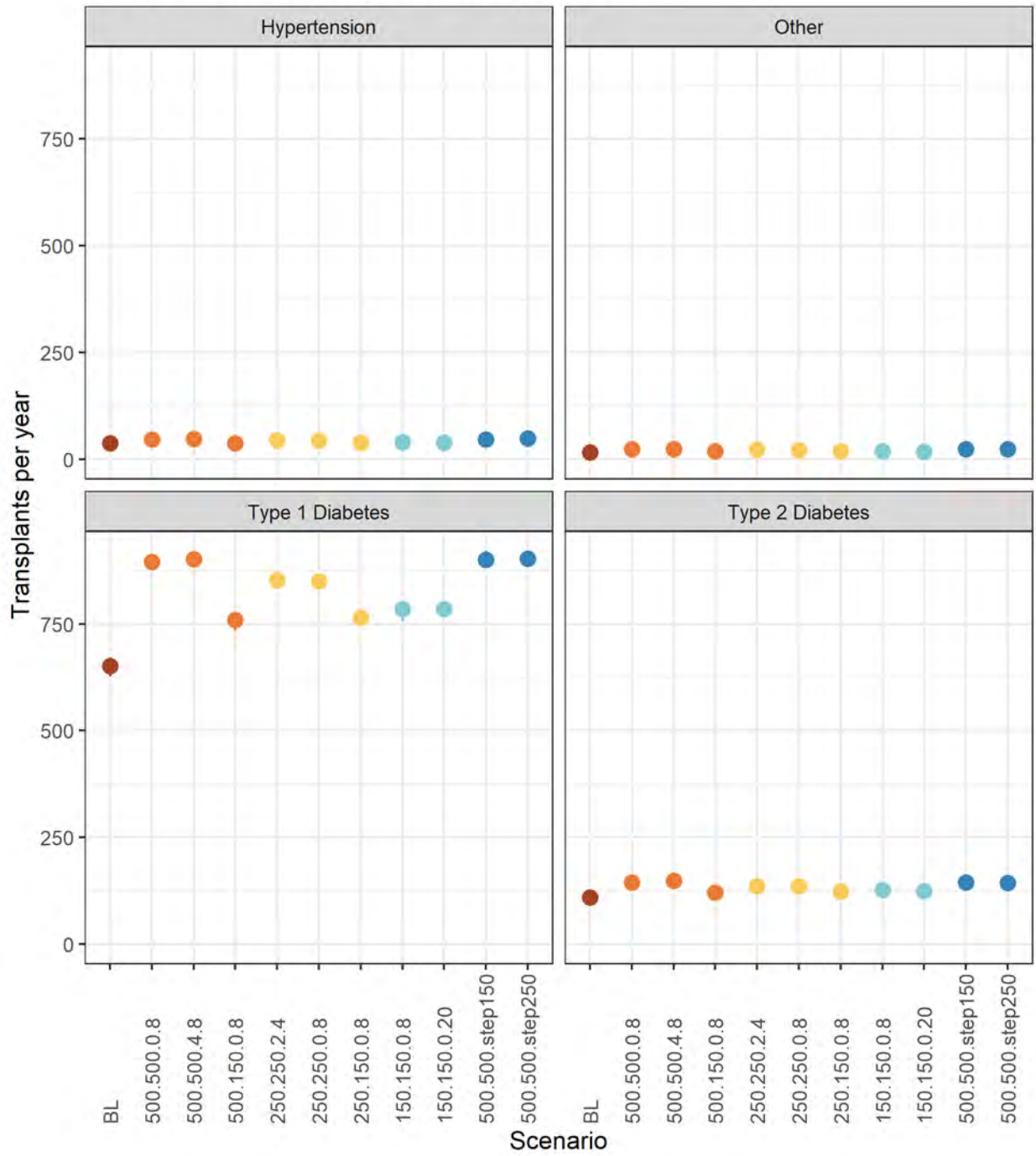
Transplant Counts: Diagnosis

Transplant Counts by Diagnosis: Kidney



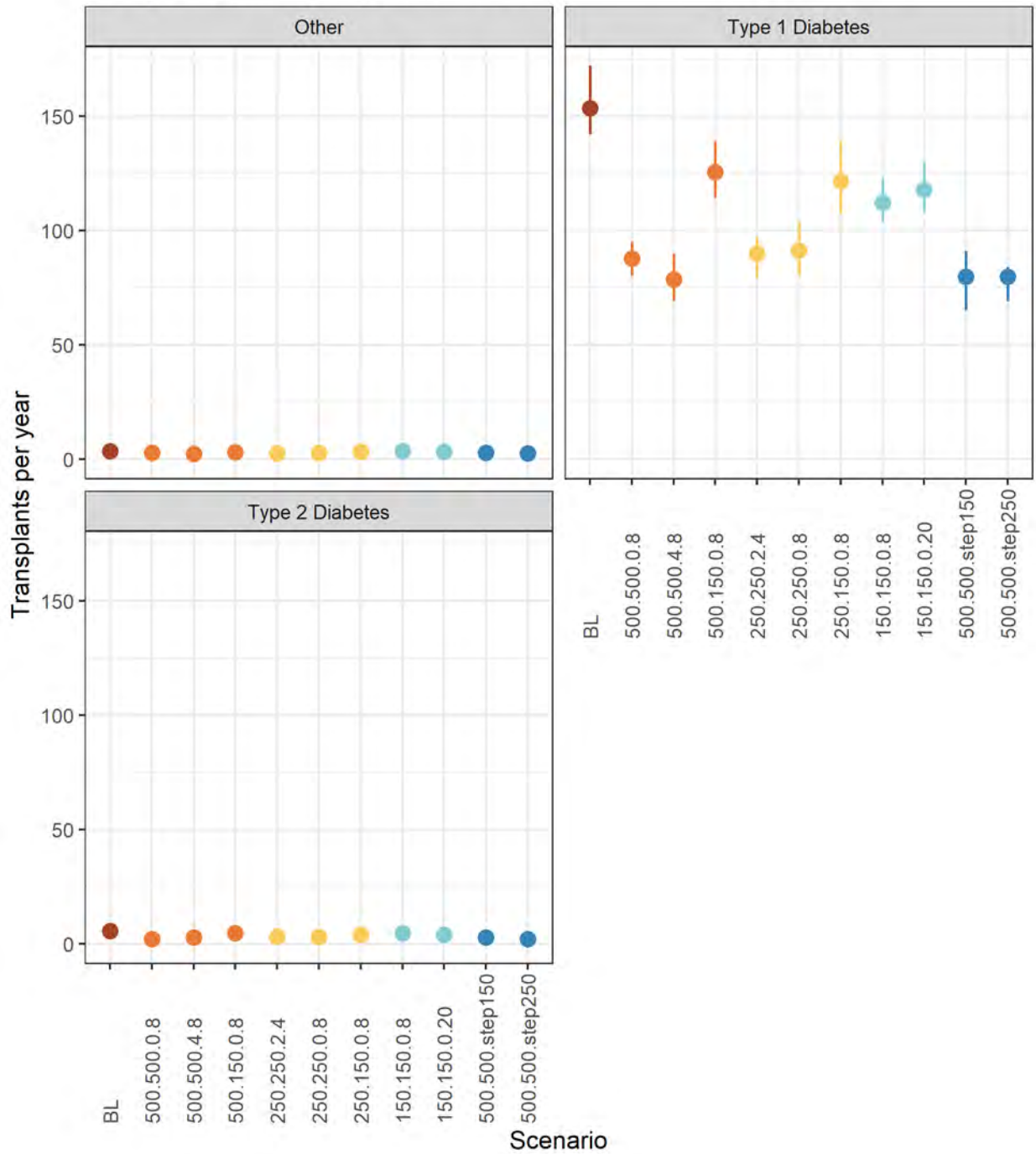
Transplant Counts by Diagnosis: Kidney

Transplant Counts by Diagnosis: Kidney-Pancreas



Transplant Counts by Diagnosis: Kidney-Pancreas

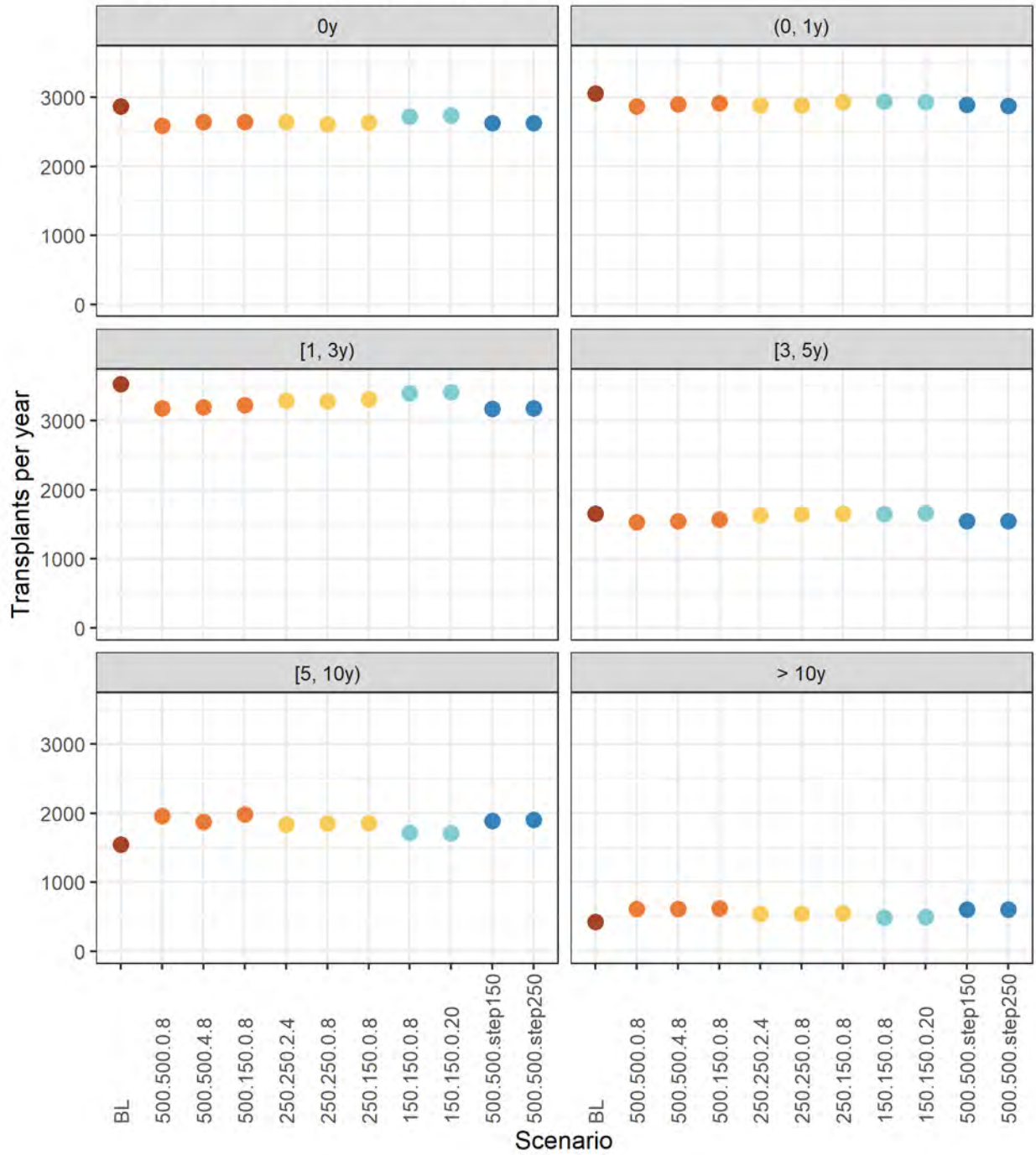
Transplant Counts by Diagnosis: Pancreas



Transplant Counts by Diagnosis: Pancreas

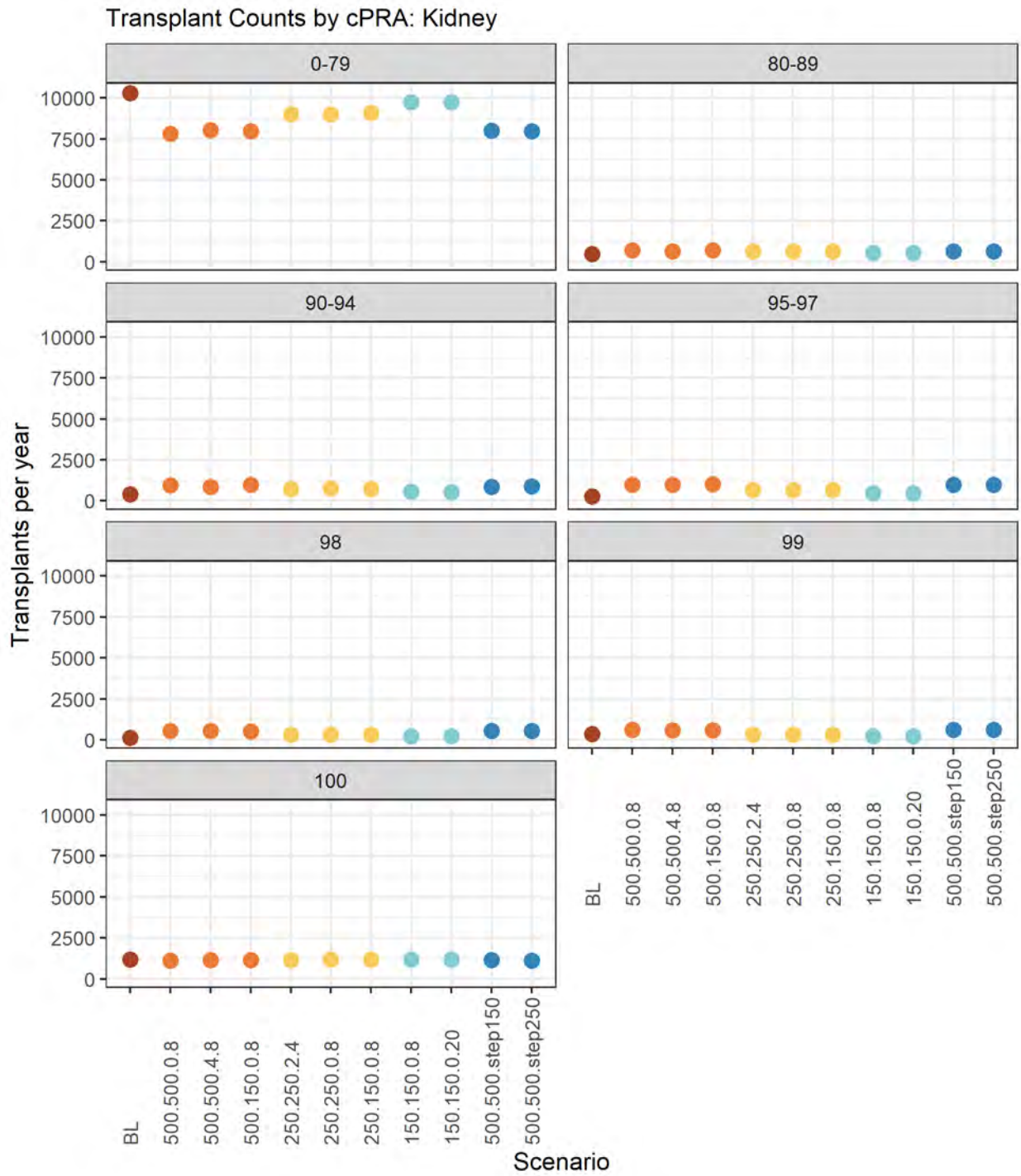
Transplant Counts: Dialysis Time

Transplant Counts by Dialysis Time: Kidney



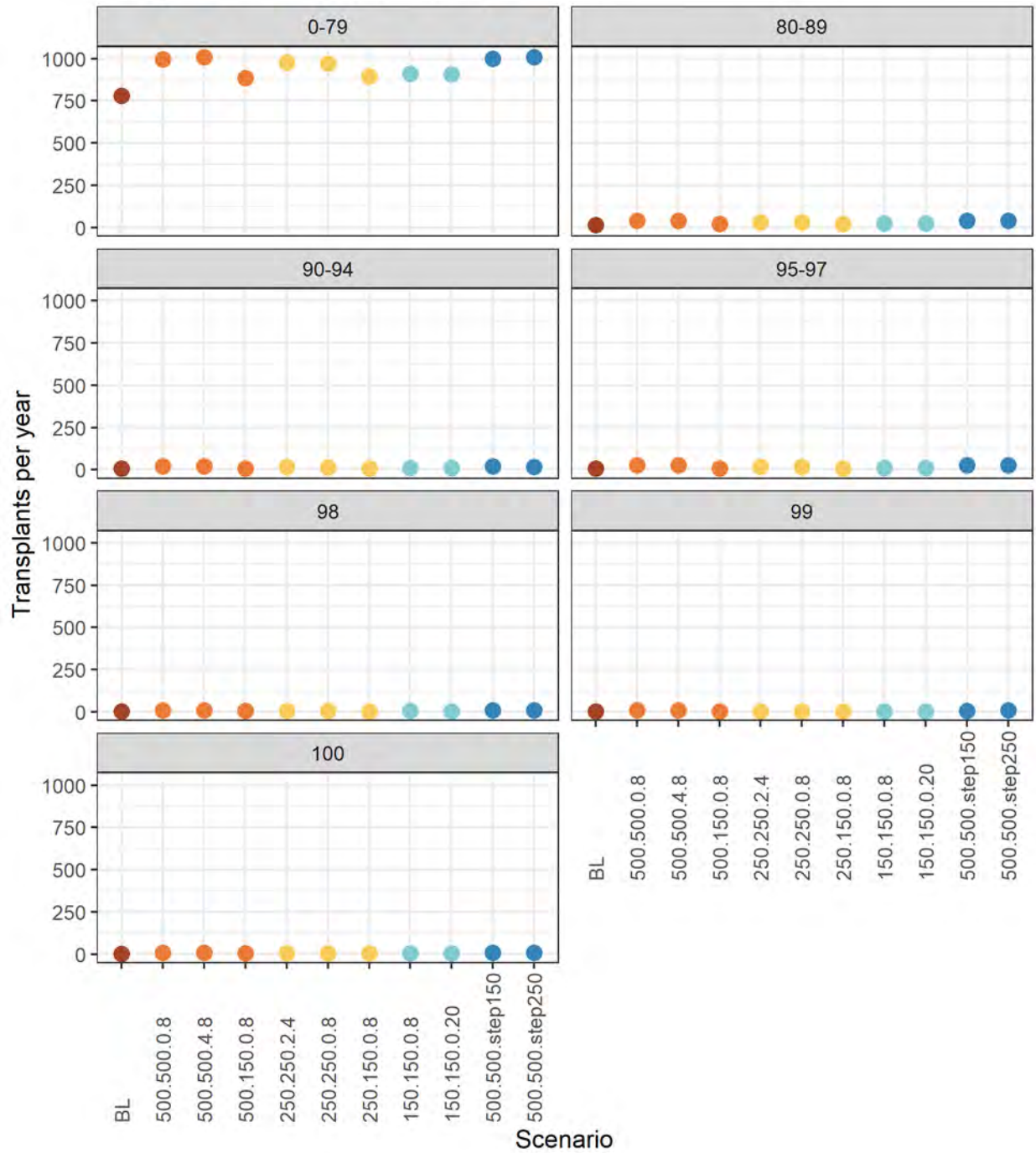
Transplant Counts by Dialysis Time: Kidney

Transplant Counts: cPRA

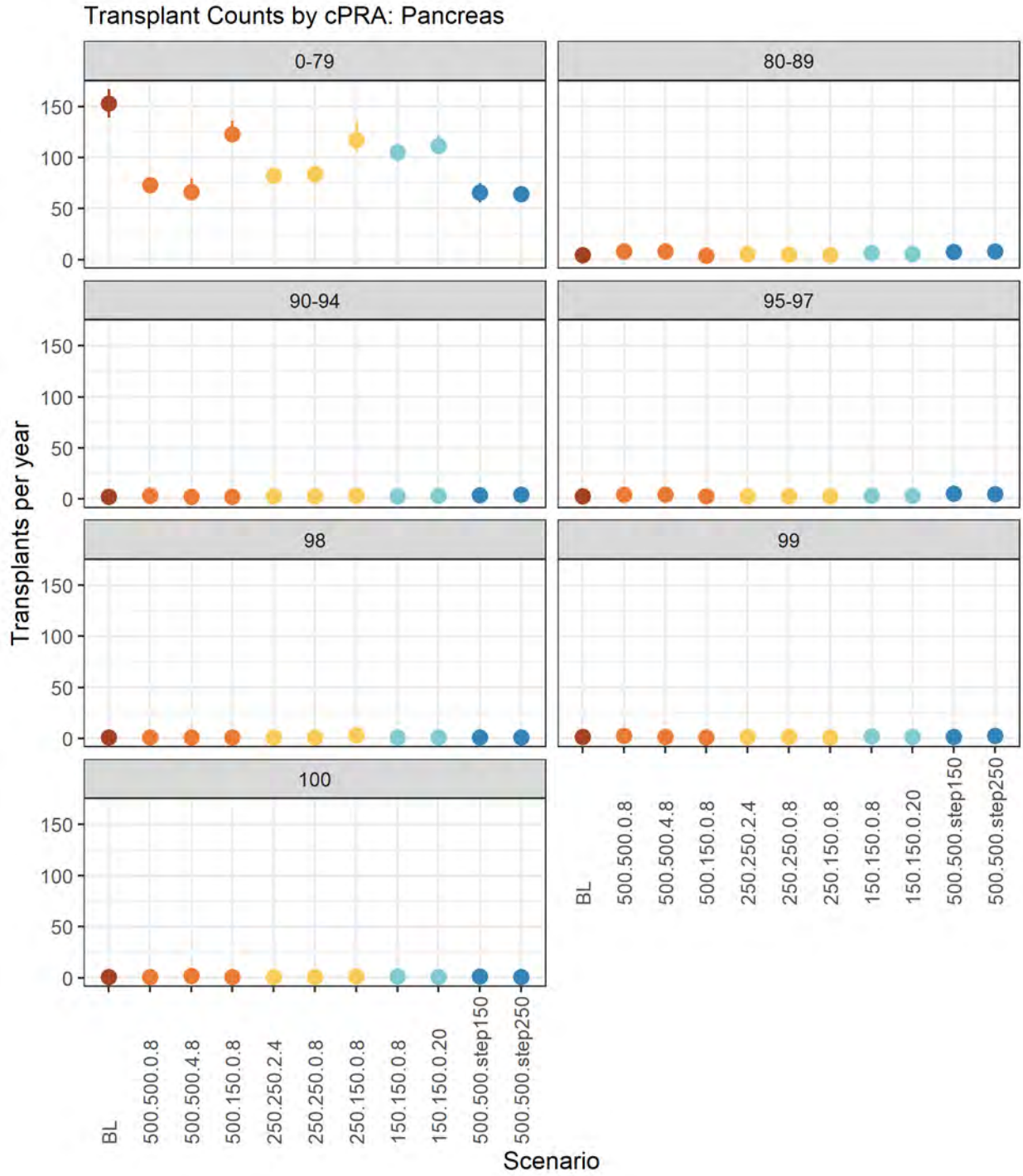


Transplant Counts by cPRA: Kidney

Transplant Counts by cPRA: Kidney-Pancreas



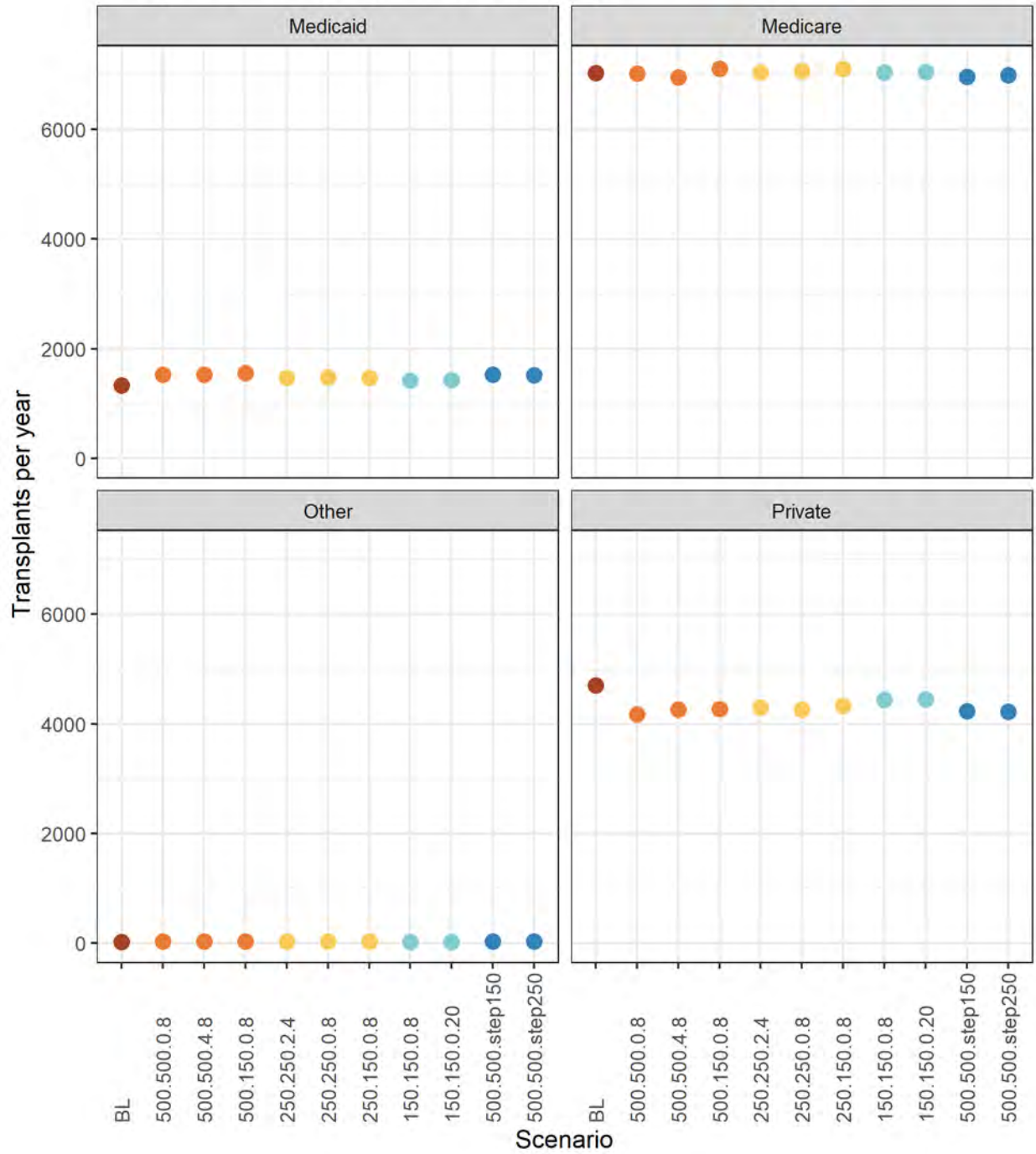
Transplant Counts by cPRA: Kidney-Pancreas



Transplant Counts by cPRA: Pancreas

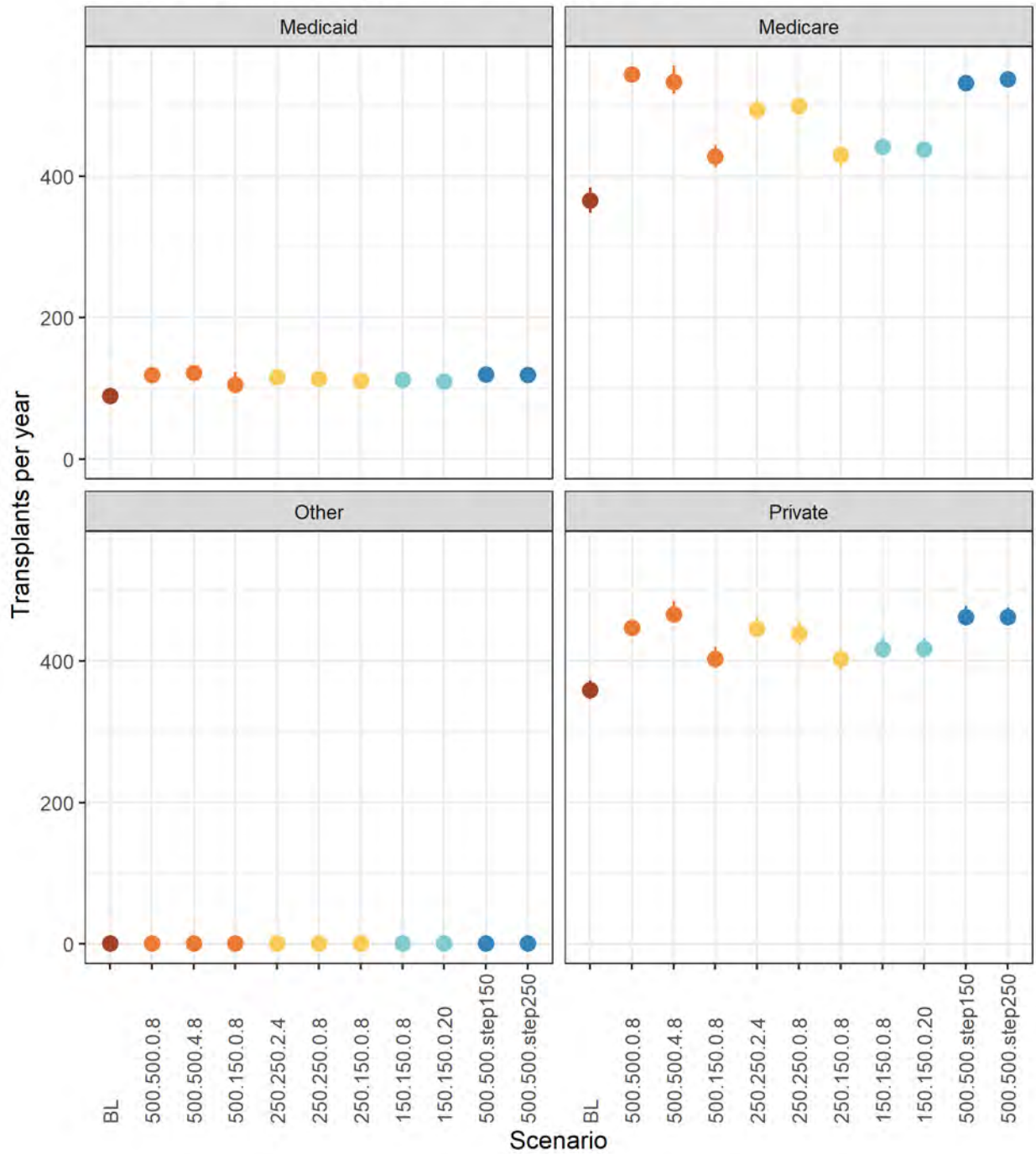
Transplant Counts: Payment Status

Transplant Counts by Payment Status: Kidney



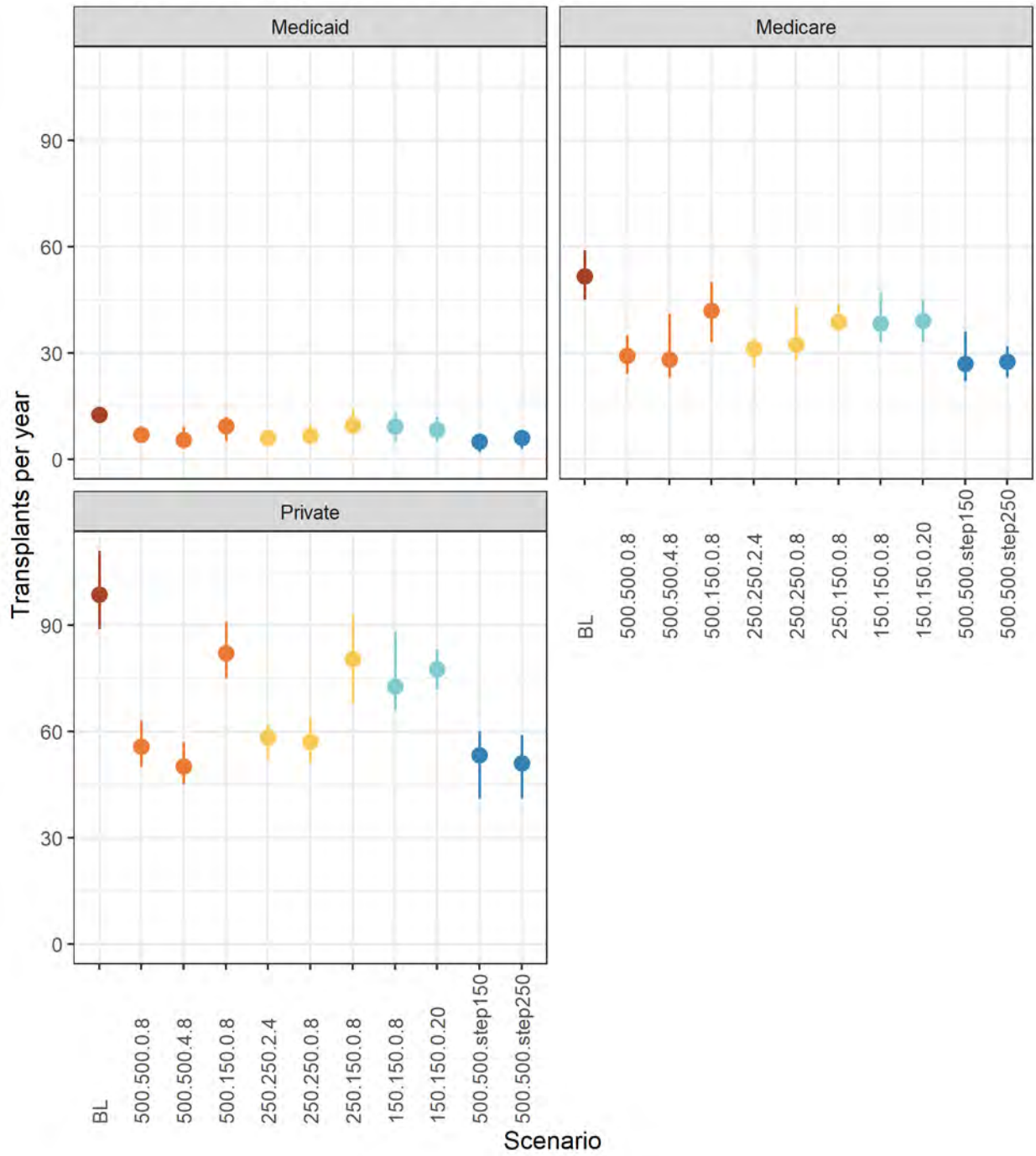
Transplant Counts by Payment Status: Kidney

Transplant Counts by Payment Status: Kidney-Pancreas



Transplant Counts by Payment Status: Kidney-Pancreas

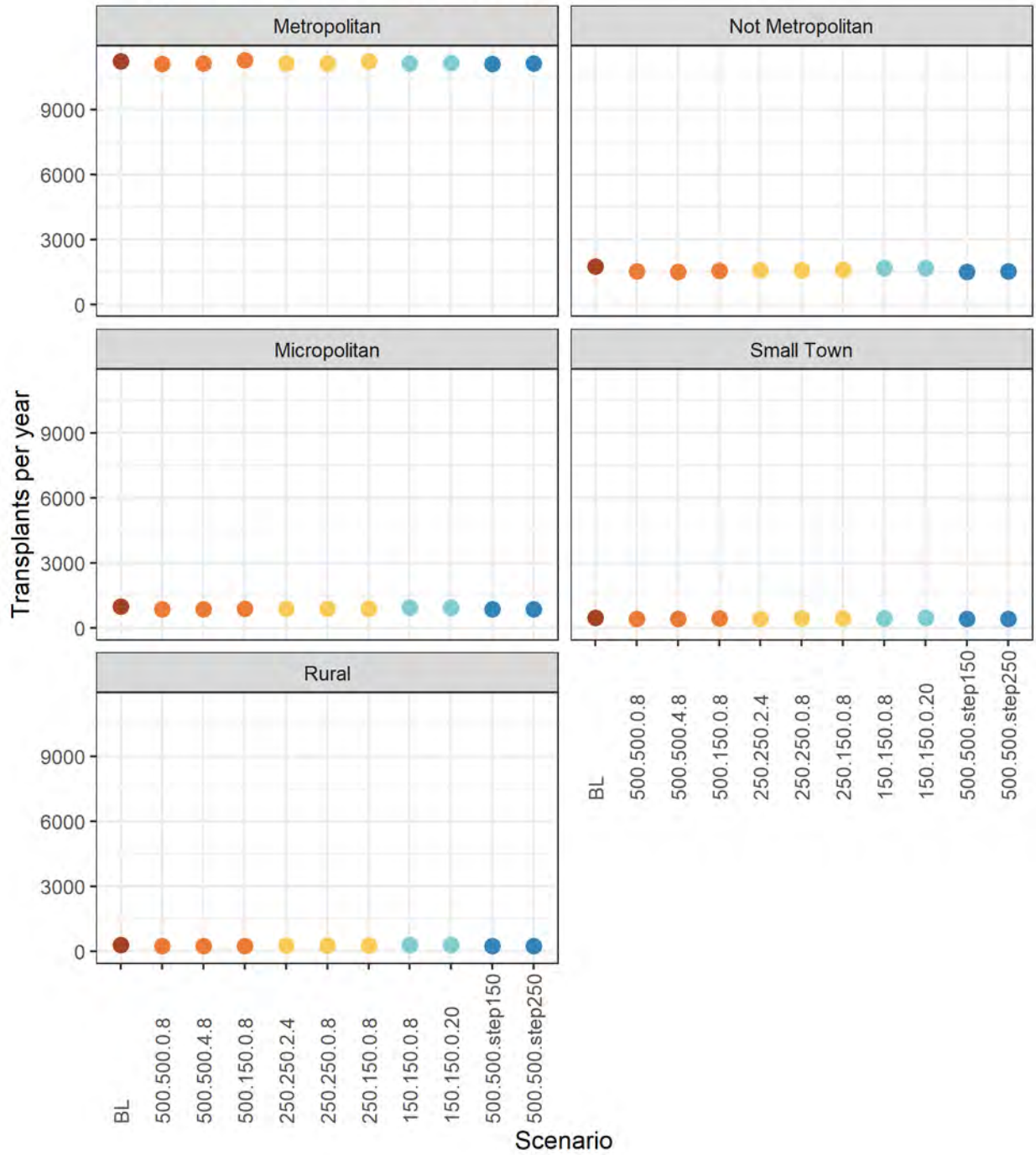
Transplant Counts by Payment Status: Pancreas



Transplant Counts by Payment Status: Pancreas

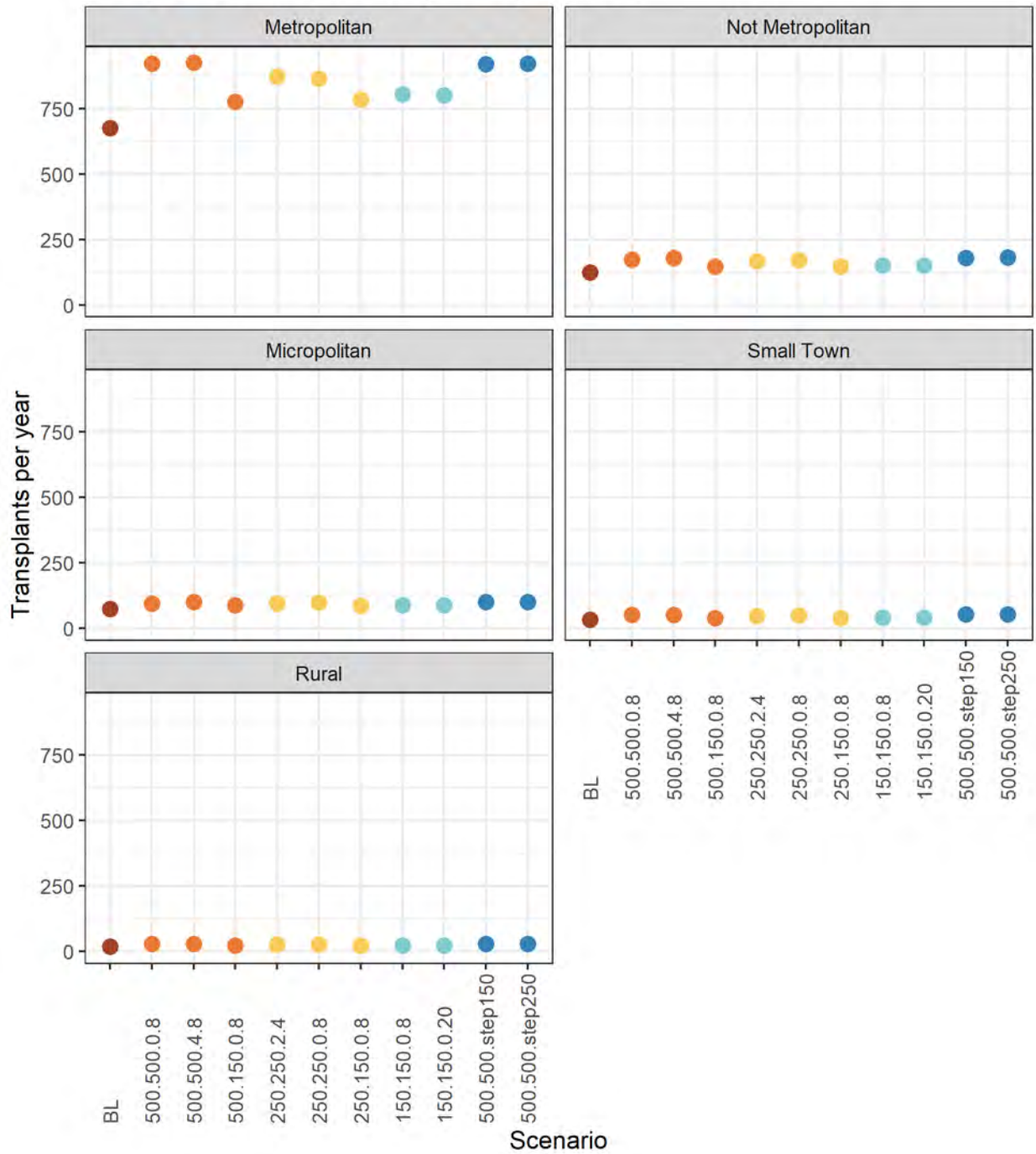
Transplant Counts: Urbanicity

Transplant Counts by Urbanicity: Kidney



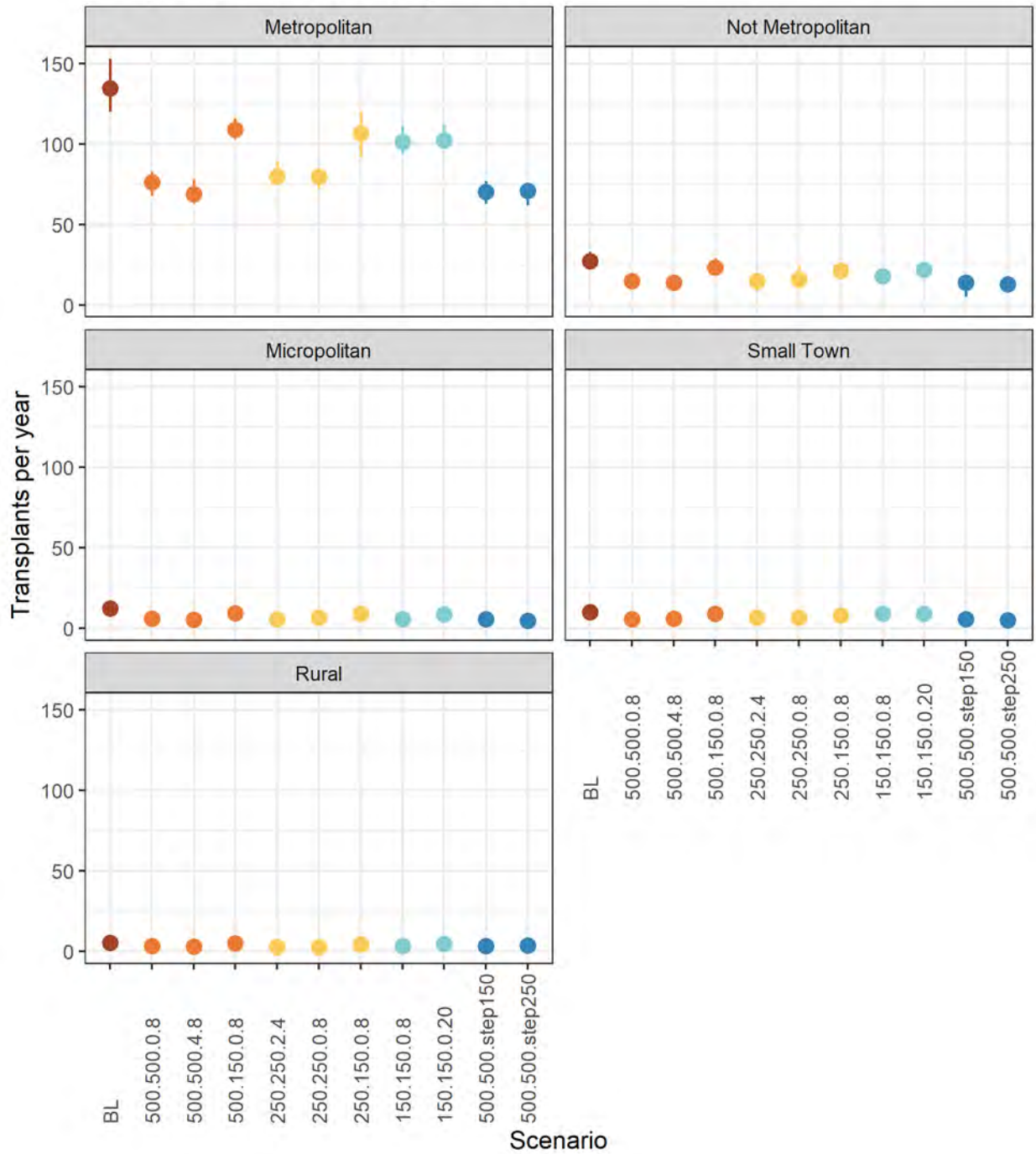
Transplant Counts by Urbanicity: Kidney

Transplant Counts by Urbanicity: Kidney-Pancreas



Transplant Counts by Urbanicity: Kidney-Pancreas

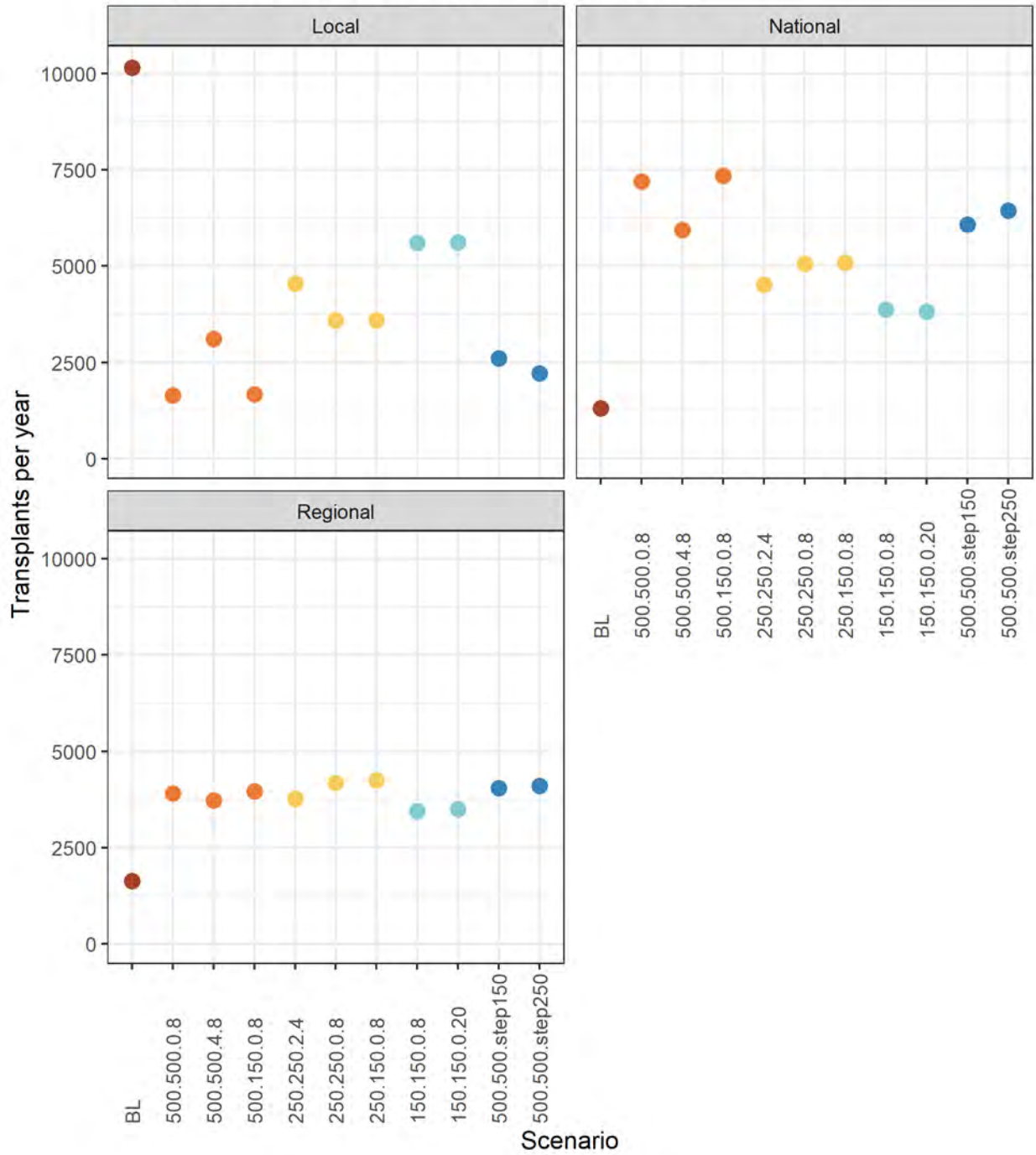
Transplant Counts by Urbanicity: Pancreas



