Analysis Report, KI2018_01:

Rerun using Donor-only Acceptance Model

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

Prepared By

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Timeline

Original Request made: September 10, 2018

Original Anaylsis plan due: September 24, 2018

Original Analysis plan submitted: September 24, 2018

Original Analysis report submitted: December 7, 2018

Rerun Analysis report due: June 17, 2019

Rerun Analysis report submitted: June 14, 2019

Rerun Analysis report update submitted: June 21, 2019

Next committee meeting: June 25, 2019

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Executive Summary

Using a donor-only acceptance model, SRTR reran the updated kidney-pancreas simulated allocation model (KPSAM) to assess the simulated impact of five allocation frameworks based on nautical miles (NM) between candidate listing program and donor hospital. These results can be contrasted with those from the original KI2018_01 report published in December 2018, which was run using an acceptance model with candidate, donor, and candidate/donor interactions, including whether an organ offer was from the candidate's local DSA. In interpreting the modeling results it is important to consider that KPSAM cannot model changes in program behaviors under new allocation policies.

Description of Runs

Model Nickname	Number of Circles	Inner Circle Size	Outer Circle Size	Inner Circle Maximum Points	Outer Circle Maximum Points
2CR_150	2	150	300	NA	NA
2CR_250	2	250	500	NA	NA
1CR_nopts	1	500	NA	0	0
1CR_shallow	1	500	NA	1	2
1CR_steep	1	500	NA	2	4

The baseline model (referred to as "BL" in all tables and figures) was the current allocation system.

Models 2CR_150 and 2CR_250 are nested two-circle allocation systems, and Models 1CR_nopts, 1CR_shallow, and 1CR_steep are single-circle allocation systems. Model 2CR_150 uses the distances of 150 NM and 300 NM in place of local and regional designation, and Model 2CR_250 will use the distances of 250 NM and 500 NM in place of local and regional designations.

Models 1CR_nopts, 1CR_shallow, and 1CR_steep use the distance of 500 NM in place of the local designation, and regional sharing is eliminated. Instead, organs are shared nationally when beyond the 500 NM border.

Additionally, Models 1CR_shallow and 1CR_steep include proximity points awarded for distance between candidate program and donor hospital zip code centroids. 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 cirlce 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.

Main Findings

Total Transplants

The simulated total number of transplants varied by fewer than 100 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, as the size of the first level of allocation (circle size) increases, relatively more kidney-pancreas transplants are performed, and relatively fewer pancreas-alone and kidney-alone.

Distance Between Transplant Recipient and Donor Hospital

Distance traveled is greatest in the larger single-circle models, and minimized in smallest two-circle model. Proximity points within the circle tend to reduce the distance traveled. For example, the median distance in run 1CR_nopts for a kidney transplant was 304 NM, but in run 1CR_steep (which employed a maximum of two proximity points within the circle, and four outside the circle) the median distance for a kidney transplant was 248 NM. The effect of proximity points outside the circle was less strong, likely because relatively few transplants were predicted to occur there (10%-20%). Kidney-pancreas transplants traveled the shortest distances, and pancreas-alone transplants traveled the furthest.

Variance in Metrics by Candidate DSA

The variance in transplant rate by listing DSA was minimized in the largest distribution circles, and maximized in the smallest circles. The pattern was consistent for all organ types. The variance in median donor-recipient distance by DSA tended to be highest in the largest distribution circles, and minimized in the smallest circles. In contrast, variance in median time on dialysis at transplant (a surrogate metric for disease severity) was minimized under the broadest sharing scenarios.

Subgroups

Kidney-alone:

In general, the largest changes in transplant rates were observd under the broadest sharing scenarios, and the smallest under the most conservative scenario (2CR_150). Transplants rates for pediatric candidates increased under all proposals, with the greatest increases under the broadest sharing scenarios. Rates for adults aged ≥50 years, and particularly aged ≥65, declined 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 under all proposals, and the increase was maximized under the broadest sharing proposals. Transplant rates for candidates with cPRA 80-99 likewise increased under broader sharing scenarios, but changed minimally in the 2-CR scenarios. Transplant rates among Medicaid and “other” payer candidates also increased, with a concomitant decrease in rates for those with private payers. There were small decreases in transplant rates among non-metropolitan candidates (where the rural-urban commuting area [RUCA] grouping is defined by candidates’ permanent zip codes). Transplant rates for candidates with EPTS ≤20% (excluding pediatric candidates) also declined under broader sharing proposals; this decline minimized in the smallest circles.