Transplant Counts by Urbanicity: Pancreas

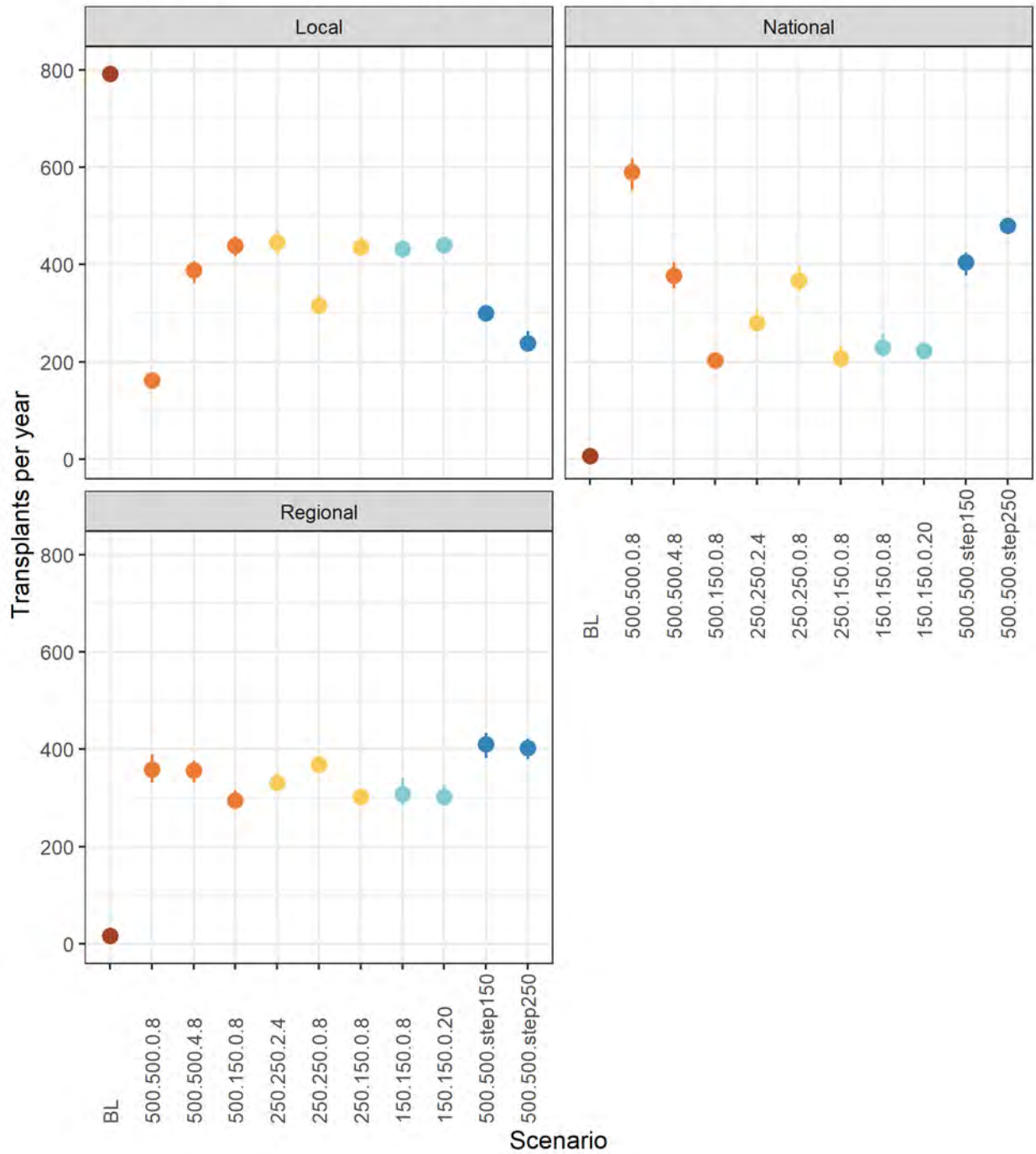
Transplant Counts: Local/Regional/National

Transplant Counts by Local/Regional/National: Kidney



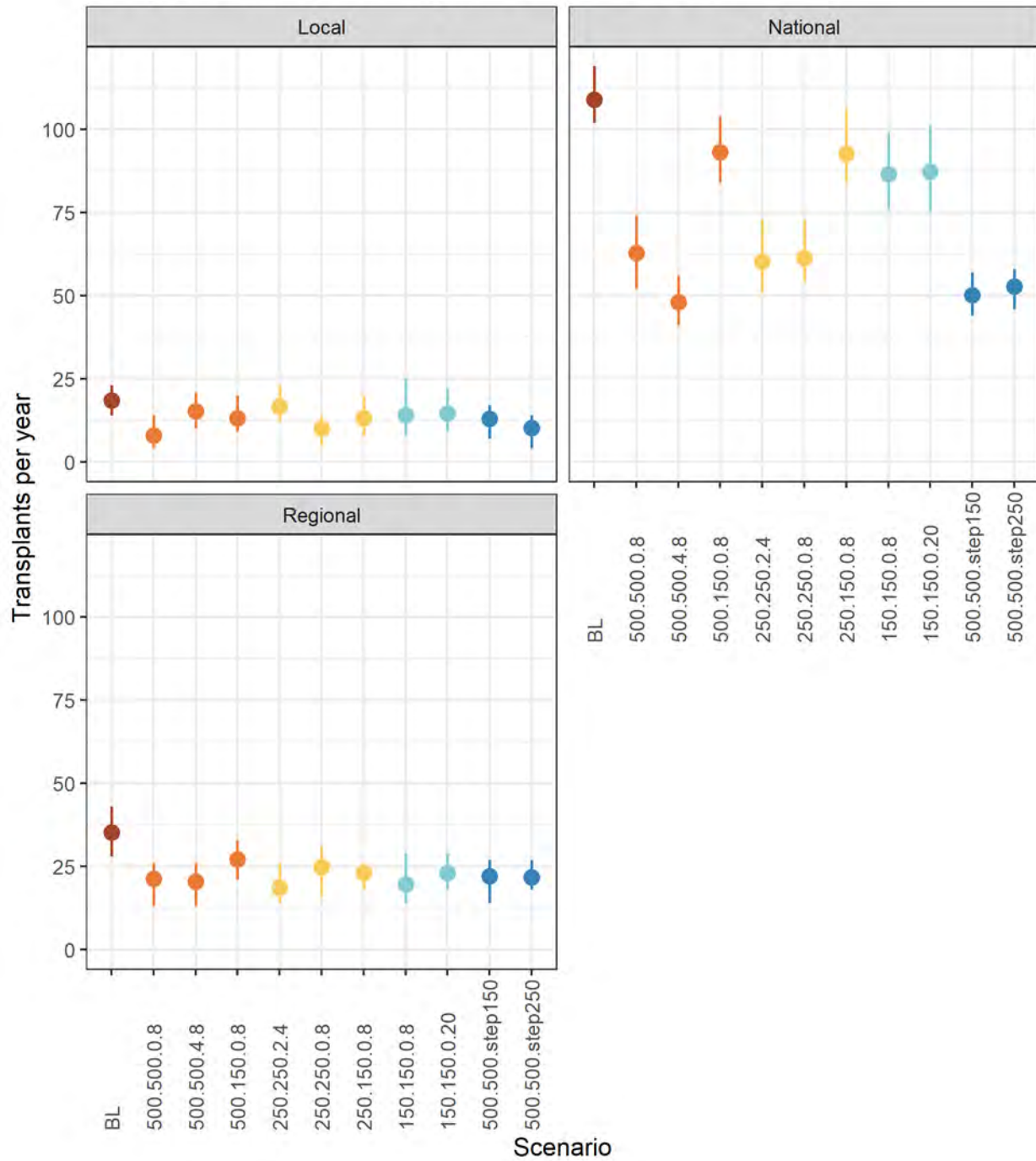
Transplant Counts by Local/Regional/National: Kidney

Transplant Counts by Local/Regional/National: Kidney-Pancreas



Transplant Counts by Local/Regional/National: Kidney-Pancreas

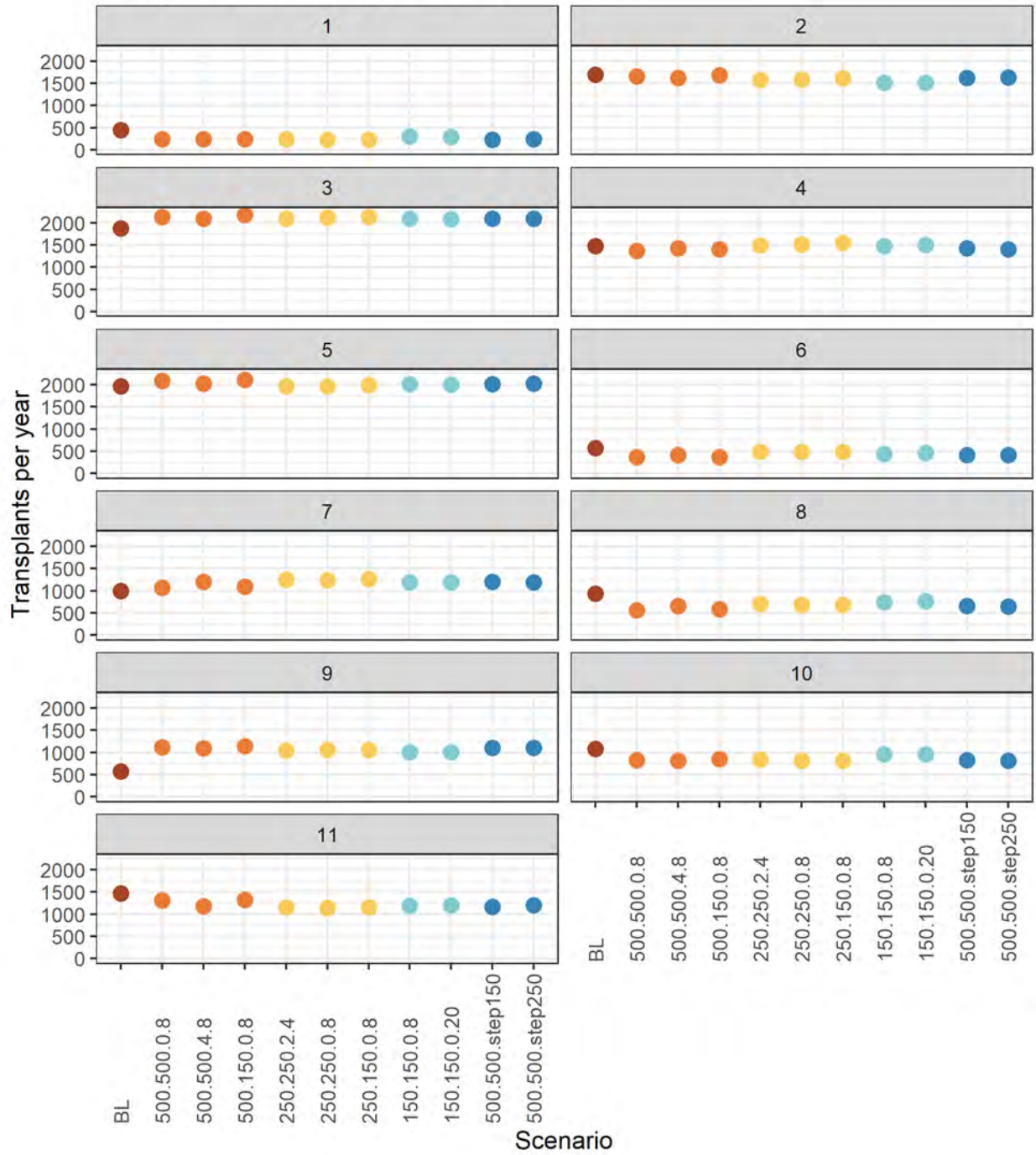
Transplant Counts by Local/Regional/National: Pancreas



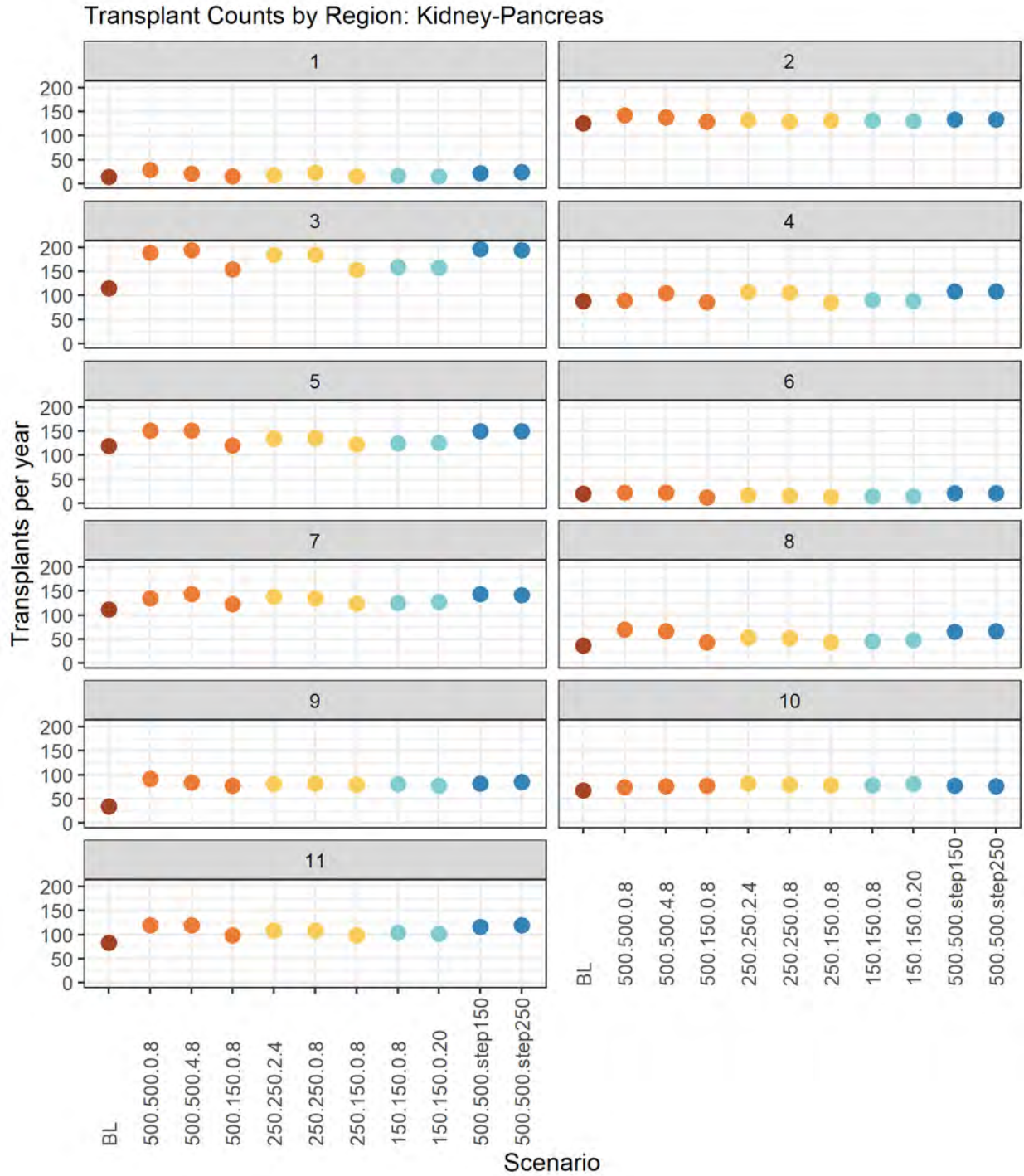
Transplant Counts by Local/Regional/National: Pancreas

Transplant Counts: Region

Transplant Counts by Region: Kidney

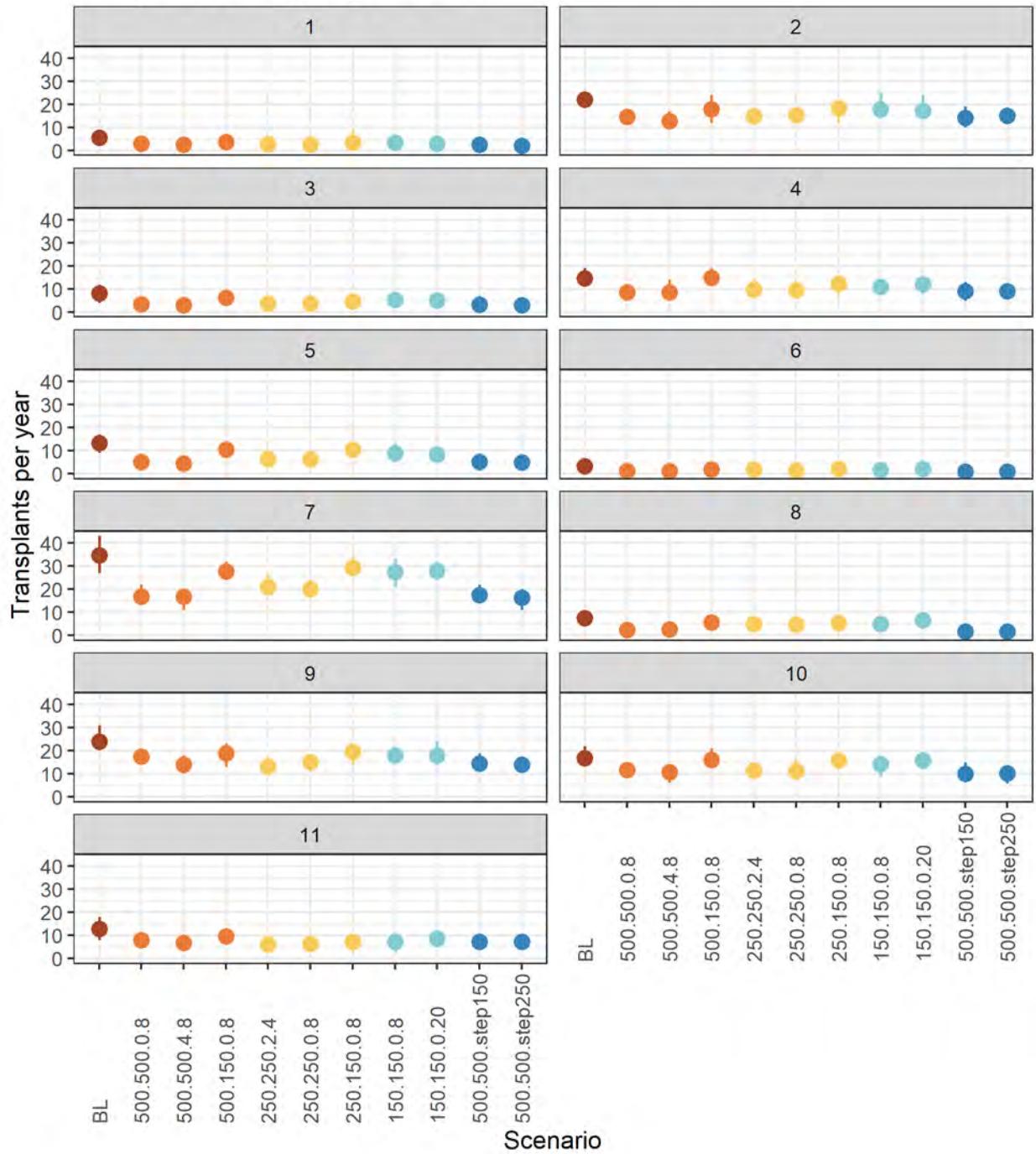


Transplant Counts by Region: Kidney



Transplant Counts by Region: Kidney-Pancreas

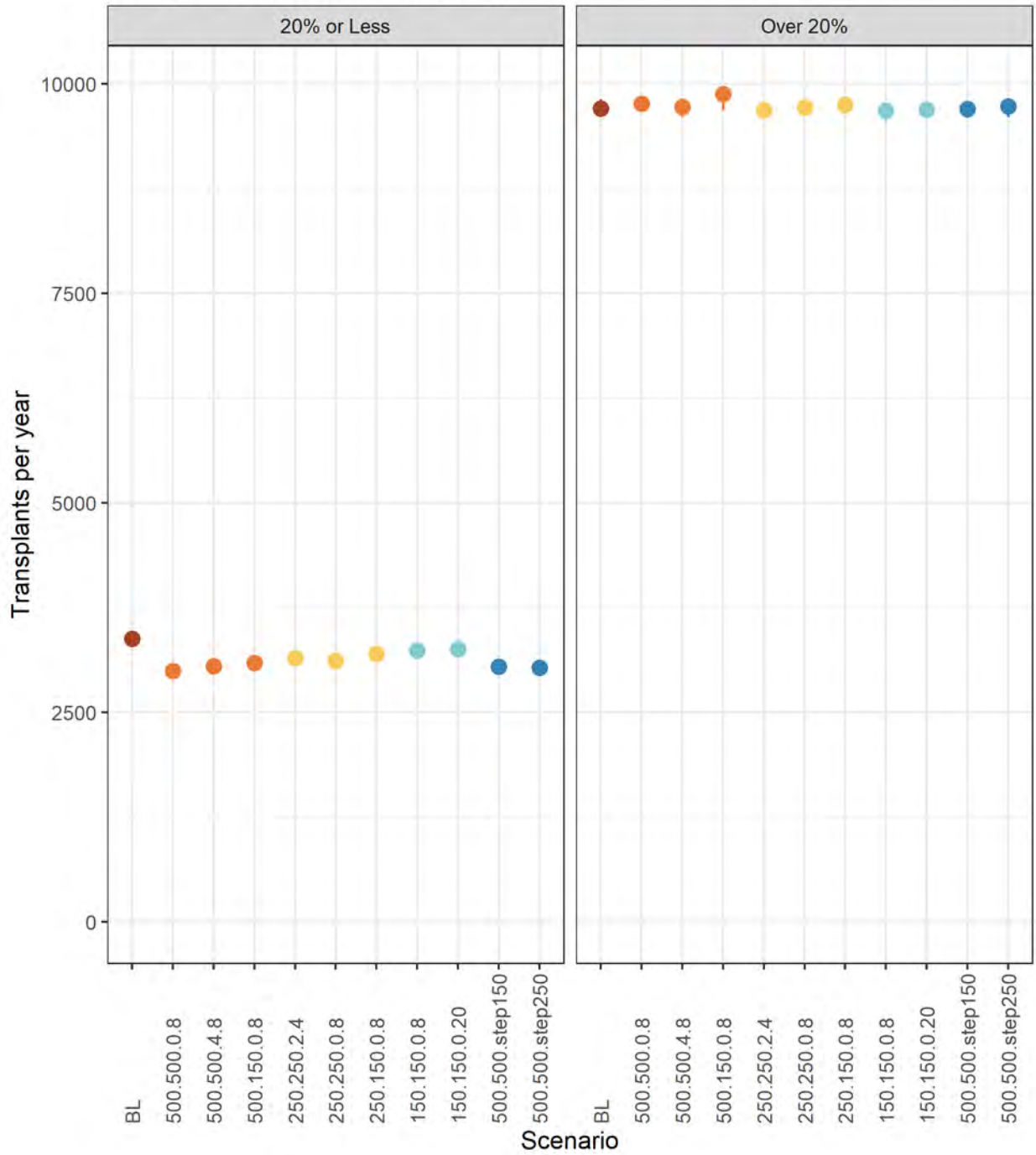
Transplant Counts by Region: Pancreas



Transplant Counts by Region: Pancreas

Transplant Counts: EPTS

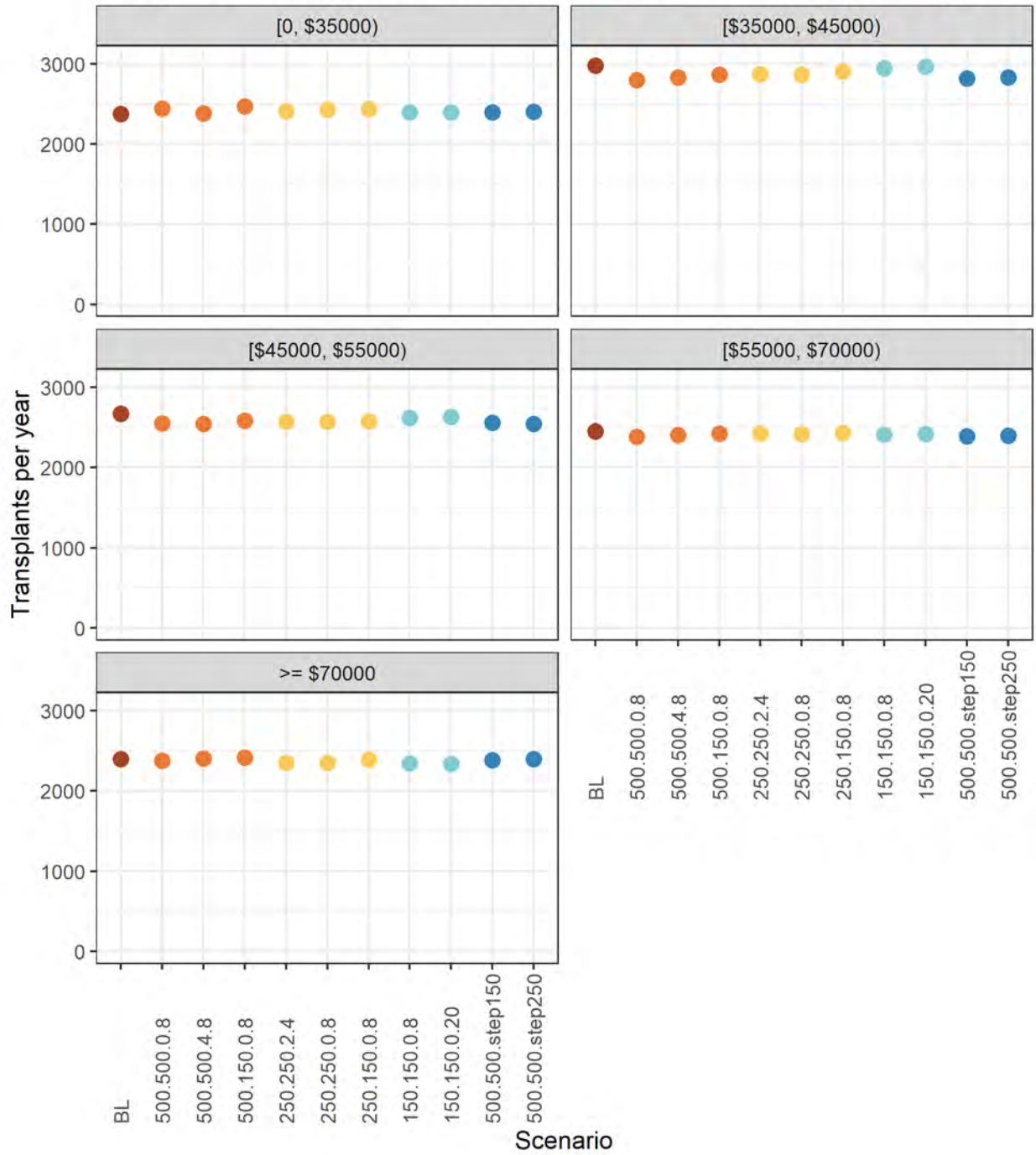
Transplant Counts by EPTS: Kidney



Transplant Counts by EPTS: Kidney

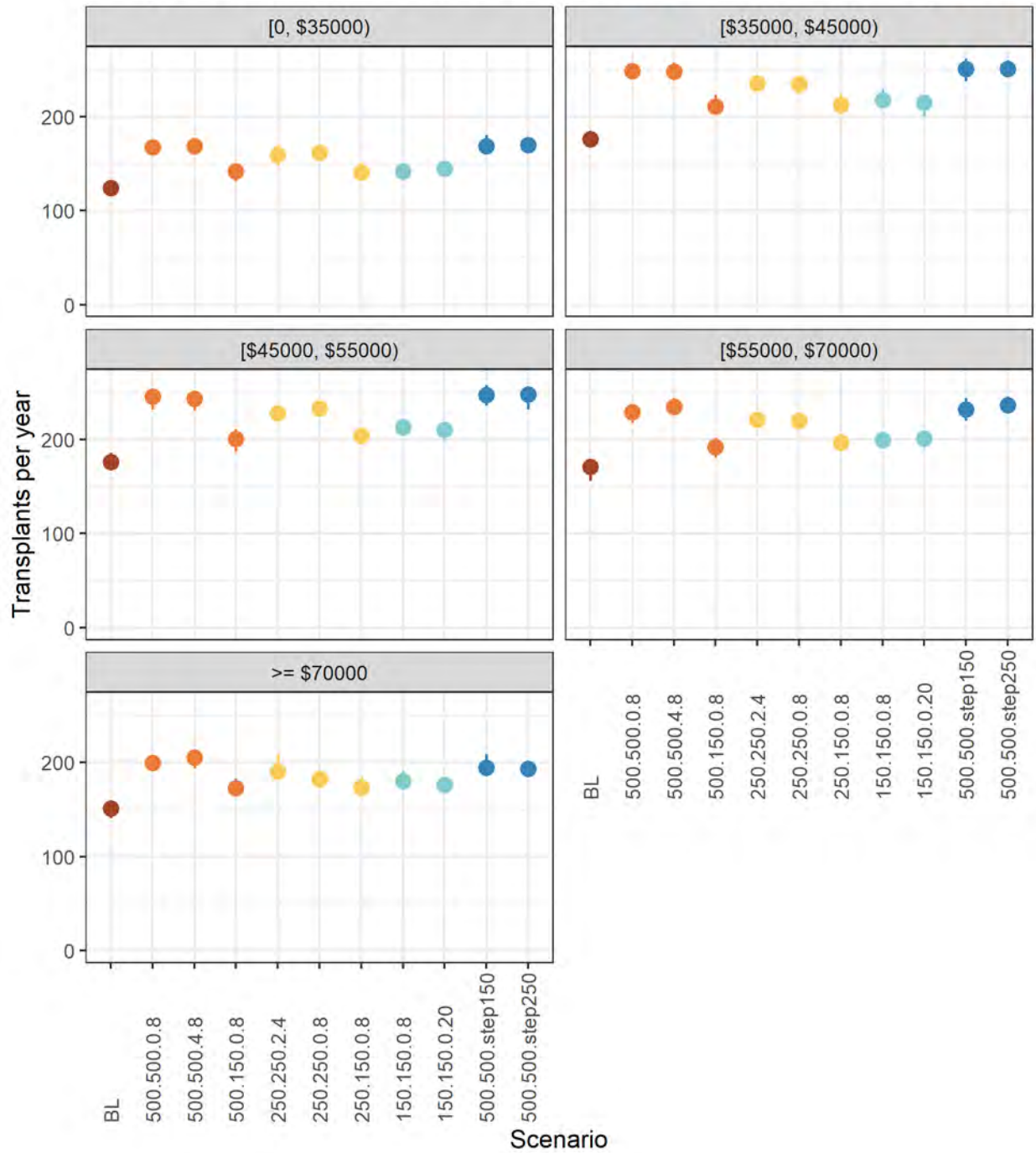
Transplant Counts: Median Household Income of Candidate Permanent Zip Code

Transplant Counts by Median Household Income of Candidate Permanent Zip Code: Kidney



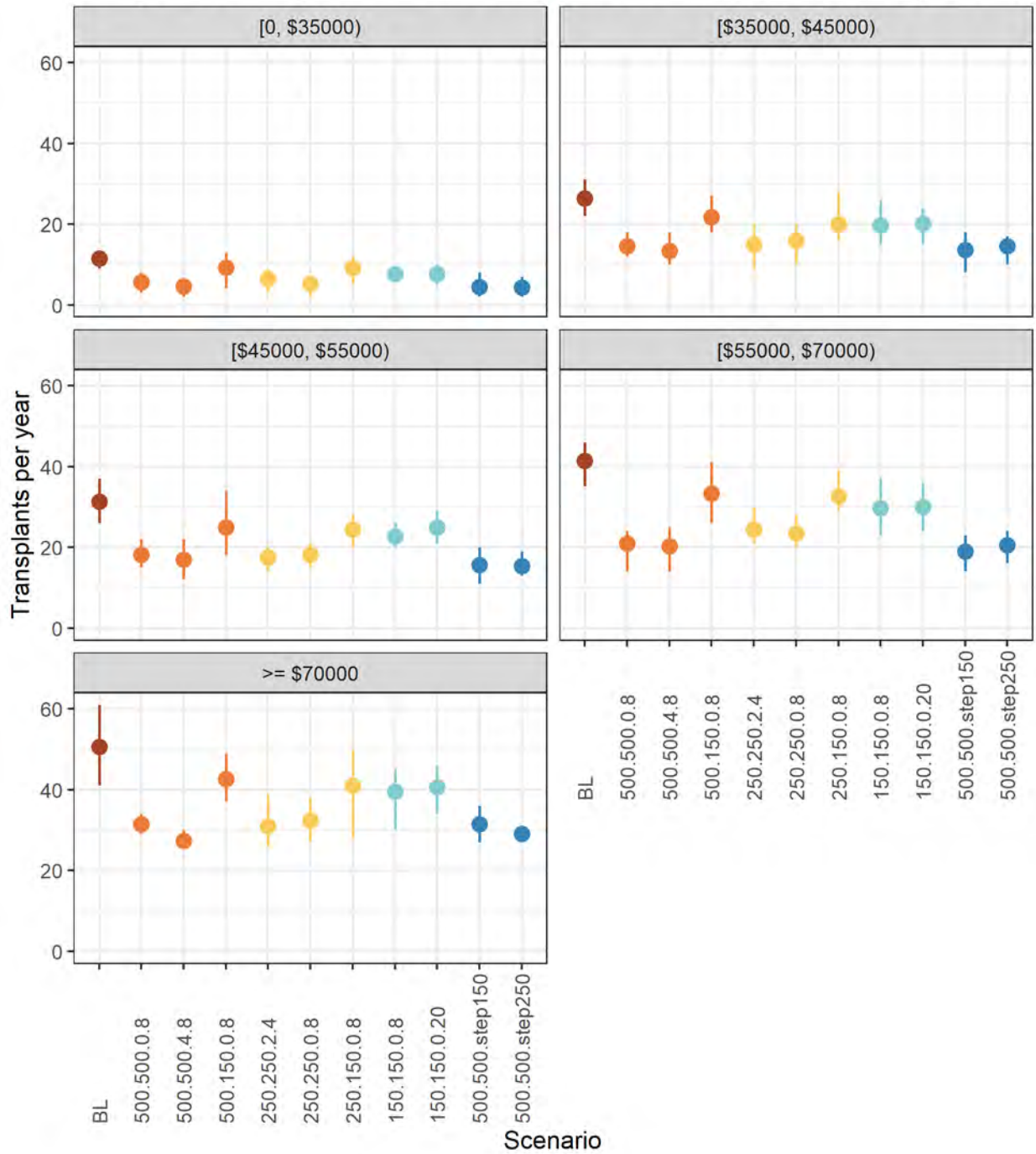
Transplant Counts by Median Household Income of Candidate Permanent Zip Code: Kidney

Transplant Counts by Median Household Income of Candidate Permanent Zip Code: Ki



Transplant Counts by Median Household Income of Candidate Permanent Zip Code: Kidney-Pancreas

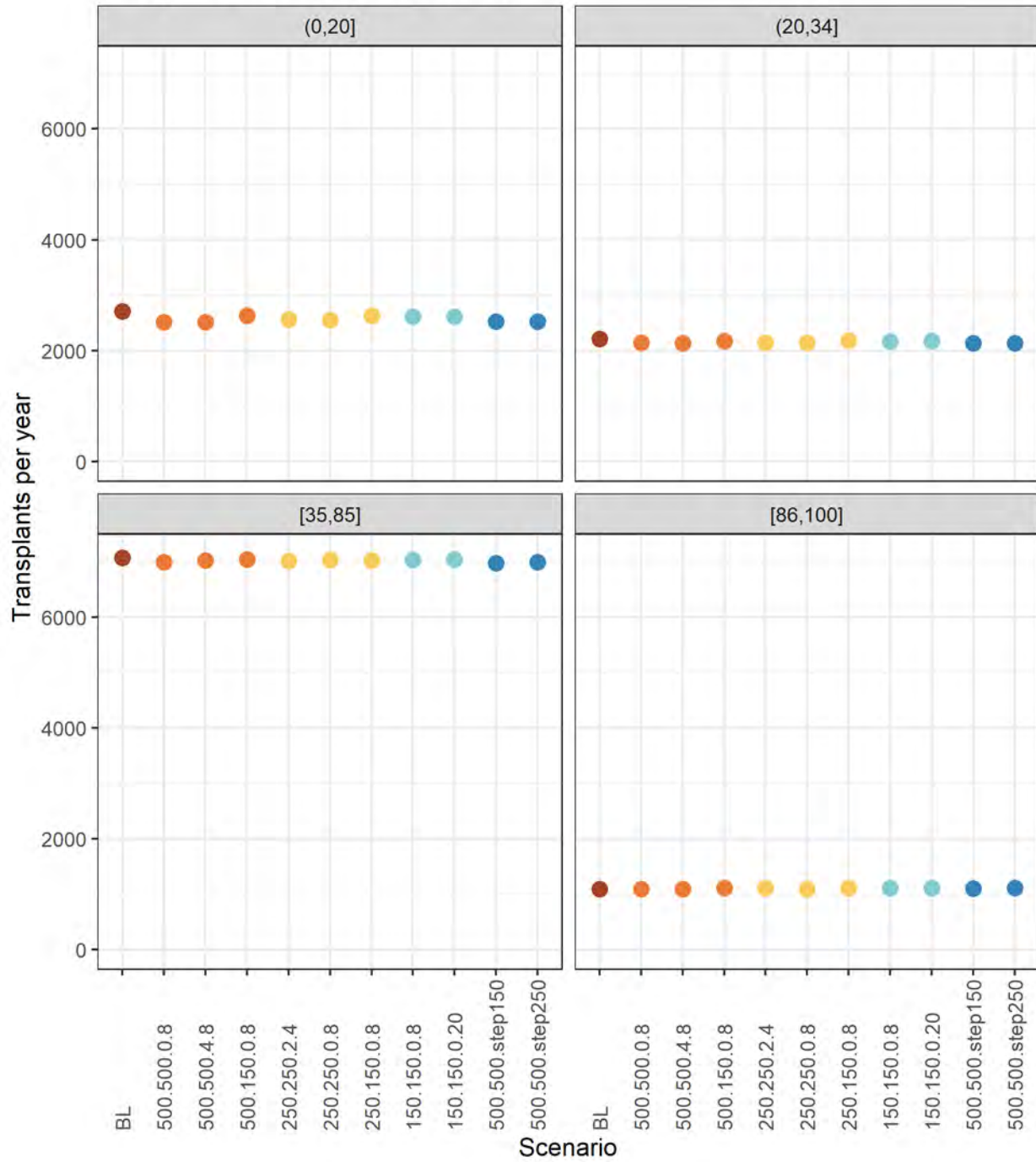
Transplant Counts by Median Household Income of Candidate Permanent Zip Code: Pa



Transplant Counts by Median Household Income of Candidate Permanent Zip Code: Pancreas

Transplant Counts: Donor KDPI

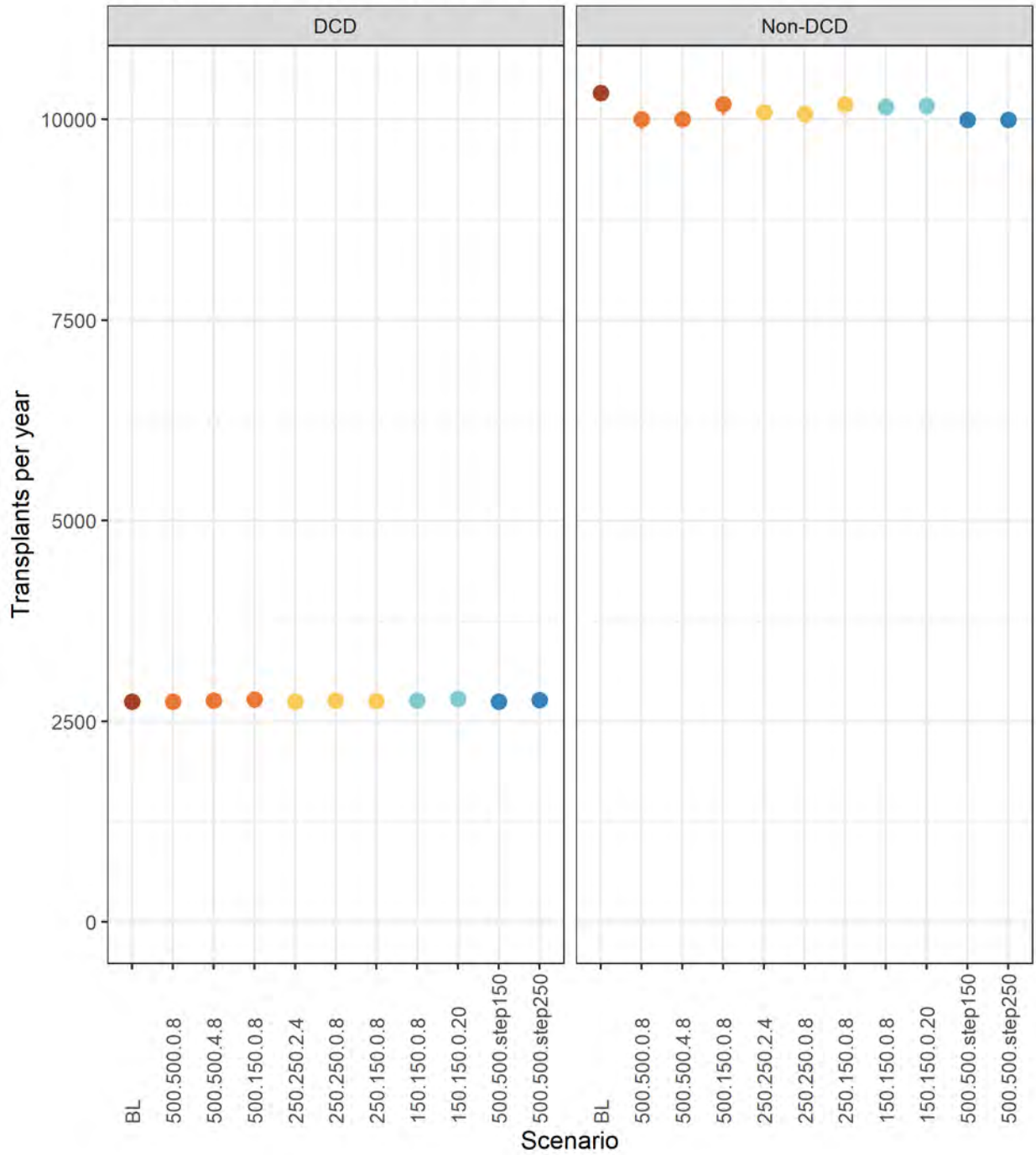
Transplant Counts by Donor KDPI: Kidney



Transplant Counts by Donor KDPI: Kidney

Transplant Counts: DCD Donor

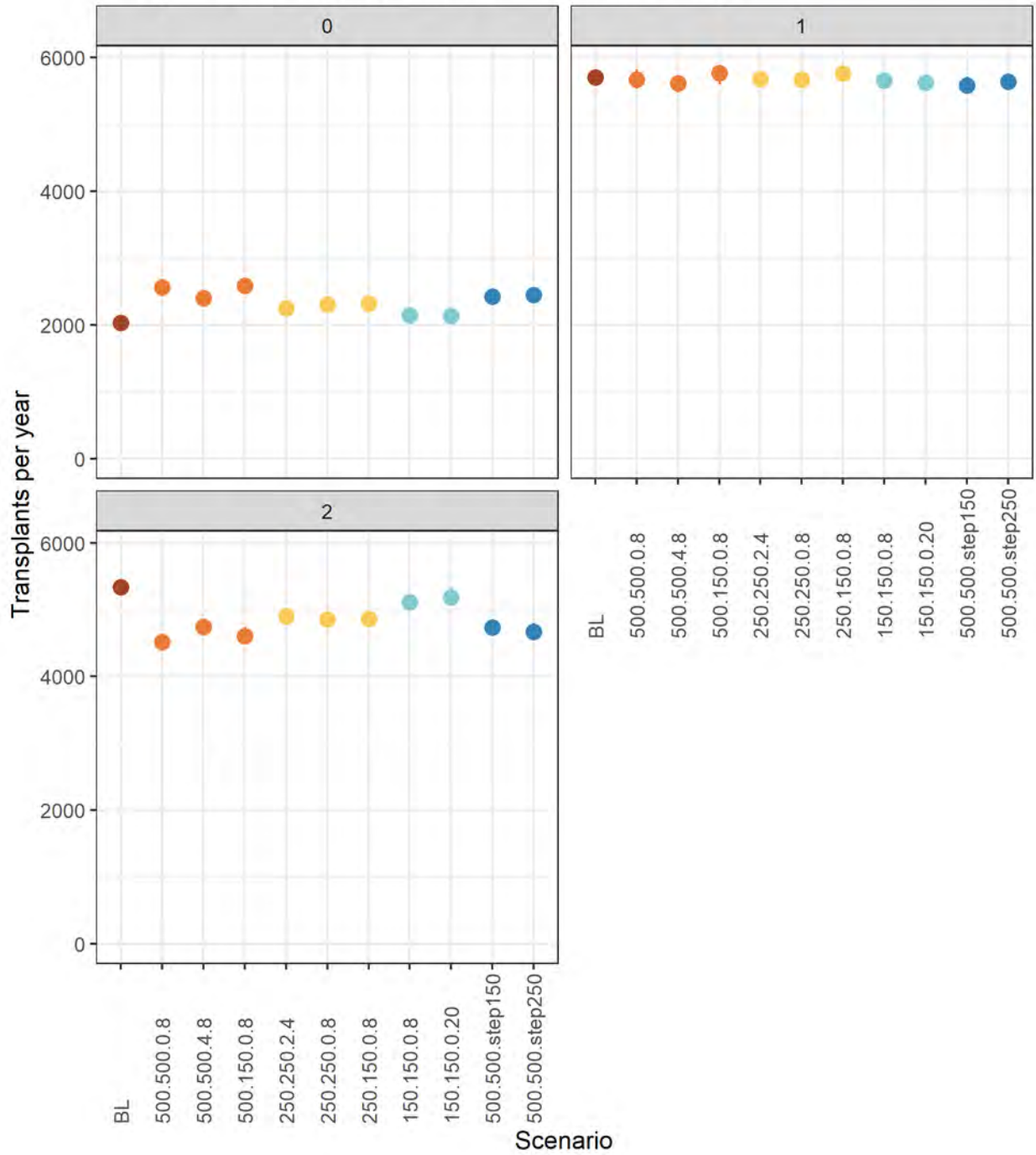
Transplant Counts by DCD Donor: Kidney



Transplant Counts by DCD Donor: Kidney

Transplant Counts: Number of DR mismatches

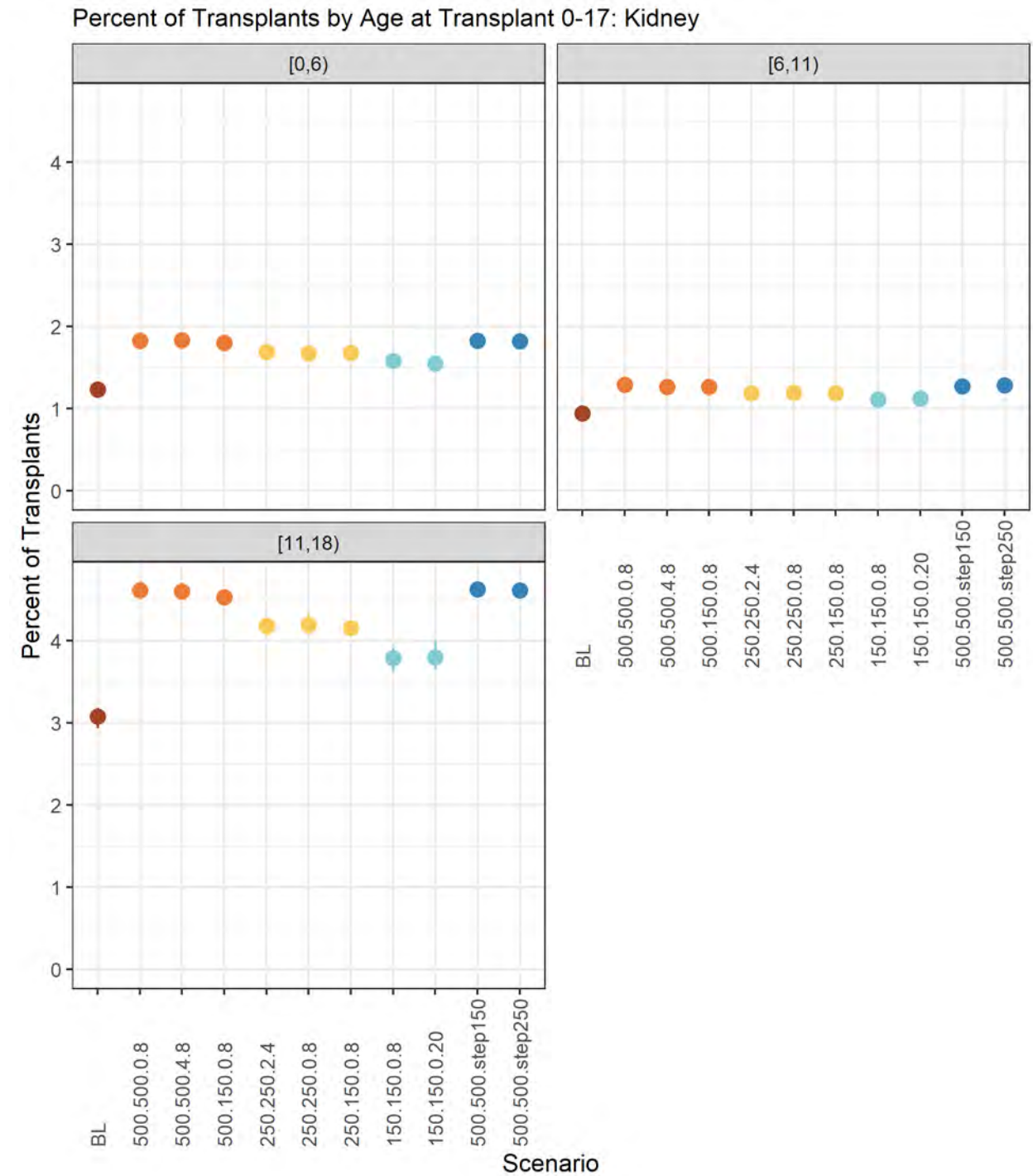
Transplant Counts by Number of DR mismatches: Kidney



Transplant Counts by Number of DR mismatches: Kidney

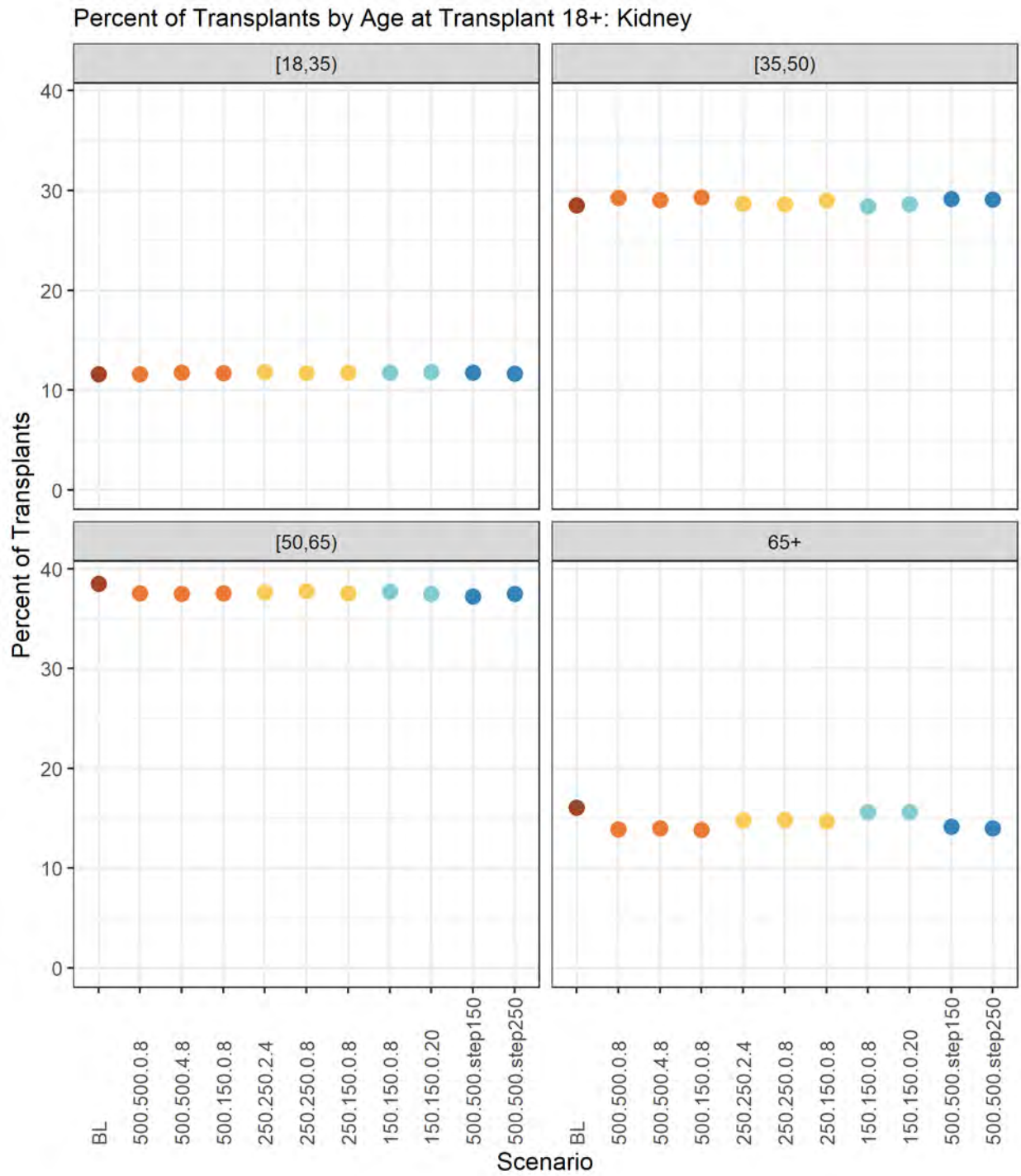
Transplant Percentages

Transplant Percentages: Age at Transplant 0-17



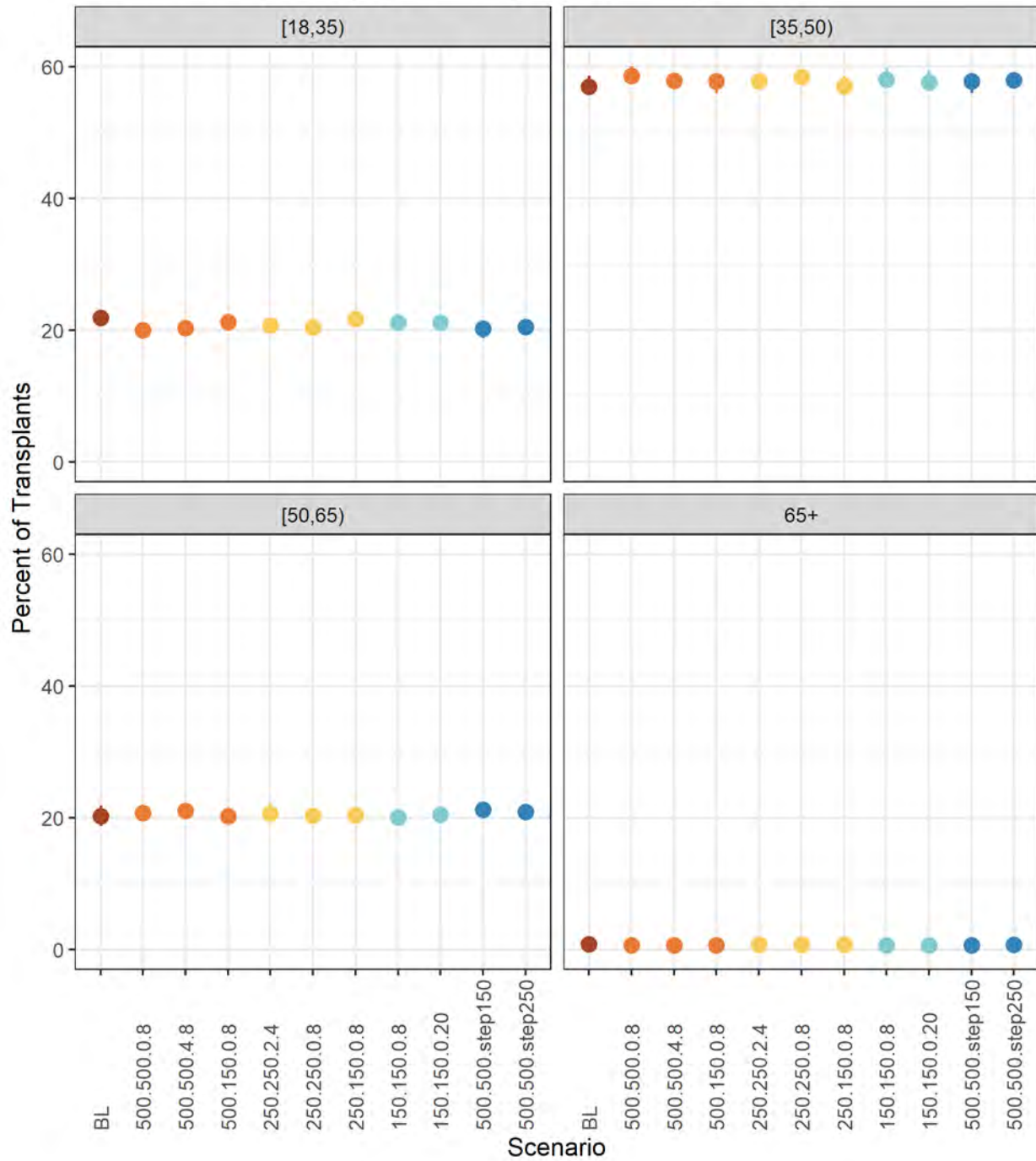
Percent of Transplants by Age at Transplant 0-17: Kidney

Transplant Percentages: Age at Transplant 18+



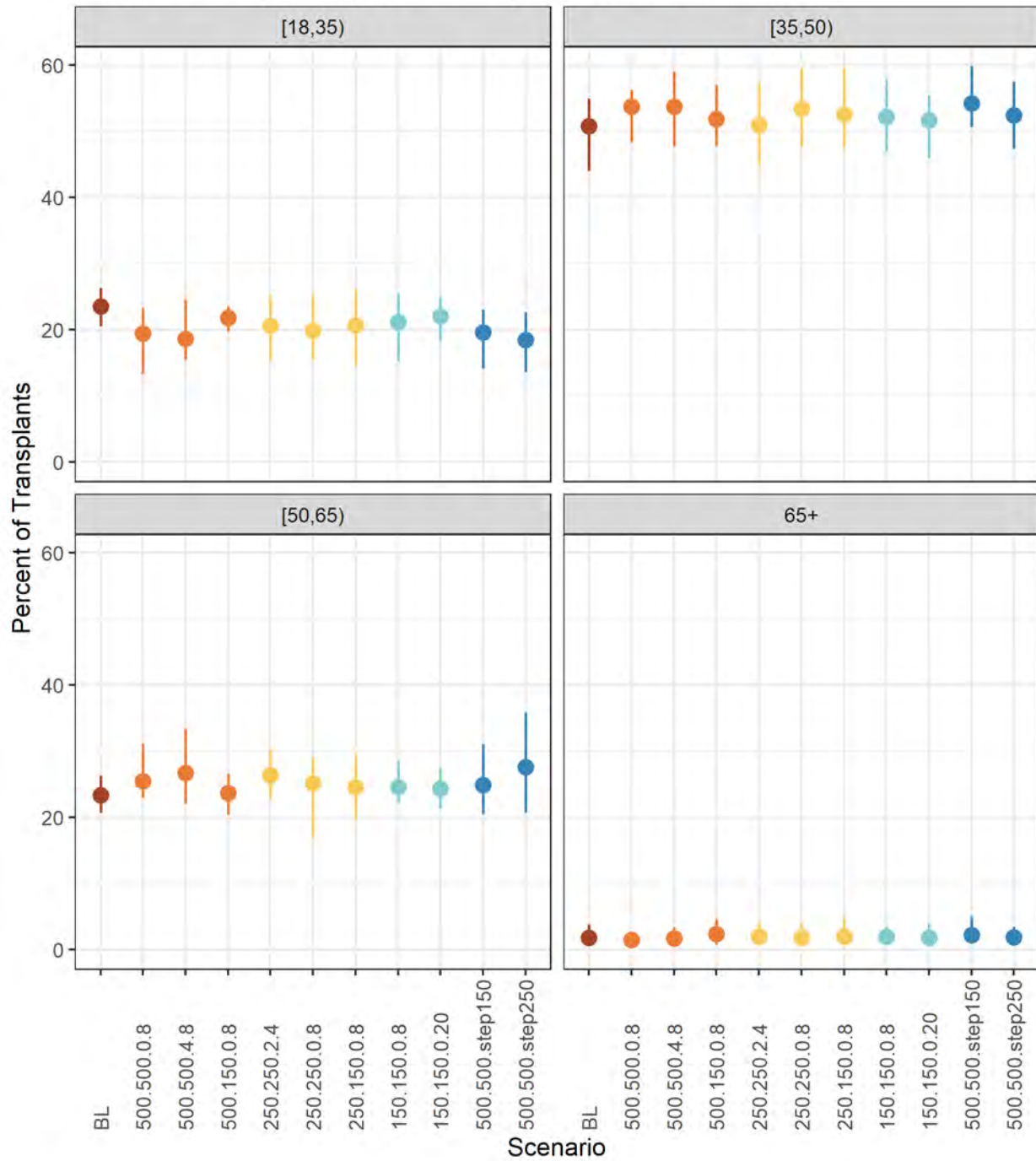
Percent of Transplants by Age at Transplant 18+: Kidney

Percent of Transplants by Age at Transplant 18+: Kidney-Pancreas



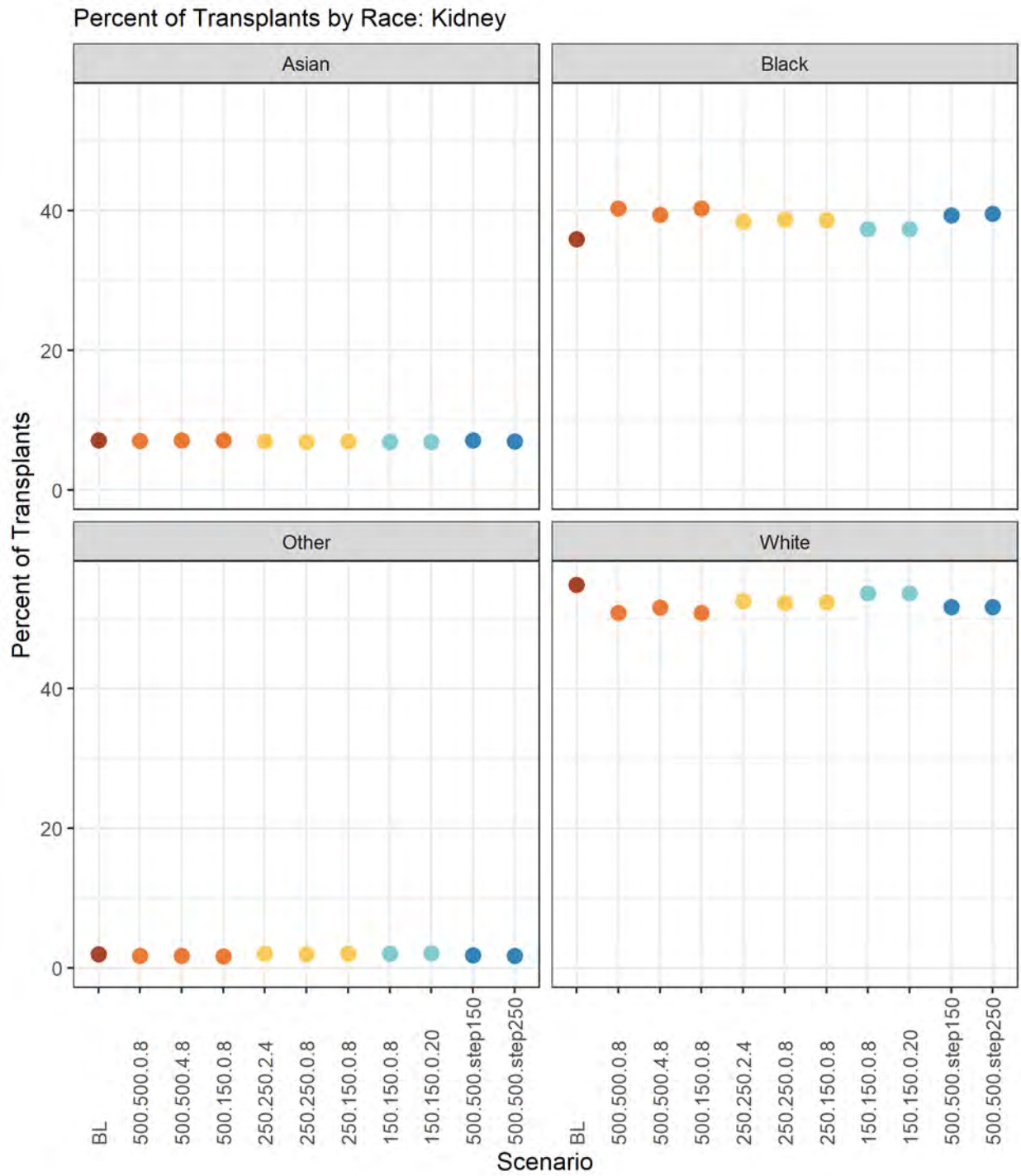
Percent of Transplants by Age at Transplant 18+: Kidney-Pancreas

Percent of Transplants by Age at Transplant 18+: Pancreas



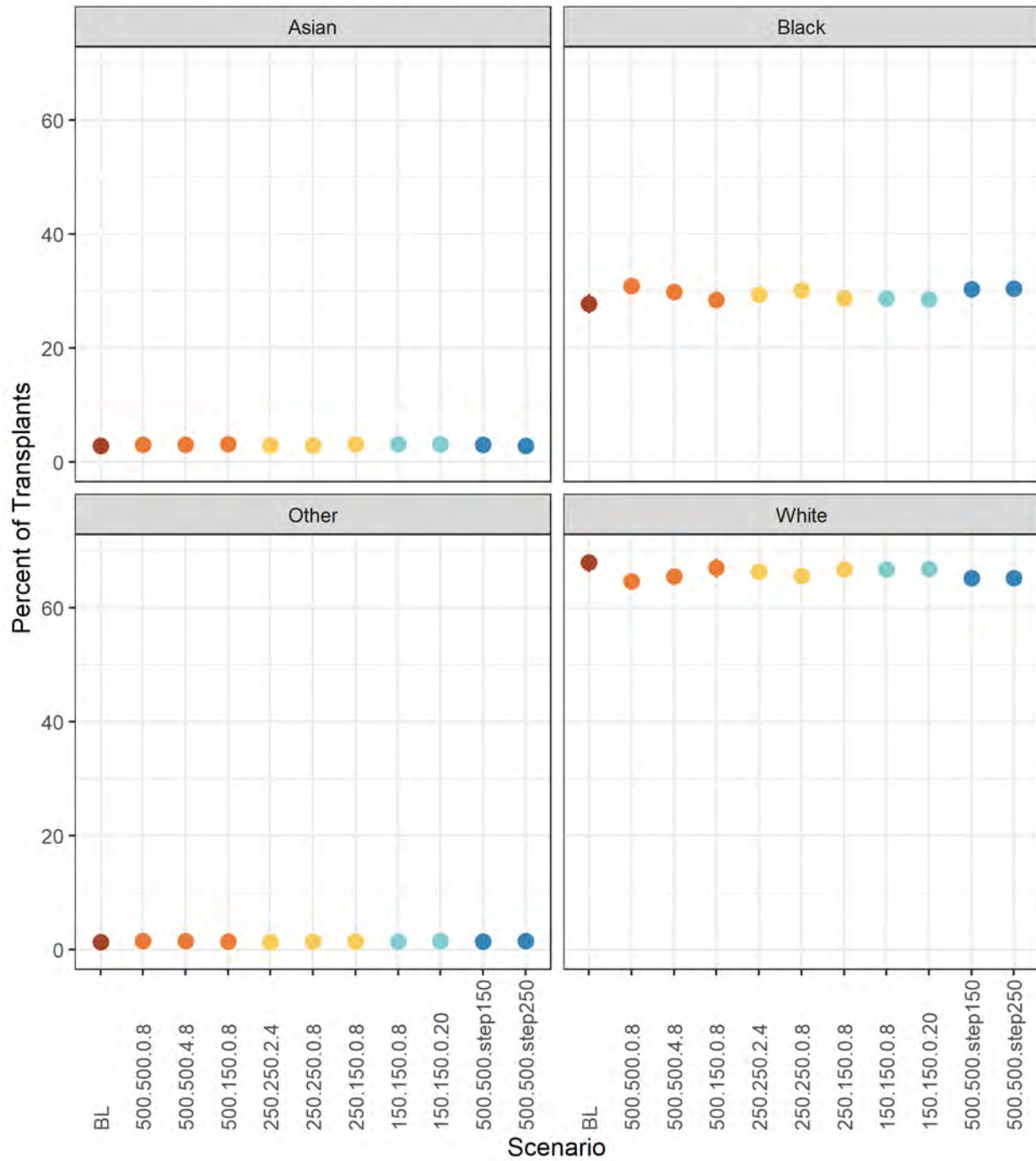
Percent of Transplants by Age at Transplant 18+: Pancreas

Transplant Percentages: Race



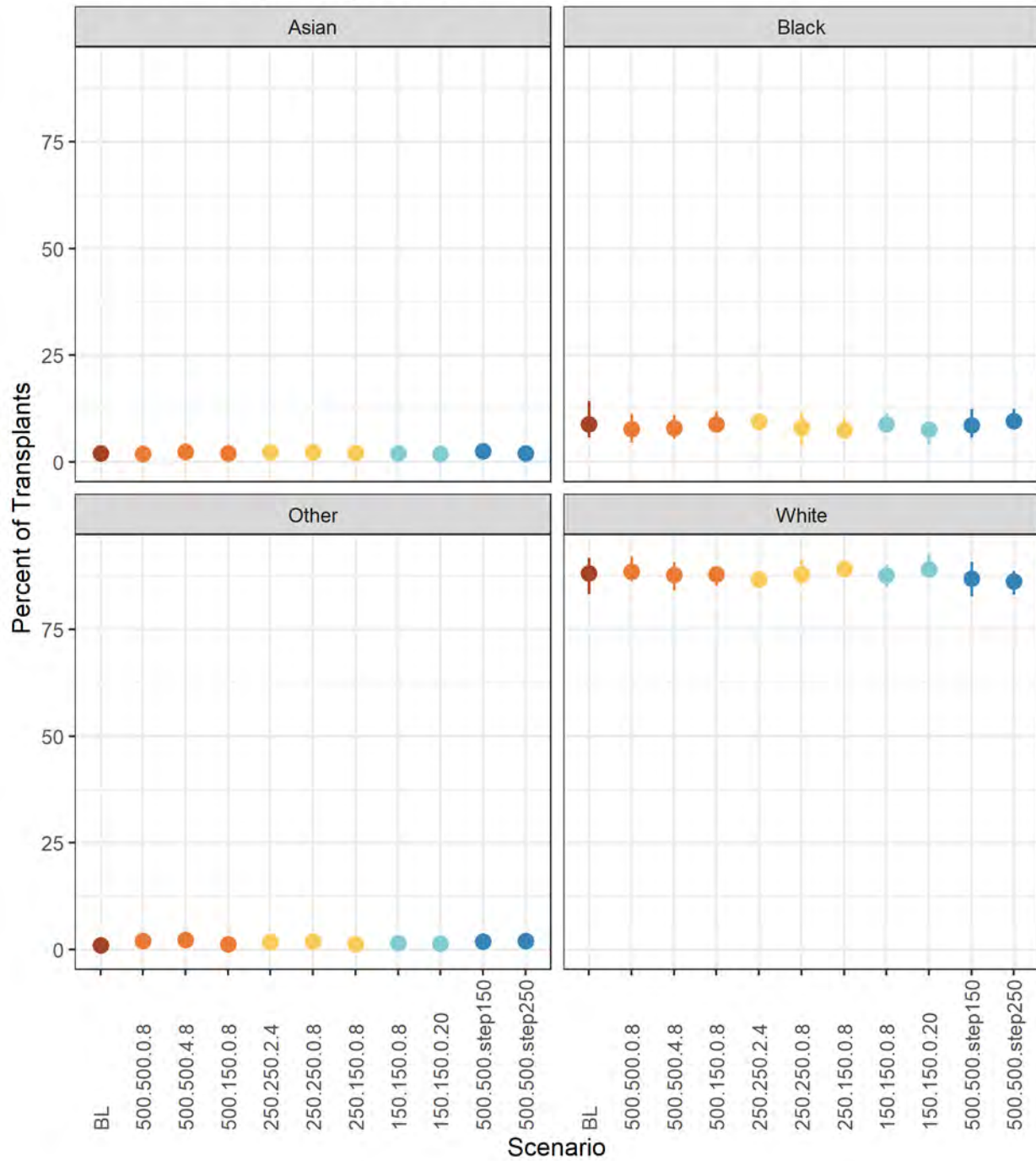
Percent of Transplants by Race: Kidney

Percent of Transplants by Race: Kidney-Pancreas



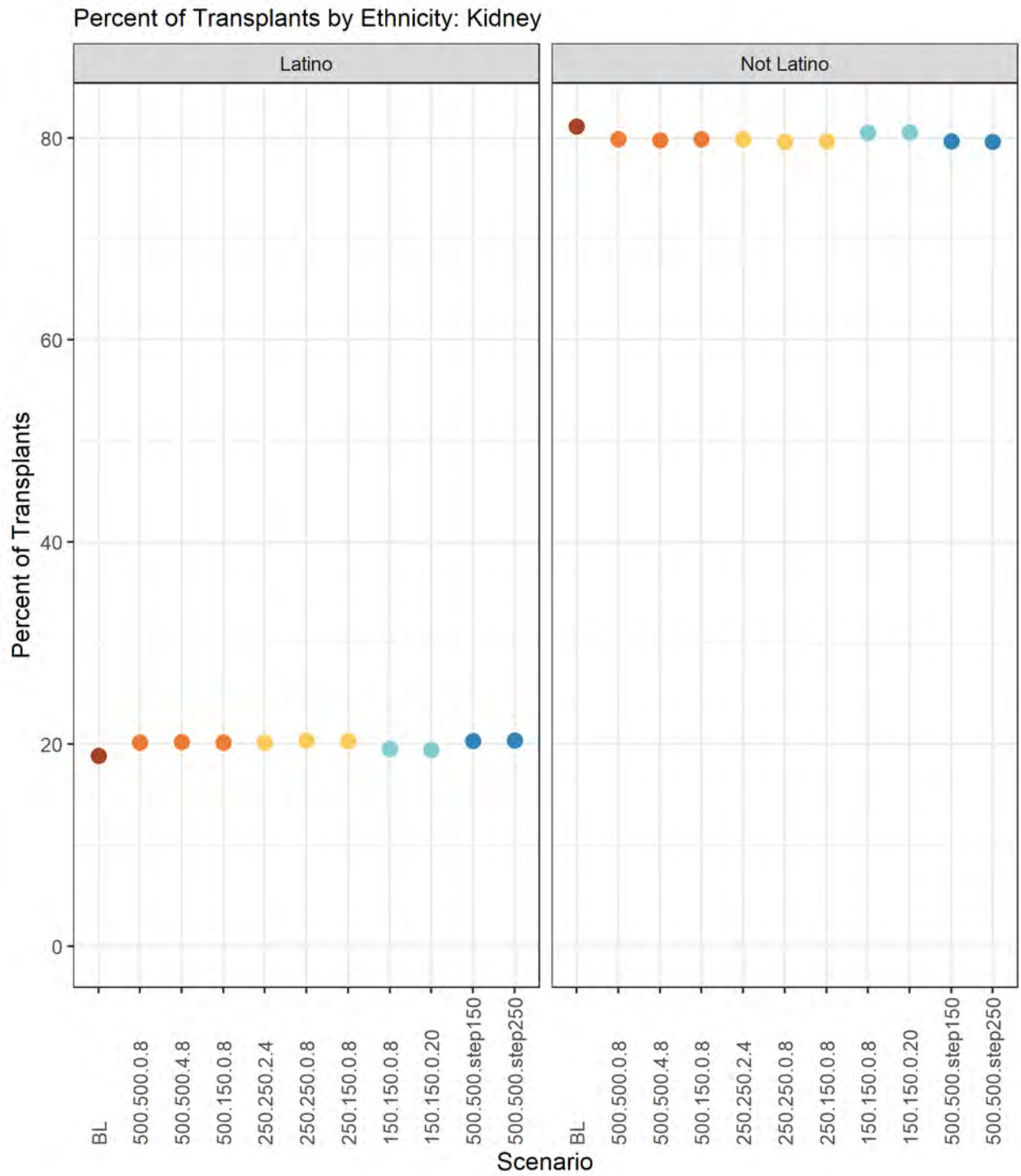
Percent of Transplants by Race: Kidney-Pancreas

Percent of Transplants by Race: Pancreas



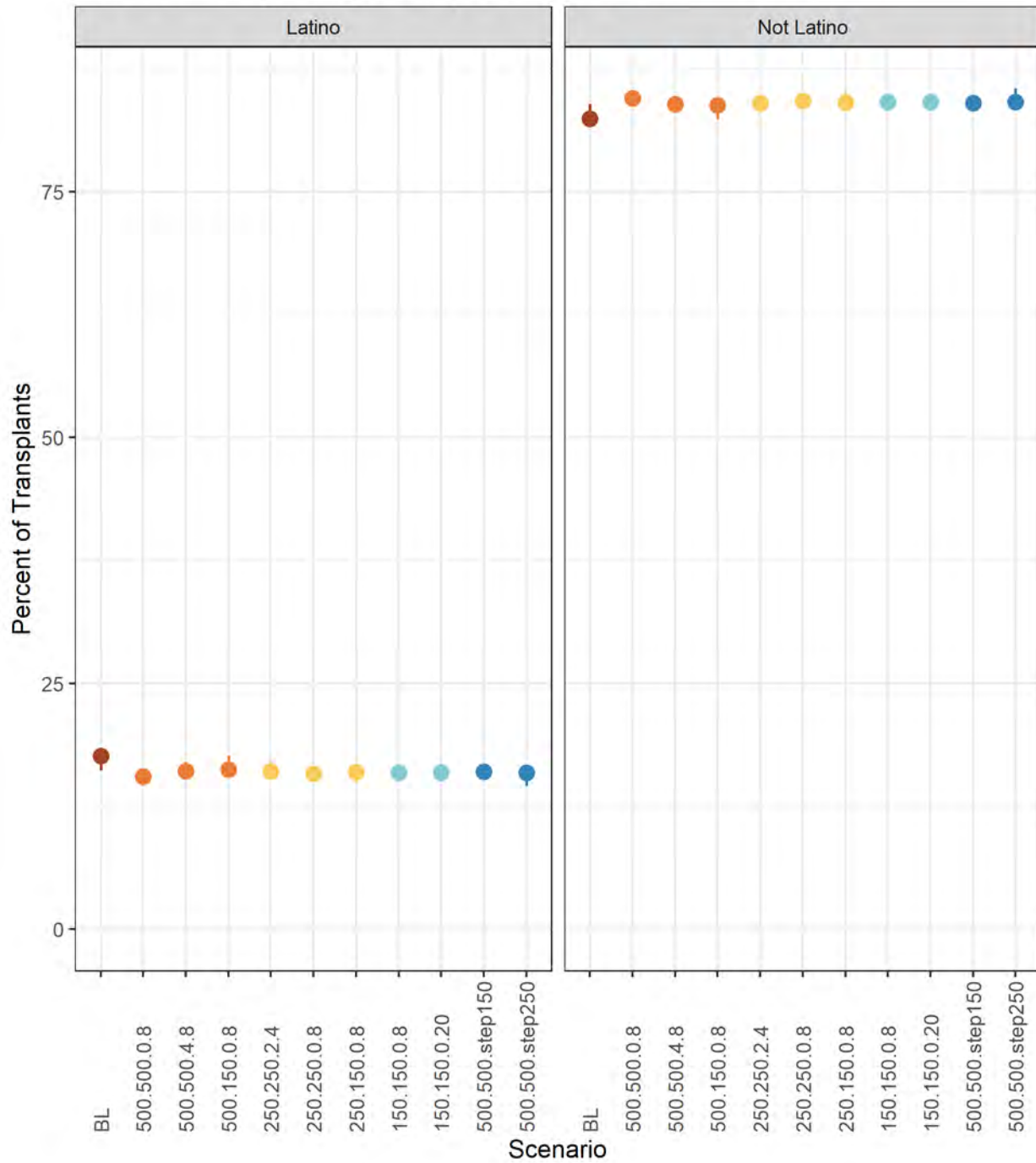
Percent of Transplants by Race: Pancreas

Transplant Percentages: Ethnicity



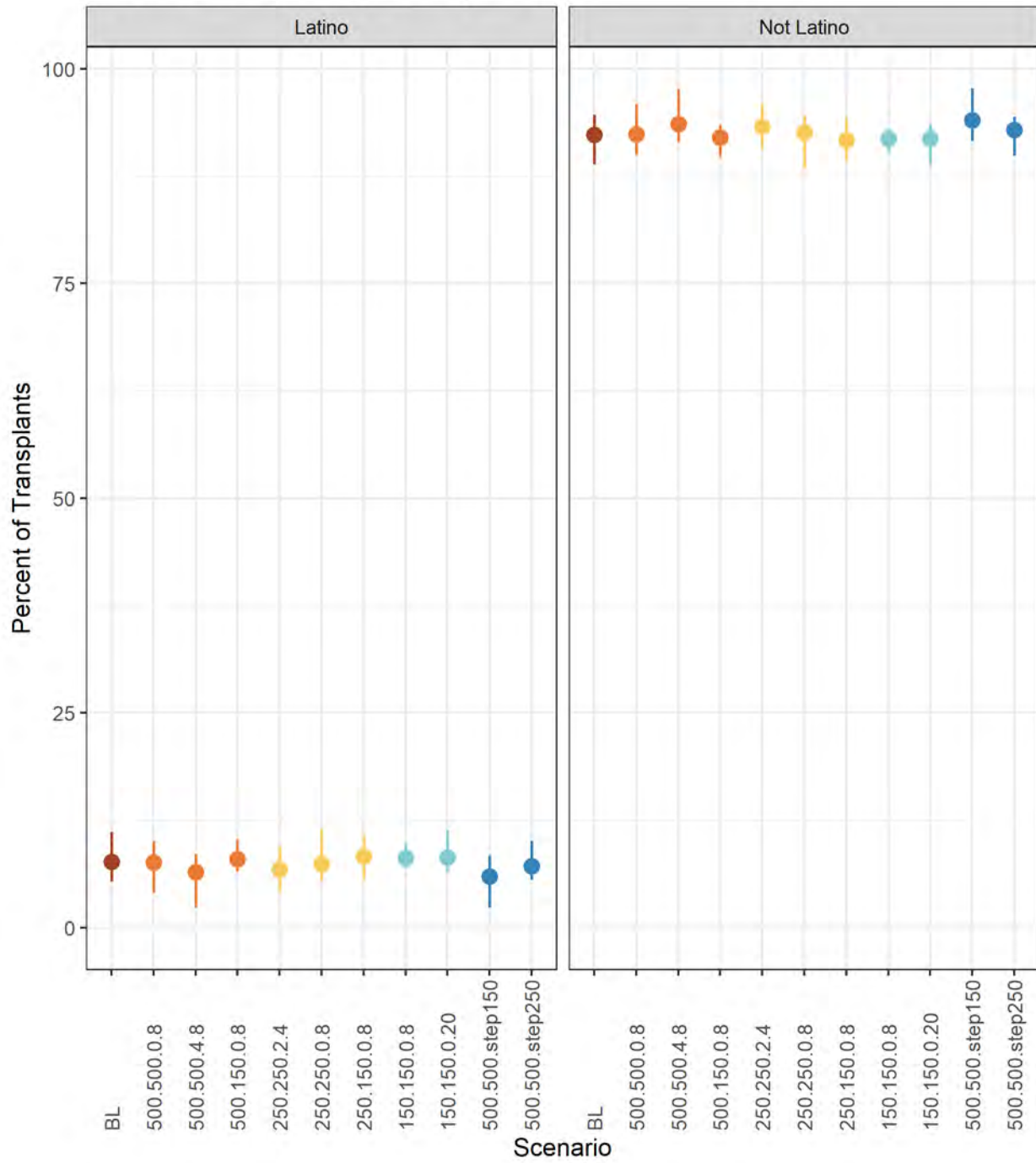
Percent of Transplants by Ethnicity: Kidney

Percent of Transplants by Ethnicity: Kidney-Pancreas



Percent of Transplants by Ethnicity: Kidney-Pancreas

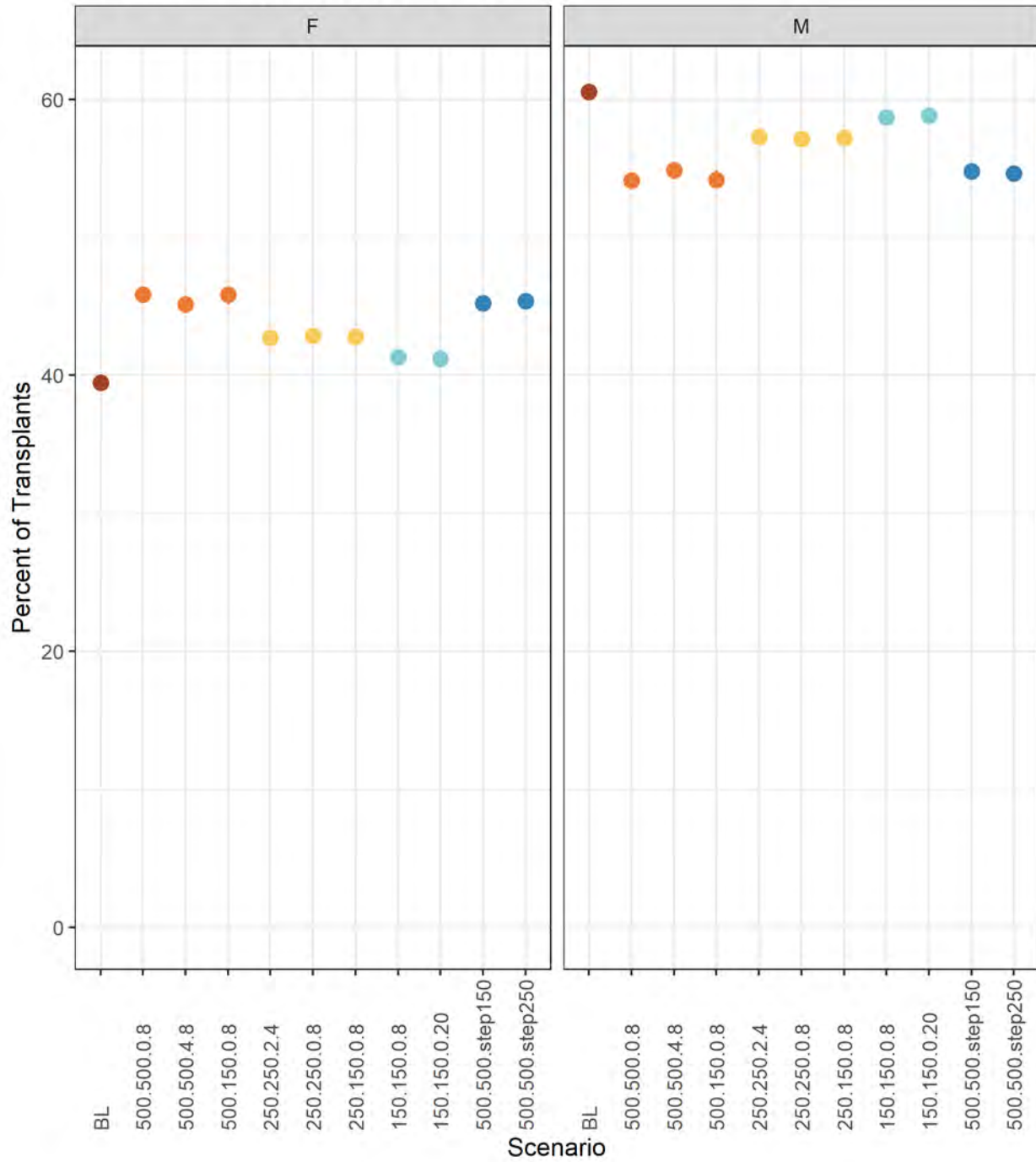
Percent of Transplants by Ethnicity: Pancreas



Percent of Transplants by Ethnicity: Pancreas

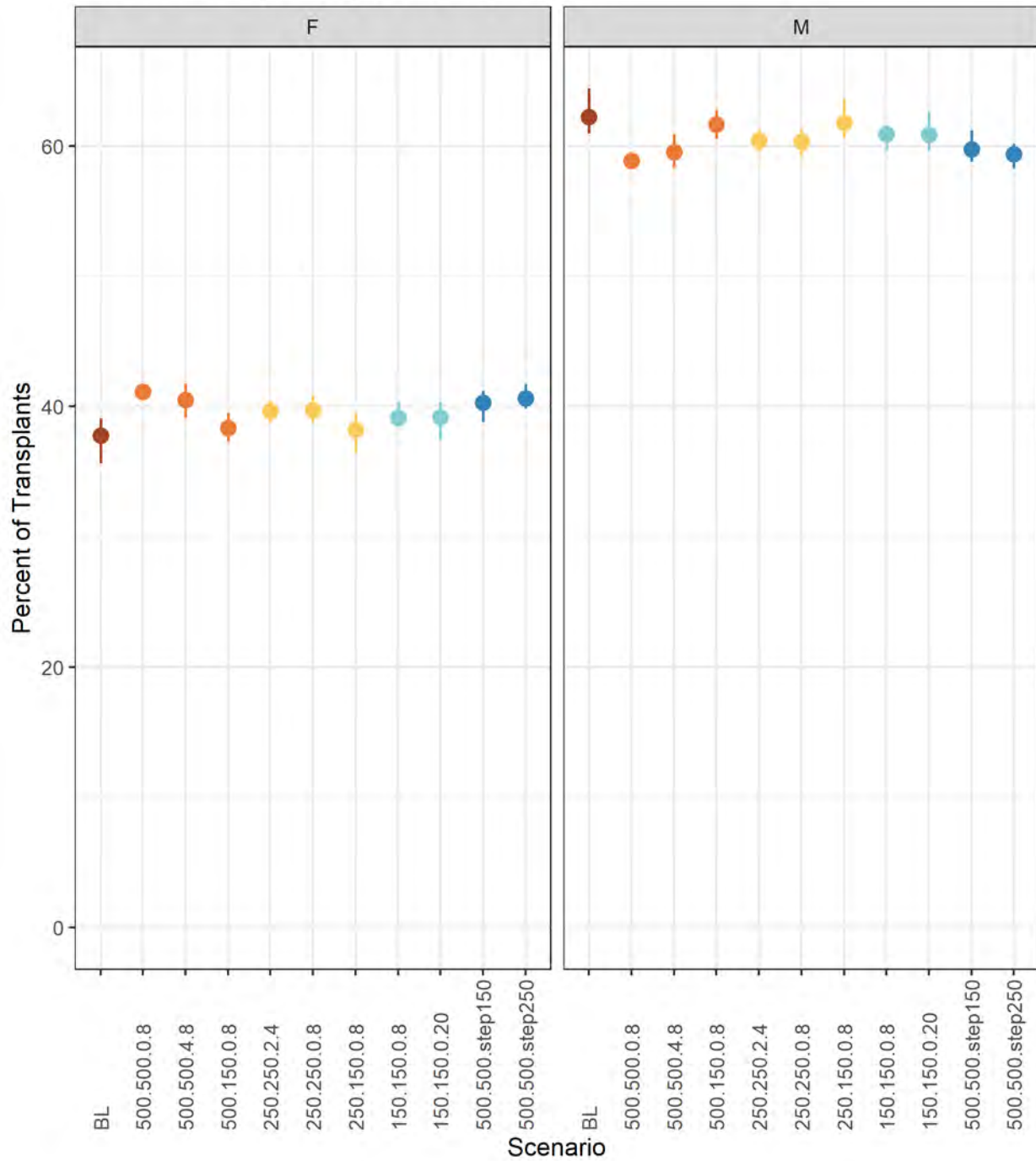
Transplant Percentages: Sex

Percent of Transplants by Sex: Kidney

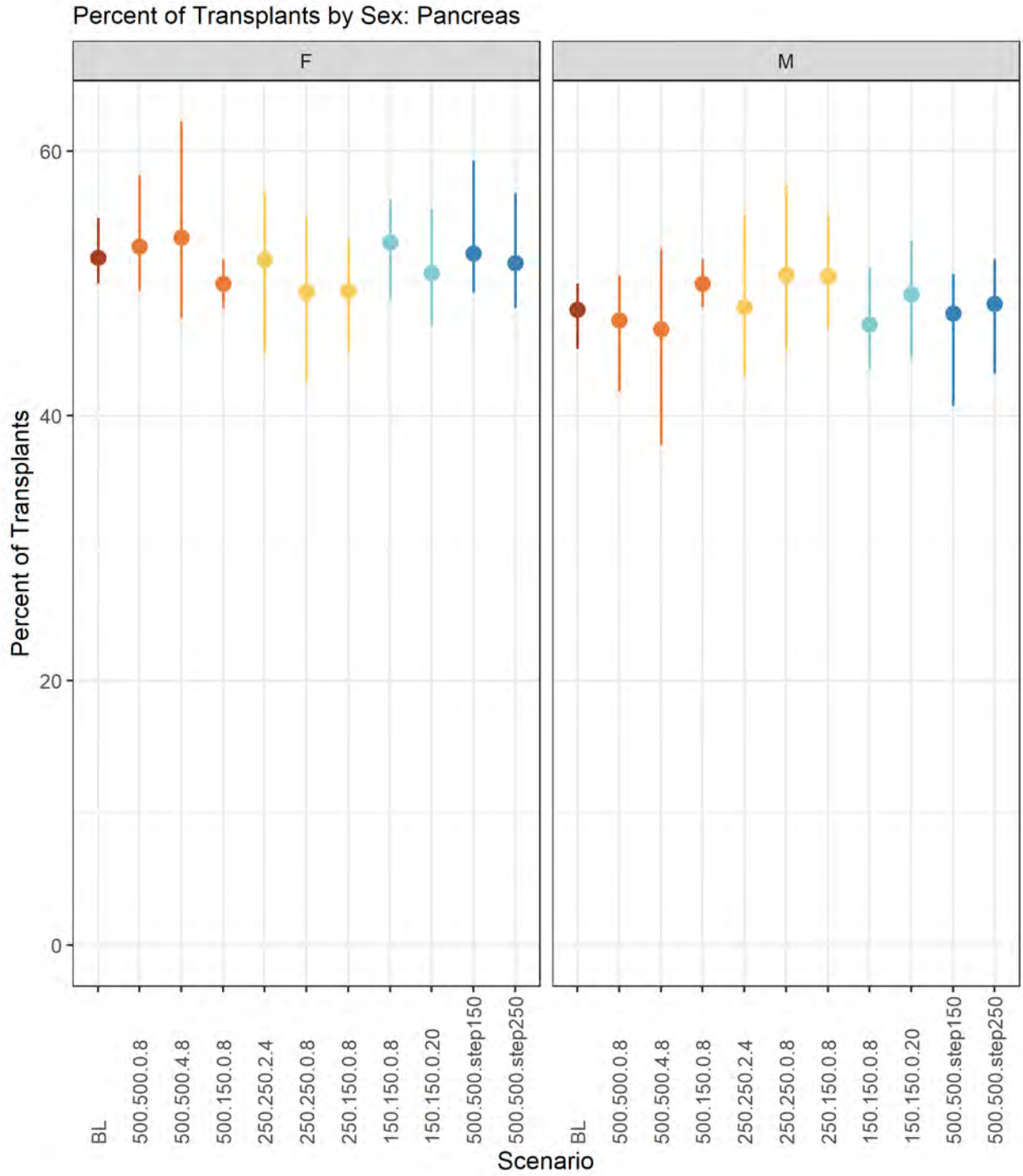


Percent of Transplants by Sex: Kidney

Percent of Transplants by Sex: Kidney-Pancreas



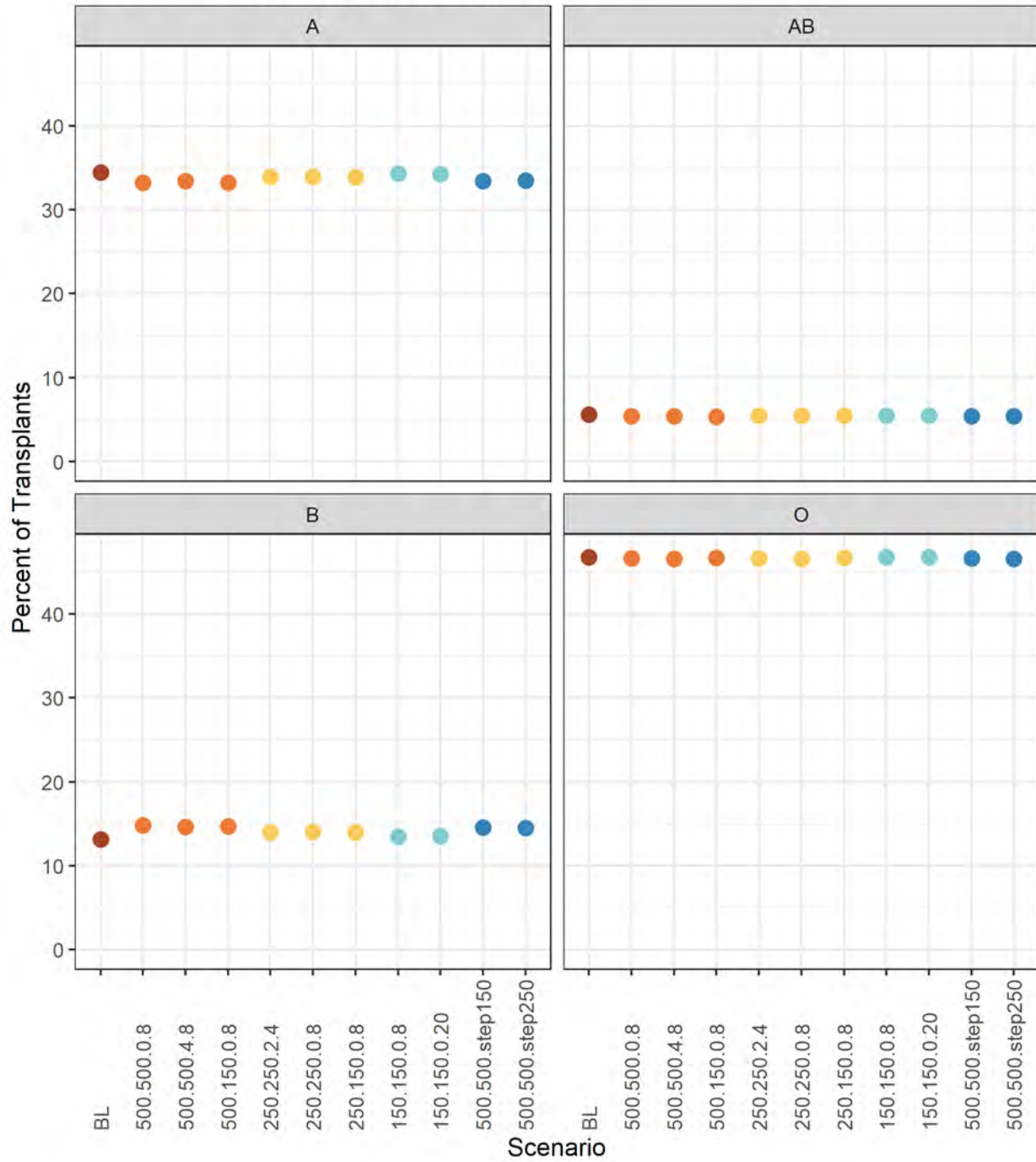
Percent of Transplants by Sex: Kidney-Pancreas