Kidney-Pancreas:

As with kidney-alone transplants, the largest changes in transplant rates were observed under the broadest sharing (e.g., 1CR proposals), and the smallest under the most conservative sharing (e.g., 2CR_150). Kidney-pancreas transplant rates and counts increased globally. Nonetheless, some subgroups underwent 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 transplants, 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 certain regarding changes in subgroups. Candidates aged 18-34 years underwent slightly fewer transplants under alternate sharing, and those aged ≥35 years slightly more. Candidates with cPRA <80% underwent 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 KI2018_01 Analysis Plan as Allocation Framework 1 and Allocation Framework 2.

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 A:

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

Analytic approach

Each of the six 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

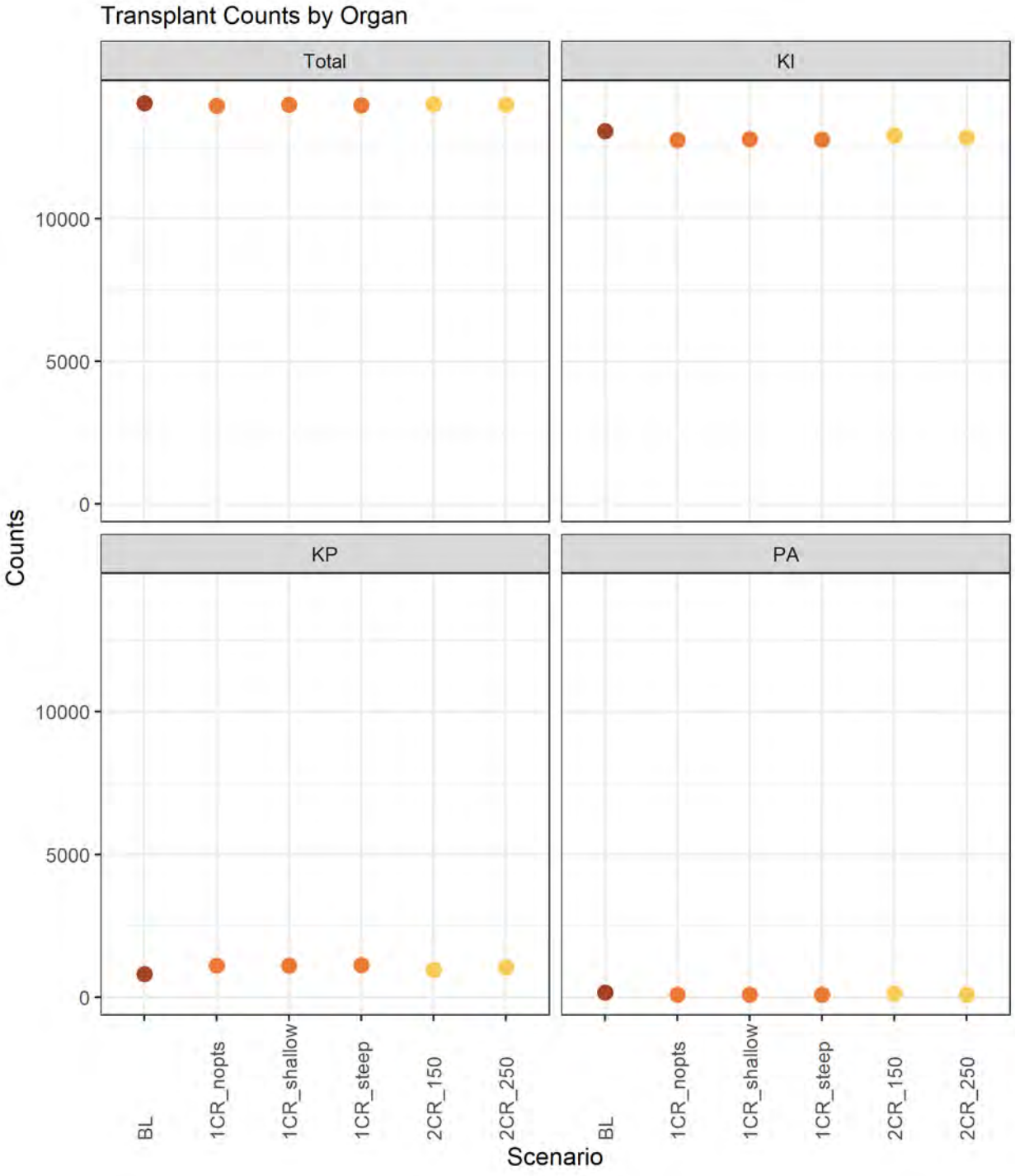
Results for the simulated scenarios are reported primarily in the form of plots, with each plot displaying the values for a given metric across the eleven scenarios simulated. In viewing these results, it is important to compare the new scenarios with the current allocation policy scenario to identify 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	14044 (13928,14143)	13062 (12947,13175)	822 (811,834)	160 (155,169)
1CR_nopts	13957 (13803,14094)	12754 (12600,12897)	1113 (1103,1121)	91 (86,95)
1CR_shallow	13990 (13835,14051)	12785 (12633,12846)	1114 (1109,1125)	91 (85,95)
1CR_steep	13976 (13910,14041)	12770 (12707,12835)	1120 (1112,1132)	87 (80,93)
2CR_150	14006 (13909,14056)	12918 (12830,12977)	965 (950,985)	123 (113,134)
2CR_250	13990 (13926,14059)	12839 (12776,12912)	1054 (1041,1064)	98 (92,106)