Percent of Transplants by Sex: Pancreas

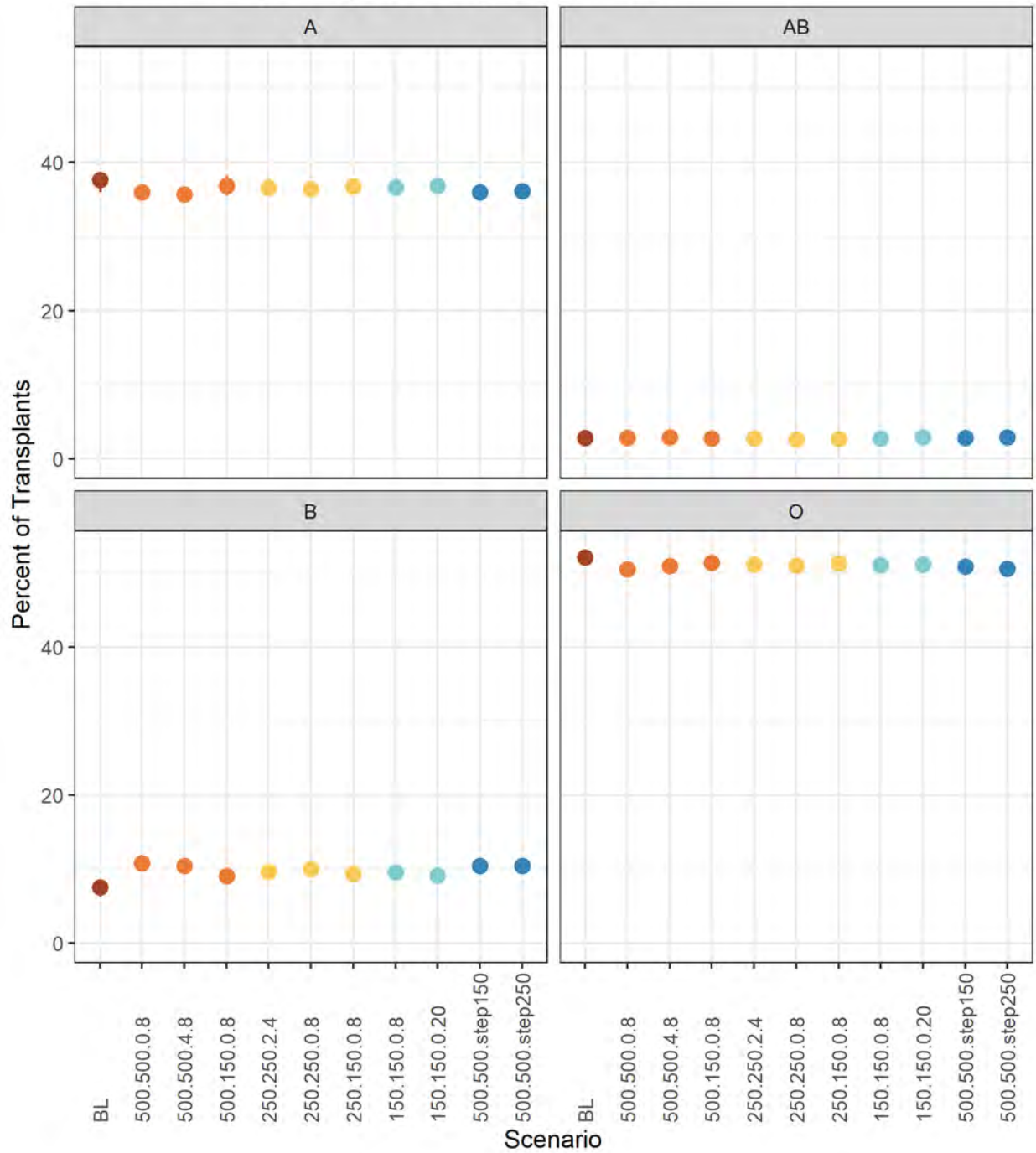
Transplant Percentages: ABO Group

Percent of Transplants by ABO Group: Kidney



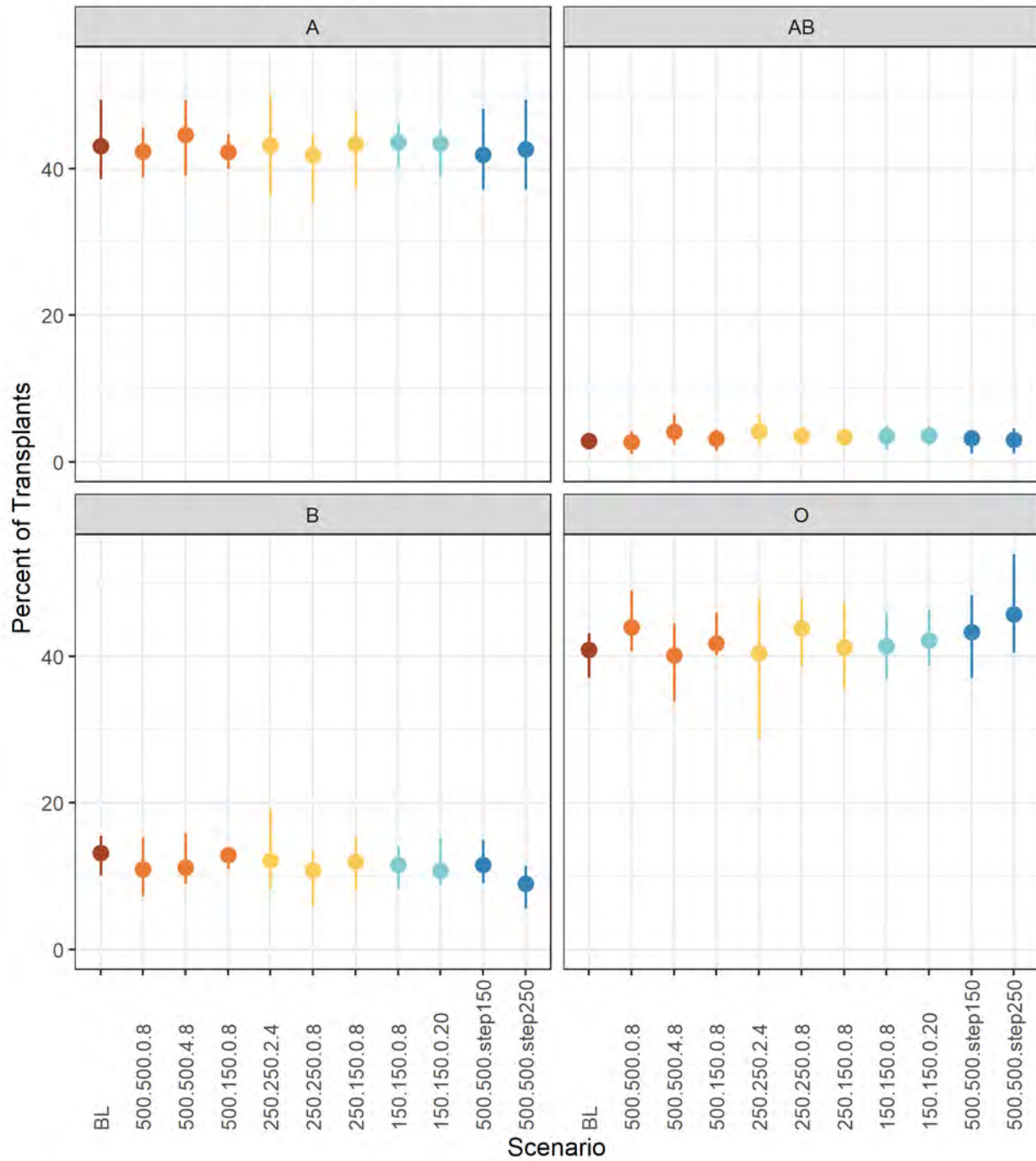
Percent of Transplants by ABO Group: Kidney

Percent of Transplants by ABO Group: Kidney-Pancreas



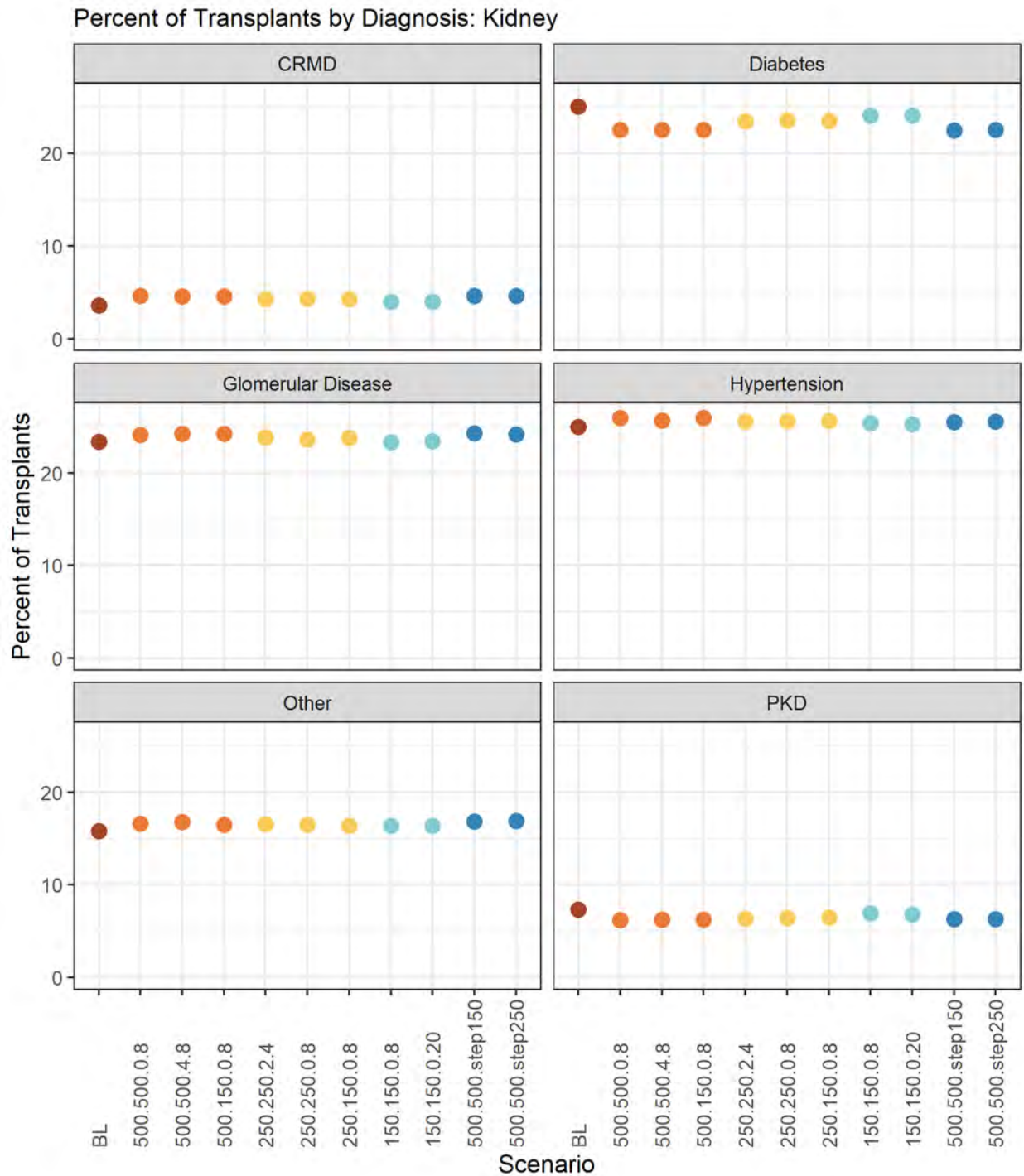
Percent of Transplants by ABO Group: Kidney-Pancreas

Percent of Transplants by ABO Group: Pancreas



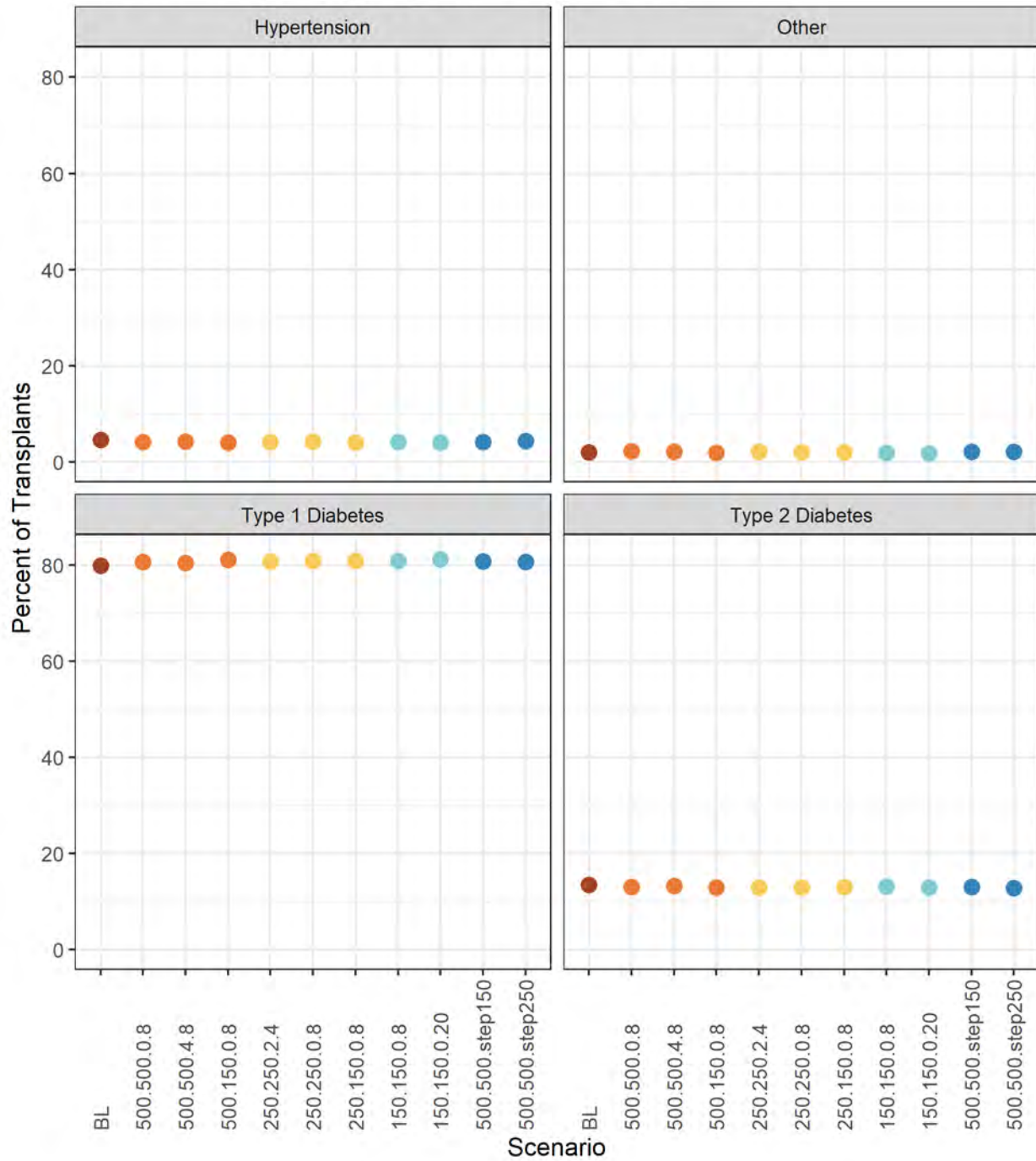
Percent of Transplants by ABO Group: Pancreas

Transplant Percentages: Diagnosis

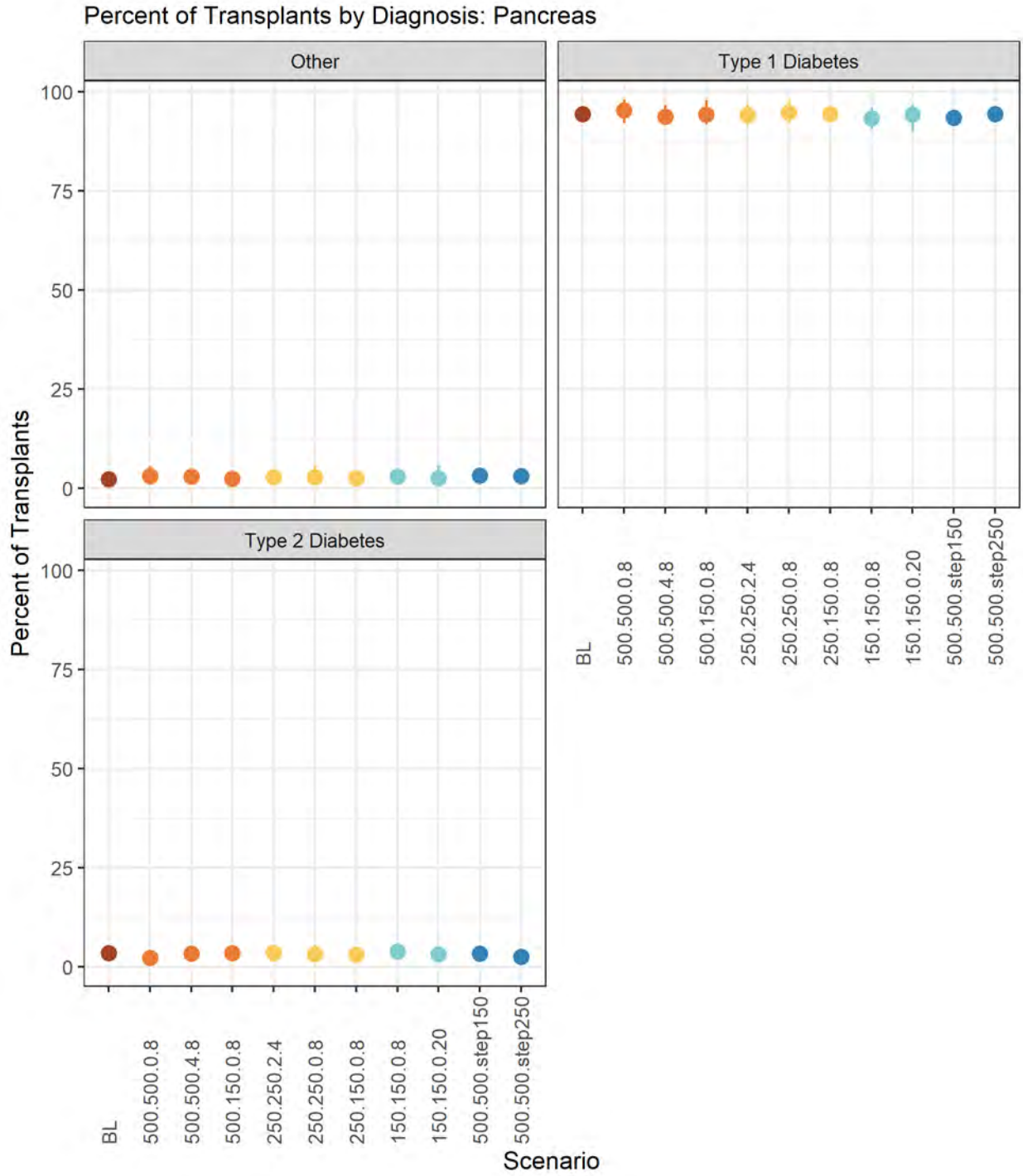


Percent of Transplants by Diagnosis: Kidney

Percent of Transplants by Diagnosis: Kidney-Pancreas

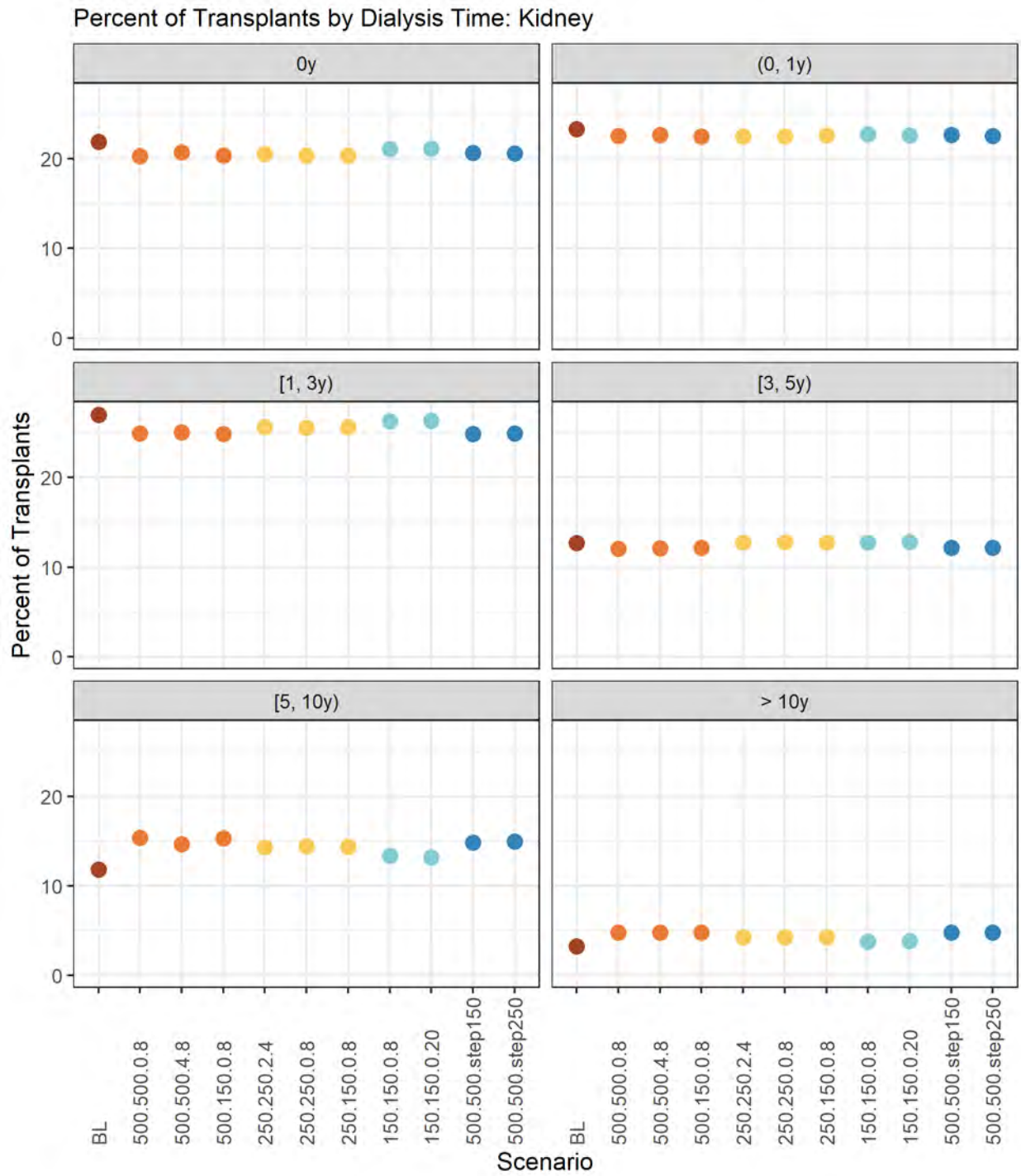


Percent of Transplants by Diagnosis: Kidney-Pancreas



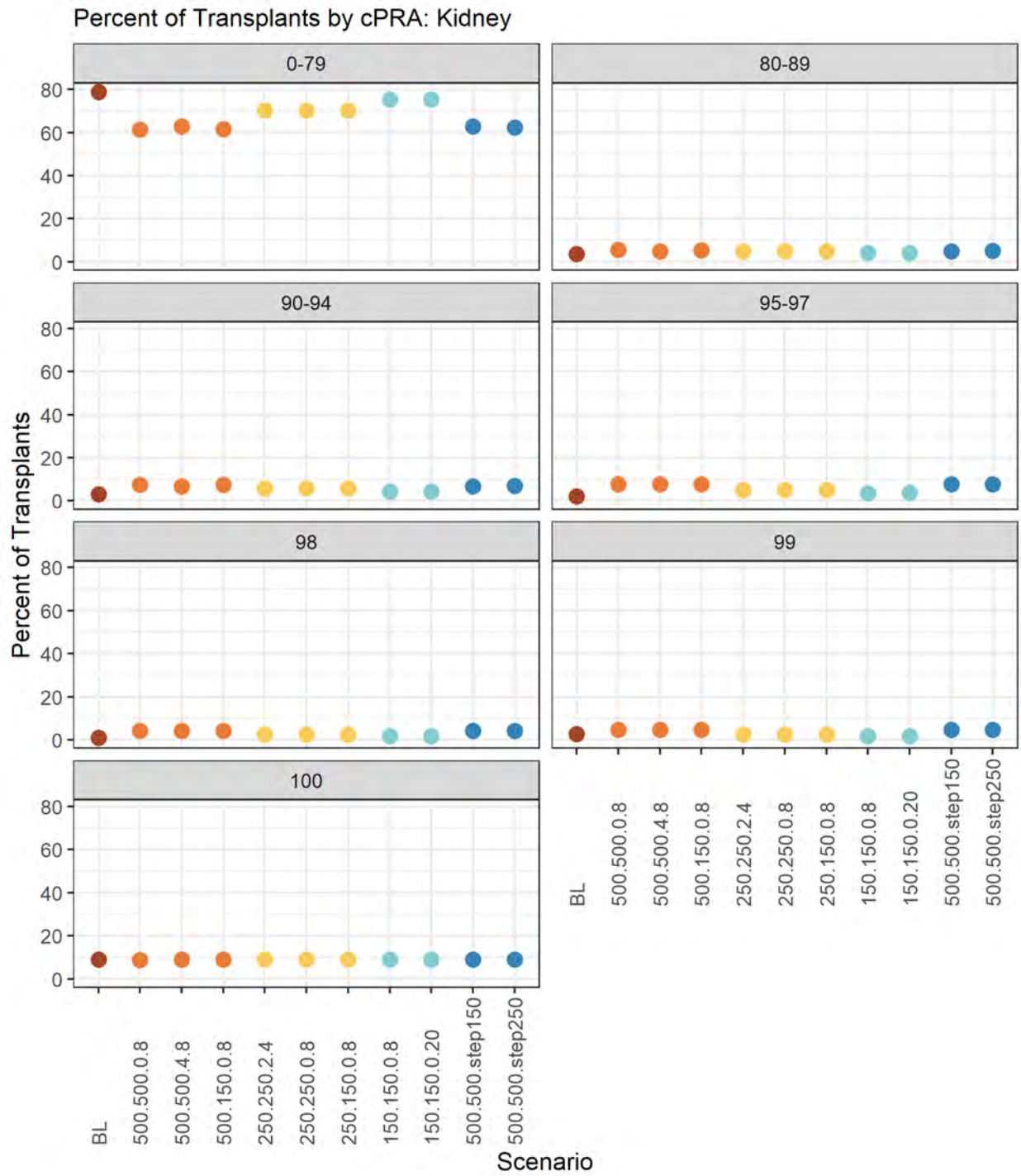
Percent of Transplants by Diagnosis: Pancreas

Transplant Percentages: Dialysis Time

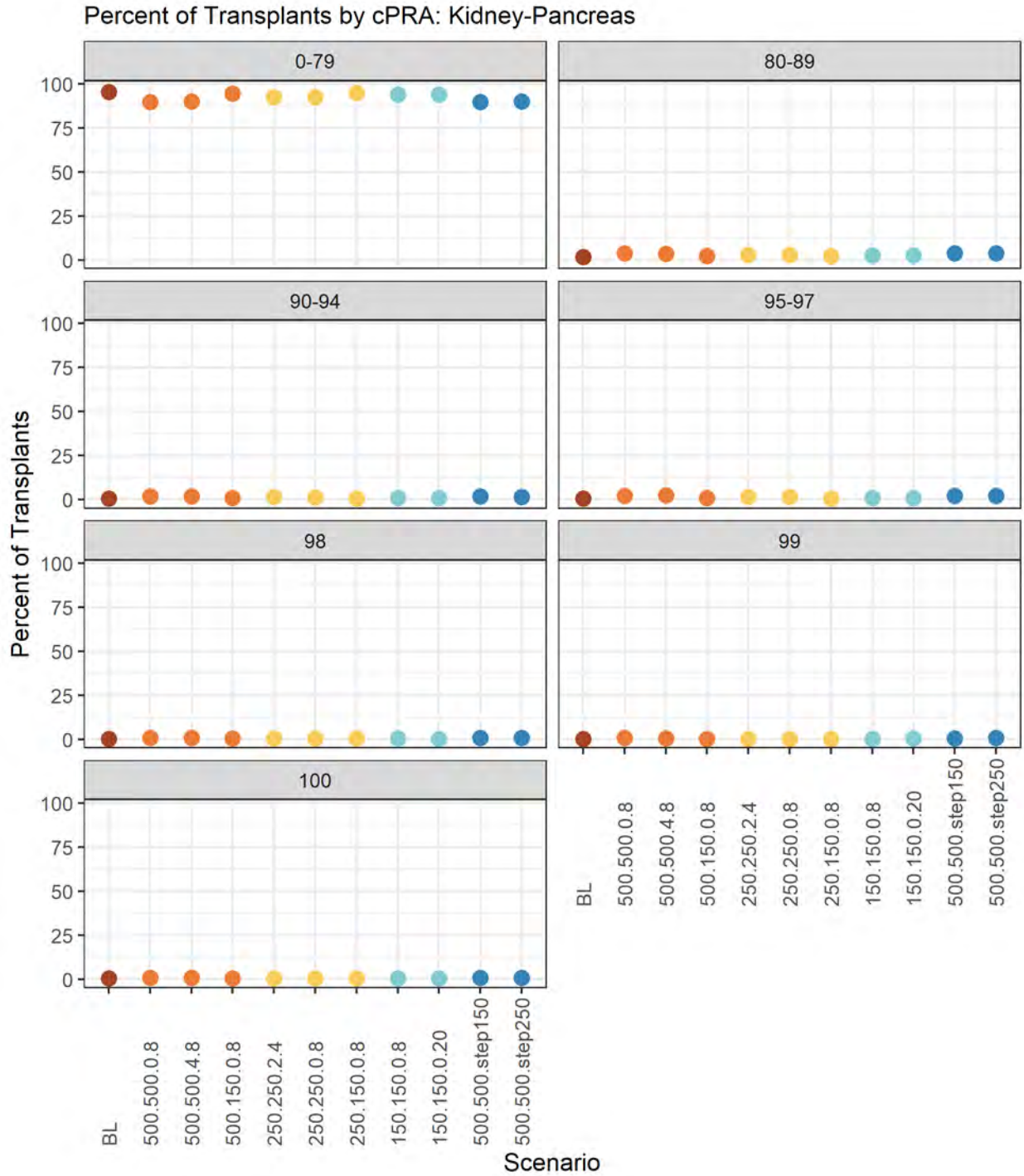


Percent of Transplants by Dialysis Time: Kidney

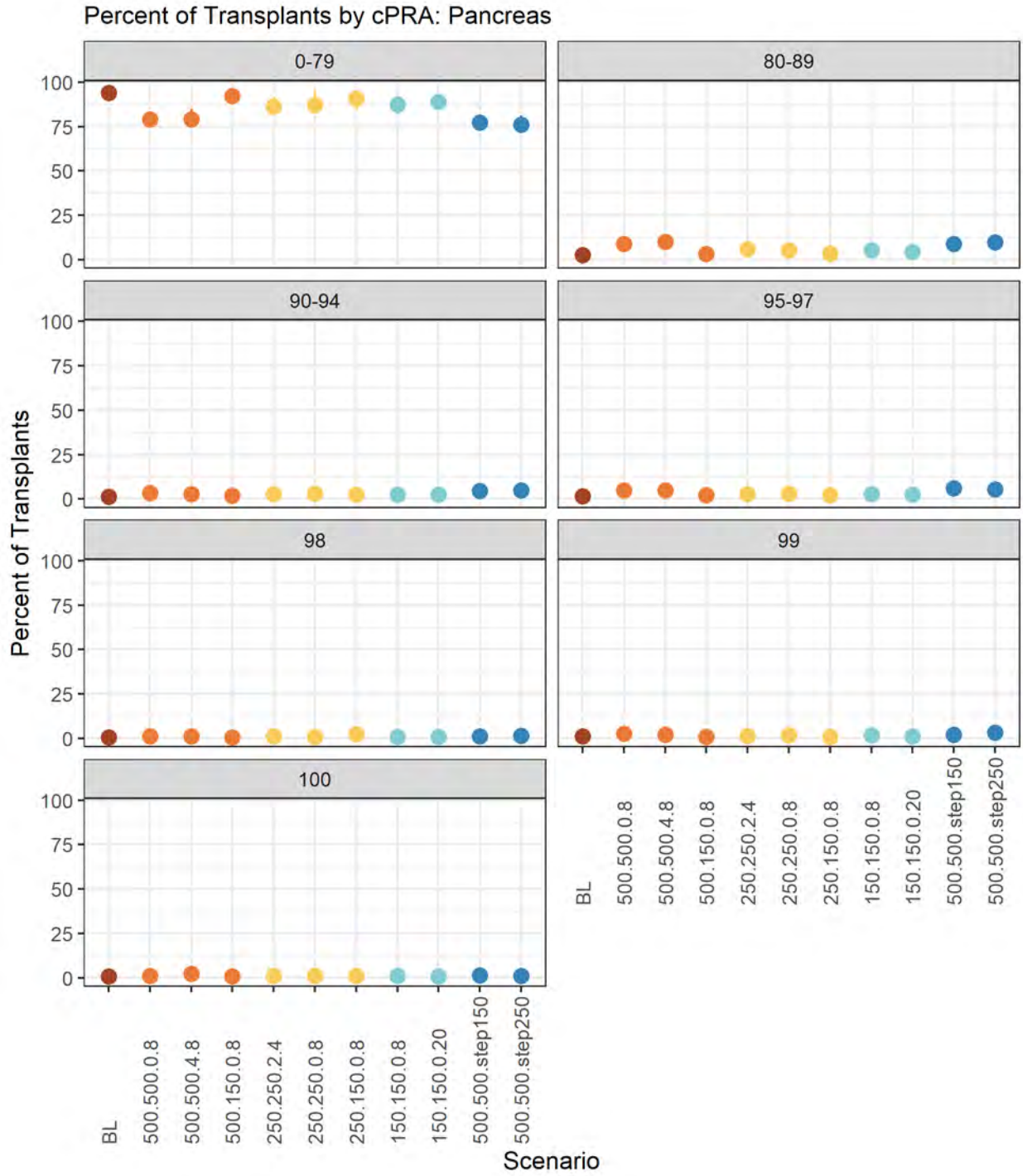
Transplant Percentages: cPRA



Percent of Transplants by cPRA: Kidney



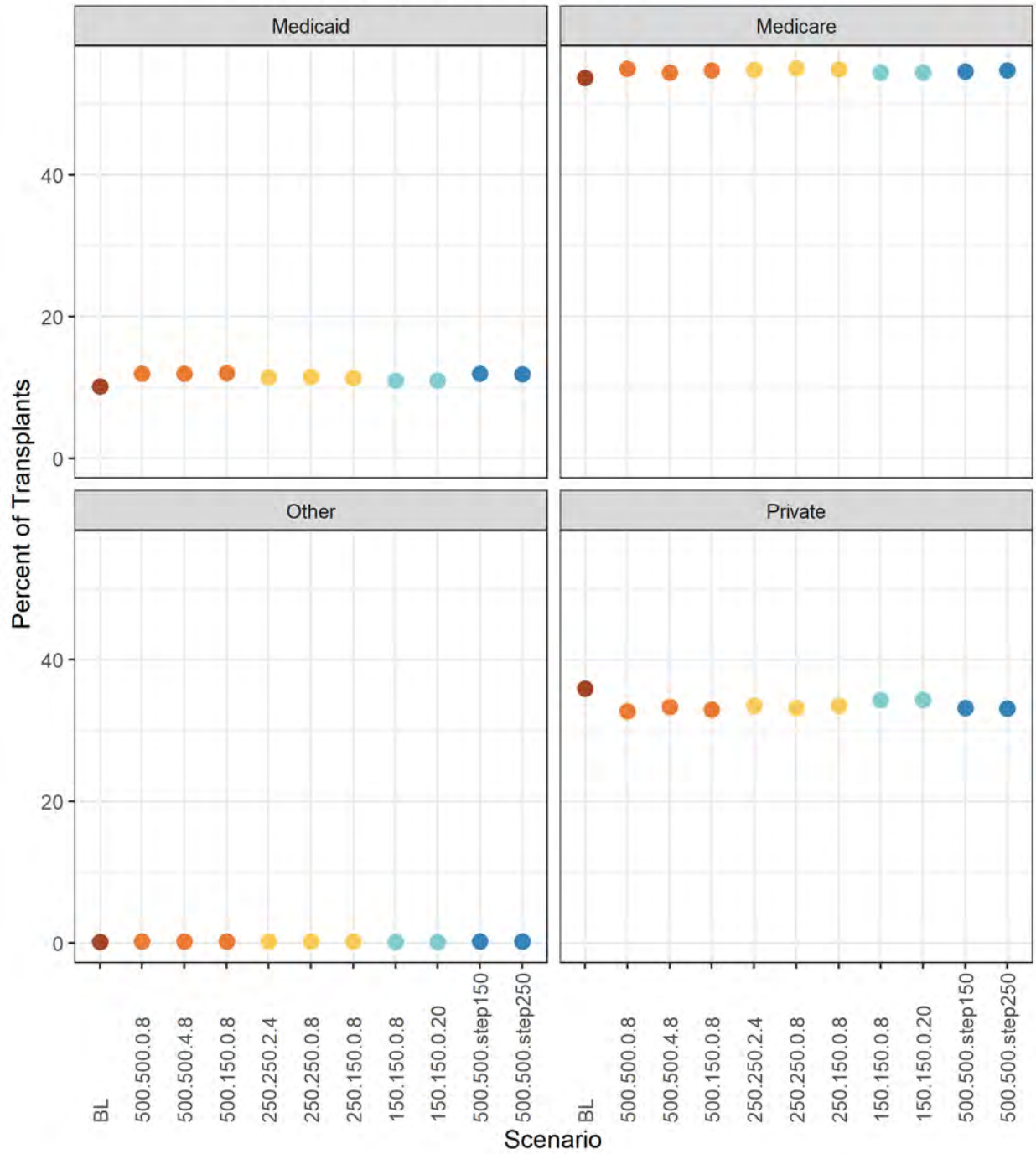
Percent of Transplants by cPRA: Kidney-Pancreas



Percent of Transplants by cPRA: Pancreas

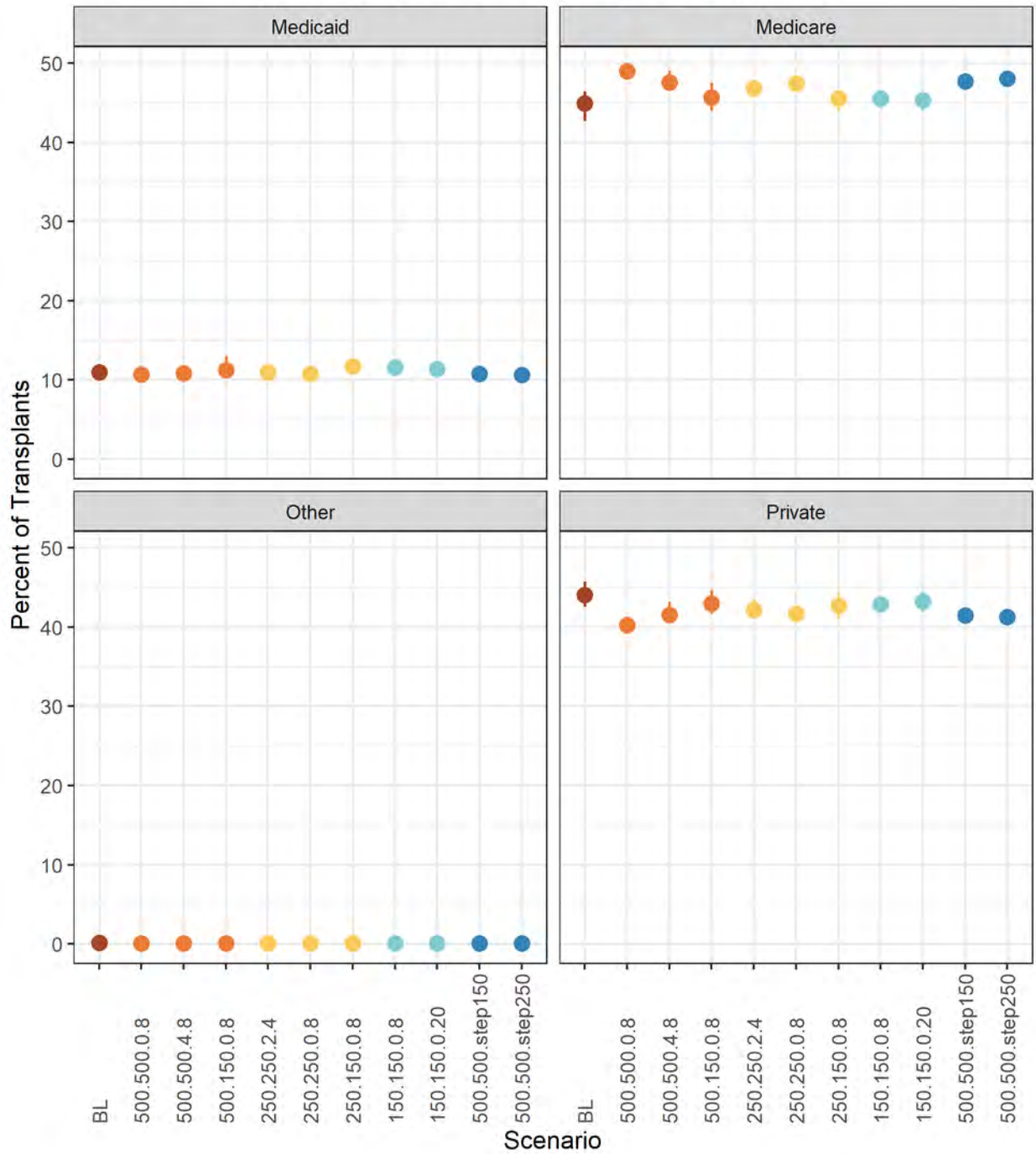
Transplant Percentages: Payment Status

Percent of Transplants by Payment Status: Kidney



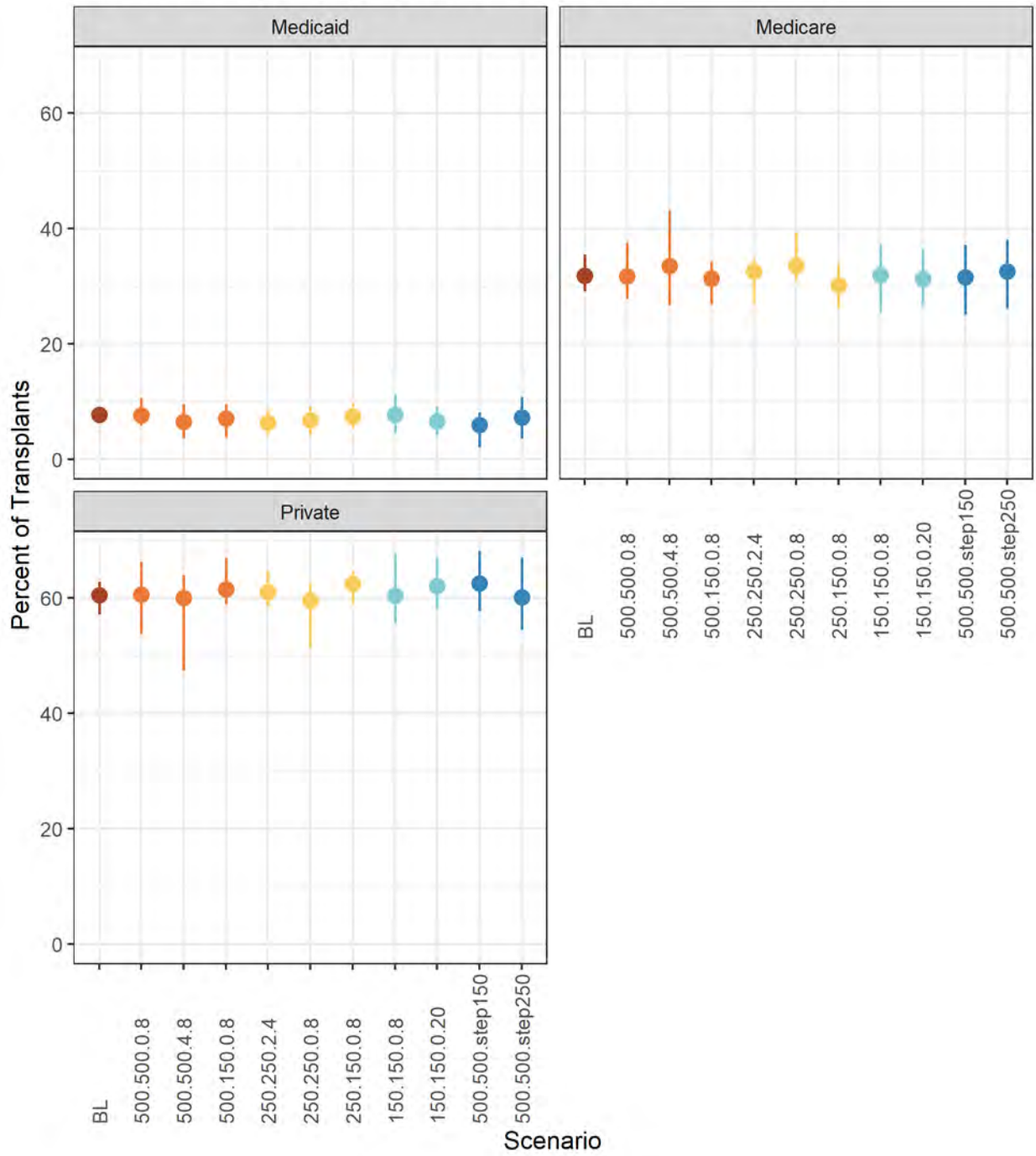
Percent of Transplants by Payment Status: Kidney

Percent of Transplants by Payment Status: Kidney-Pancreas



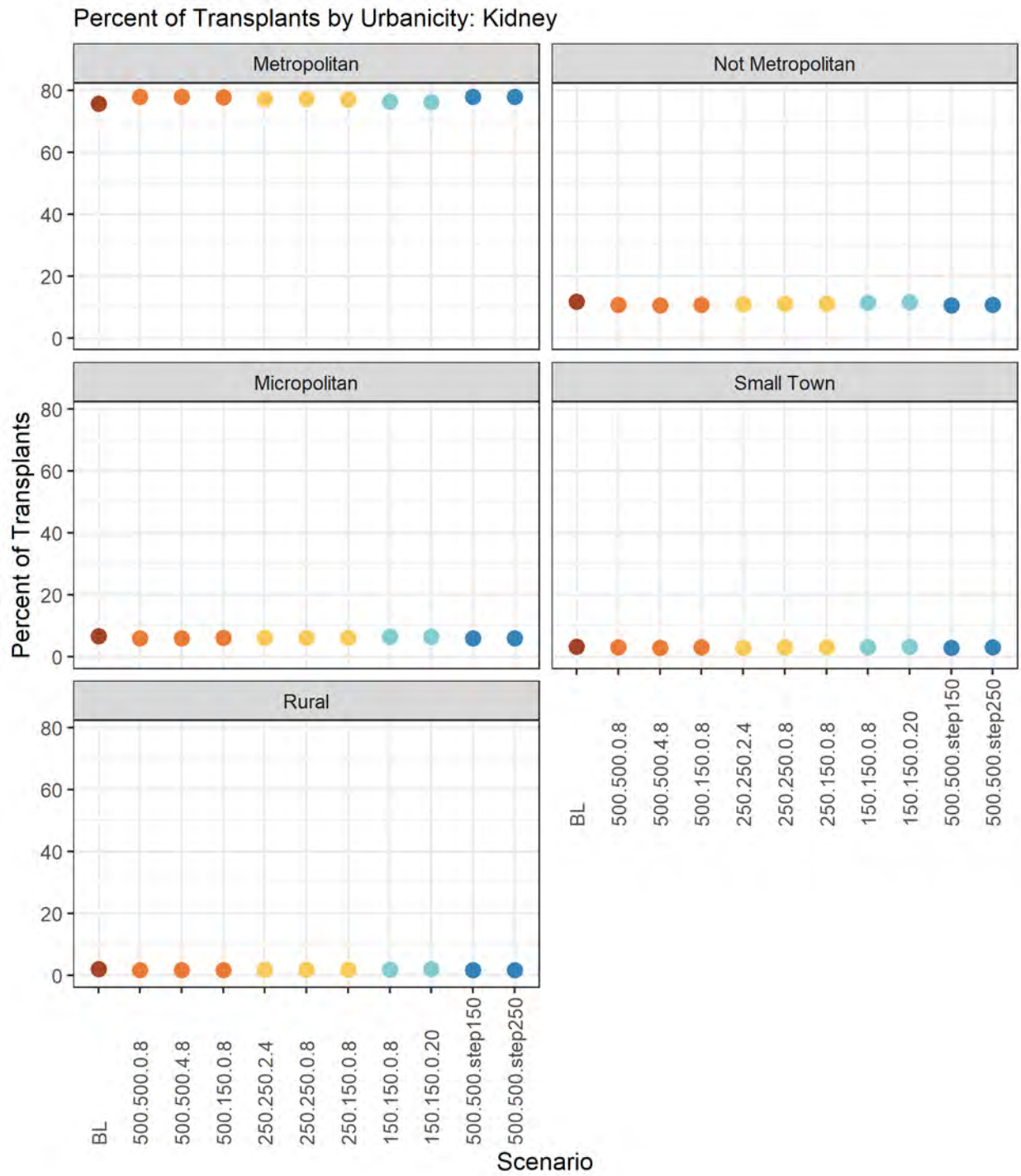
Percent of Transplants by Payment Status: Kidney-Pancreas

Percent of Transplants by Payment Status: Pancreas



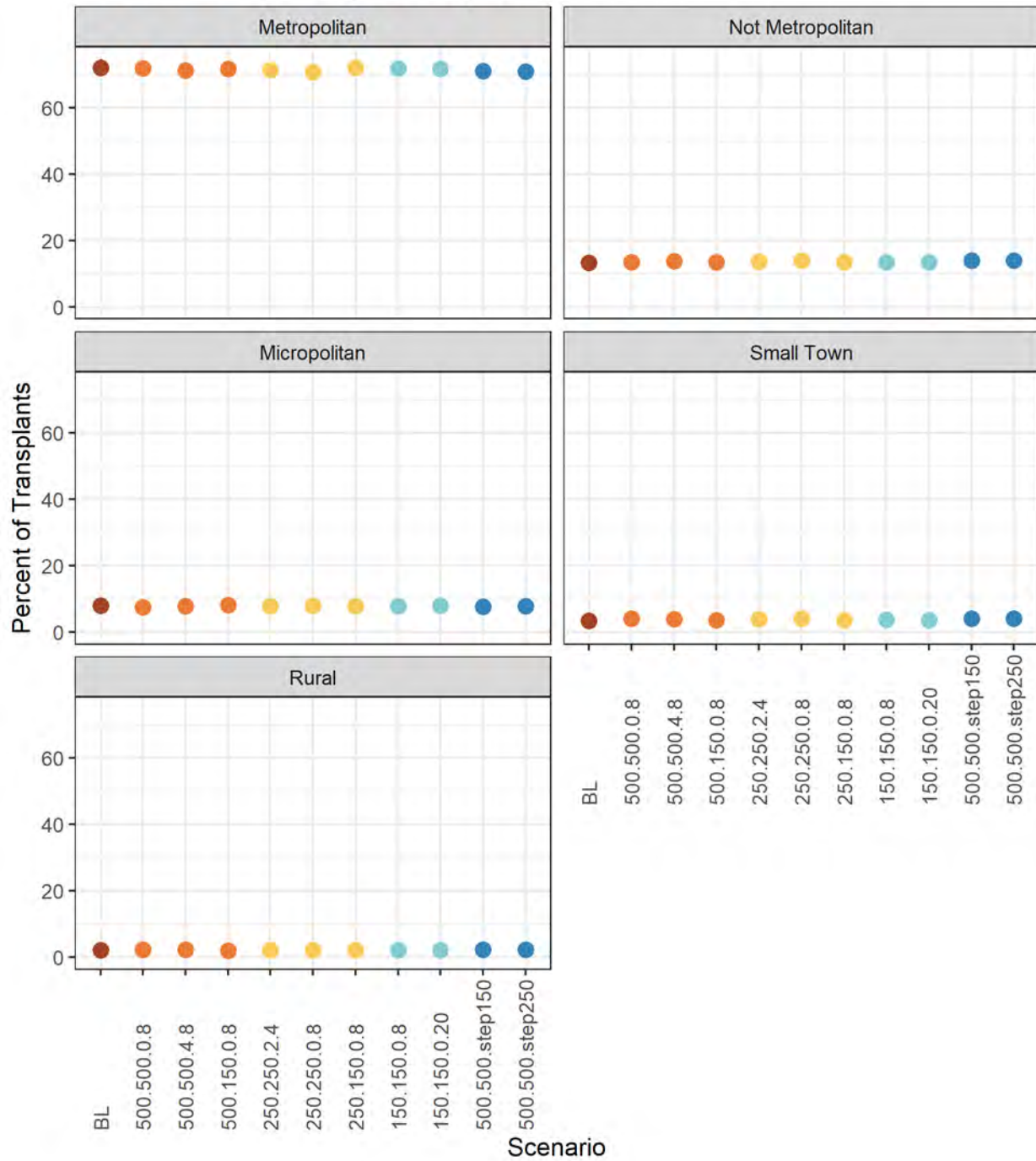
Percent of Transplants by Payment Status: Pancreas

Transplant Percentages: Urbanicity



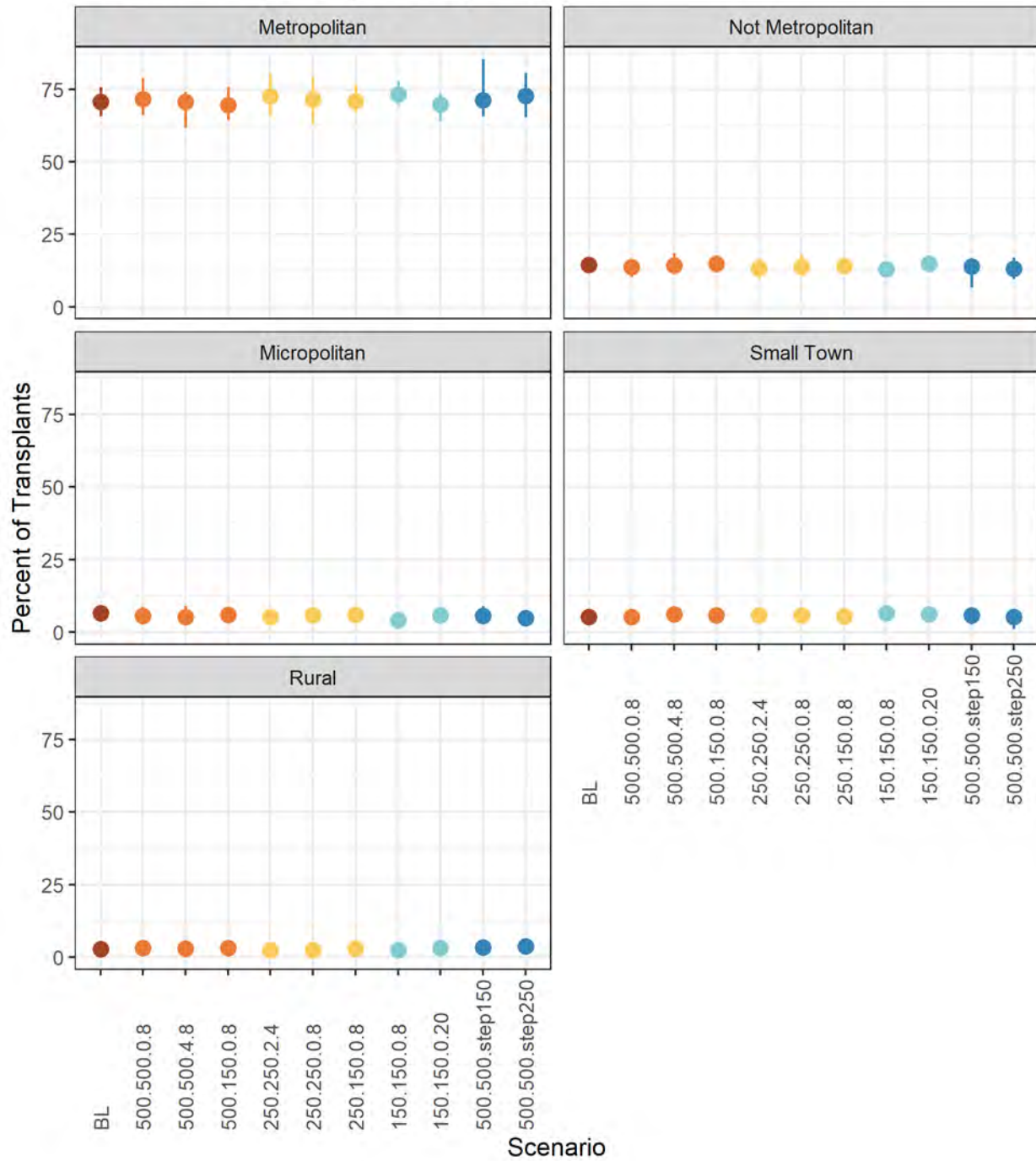
Percent of Transplants by Urbanicity: Kidney

Percent of Transplants by Urbanicity: Kidney-Pancreas



Percent of Transplants by Urbanicity: Kidney-Pancreas

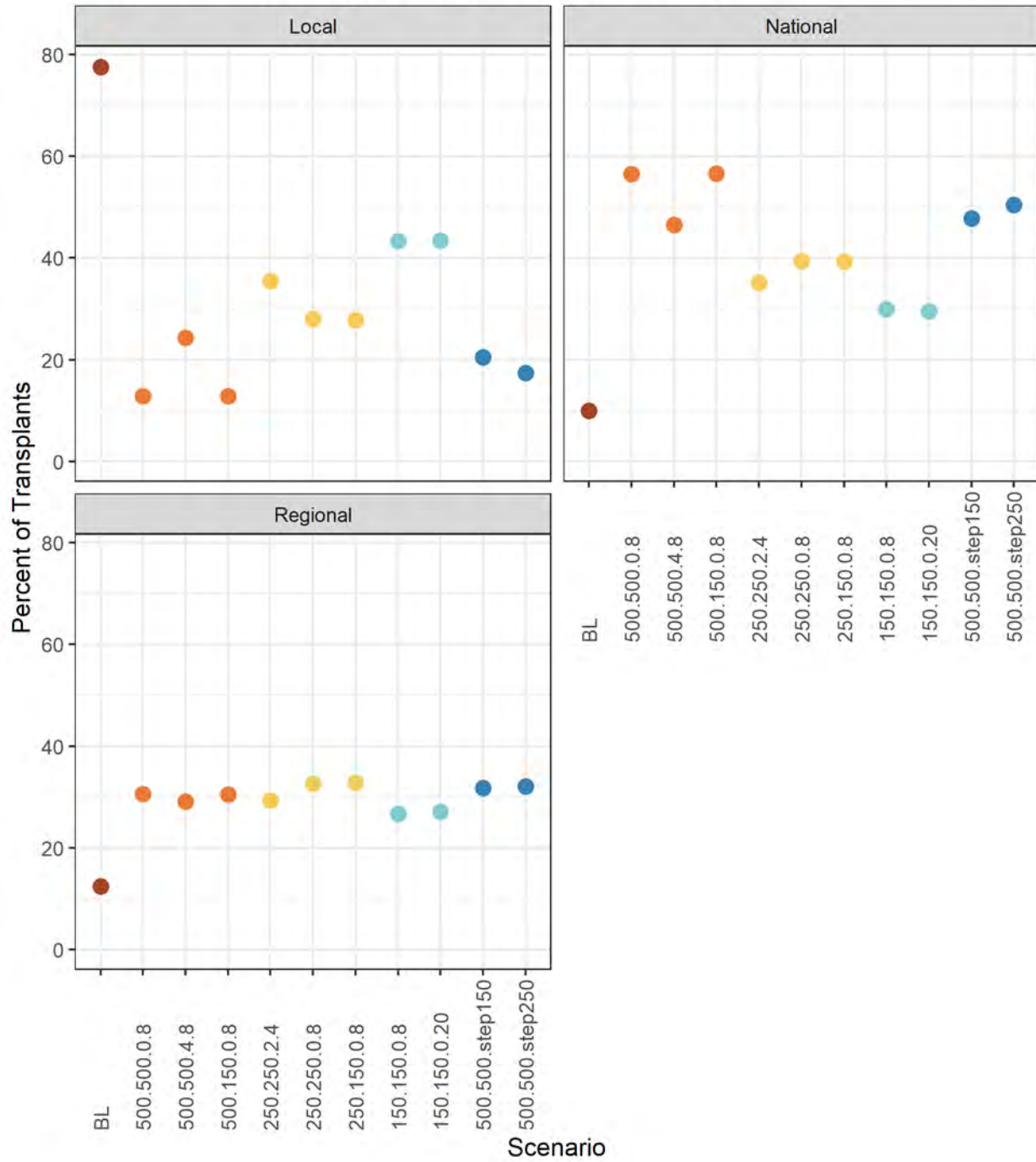
Percent of Transplants by Urbanicity: Pancreas



Percent of Transplants by Urbanicity: Pancreas

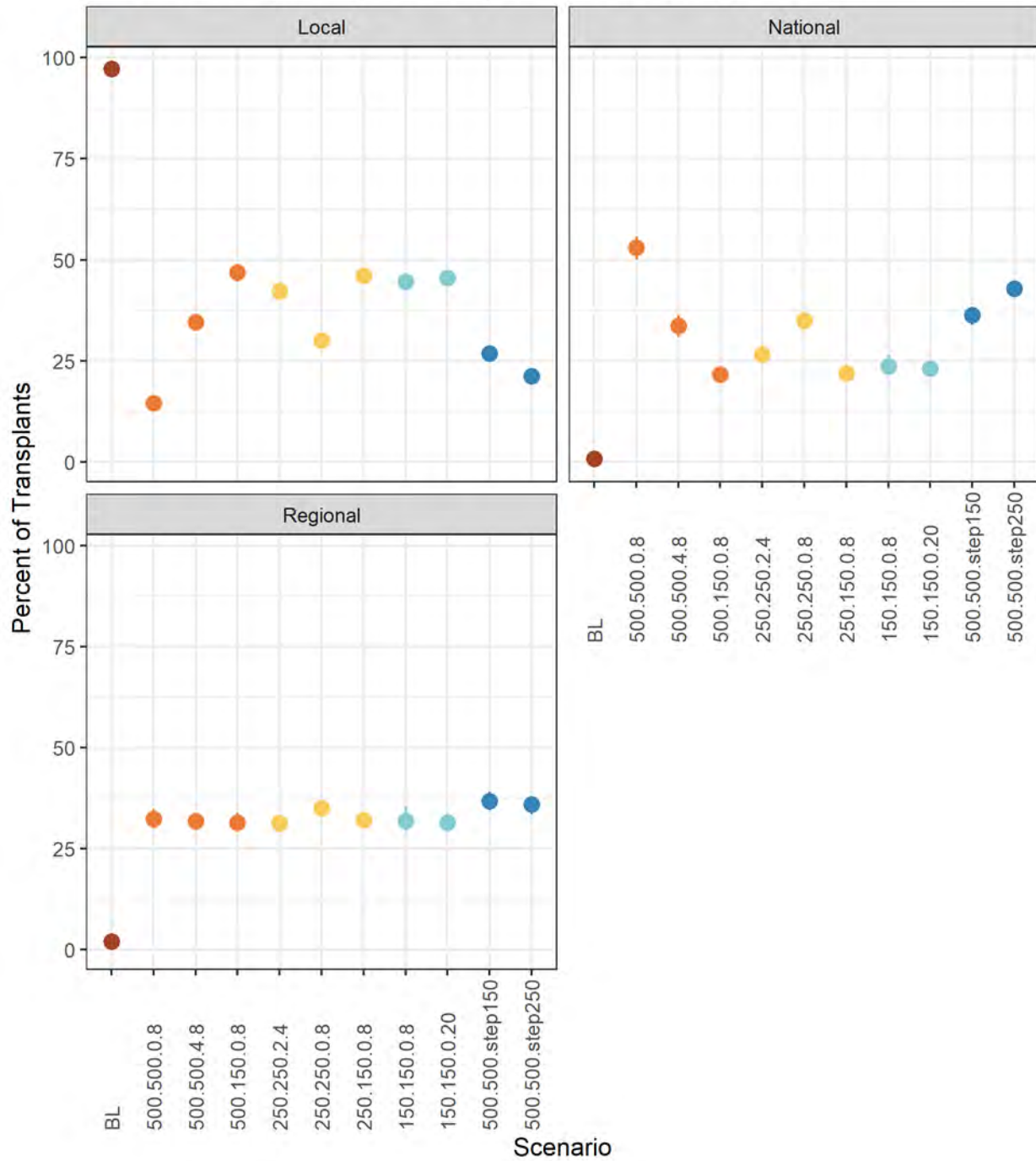
Transplant Percentages: Local/Regional/National

Percent of Transplants by Local/Regional/National: Kidney



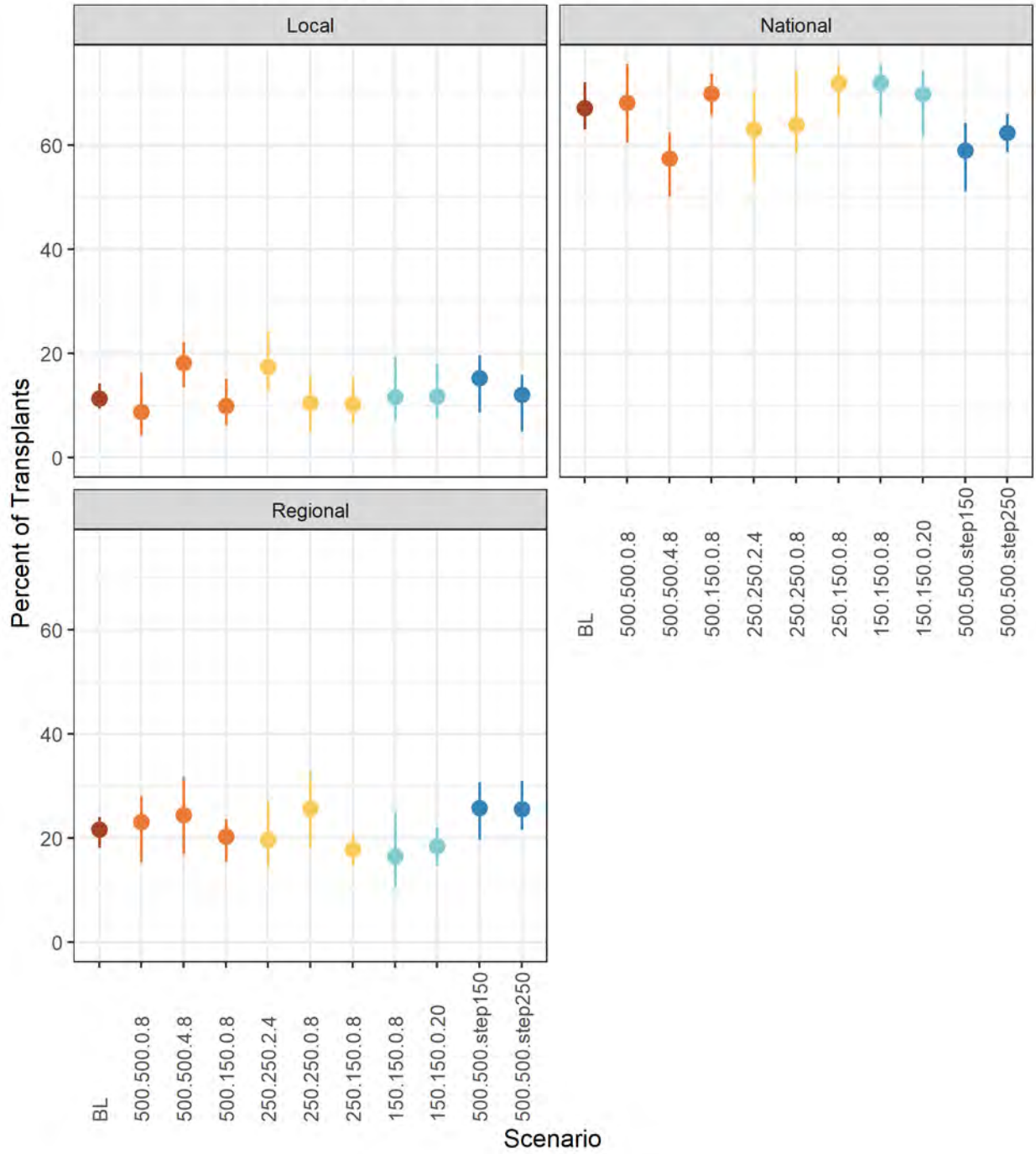
Percent of Transplants by Local/Regional/National: Kidney

Percent of Transplants by Local/Regional/National: Kidney-Pancreas



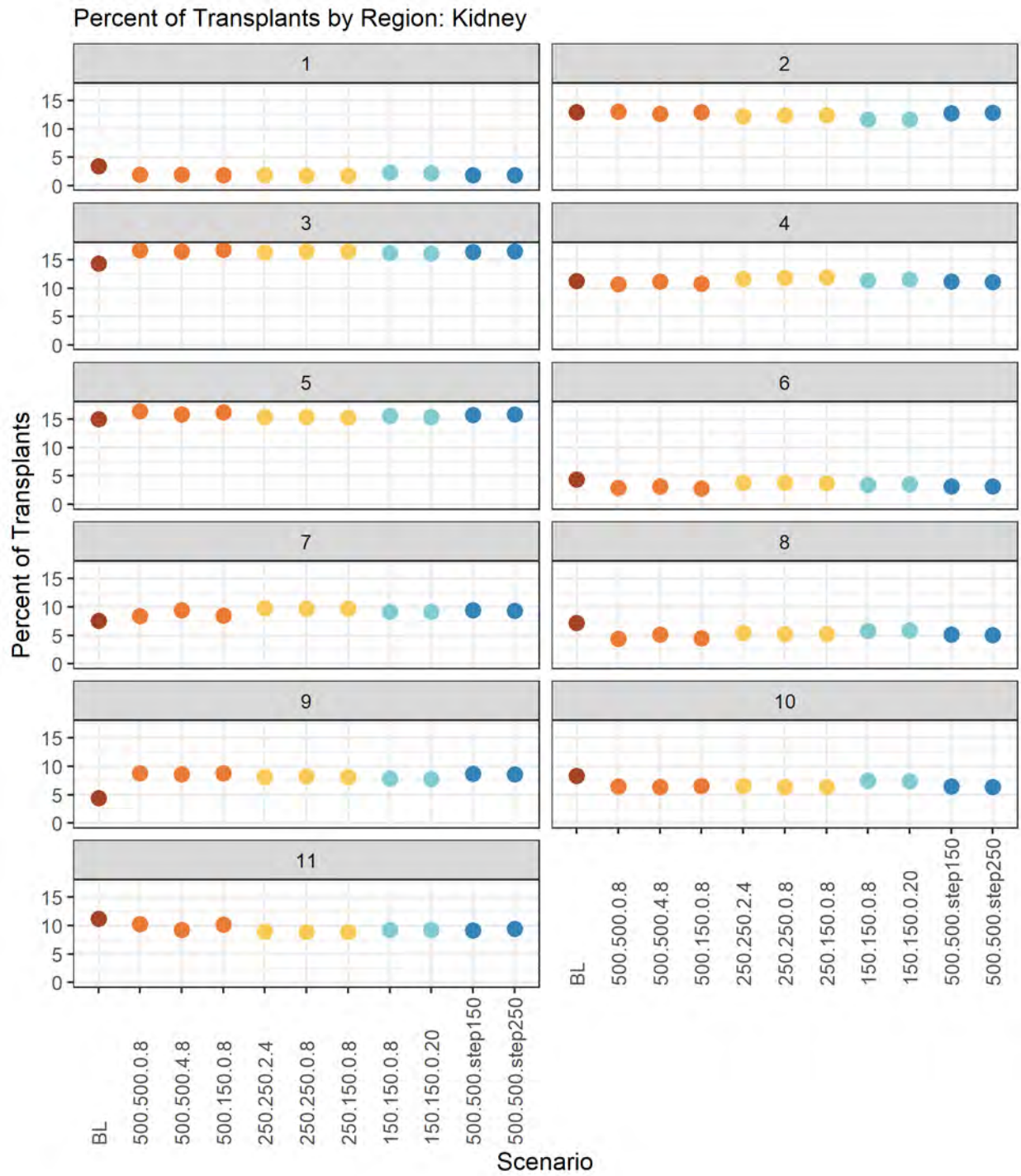
Percent of Transplants by Local/Regional/National: Kidney-Pancreas

Percent of Transplants by Local/Regional/National: Pancreas



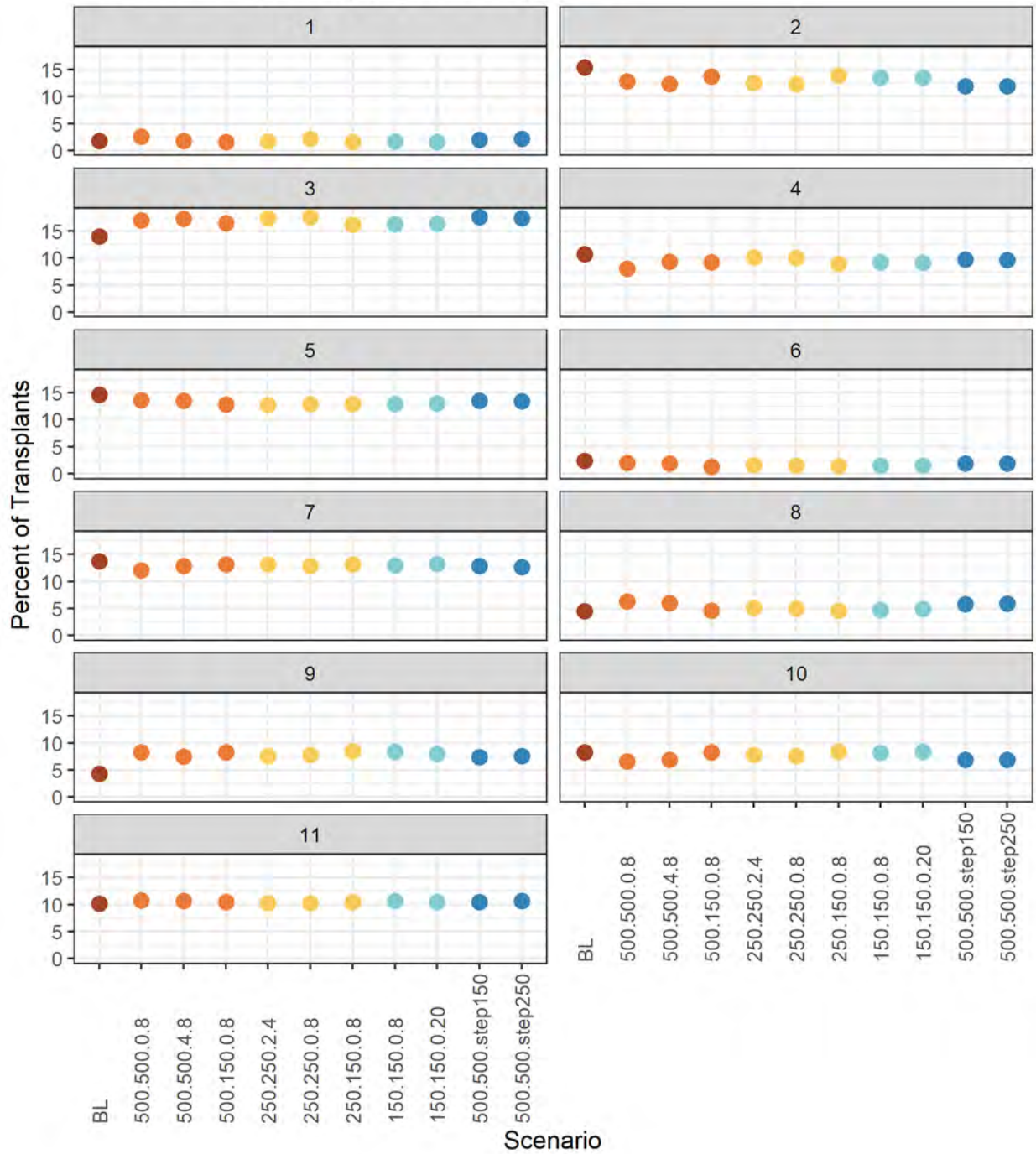
Percent of Transplants by Local/Regional/National: Pancreas

Transplant Percentages: Region

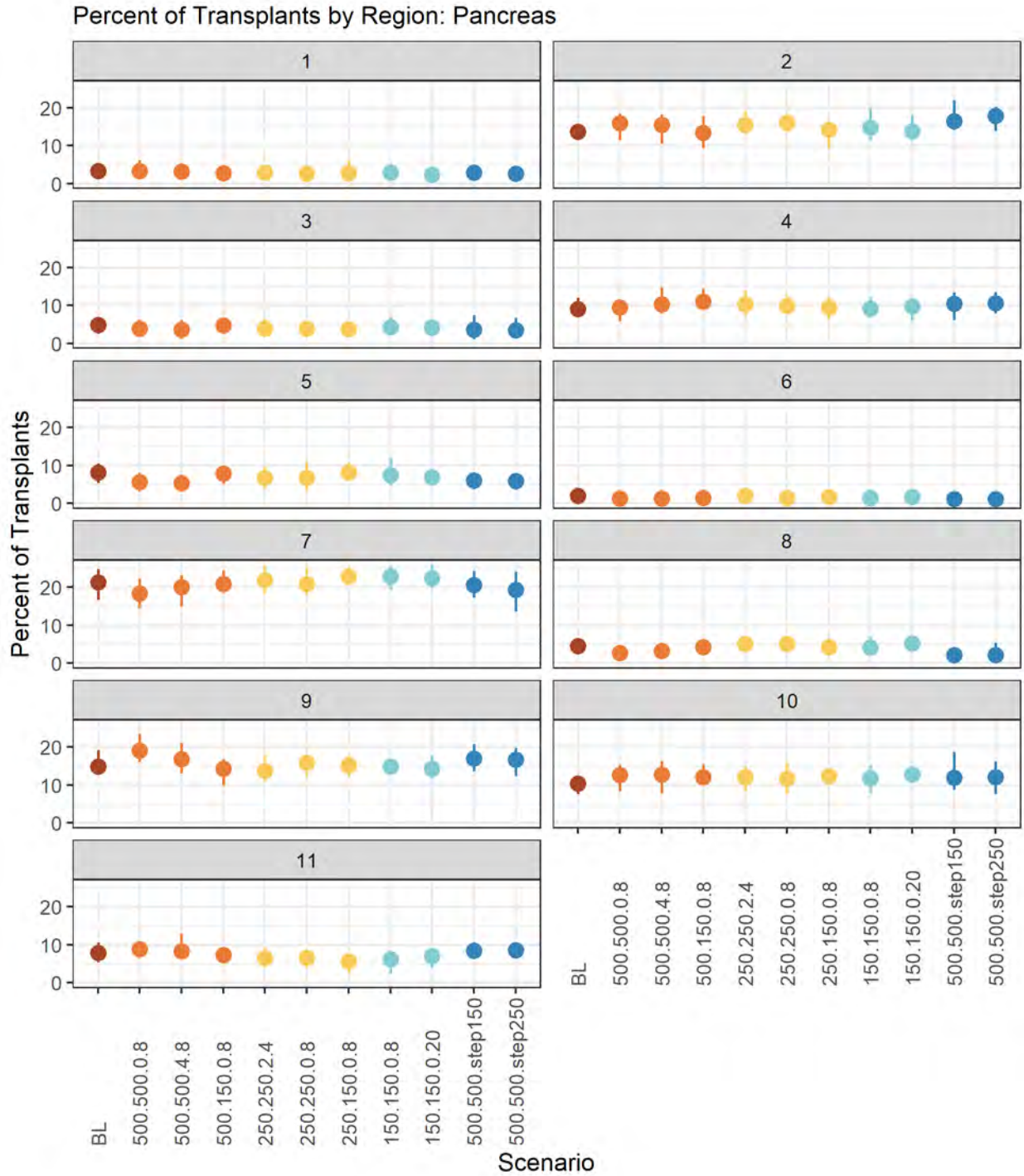


Percent of Transplants by Region: Kidney

Percent of Transplants by Region: Kidney-Pancreas

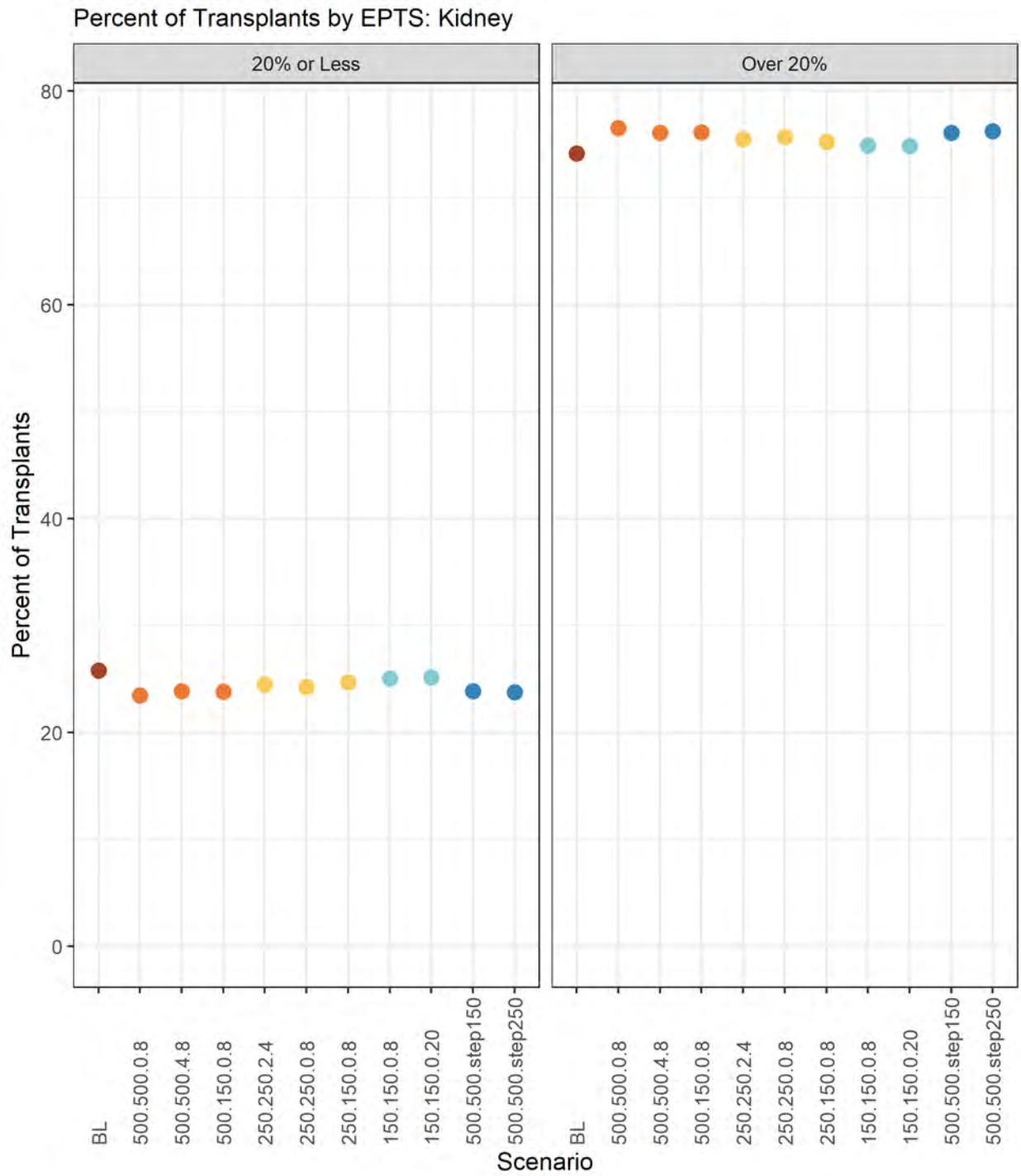


Percent of Transplants by Region: Kidney-Pancreas



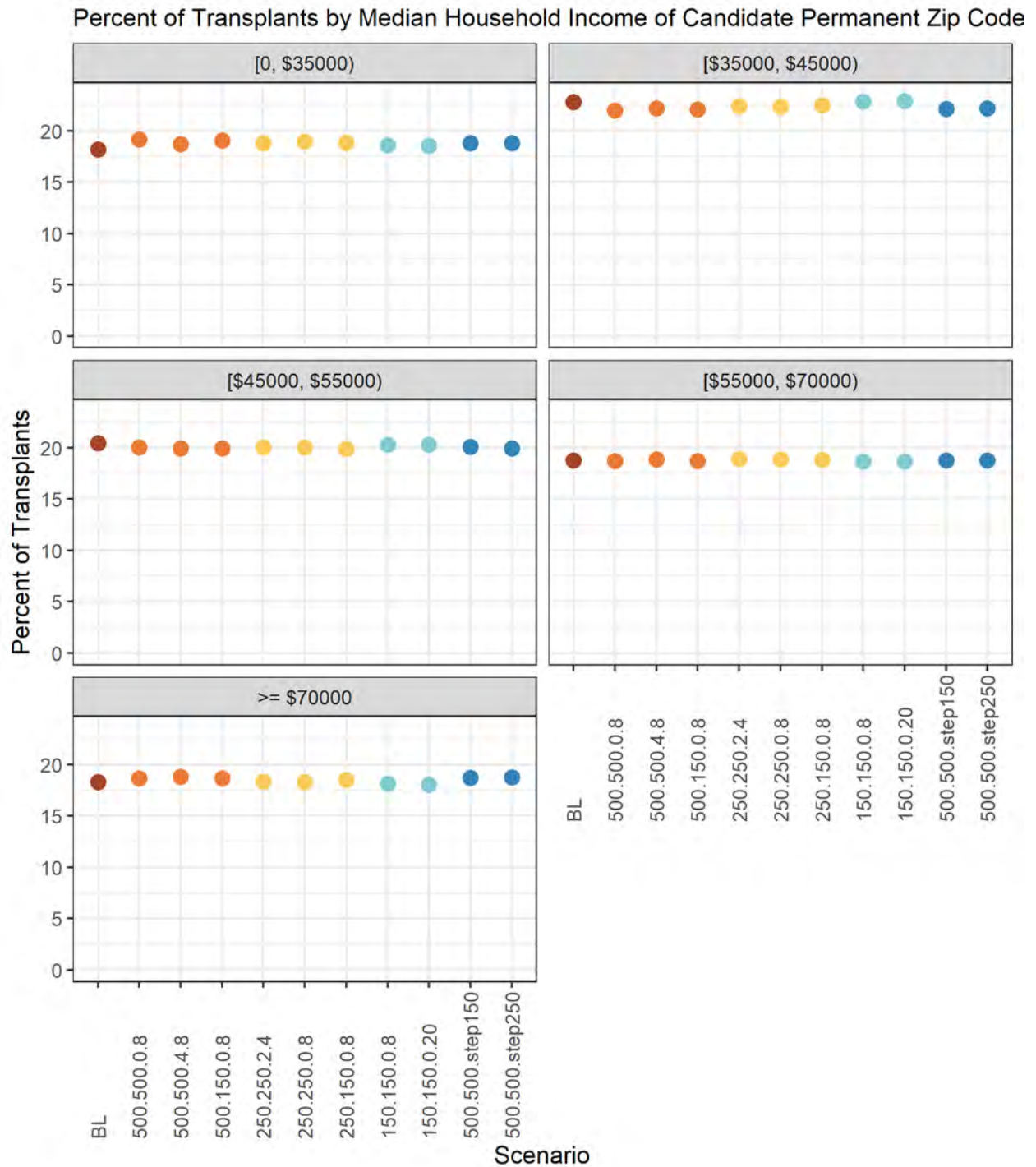
Percent of Transplants by Region: Pancreas

Transplant Percentages: EPTS



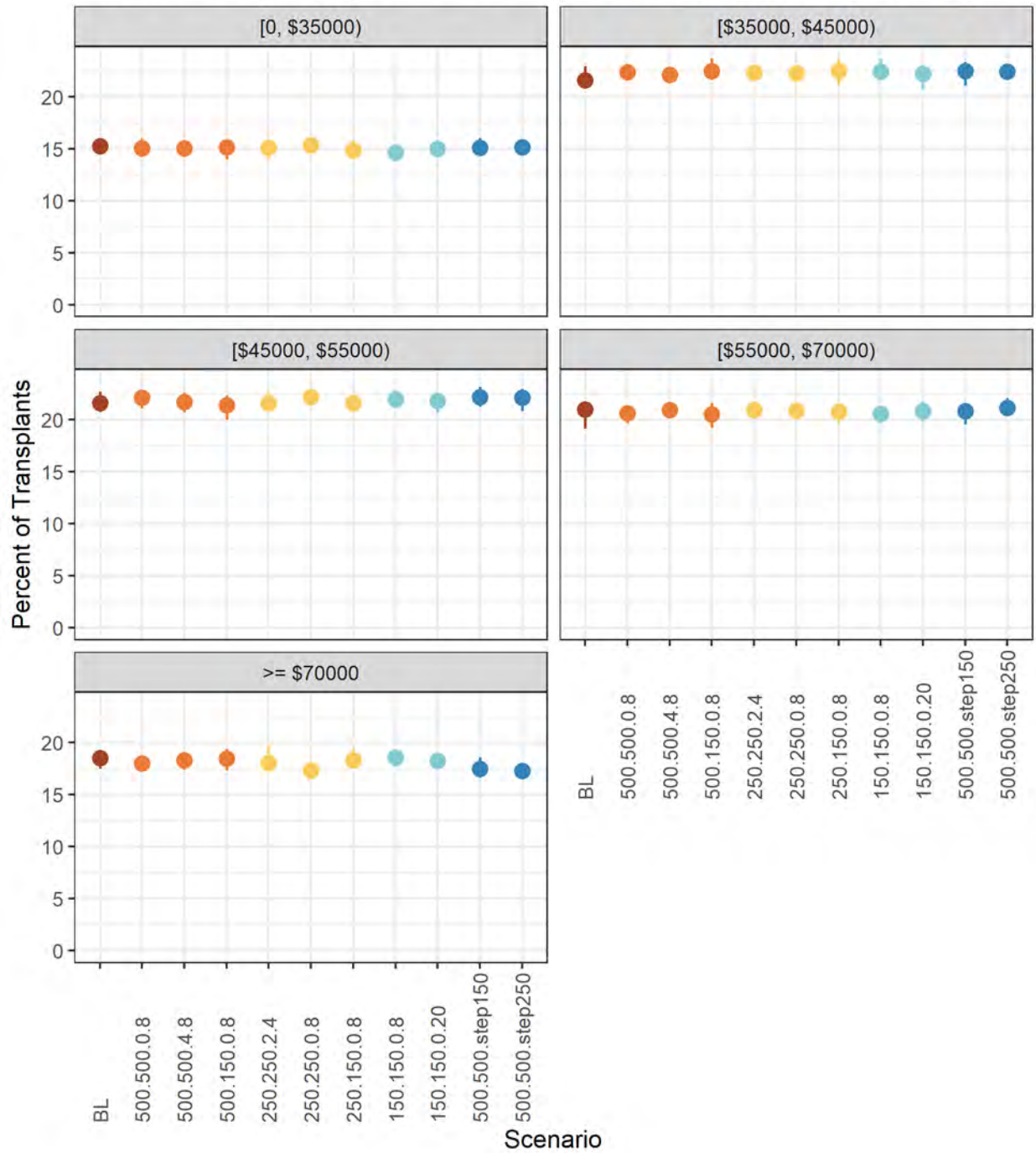
Percent of Transplants by EPTS: Kidney

Transplant Percentages: Median Household Income of Candidate Permanent Zip Code



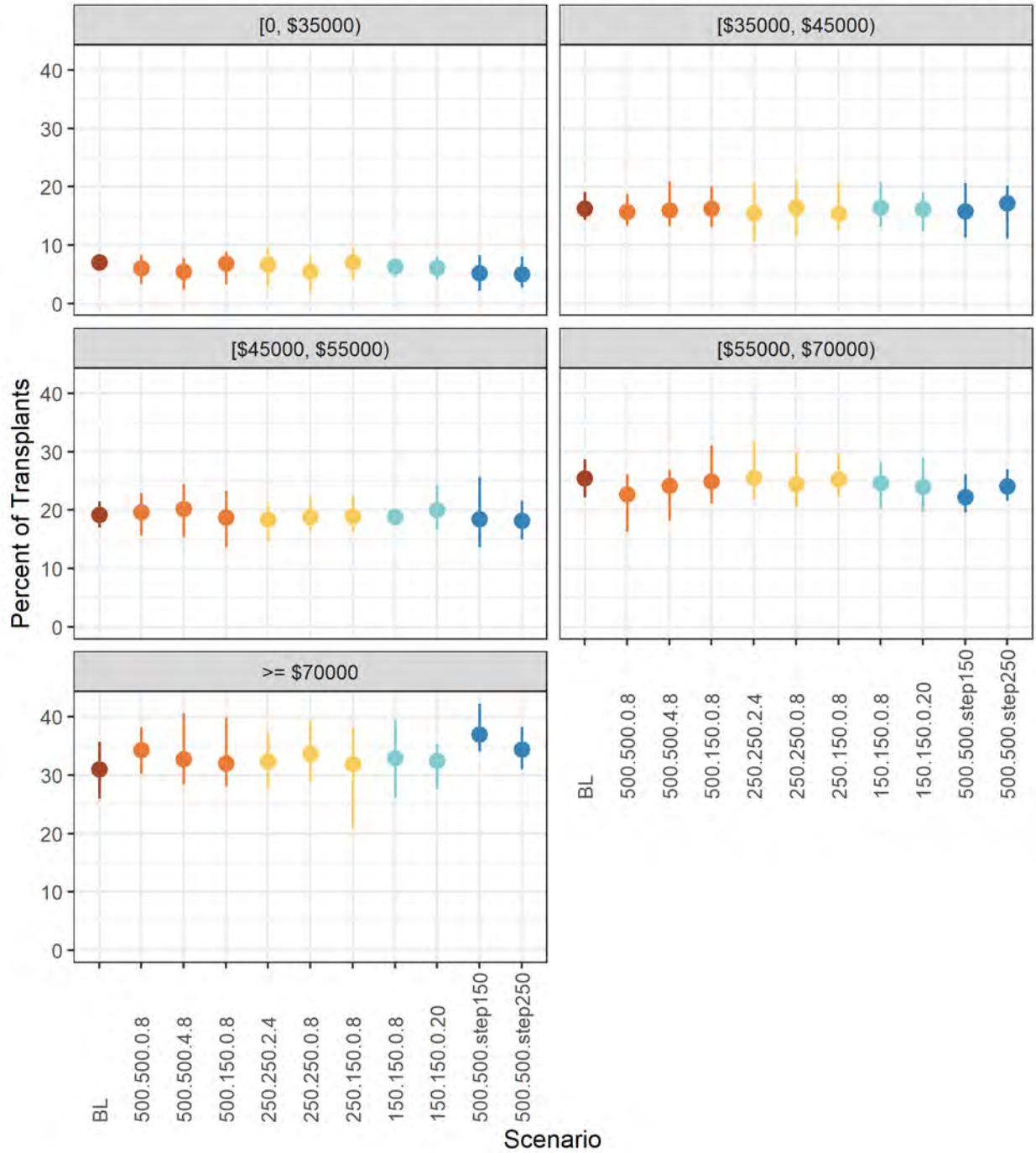
Percent of Transplants by Median Household Income of Candidate Permanent Zip Code: Kidney

Percent of Transplants by Median Household Income of Candidate Permanent Zip Code



Percent of Transplants by Median Household Income of Candidate Permanent Zip Code: Kidney-Pancreas

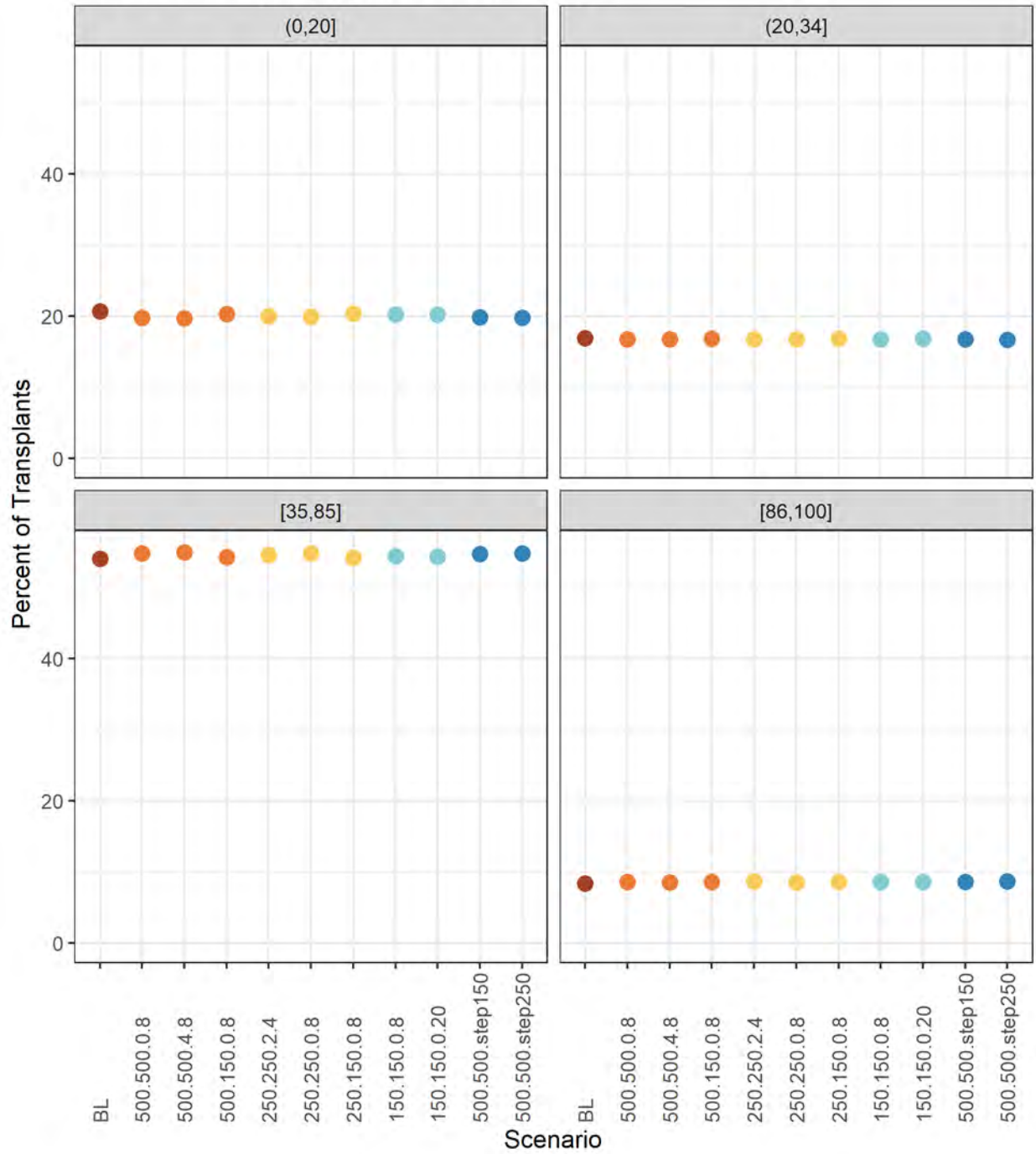
Percent of Transplants by Median Household Income of Candidate Permanent Zip Code



Percent of Transplants by Median Household Income of Candidate Permanent Zip Code: Pancreas