Transplant Counts by Organ



Transplant Counts by Organ

Transplant Counts

Main Metrics for Kidney-Alone

Overview of Main Metrics for Kidney

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	0.118 (0.117,0.119)	13062 (12947,13175)	0.047 (0.047,0.048)	5243 (5213,5260)	0.075 (0.072,0.079)
1CR_nopts	0.115 (0.114,0.116)	12754 (12600,12897)	0.048 (0.047,0.048)	5266 (5249,5279)	0.081 (0.076,0.085)
1CR_shallow	0.115 (0.114,0.116)	12785 (12633,12846)	0.047 (0.047,0.048)	5262 (5243,5285)	0.079 (0.075,0.083)
1CR_steep	0.115 (0.115,0.116)	12770 (12707,12835)	0.047 (0.047,0.048)	5264 (5252,5277)	0.078 (0.07,0.082)
2CR_150	0.117 (0.116,0.117)	12918 (12830,12977)	0.047 (0.047,0.048)	5255 (5243,5273)	0.078 (0.072,0.083)
2CR_250	0.116 (0.115,0.117)	12839 (12776,12912)	0.047 (0.047,0.048)	5261 (5237,5286)	0.078 (0.074,0.083)

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	0.425 (0.419,0.434)	822 (811,834)	0.053 (0.051,0.057)	103 (98,110)	0.129 (0.12,0.138)
1CR_nopts	0.625 (0.611,0.631)	1113 (1103,1121)	0.054 (0.053,0.057)	96 (94,100)	0.135 (0.12,0.158)
1CR_shallow	0.625 (0.619,0.631)	1114 (1109,1125)	0.054 (0.053,0.056)	96 (94,99)	0.14 (0.135,0.148)
1CR_steep	0.629 (0.619,0.64)	1120 (1112,1132)	0.054 (0.052,0.056)	97 (92,101)	0.141 (0.124,0.158)
2CR_150	0.52 (0.507,0.529)	965 (950,985)	0.053 (0.051,0.057)	99 (95,104)	0.133 (0.118,0.16)
2CR_250	0.581 (0.573,0.59)	1054 (1041,1064)	0.054 (0.05,0.057)	97 (91,102)	0.135 (0.11,0.179)