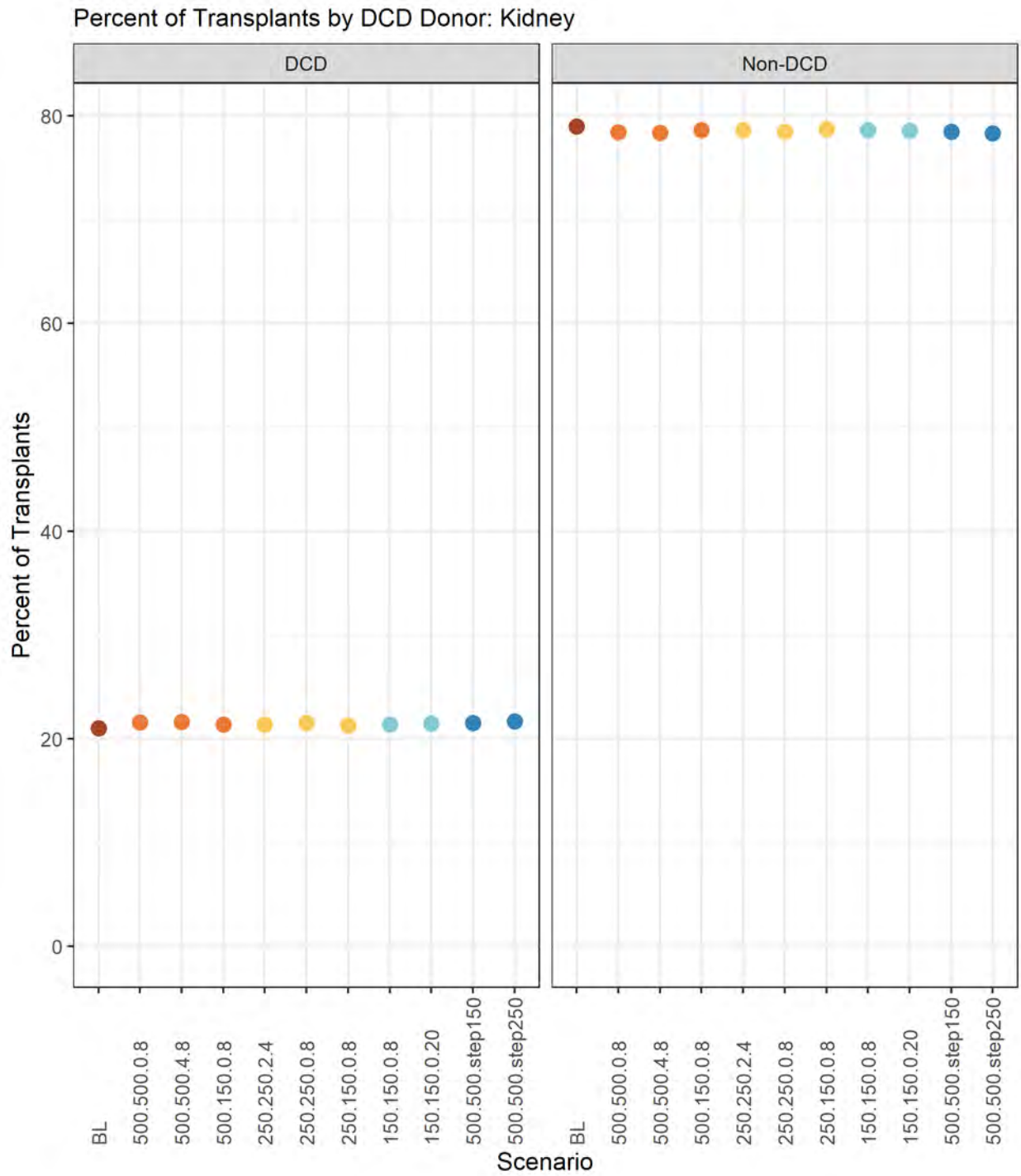
Transplant Percentages: Donor KDPI

Percent of Transplants by Donor KDPI: Kidney



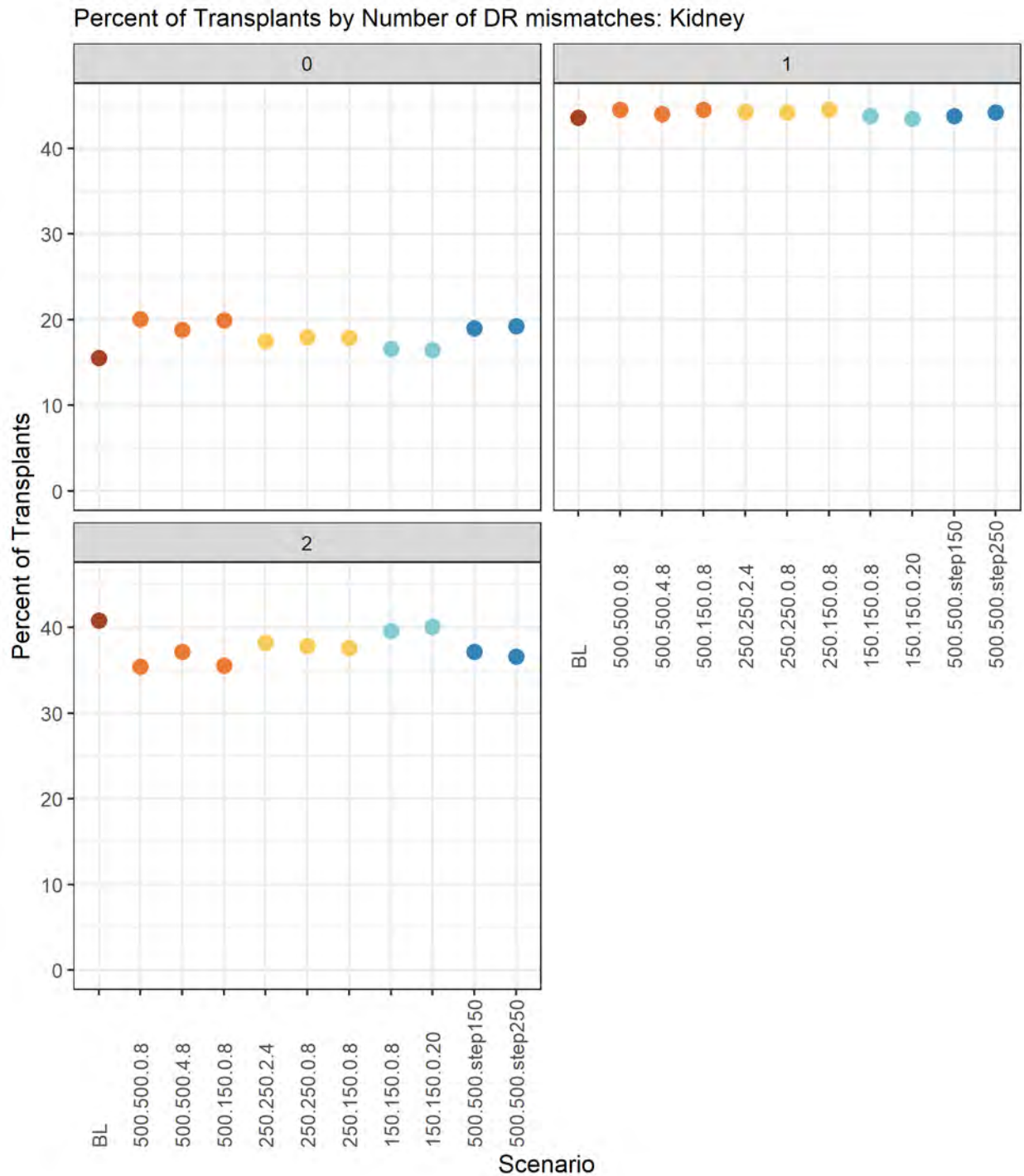
Percent of Transplants by Donor KDPI: Kidney

Transplant Percentages: DCD Donor



Percent of Transplants by DCD Donor: Kidney

Transplant Percentages: Number of DR mismatches



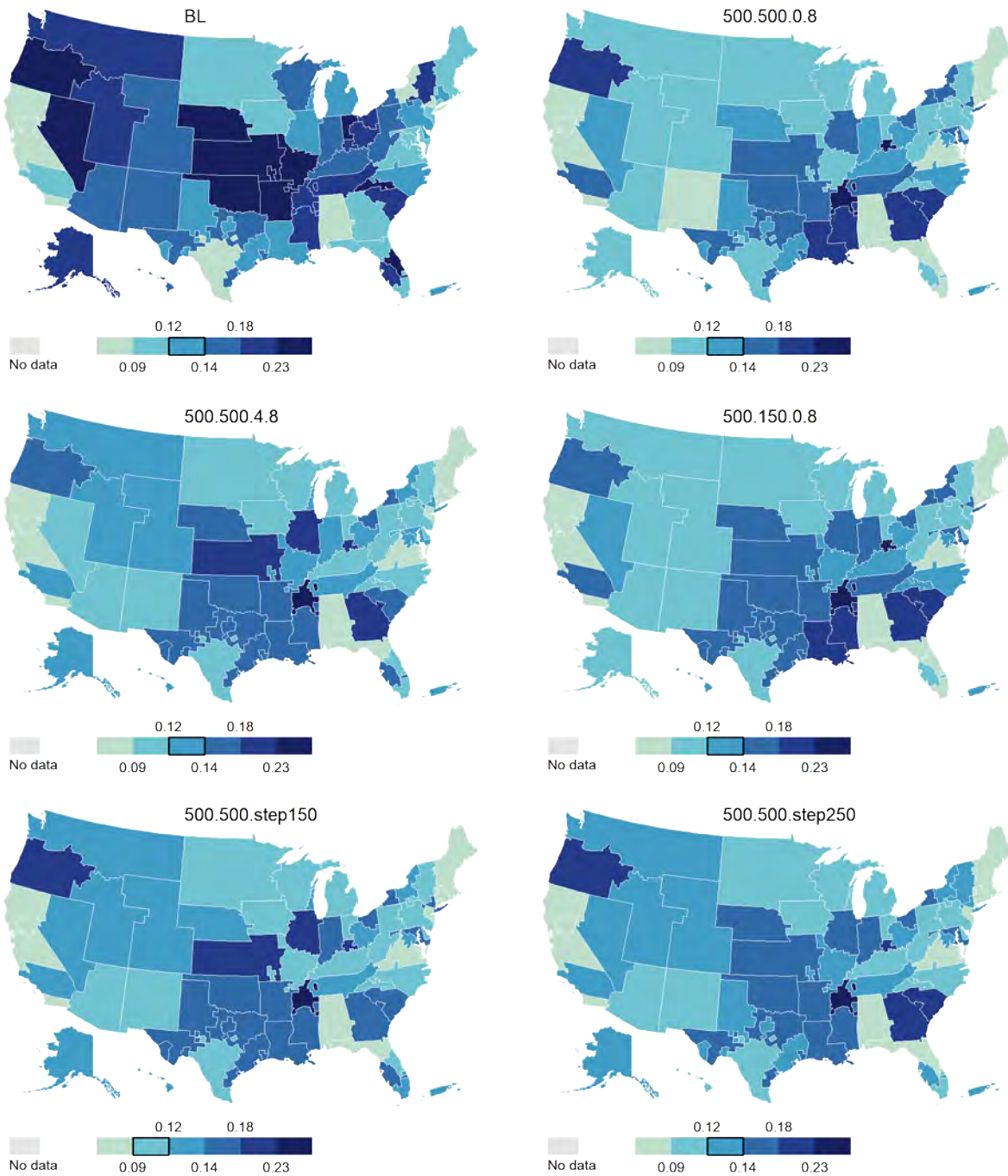
Percent of Transplants by Number of DR mismatches: Kidney

Choropleth Maps of Metrics by DSA

DSAs with either no transplant program or without the given outcome during the simulation (e.g. transplant or waitlist death) are both shown as having "No Data."

Maps of Transplant Rate by DSA, Kidney-Alone: 500 NM

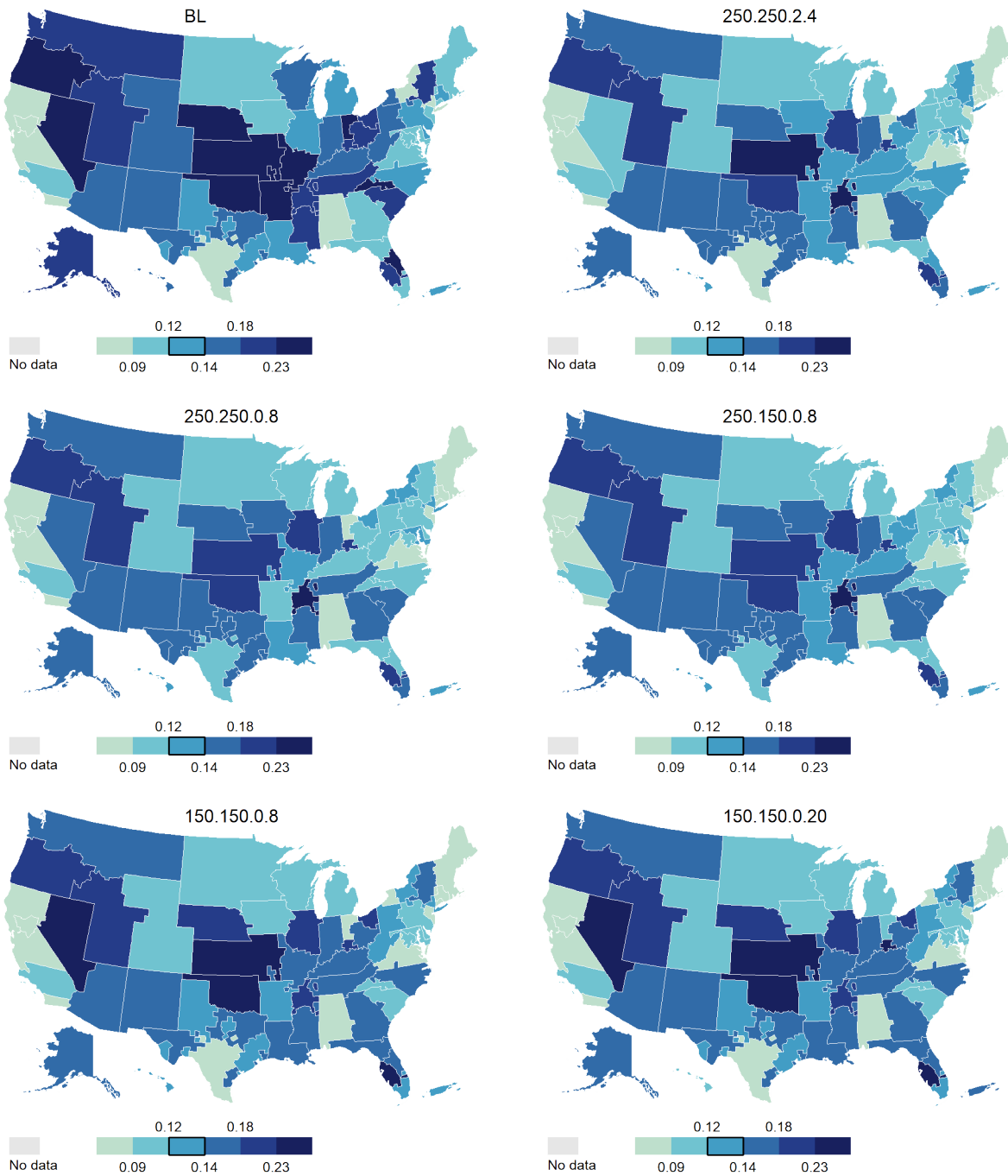
Maps of Transplant Rate by DSA, Kidney-Alone: 500 NM



Maps of Transplant Rate by DSA, Kidney-Alone: 500 NM

Maps of Transplant Rate by DSA, Kidney-Along

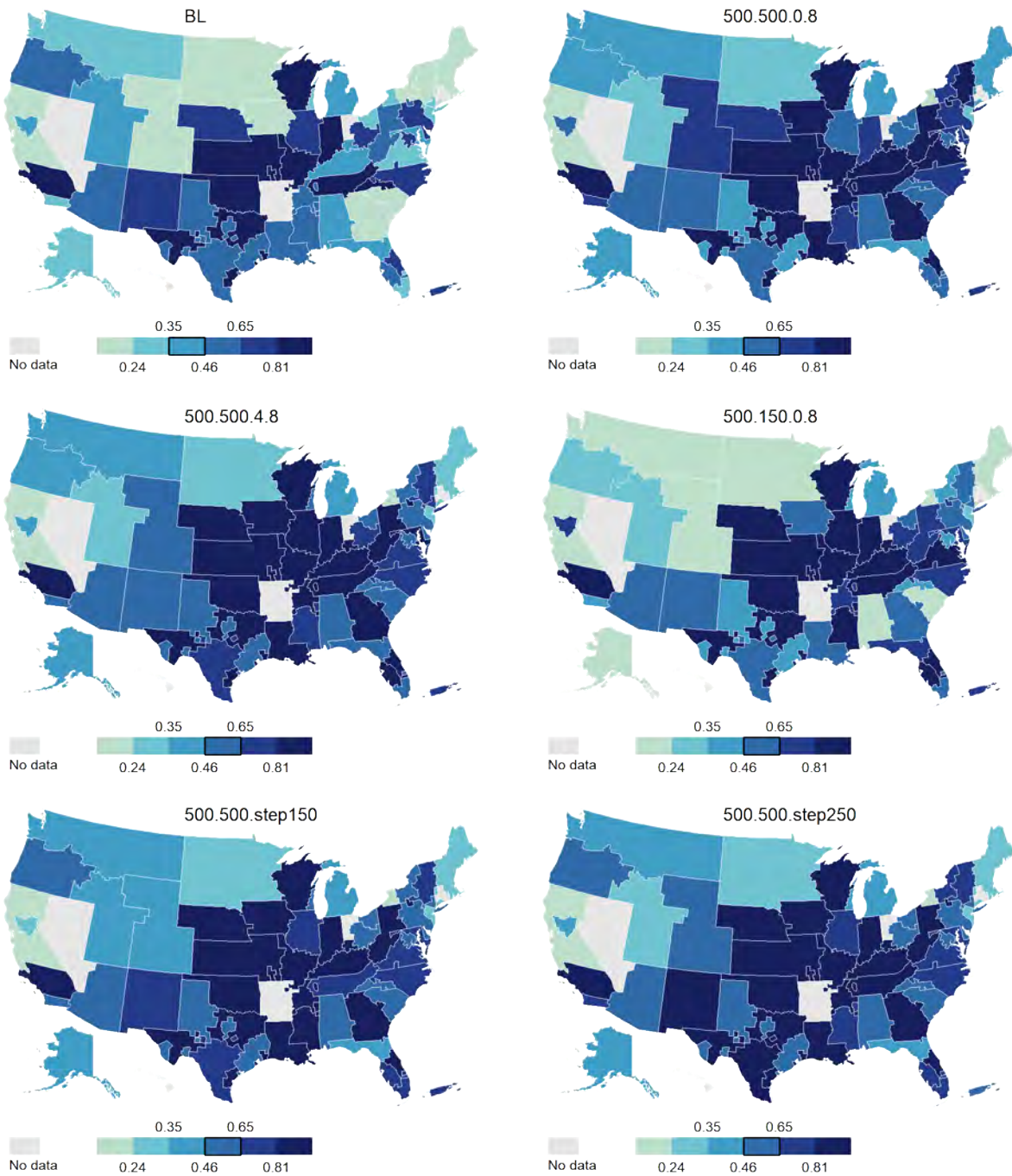
Maps of Transplant Rate by DSA, Kidney-Along



Maps of Transplant Rate by DSA, Kidney-Along

Maps of Transplant Rate by DSA, Kidney-Pancreas: 500 NM

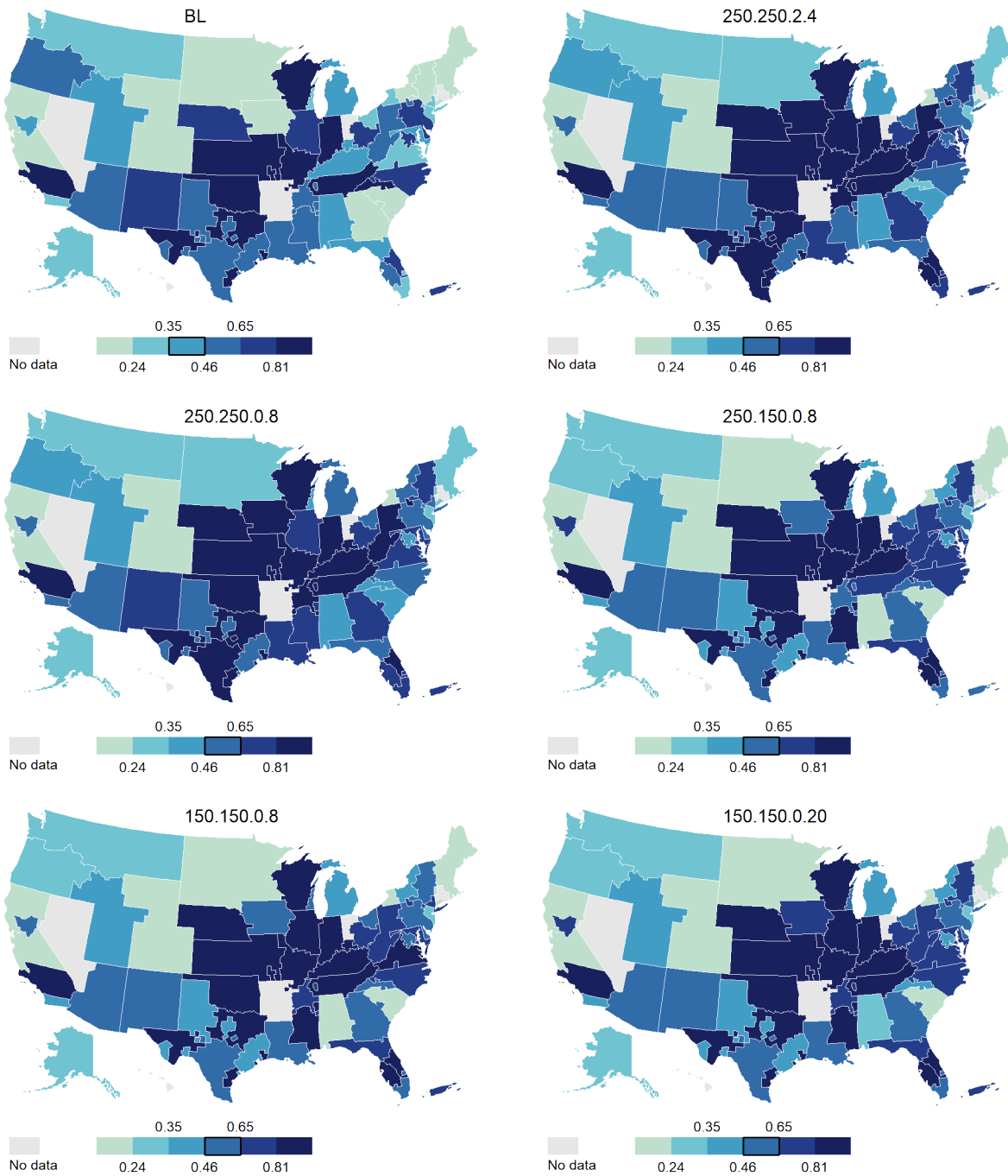
Maps of Transplant Rate by DSA, Kidney-Pancreas: 500 NM



Maps of Transplant Rate by DSA, Kidney-Pancreas: 500 NM

Maps of Transplant Rate by DSA, Kidney-Pancreas

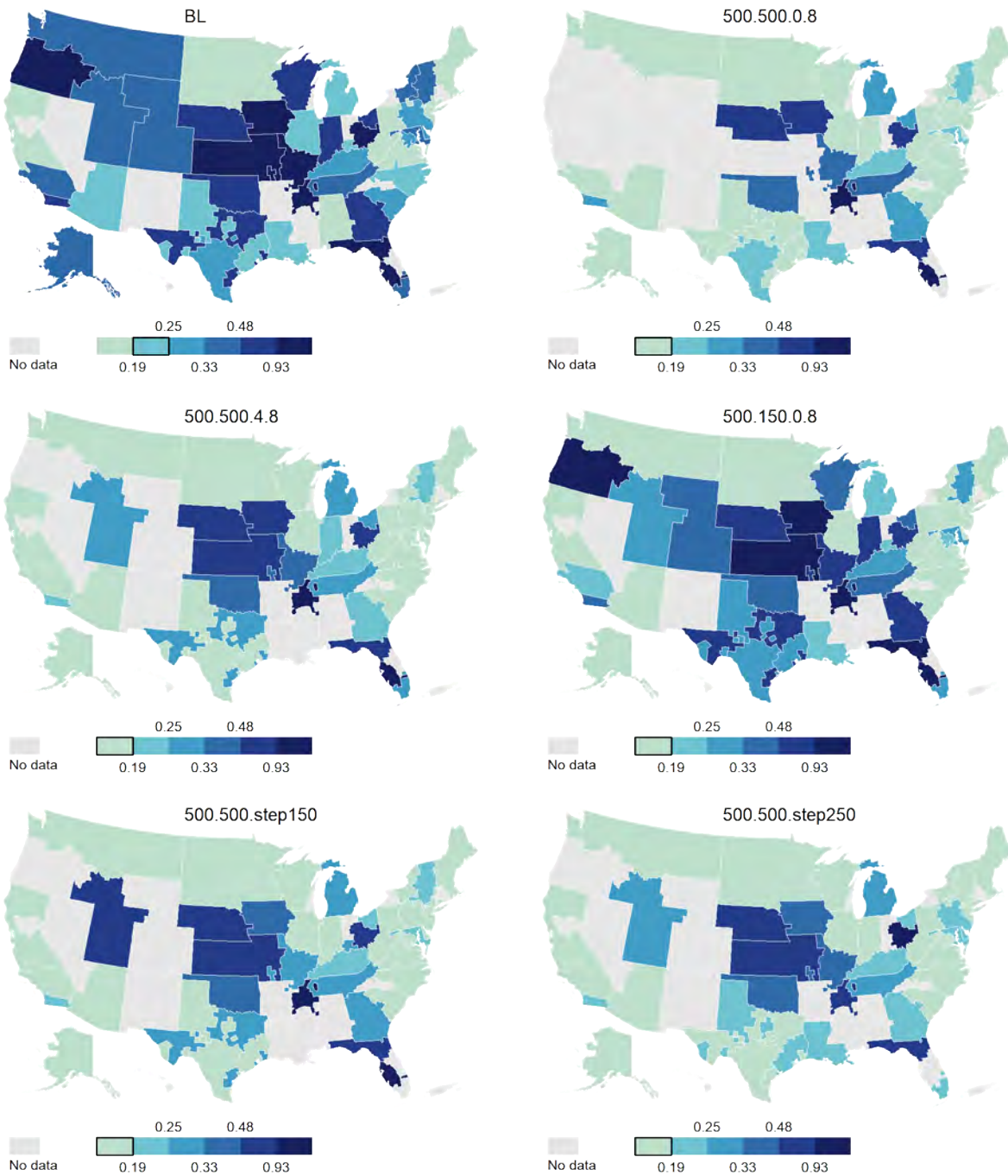
Maps of Transplant Rate by DSA, Kidney-Pancreas



Maps of Transplant Rate by DSA, Kidney-Pancreas

Maps of Transplant Rate by DSA, Pancreas-Alone: 500 NM

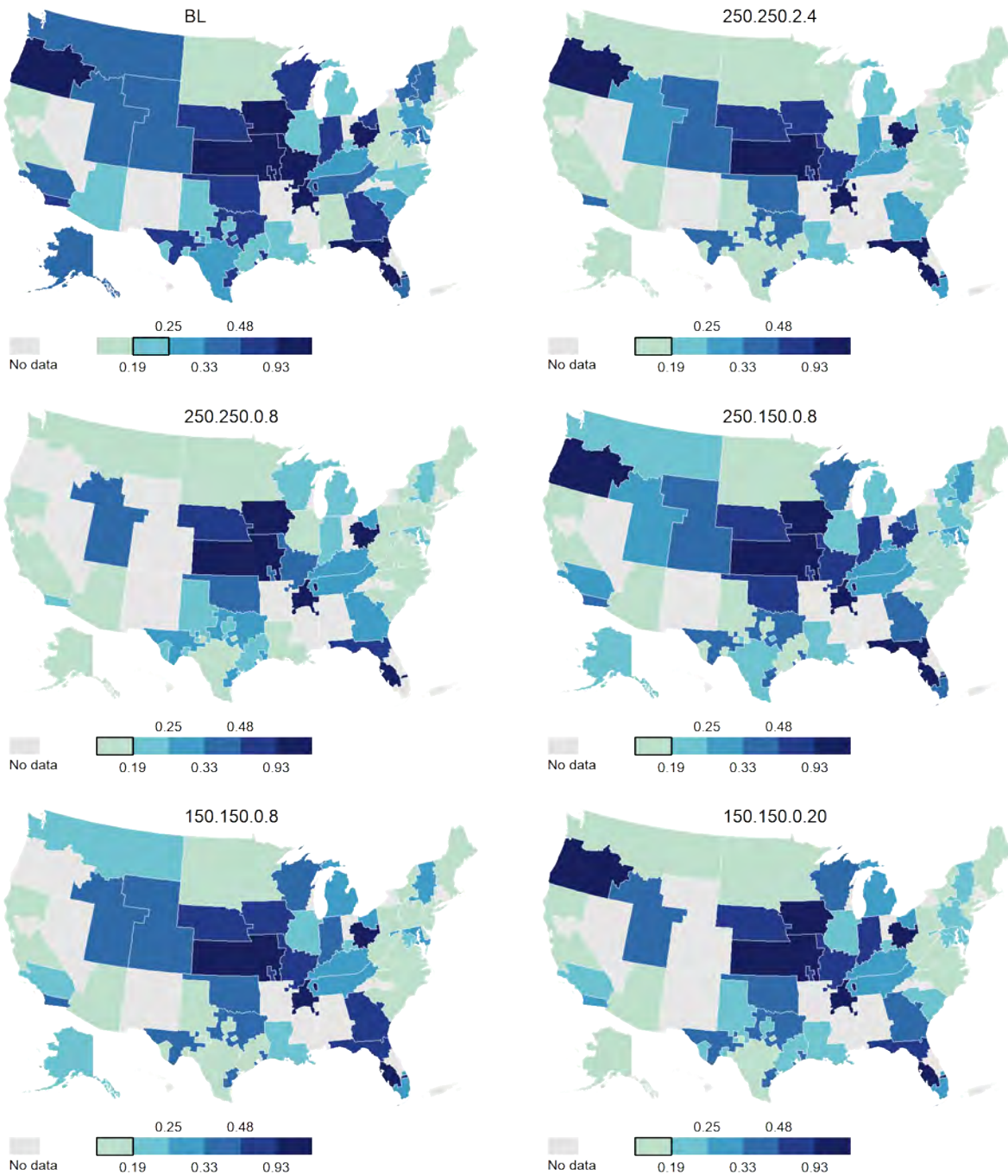
Maps of Transplant Rate by DSA, Pancreas-Alone: 500 NM



Maps of Transplant Rate by DSA, Pancreas-Alone: 500 NM

Maps of Transplant Rate by DSA, Pancreas-alone

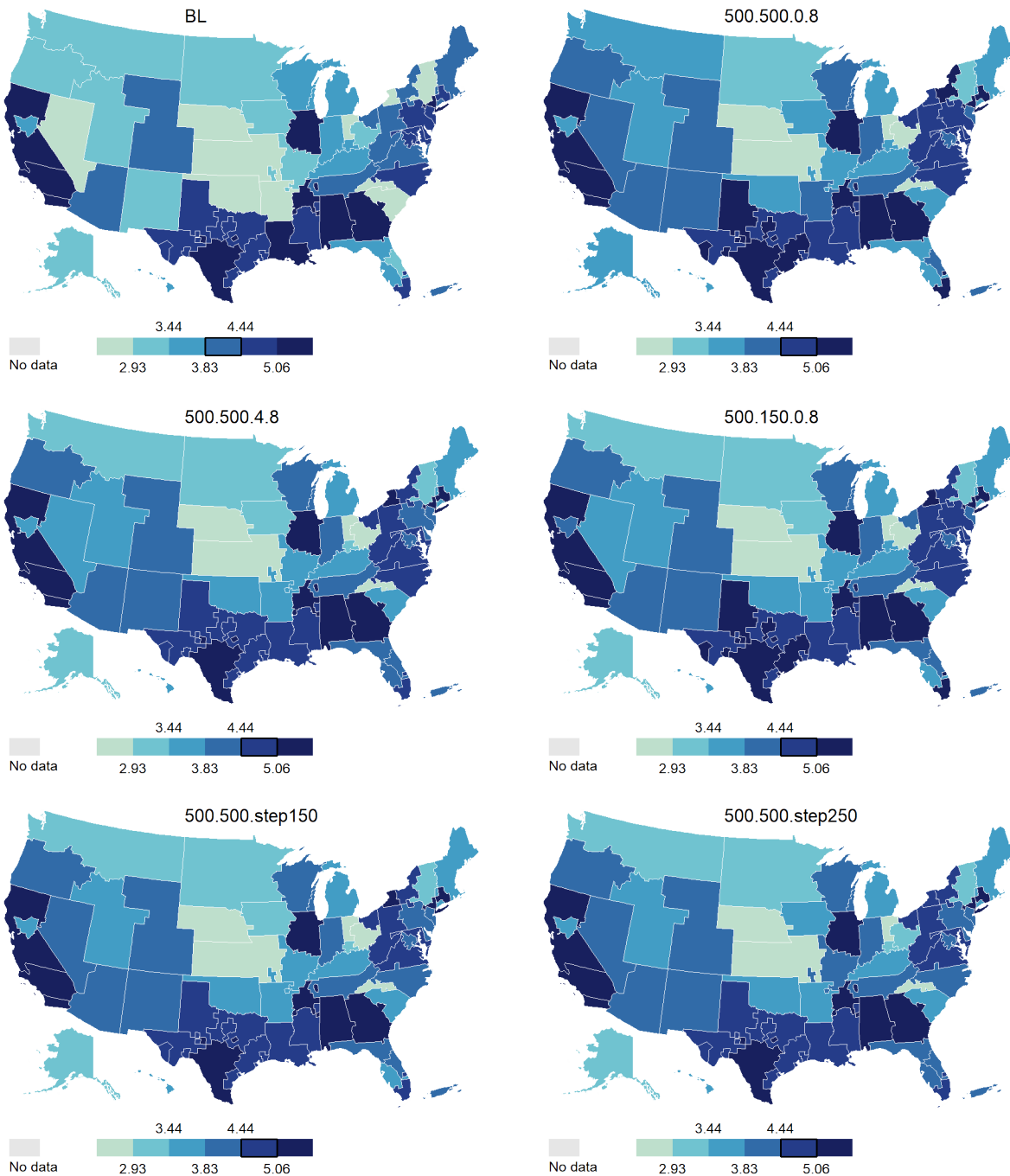
Maps of Transplant Rate by DSA, Pancreas-Alone



Maps of Transplant Rate by DSA, Pancreas-Alone

Maps of Median Years on Dialysis at Transplant, Kidney-Along: 500 NM

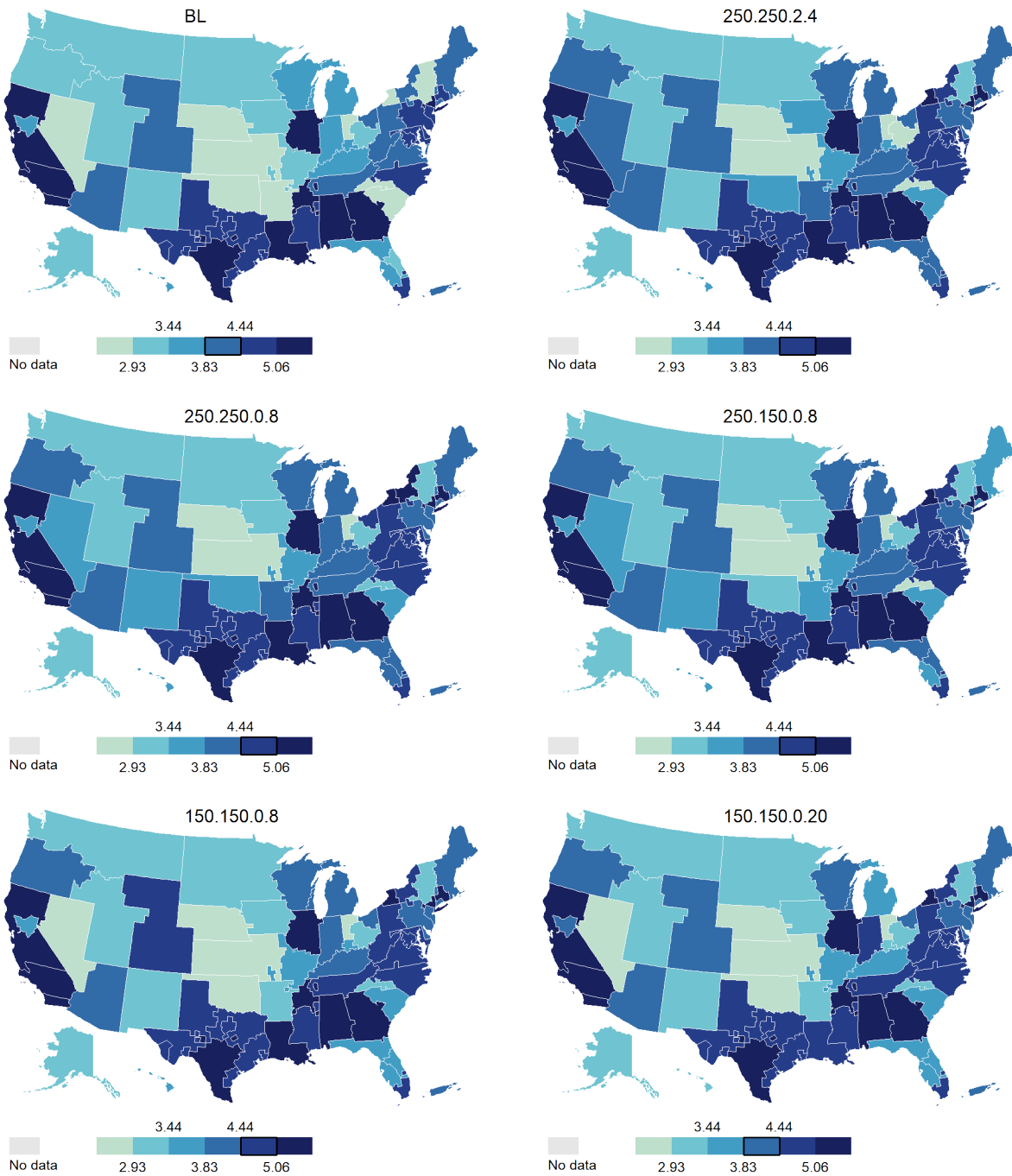
Maps of Median Years on Dialysis at Transplant, Kidney-Along: 500 NM



Maps of Median Years on Dialysis at Transplant, Kidney-Along: 500 NM

Maps of Median Years on Dialysis at Transplant, Kidney-Only

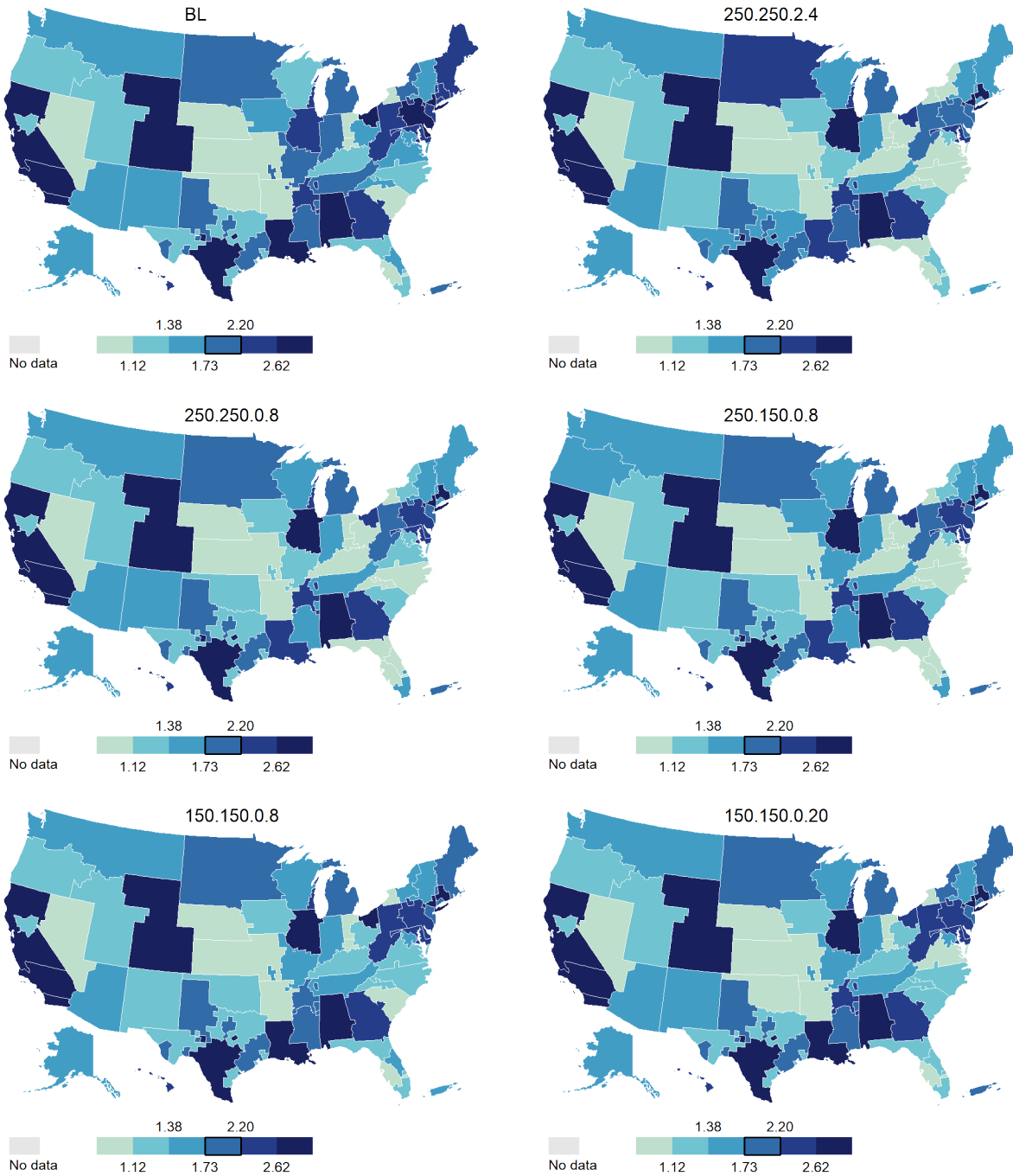
Maps of Median Years on Dialysis at Transplant, Kidney-Only



Maps of Median Years on Dialysis at Transplant, Kidney-Only

Maps of Median Years on Waitlist at Transplant, Kidney-Only: 500 NM

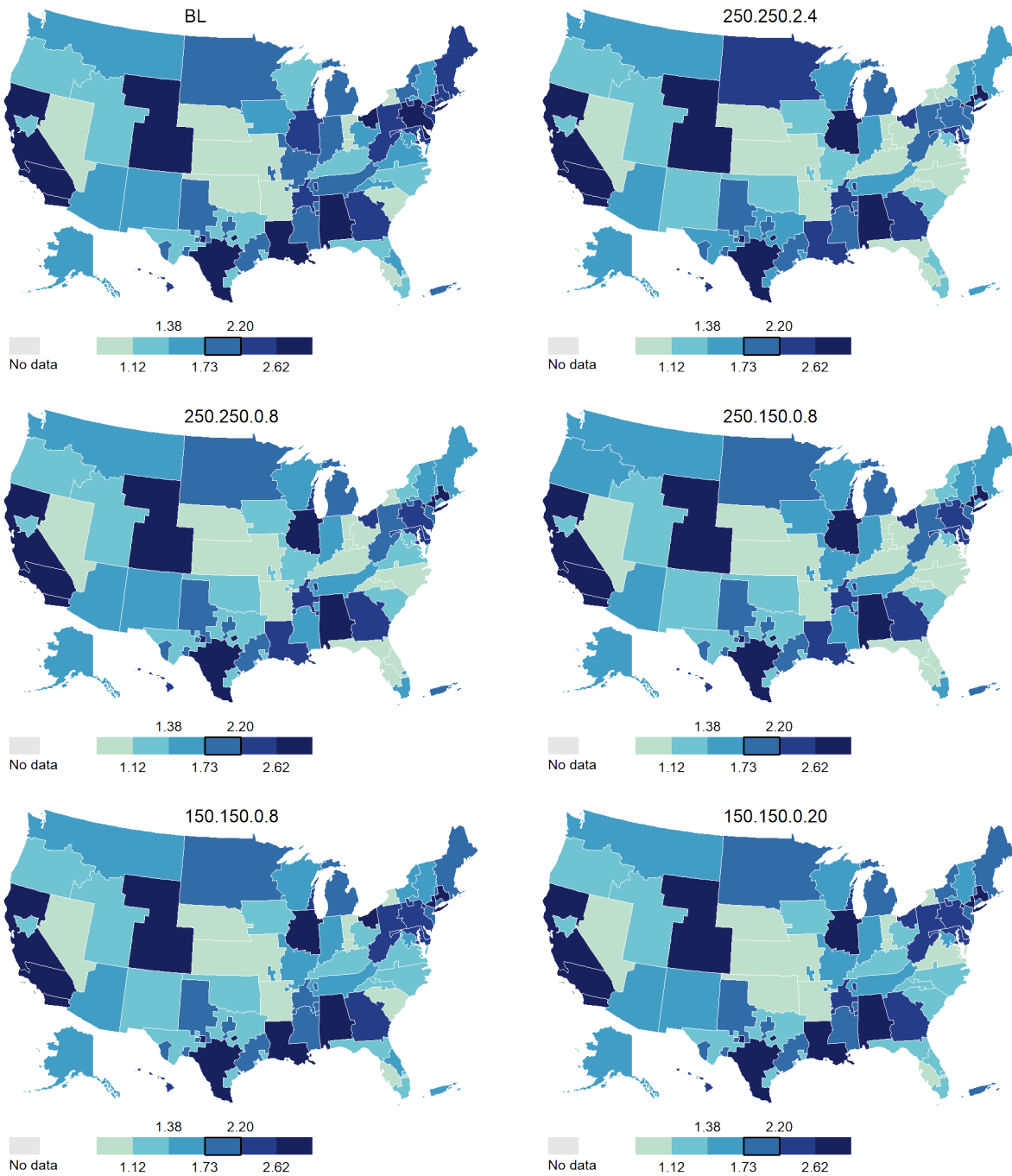
Maps of Median Years on Waitlist at Transplant, Kidney-Only: 500 NM



Maps of Median Years on Waitlist at Transplant, Kidney-Only: 500 NM

Maps of Median Years on Waitlist at Transplant, Kidney-Along

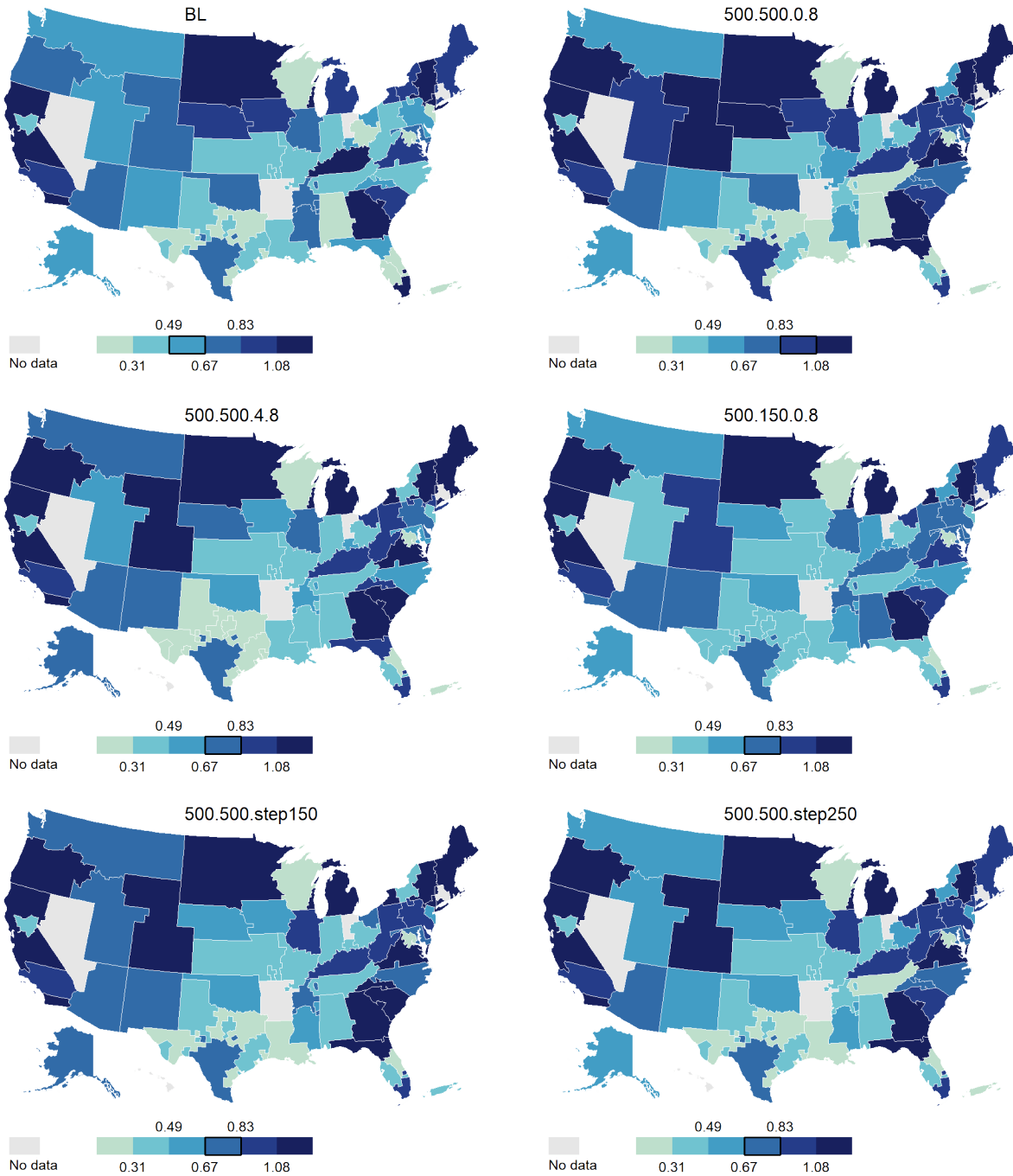
Maps of Median Years on Waitlist at Transplant, Kidney-Along: 500 NM



Maps of Median Years on Waitlist at Transplant, Kidney-Along: 500 NM

Maps of Median Years on Waitlist at Transplant, Kidney-Pancreas: 500 NM

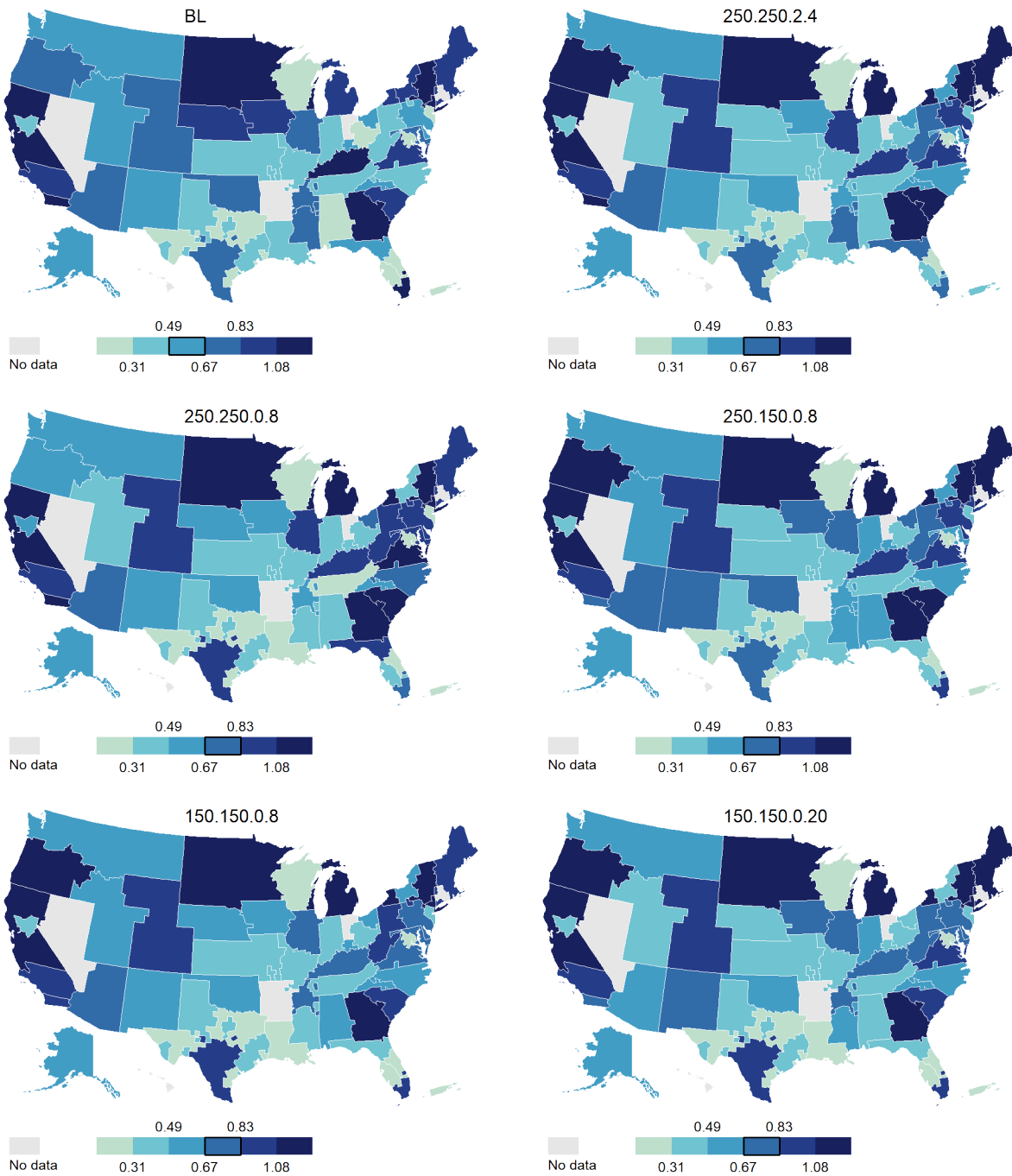
Maps of Median Years on Waitlist at Transplant, Kidney-Pancreas: 500 NM



Maps of Median Years on Waitlist at Transplant, Kidney-Pancreas: 500 NM

Maps of Median Years on Waitlist at Transplant, Kidney-Pancreas

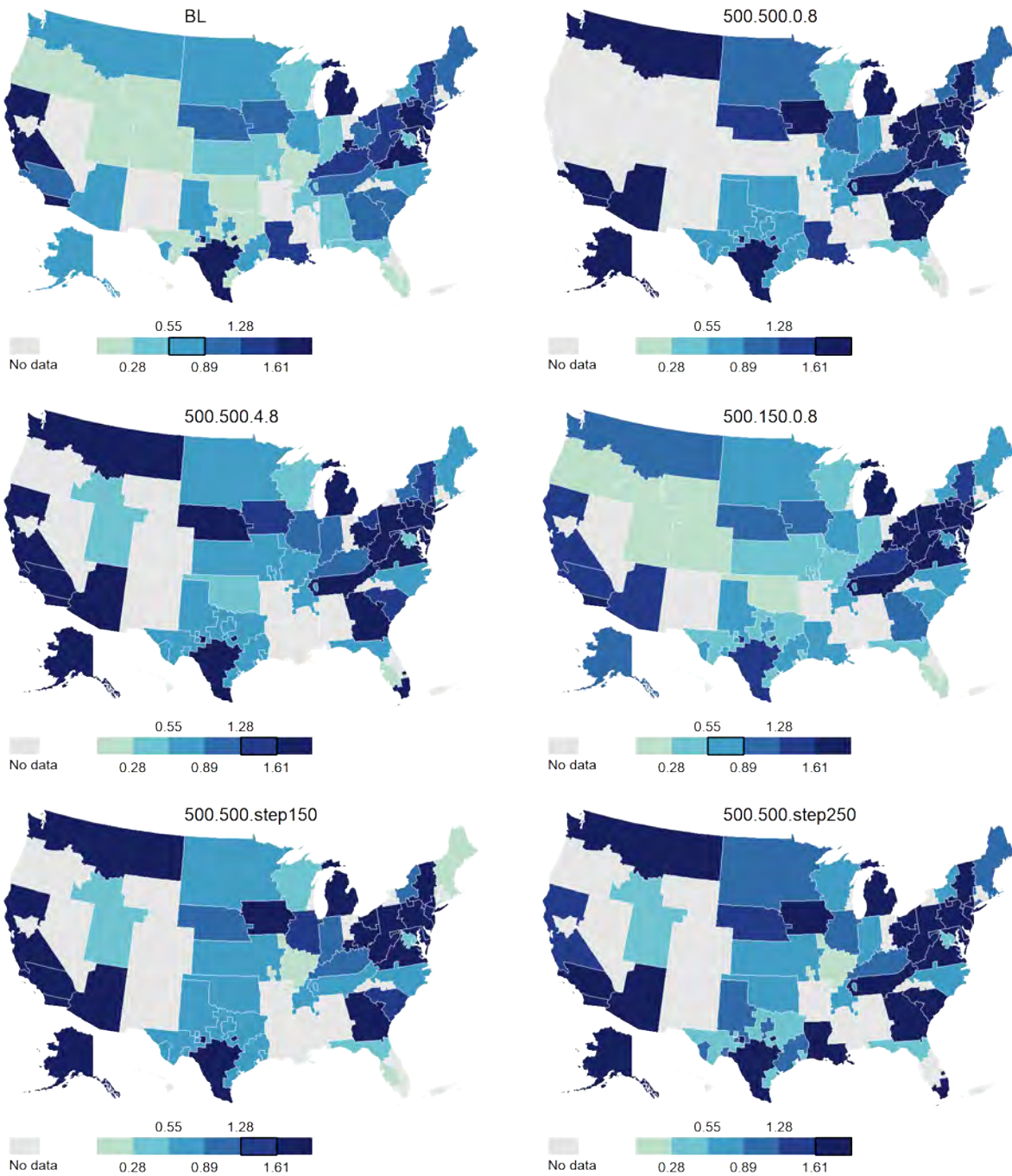
Maps of Median Years on Waitlist at Transplant, Kidney-Pancreas



Maps of Median Years on Waitlist at Transplant, Kidney-Pancreas

Maps of Median Years on Waitlist at Transplant, Pancreas-Alone: 500 NM

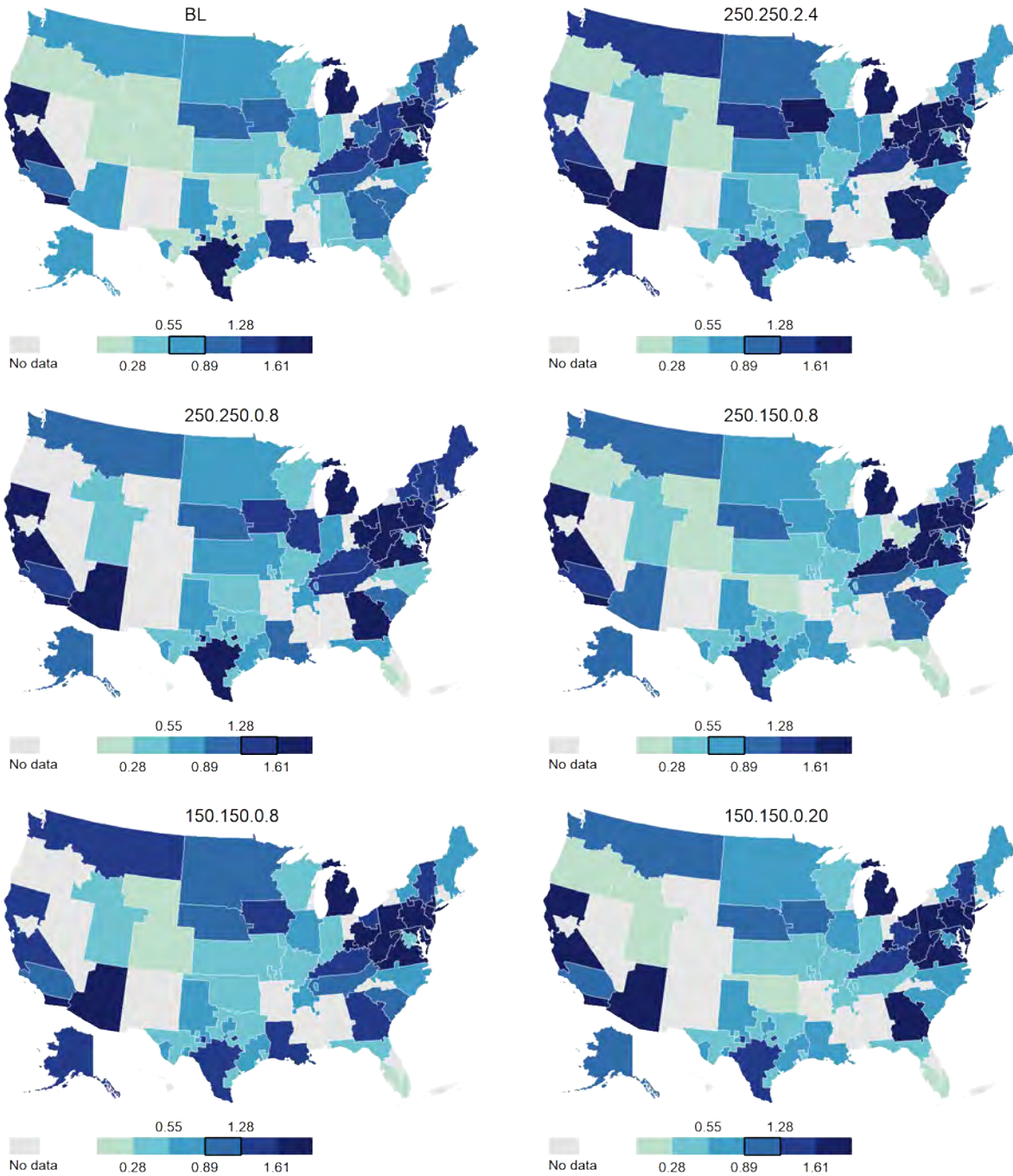
Maps of Median Years on Waitlist at Transplant, Pancreas-Alone: 500 NM



Maps of Median Years on Waitlist at Transplant, Pancreas-Alone: 500 NM

Maps of Median Years on Waitlist at Transplant, Pancreas-Alone

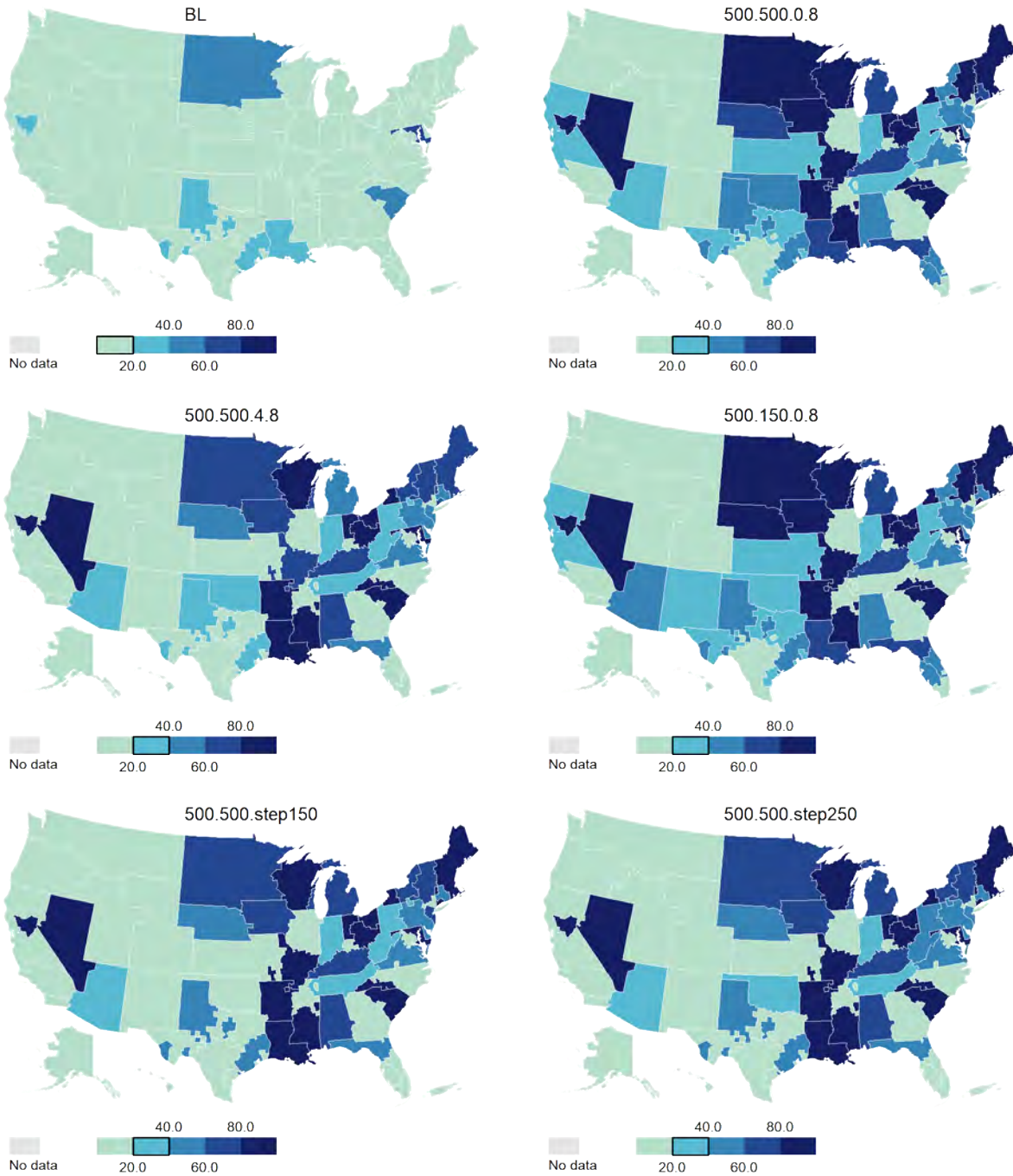
Maps of Median Years on Waitlist at Transplant, Pancreas-Alone



Maps of Median Years on Waitlist at Transplant, Pancreas-Alone

Maps of Median cPRA at Transplant, Kidney-Along: 500 NM

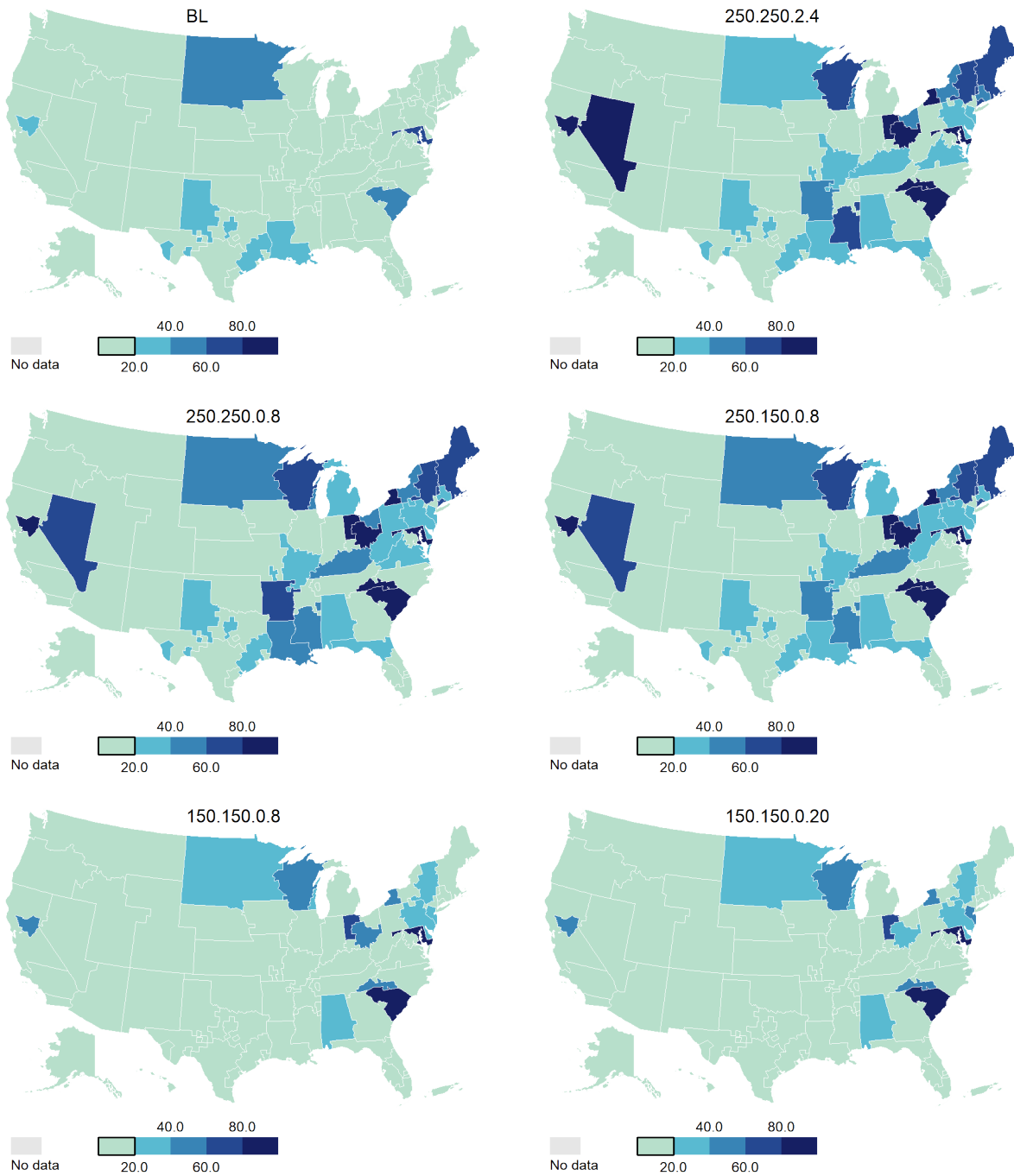
Maps of Median cPRA at Transplant, Kidney-Along: 500 NM



Maps of Median cPRA at Transplant, Kidney-Along: 500 NM

Maps of Median cPRA at Transplant, Kidney-Only

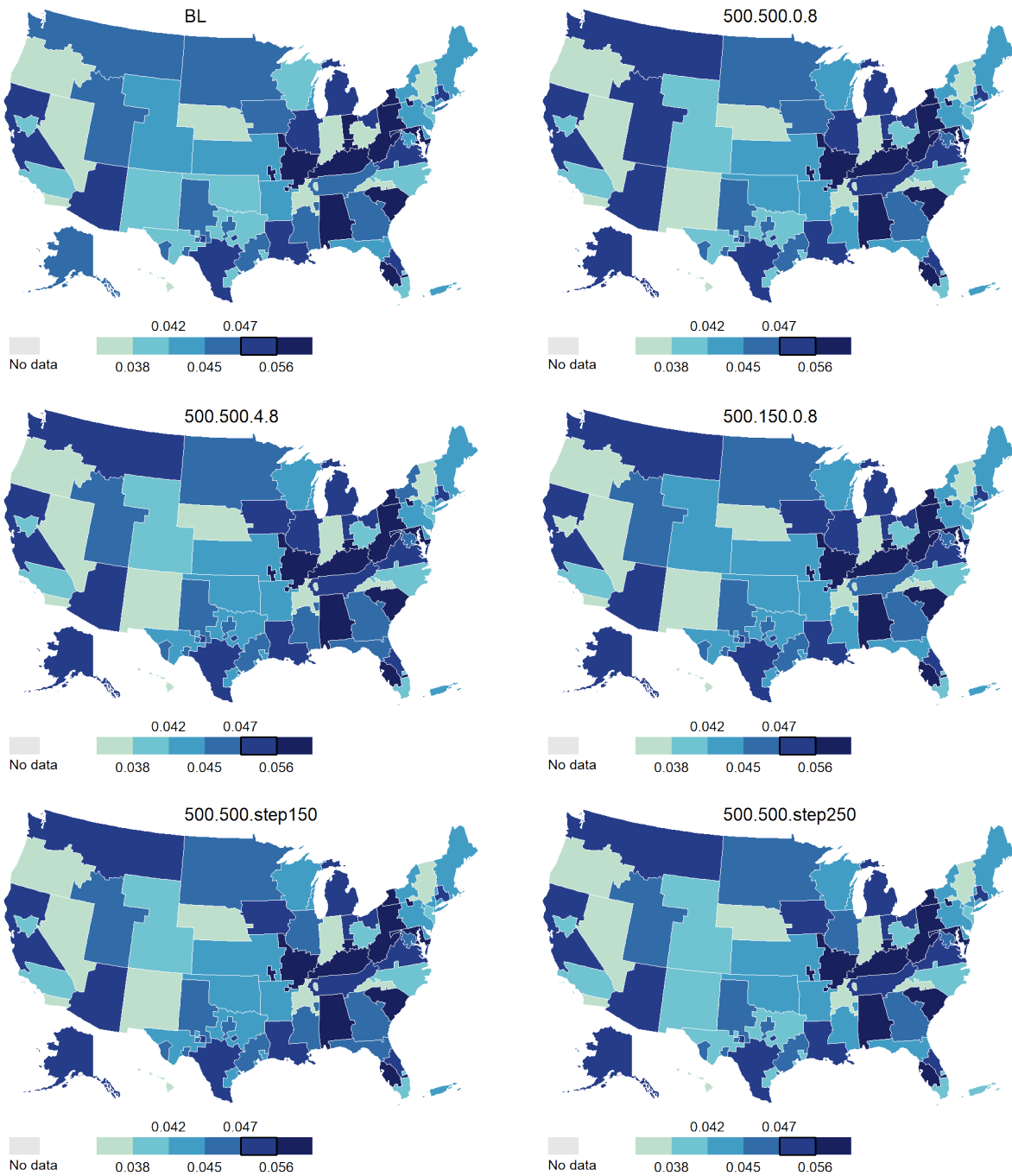
Maps of Median cPRA at Transplant, Kidney-Only



Maps of Median cPRA at Transplant, Kidney-Only

Maps of Waitlist Mortality Rate by DSA, Kidney-Along: 500 NM

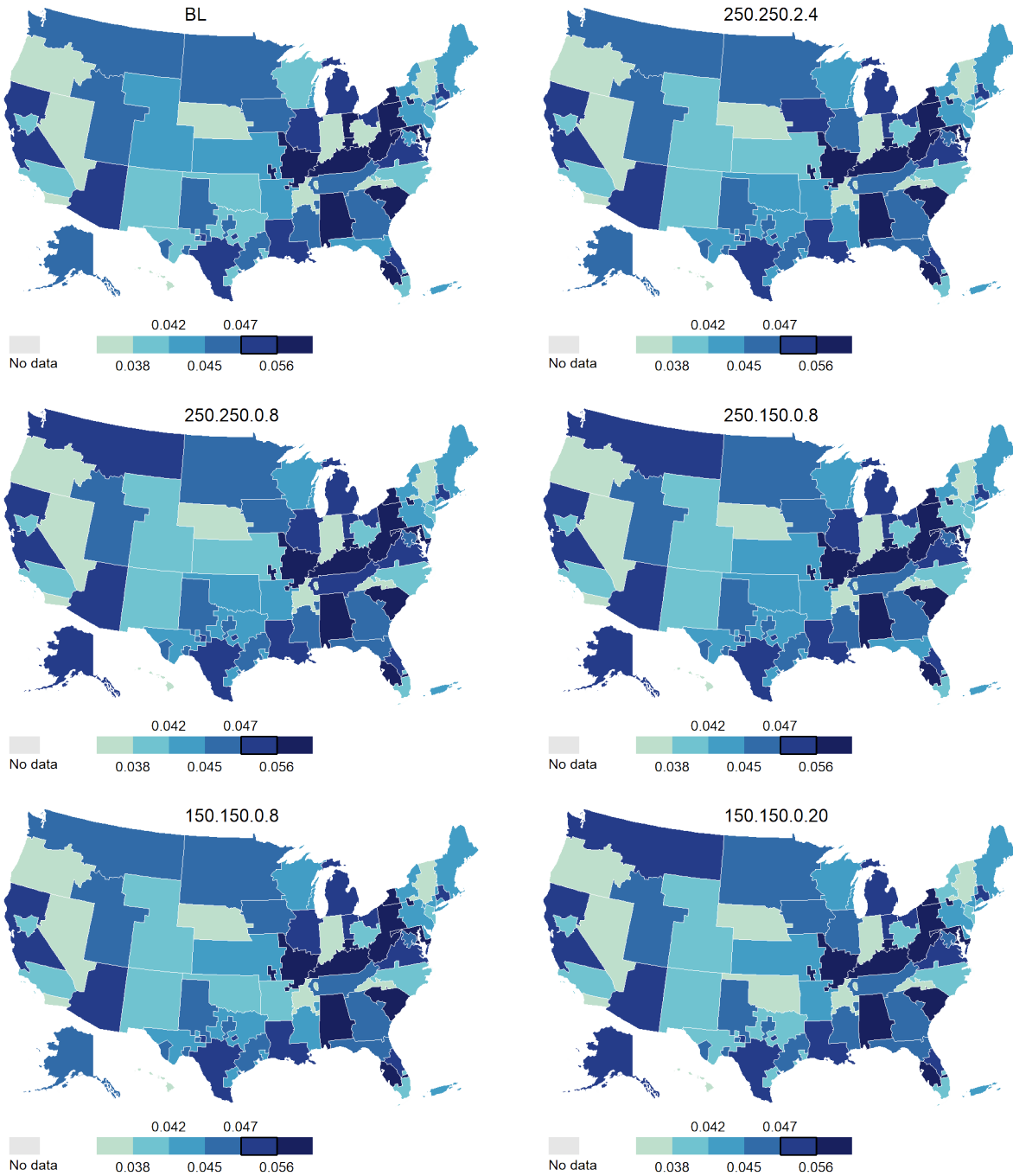
Maps of Waitlist Mortality Rate by DSA, Kidney-Along: 500 NM



Maps of Waitlist Mortality Rate by DSA, Kidney-Along: 500 NM

Maps of Waitlist Mortality Rate by DSA, Kidney-Along

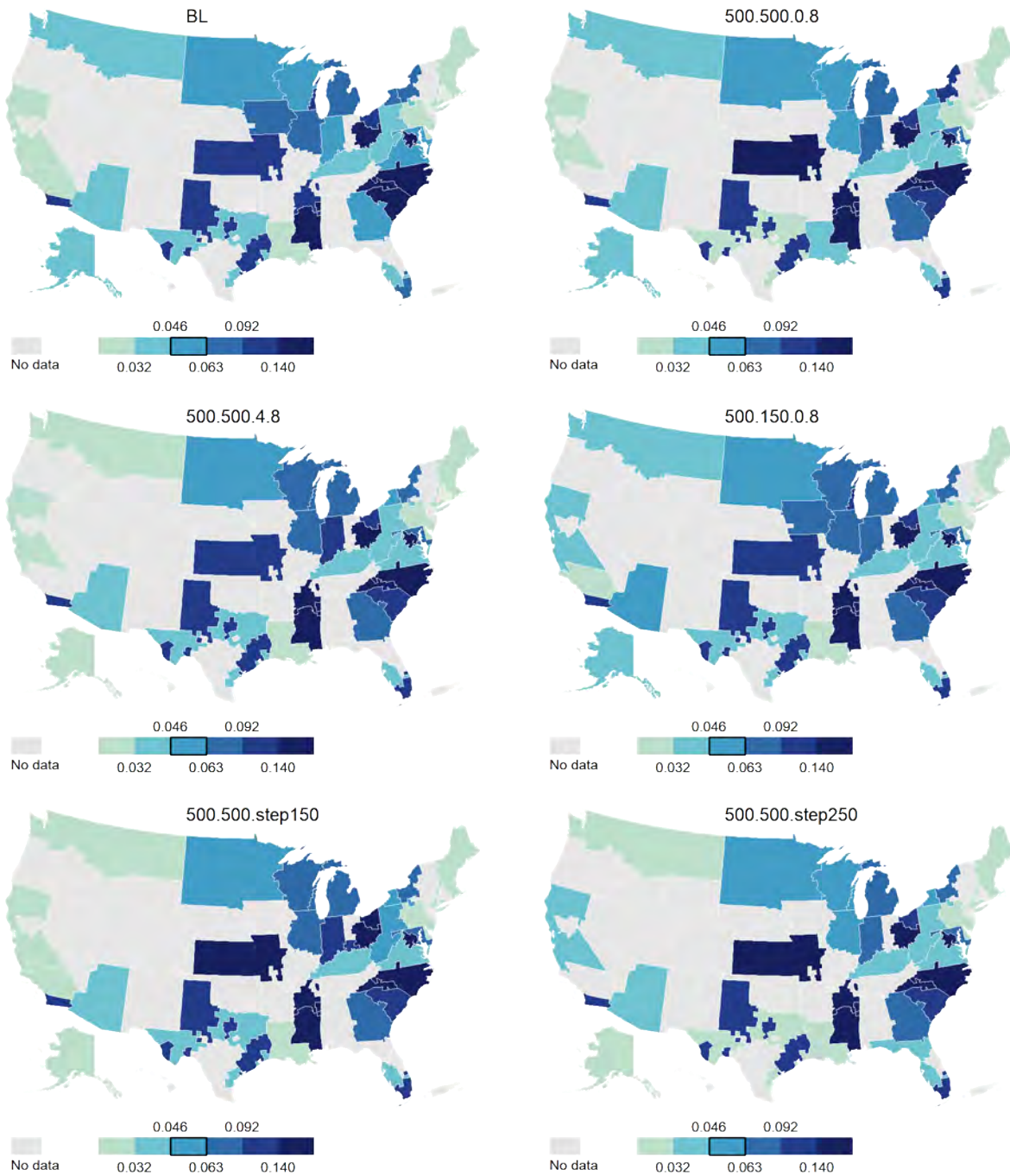
Maps of Waitlist Mortality Rate by DSA, Kidney-Along



Maps of Waitlist Mortality Rate by DSA, Kidney-Along

Maps of Waitlist Mortality Rate by DSA, Kidney-Pancreas: 500 NM

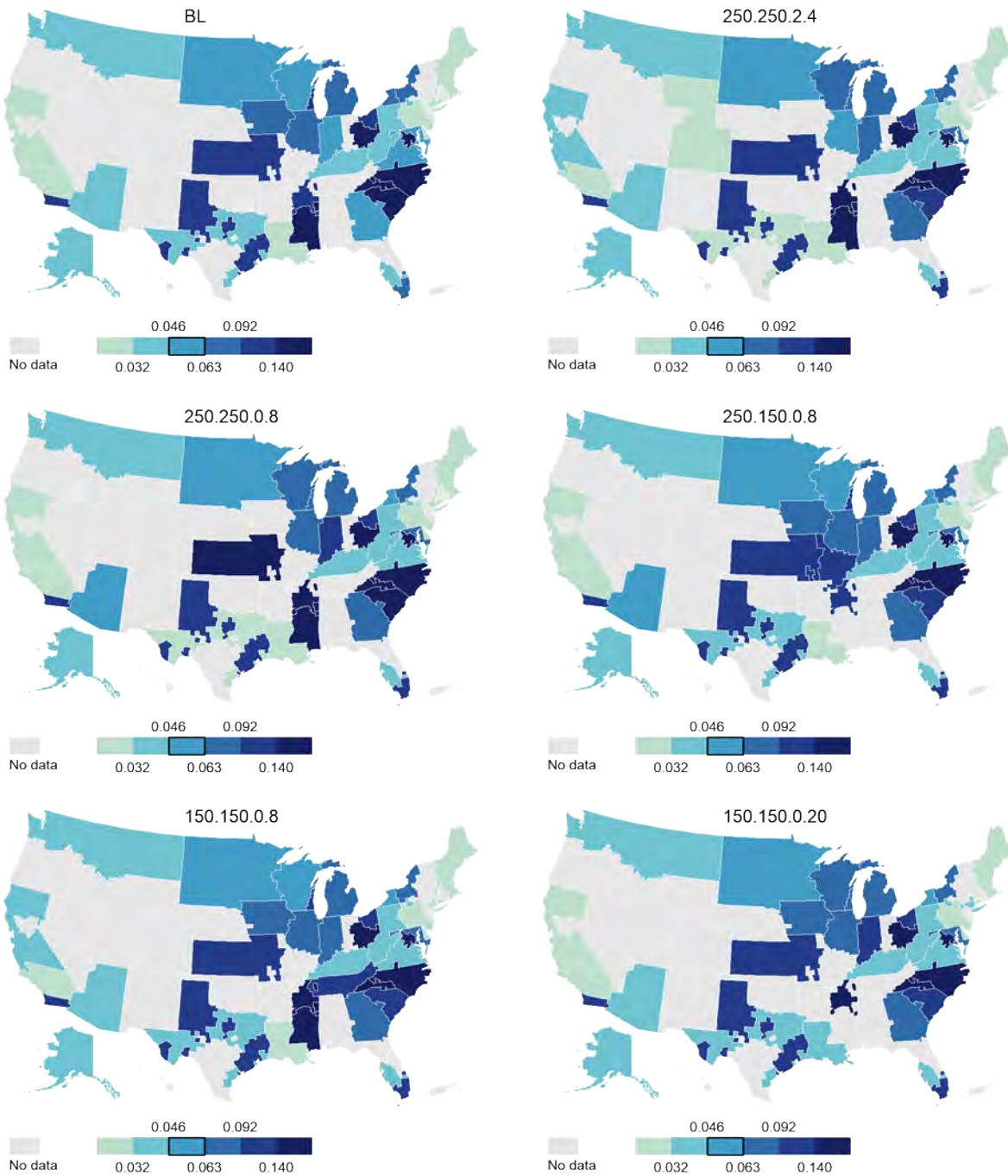
Maps of Waitlist Mortality Rate by DSA, Kidney-Pancreas: 500 NM



Maps of Waitlist Mortality Rate by DSA, Kidney-Pancreas: 500 NM

Maps of Waitlist Mortality Rate by DSA, Kidney-Pancreas

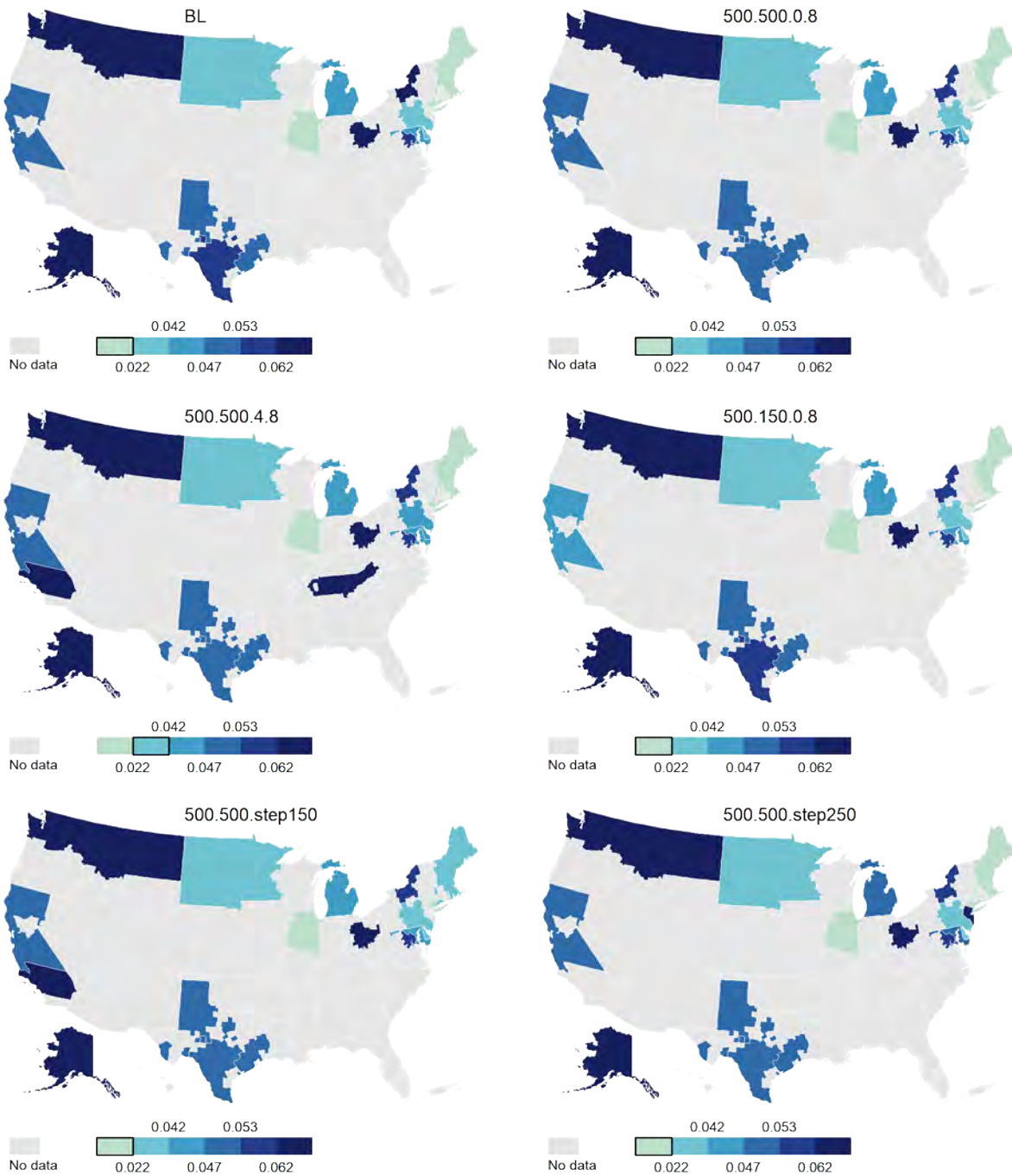
Maps of Waitlist Mortality Rate by DSA, Kidney-Pancreas



Maps of Waitlist Mortality Rate by DSA, Kidney-Pancreas

Maps of Waitlist Mortality Rate by DSA, Pancreas-Alone: 500 NM

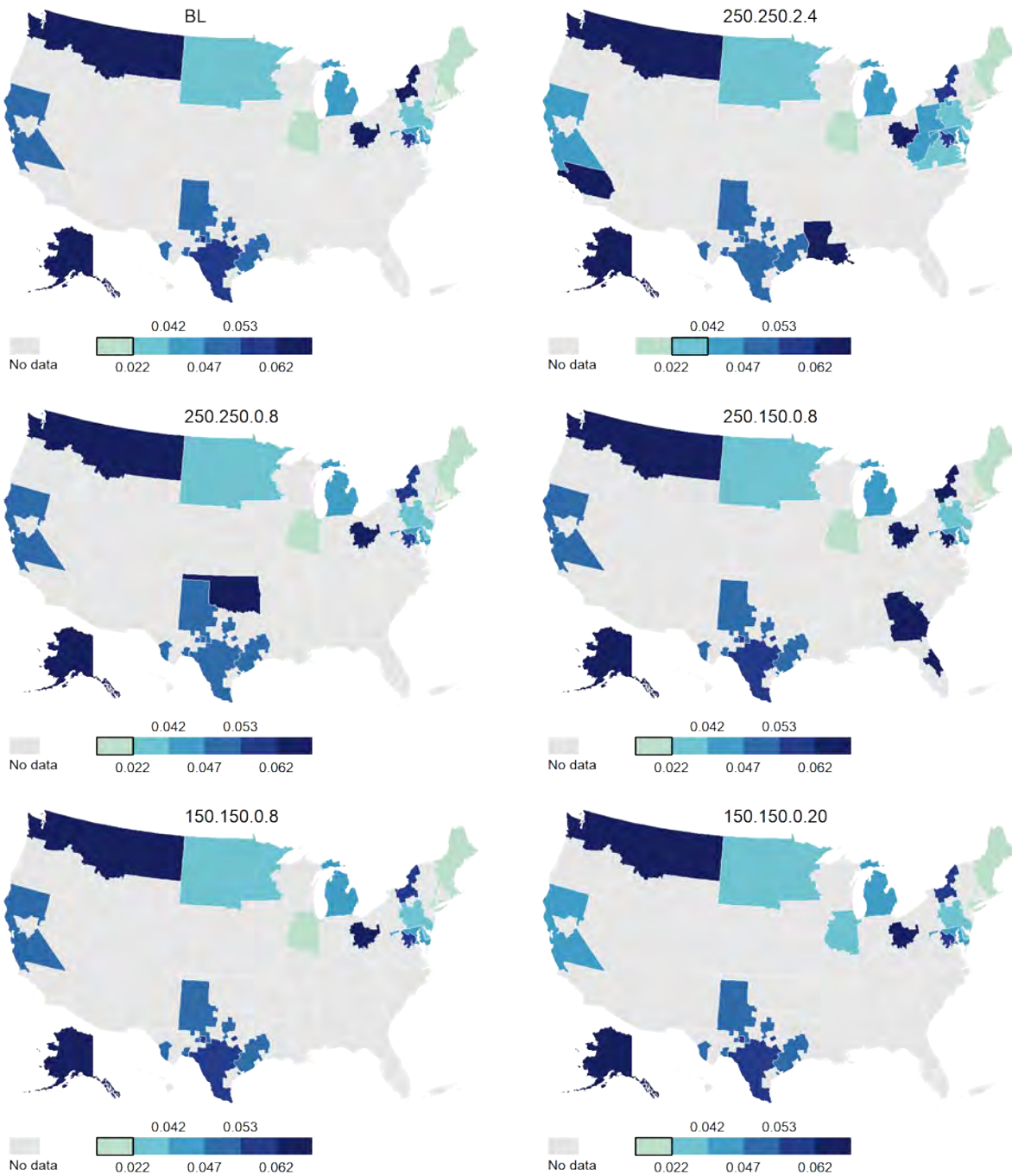
Maps of Waitlist Mortality Rate by DSA, Pancreas-Alone: 500 NM



Maps of Waitlist Mortality Rate by DSA, Pancreas-Alone: 500 NM

Maps of Waitlist Mortality Rate by DSA, Pancreas-Alone

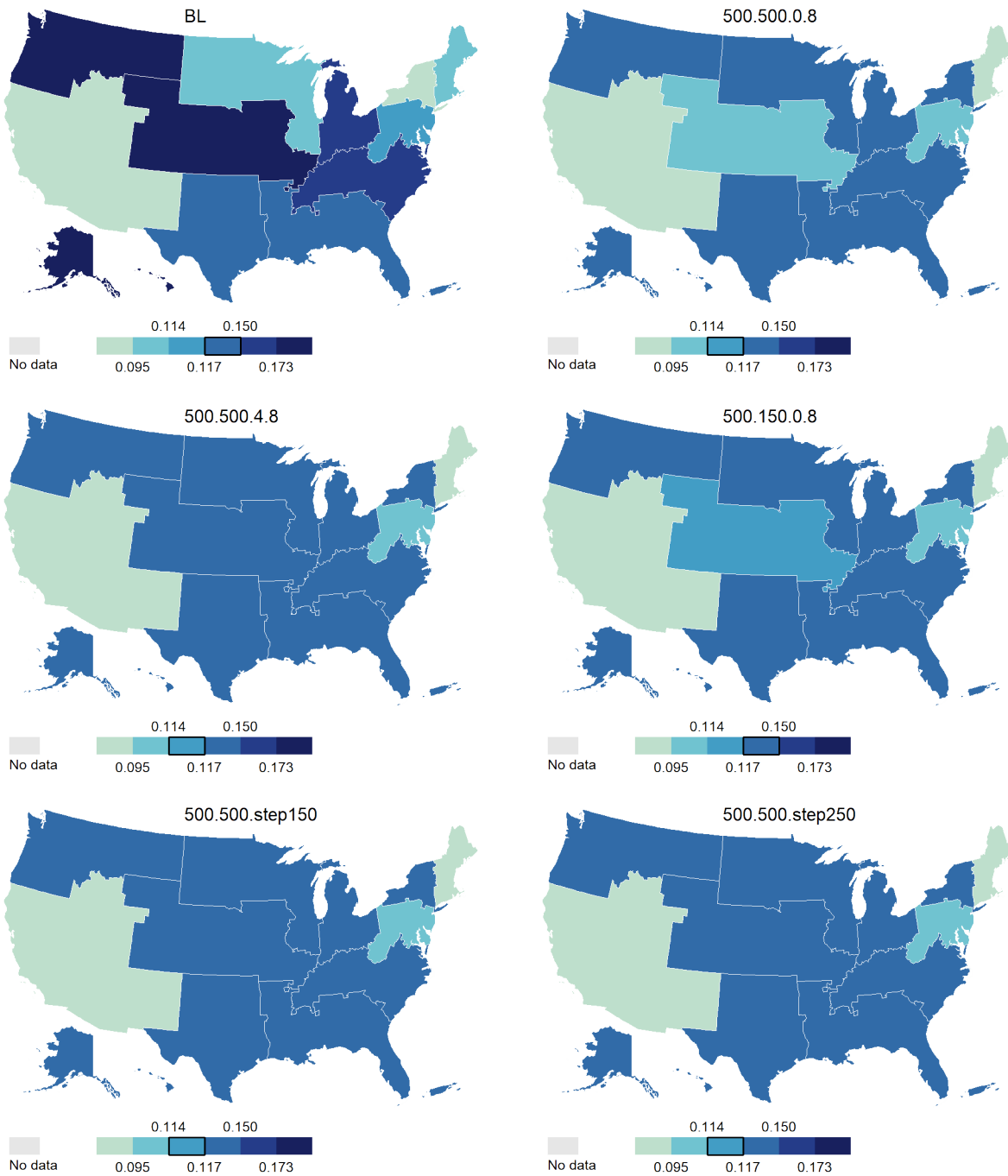
Maps of Waitlist Mortality Rate by DSA, Pancreas-Alone



Maps of Waitlist Mortality Rate by DSA, Pancreas-Alone

Maps of Transplant Rate by Region, Kidney-Along: 500 NM

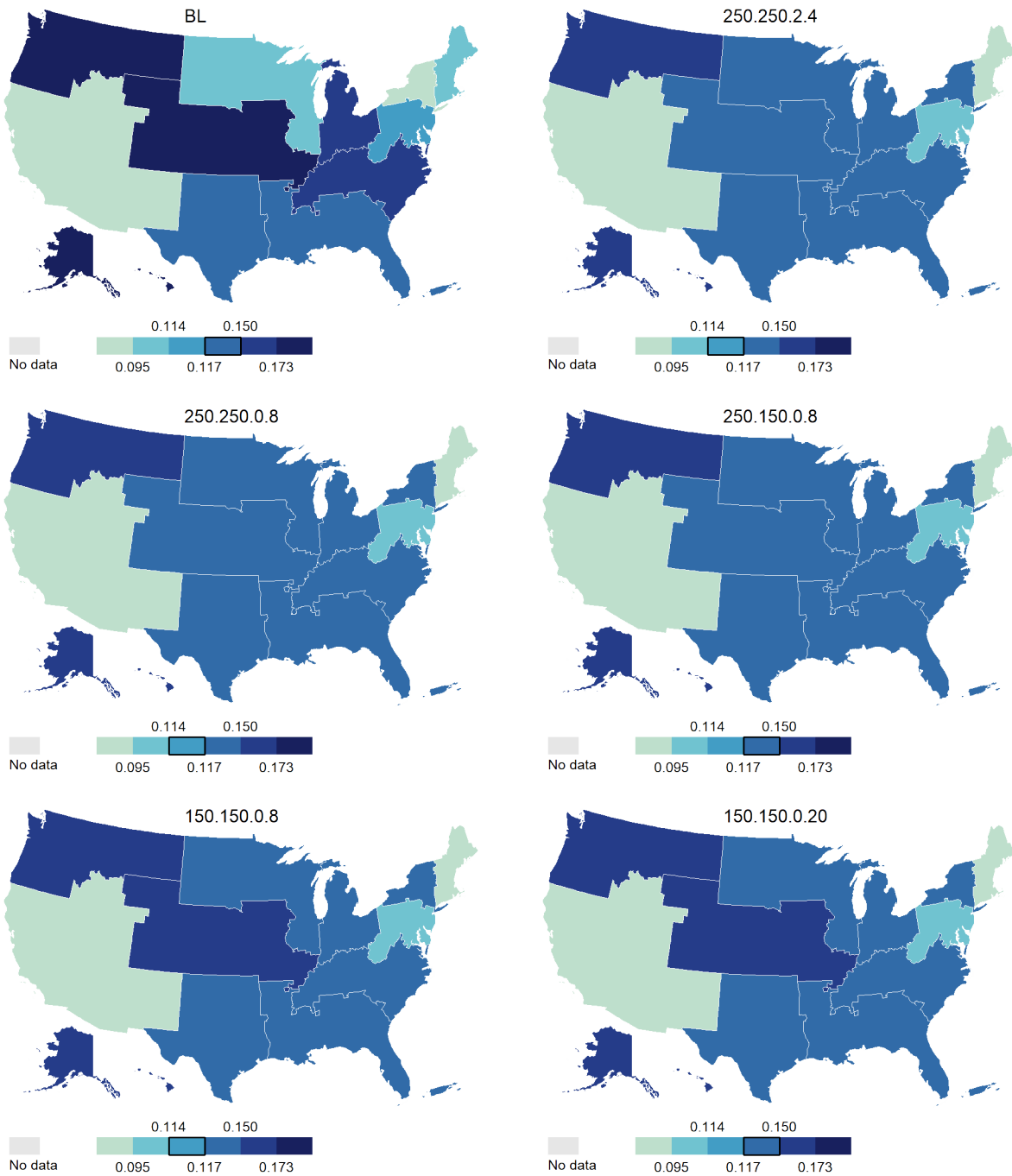
Maps of Transplant Rate by Region, Kidney-Along: 500 NM



Maps of Transplant Rate by Region, Kidney-Along: 500 NM

Maps of Transplant Rate by Region, Kidney-Along

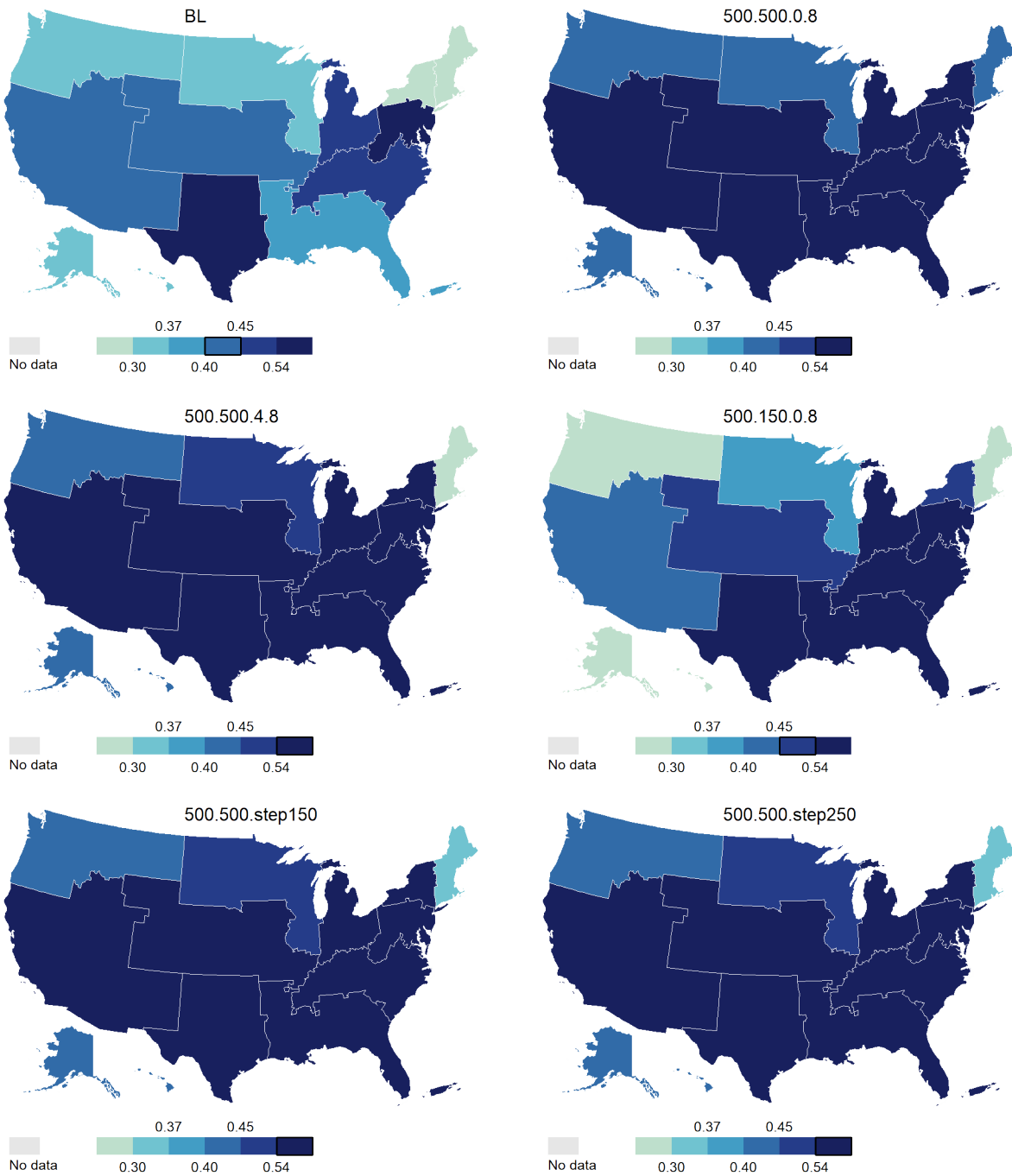
Maps of Transplant Rate by Region, Kidney-Along



Maps of Transplant Rate by Region, Kidney-Along

Maps of Transplant Rate by Region, Kidney-Pancreas: 500 NM

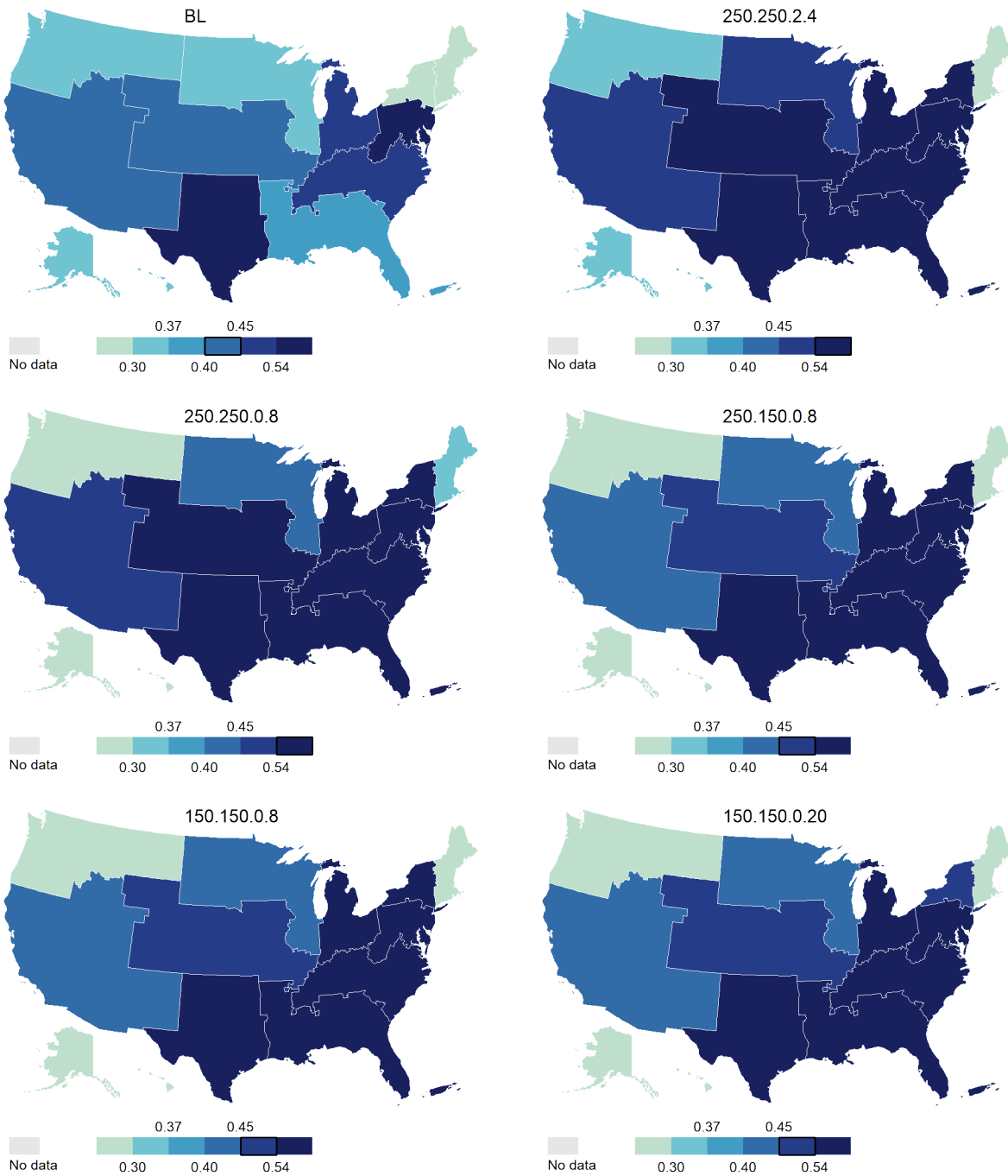
Maps of Transplant Rate by Region, Kidney-Pancreas: 500 NM



Maps of Transplant Rate by Region, Kidney-Pancreas: 500 NM

Maps of Transplant Rate by Region, Kidney-Pancreas

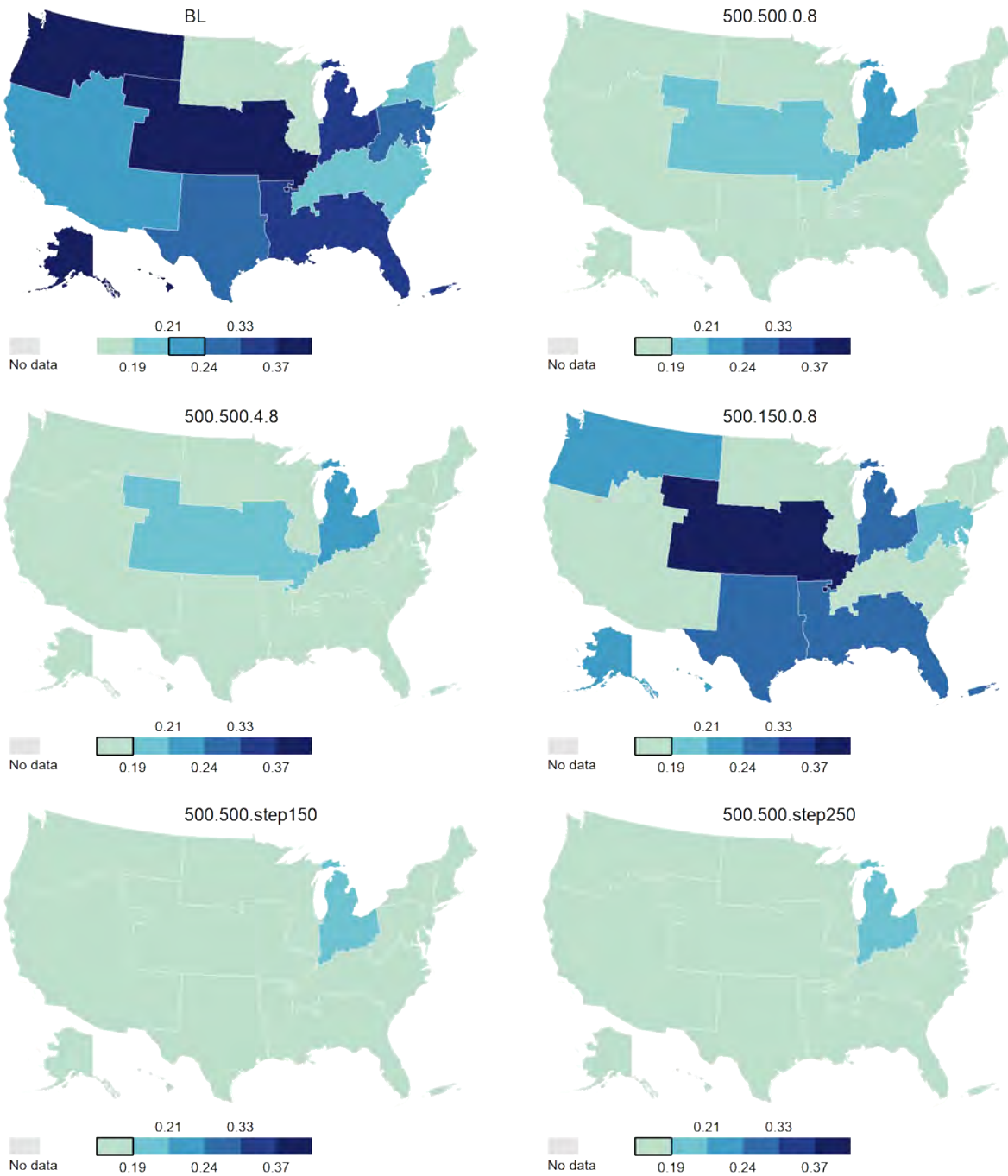
Maps of Transplant Rate by Region, Kidney-Pancreas



Maps of Transplant Rate by Region, Kidney-Pancreas

Maps of Transplant Rate by Region, Pancreas-Alone: 500 NM

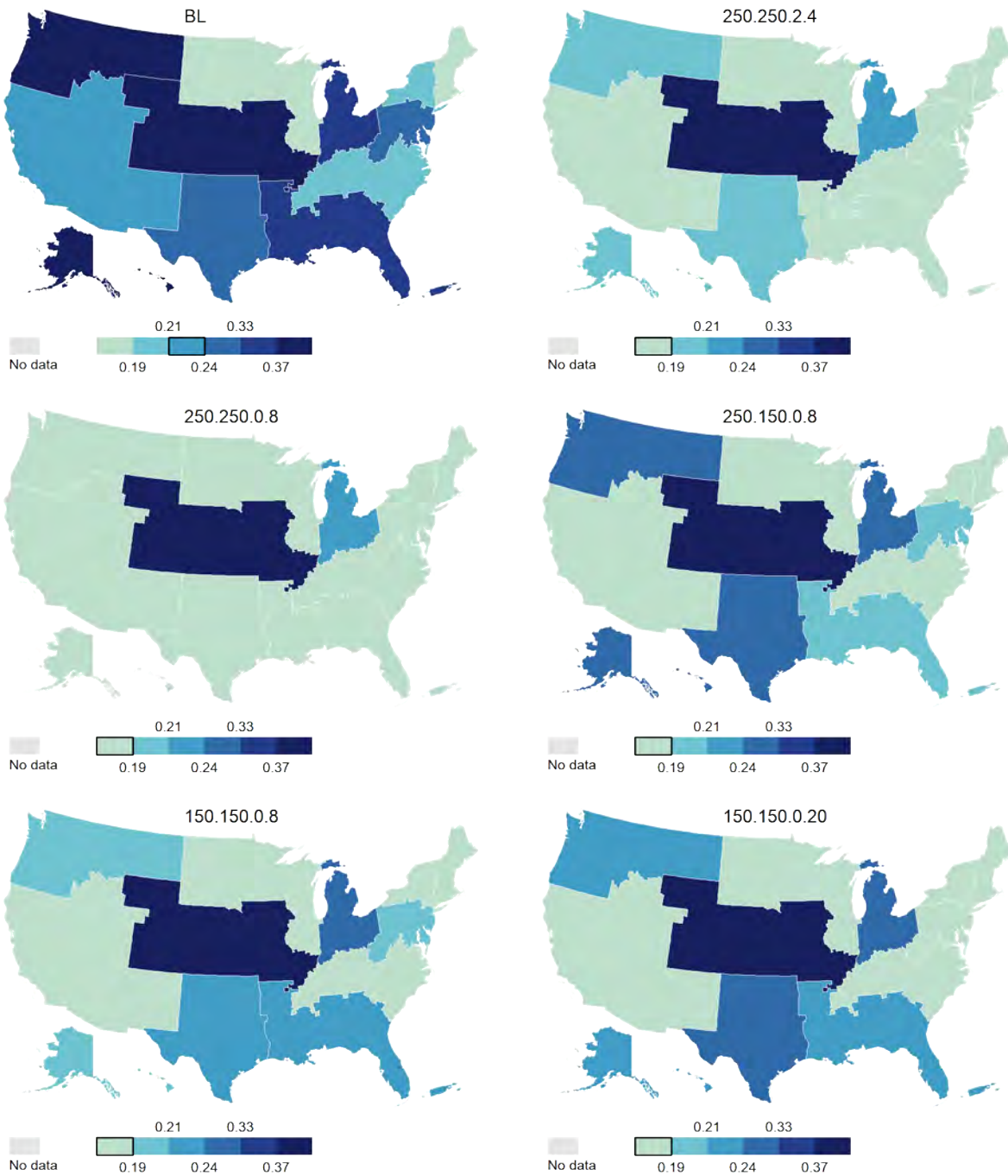
Maps of Transplant Rate by Region, Pancreas-Alone: 500 NM



Maps of Transplant Rate by Region, Pancreas-Alone: 500 NM

Maps of Transplant Rate by Region, Pancreas-Alone

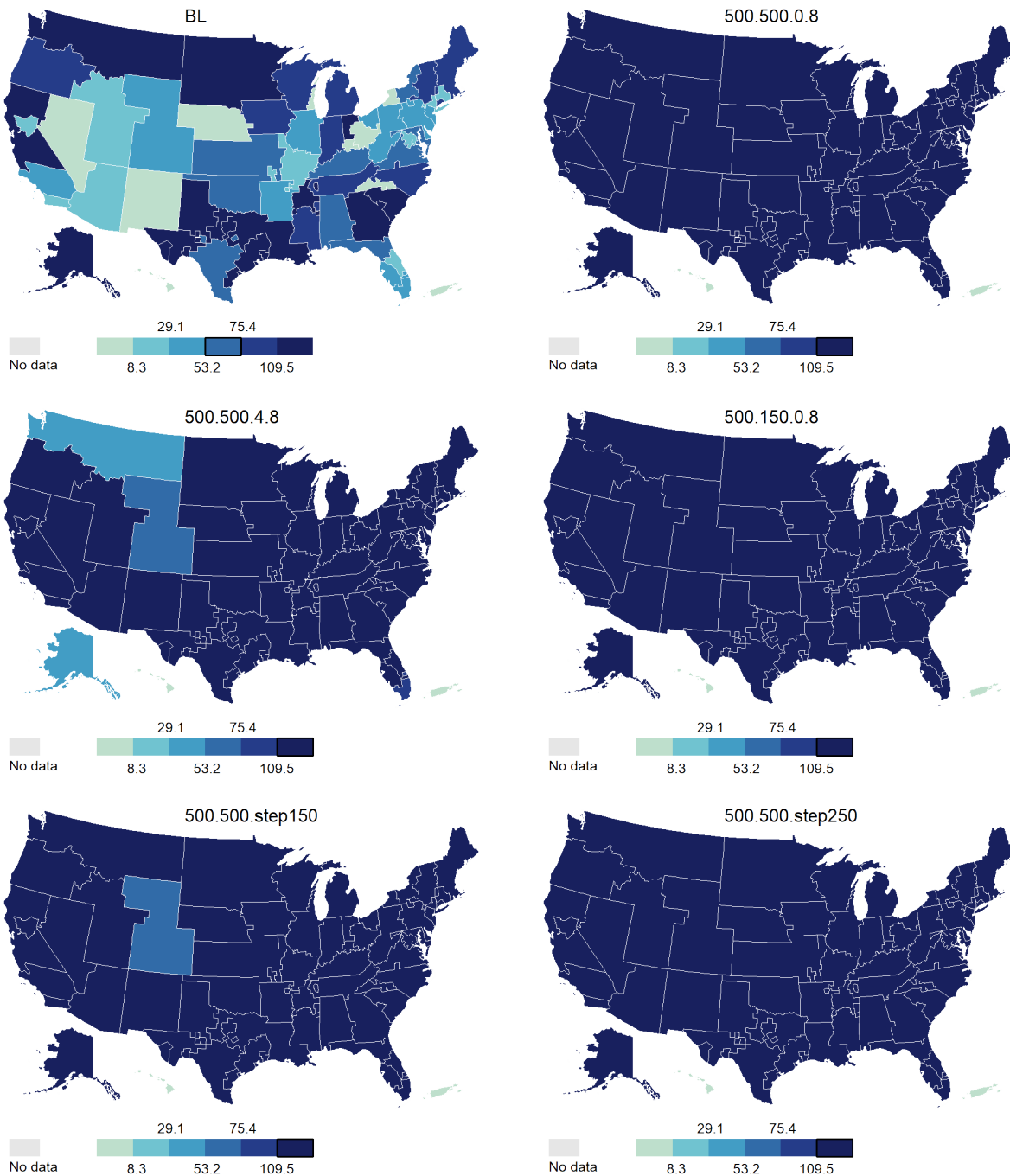
Maps of Transplant Rate by Region, Pancreas-Alone



Maps of Transplant Rate by Region, Pancreas-Alone

Maps of Median Organ Travel Distance by DSA, Kidney- Alone: 500 NM

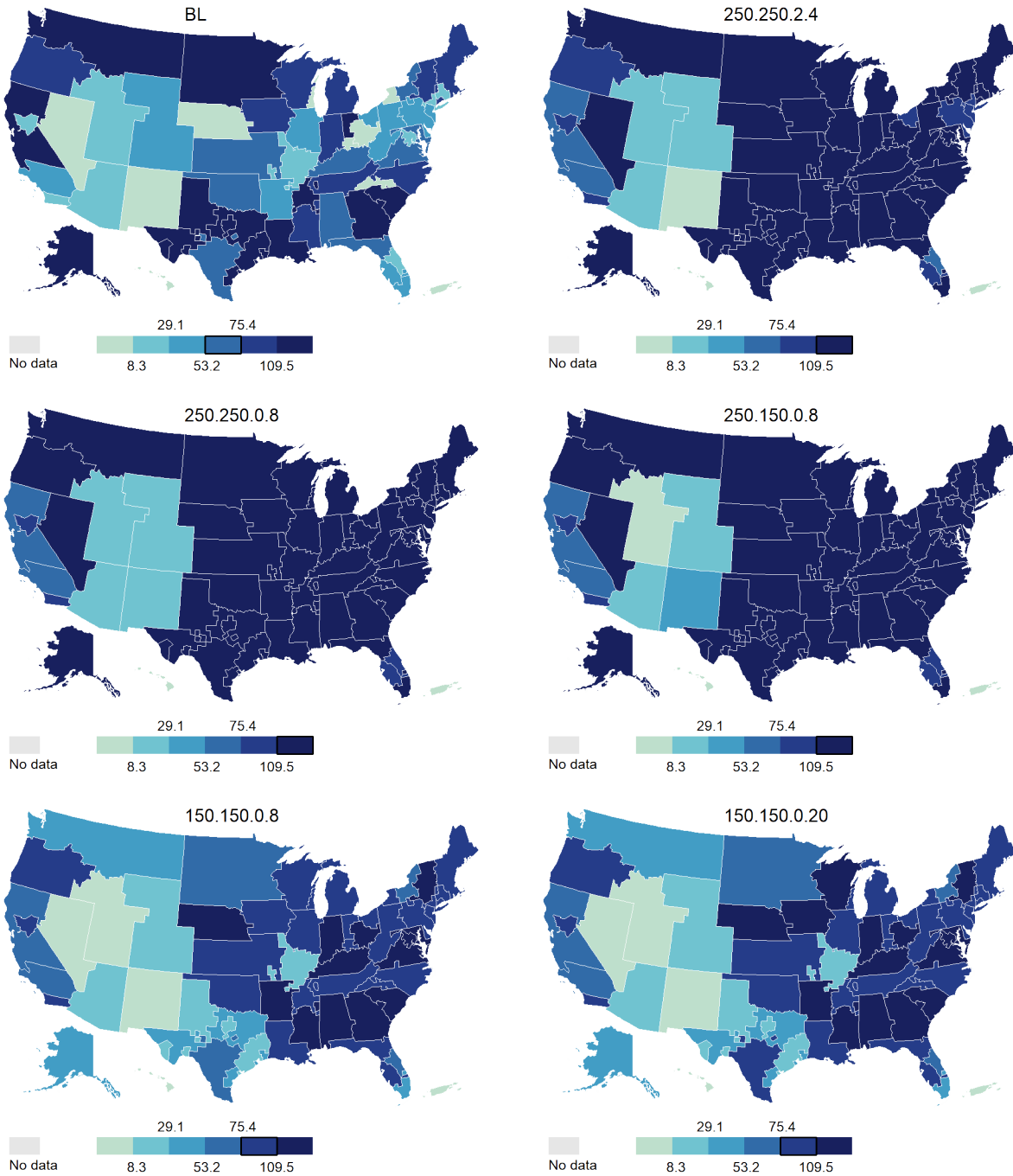
Maps of Median Organ Travel Distance by DSA, Kidney- Alone: 500 NM



Maps of Median Organ Travel Distance by DSA, Kidney- Alone: 500 NM

Maps of Median Organ Travel Distance by DSA, Kidney-Along

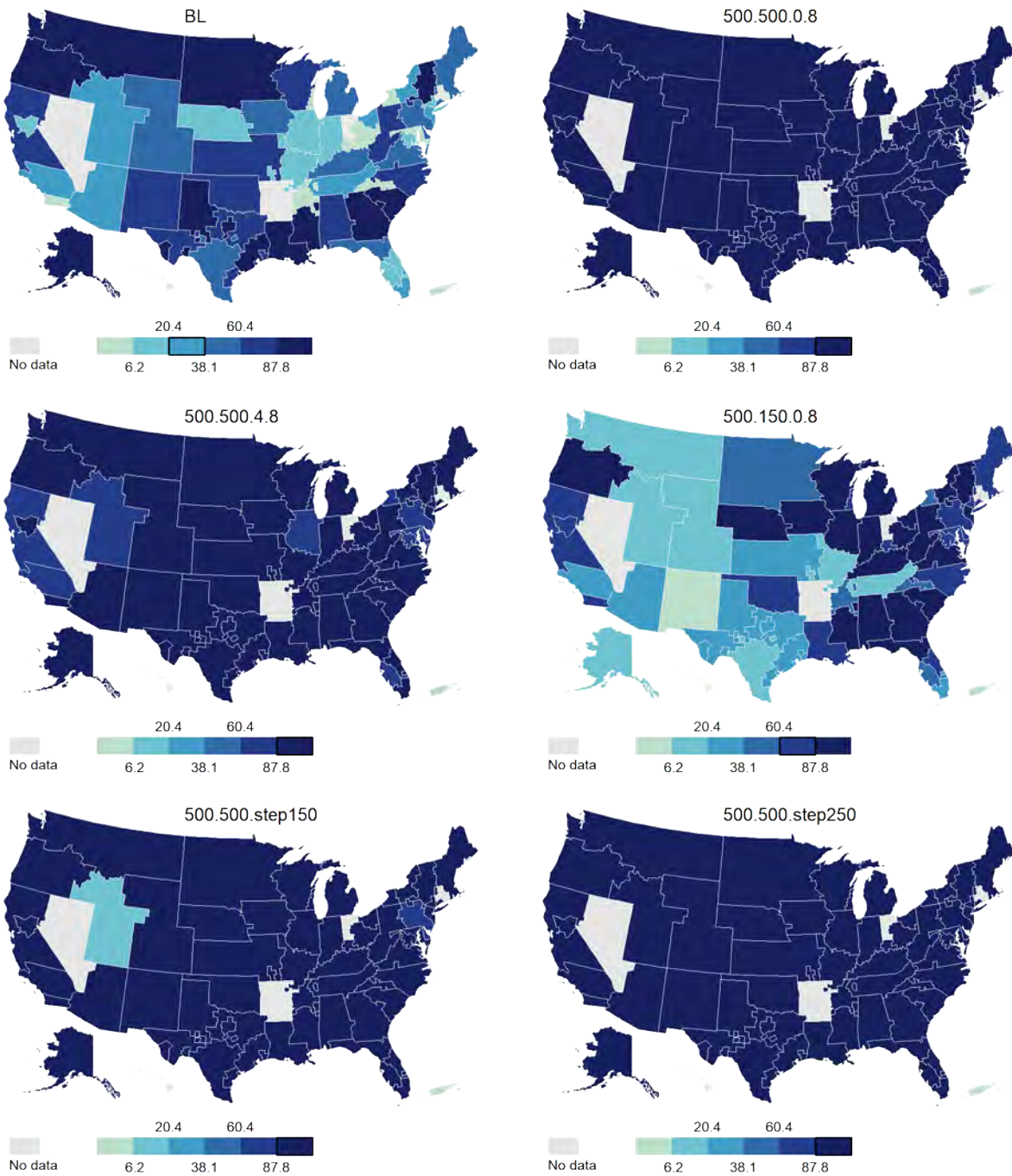
Maps of Median Organ Travel Distance by DSA, Kidney-Along



Maps of Median Organ Travel Distance by DSA, Kidney-Along

Maps of Median Organ Travel Distance by DSA, Kidney-Pancreas: 500 NM

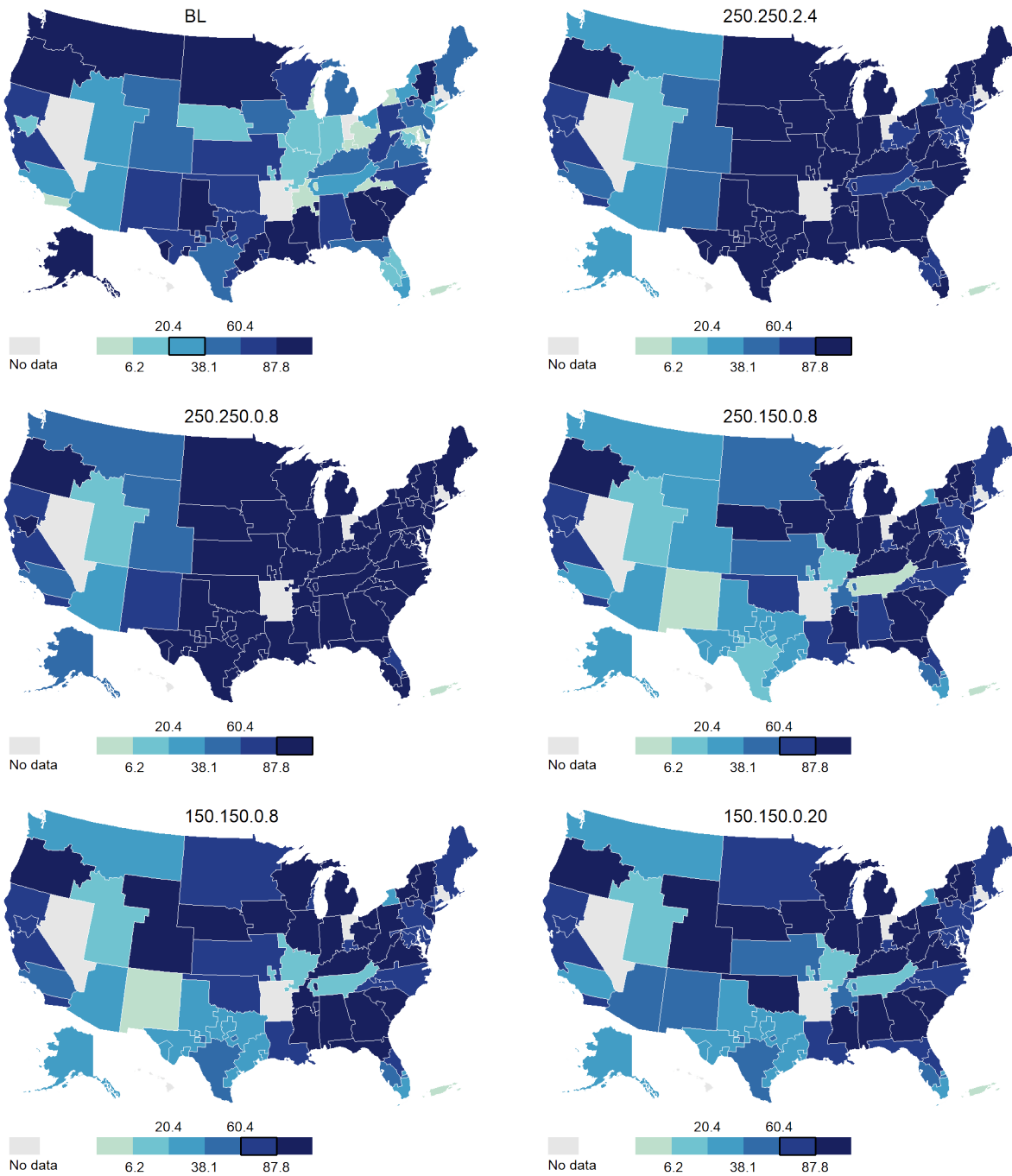
Maps of Median Organ Travel Distance by DSA, Kidney-Pancreas: 500 NM



Maps of Median Organ Travel Distance by DSA, Kidney-Pancreas: 500 NM

Maps of Median Organ Travel Distance by DSA, Kidney-Pancreas

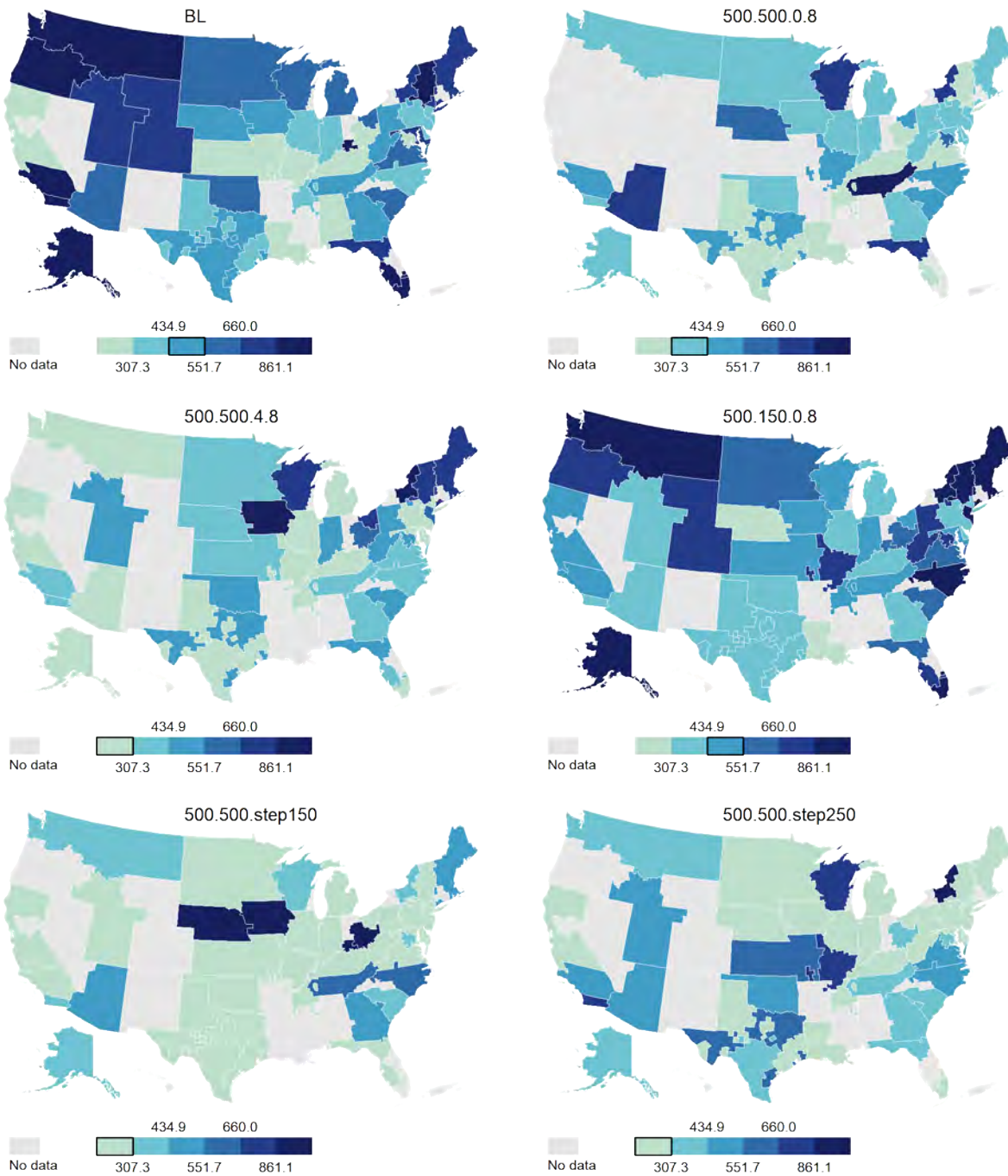
Maps of Median Organ Travel Distance by DSA, Kidney-Pancreas



Maps of Median Organ Travel Distance by DSA, Kidney-Pancreas

Maps of Median Organ Travel Distance by DSA, Pancreas-Alone: 500 NM

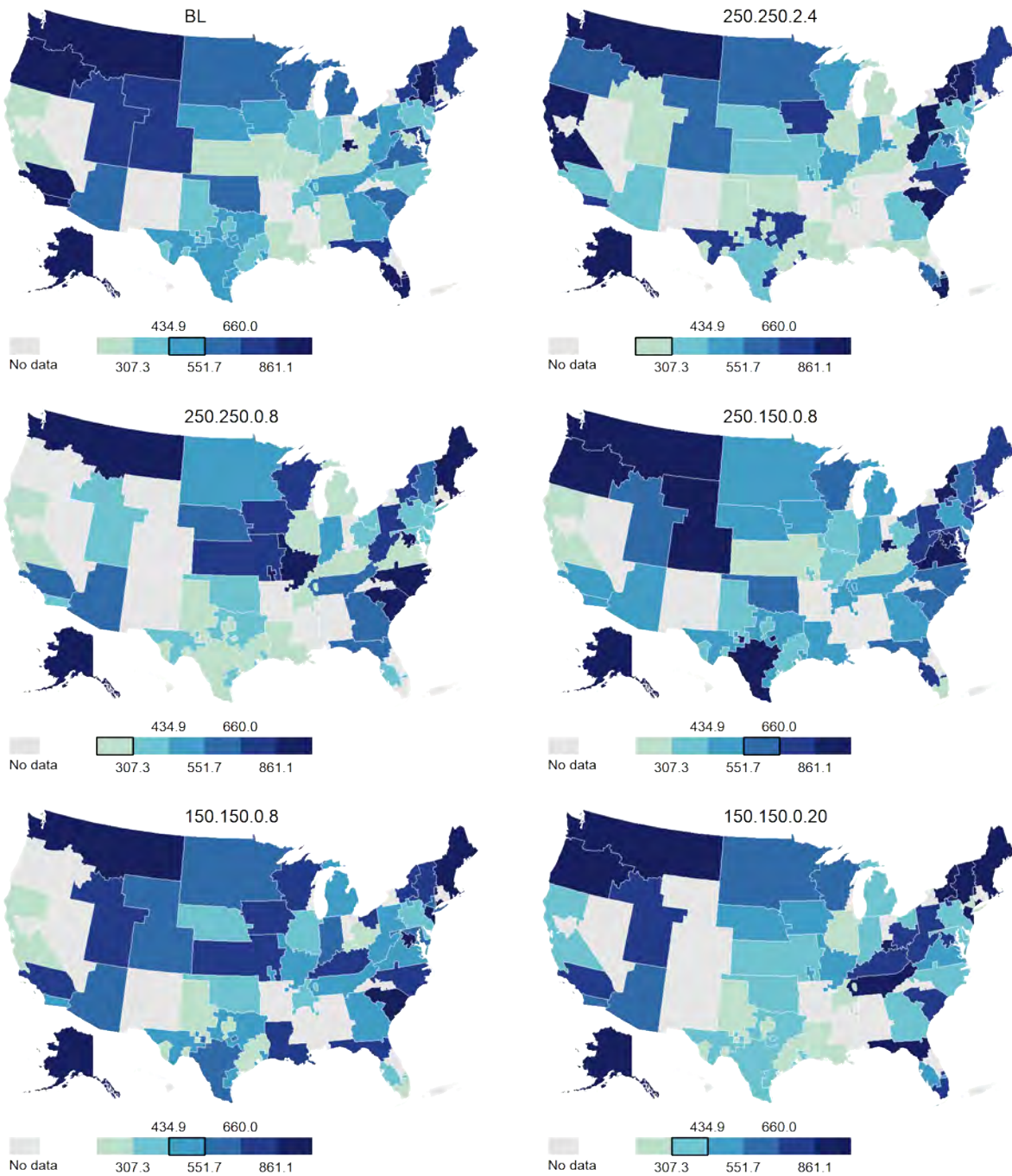
Maps of Median Organ Travel Distance by DSA, Pancreas-Alone: 500 NM



Maps of Median Organ Travel Distance by DSA, Pancreas-Alone: 500 NM

Maps of Median Organ Travel Distance by DSA, Pancreas-Alone

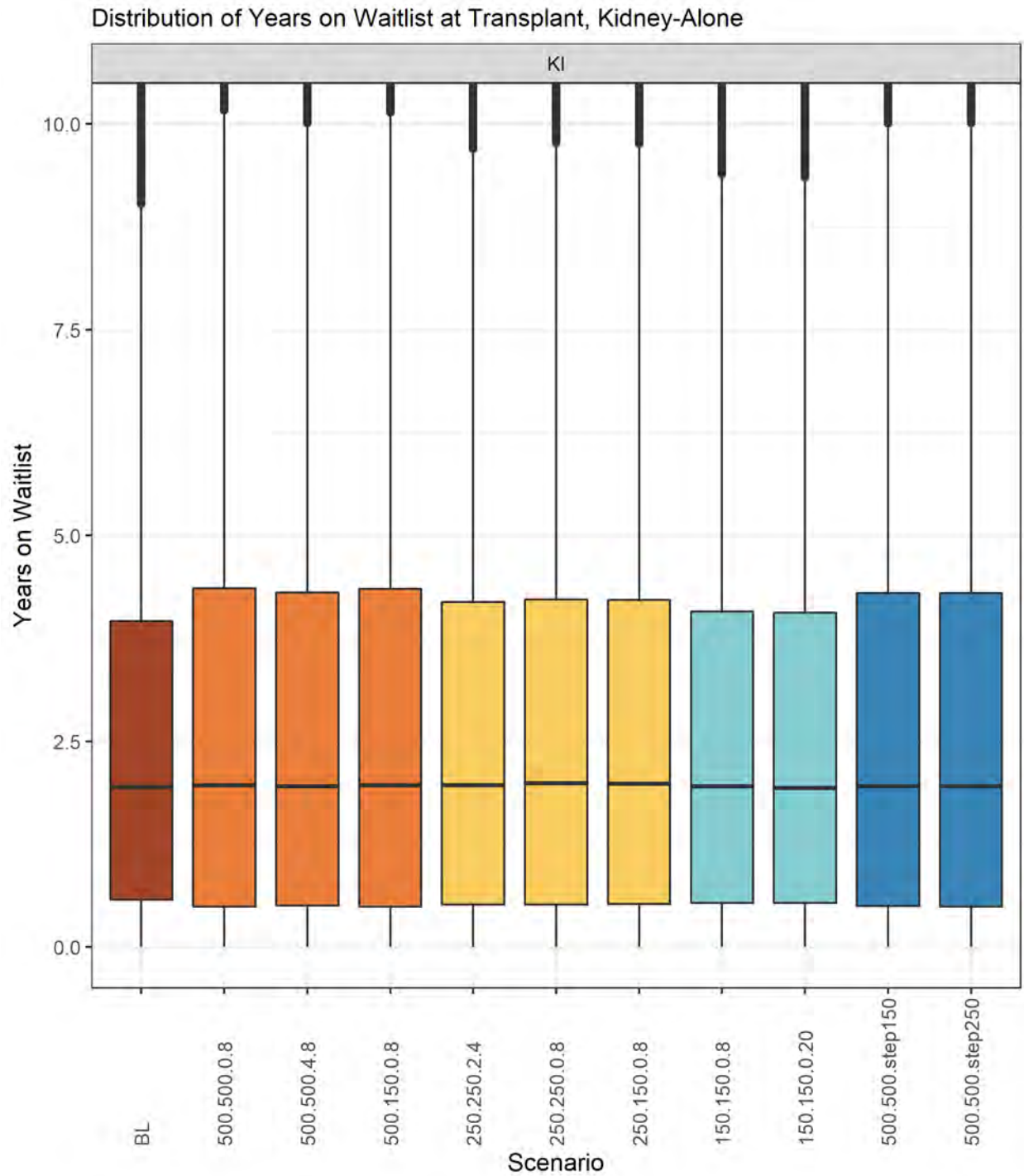
Maps of Median Organ Travel Distance by DSA, Pancreas-Alone



Maps of Median Organ Travel Distance by DSA, Pancreas-Alone

Distribution of Time on Waiting List at Transplant

Distribution of Years on Waitlist at Transplant, Kidney-Along

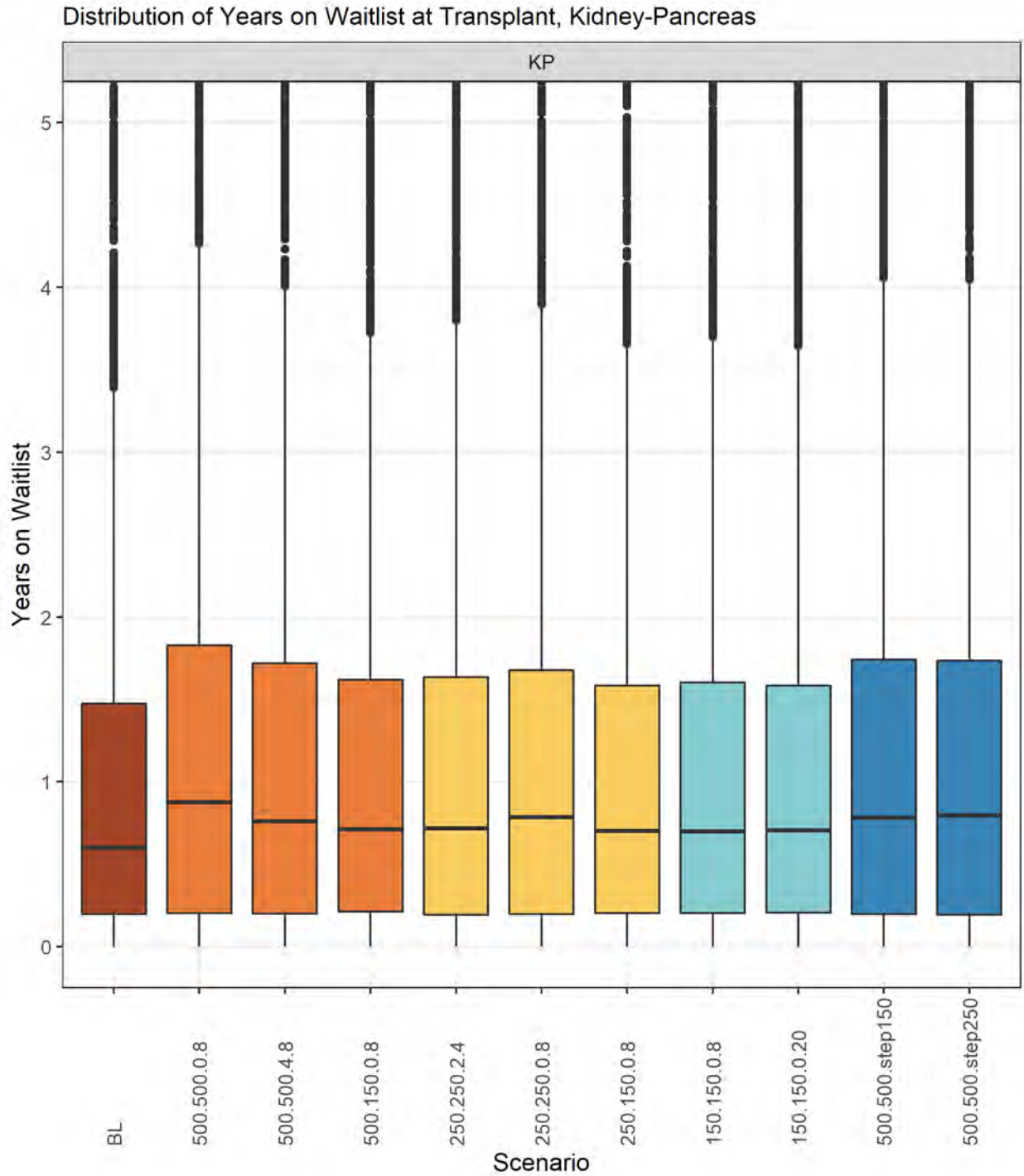


Distribution of Years on Waitlist at Transplant, Kidney-Along

Time on the Waitlist at Transplant, Kidney-Along Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	0.07	0.57	1.94	2.59	3.96	7.20	2.50
500.500.0.8	0.02	0.49	1.96	2.77	4.36	7.85	2.78
500.500.4.8	0.03	0.50	1.95	2.74	4.30	7.79	2.76
500.150.0.8	0.02	0.49	1.96	2.76	4.35	7.83	2.78
250.250.2.4	0.04	0.52	1.97	2.69	4.19	7.55	2.65
250.250.0.8	0.04	0.52	1.99	2.70	4.22	7.56	2.65
250.150.0.8	0.04	0.52	1.98	2.70	4.22	7.55	2.66
150.150.0.8	0.05	0.53	1.95	2.63	4.08	7.38	2.57
150.150.0.20	0.05	0.53	1.93	2.62	4.06	7.37	2.58
500.500.step150	0.03	0.50	1.95	2.74	4.30	7.81	2.76
500.500.step250	0.02	0.49	1.95	2.74	4.30	7.78	2.76

Distribution of Years on Waitlist at Transplant, Kidney-Pancreas

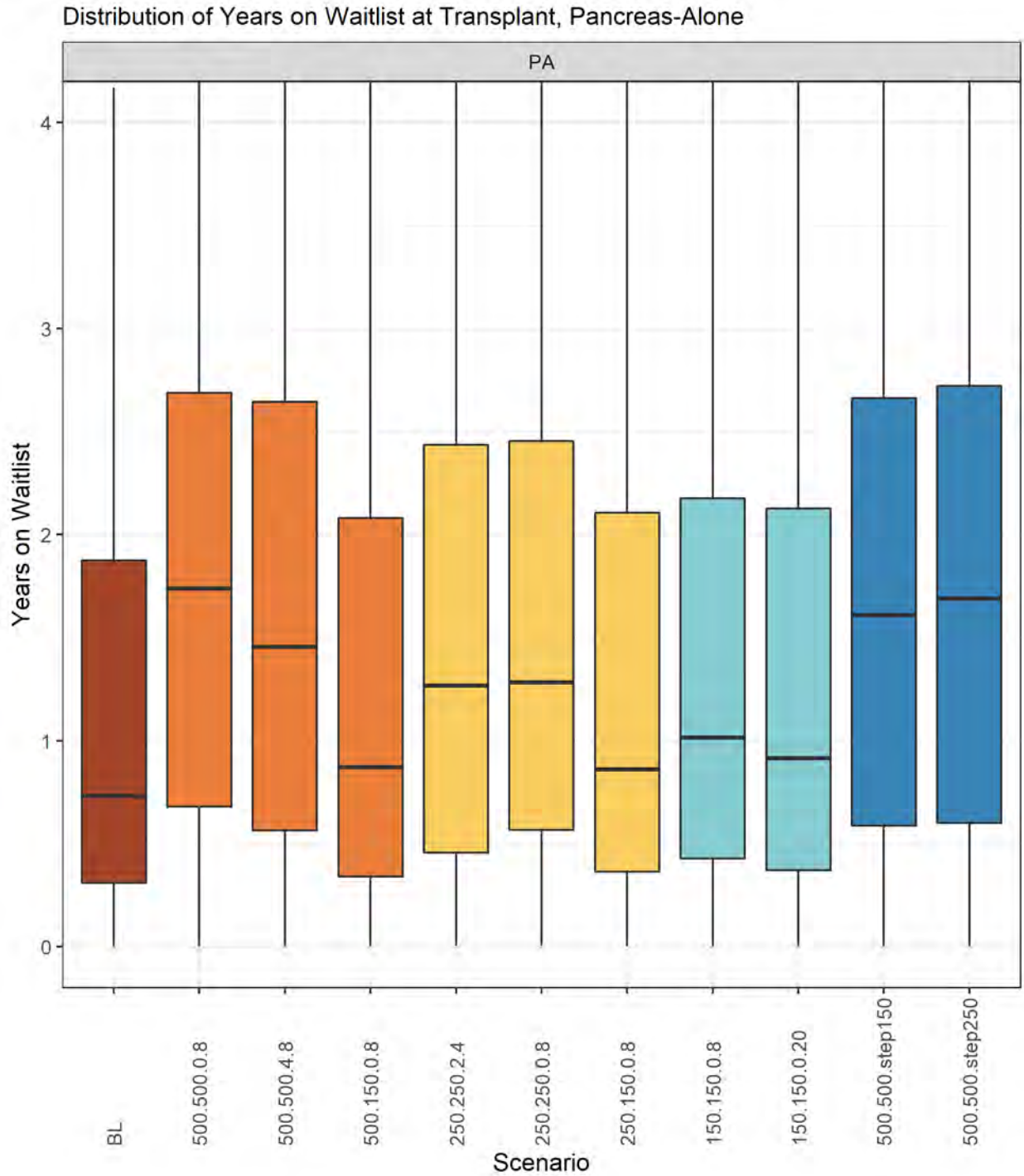


Distribution of Years on Waitlist at Transplant, Kidney-Pancreas

Time on the Waitlist at Transplant, Kidney-Pancreas Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	0.03	0.20	0.60	1.08	1.48	3.56	1.32
500.500.0.8	0.01	0.21	0.88	1.26	1.83	3.81	1.41
500.500.4.8	0.02	0.20	0.76	1.20	1.72	3.77	1.40
500.150.0.8	0.03	0.21	0.72	1.15	1.61	3.62	1.34
250.250.2.4	0.02	0.19	0.72	1.16	1.64	3.67	1.36
250.250.0.8	0.02	0.20	0.79	1.19	1.68	3.66	1.35
250.150.0.8	0.03	0.20	0.70	1.14	1.58	3.61	1.34
150.150.0.8	0.02	0.20	0.70	1.15	1.60	3.63	1.34
150.150.0.20	0.02	0.21	0.71	1.14	1.58	3.62	1.35
500.500.step150	0.02	0.20	0.78	1.22	1.74	3.80	1.40
500.500.step250	0.02	0.20	0.80	1.22	1.73	3.75	1.40

Distribution of Years on Waitlist at Transplant, Pancreas-Alone



Distribution of Years on Waitlist at Transplant, Pancreas-Alone

Time on the Waitlist at Transplant, Pancreas-Alone Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	0.07	0.32	0.73	1.22	1.90	3.41	1.26
500.500.0.8	0.11	0.69	1.74	1.95	2.69	4.92	1.57
500.500.4.8	0.13	0.58	1.49	1.80	2.63	4.69	1.53
500.150.0.8	0.06	0.34	0.88	1.36	2.07	3.96	1.37
250.250.2.4	0.08	0.47	1.22	1.66	2.44	4.69	1.58
250.250.0.8	0.10	0.58	1.29	1.69	2.43	4.56	1.50
250.150.0.8	0.08	0.36	0.86	1.38	2.07	4.11	1.42
150.150.0.8	0.07	0.44	1.04	1.47	2.17	4.25	1.42
150.150.0.20	0.08	0.38	0.90	1.41	2.12	4.19	1.43
500.500.step150	0.10	0.60	1.60	1.88	2.68	4.94	1.62
500.500.step250	0.11	0.60	1.68	1.92	2.70	5.03	1.62