** 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

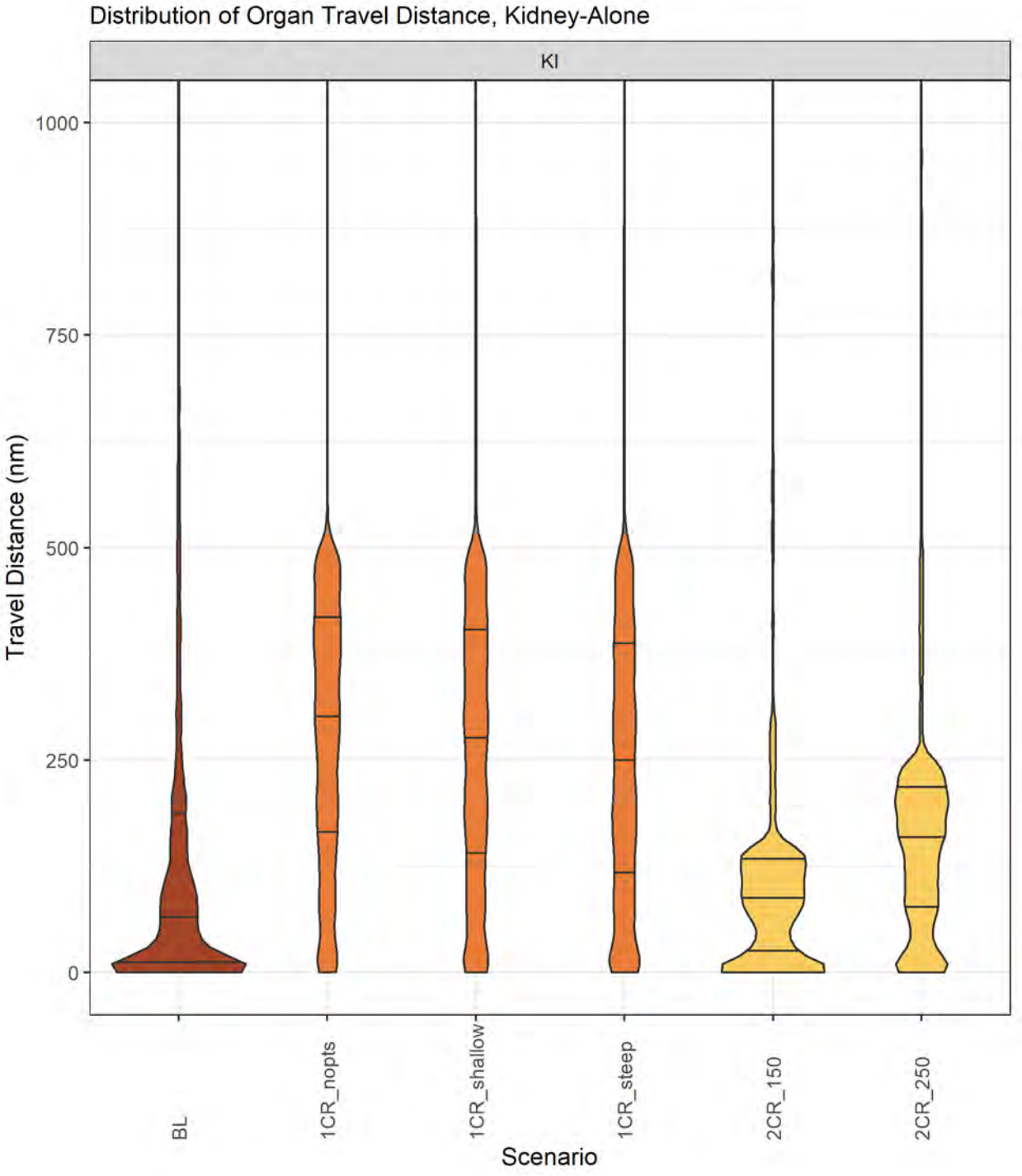
Scenario	Transplant Rate per Patient-Year (N)	Transplant Count (N)	Waitlist Mortality Rate per Patient-Year	Waitlist Mortality Count (N)	Graft Failure Rate per Patient-Year
BL	0.216 (0.209,0.23)	160 (155,169)	0.02 (0.018,0.023)	15 (13,17)	0.19 (0.151,0.246)
1CR_nopts	0.117 (0.11,0.123)	91 (86,95)	0.02 (0.018,0.025)	16 (14,19)	0.21 (0.12,0.311)
1CR_shallow	0.117 (0.109,0.123)	91 (85,95)	0.021 (0.019,0.023)	17 (15,18)	0.214 (0.143,0.296)
1CR_steep	0.112 (0.103,0.12)	87 (80,93)	0.021 (0.019,0.023)	16 (15,18)	0.218 (0.117,0.323)
2CR_150	0.161 (0.148,0.176)	123 (113,134)	0.02 (0.018,0.024)	16 (14,18)	0.191 (0.157,0.253)
2CR_250	0.126 (0.119,0.138)	98 (92,106)	0.02 (0.018,0.022)	16 (14,17)	0.205 (0.14,0.334)

** 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

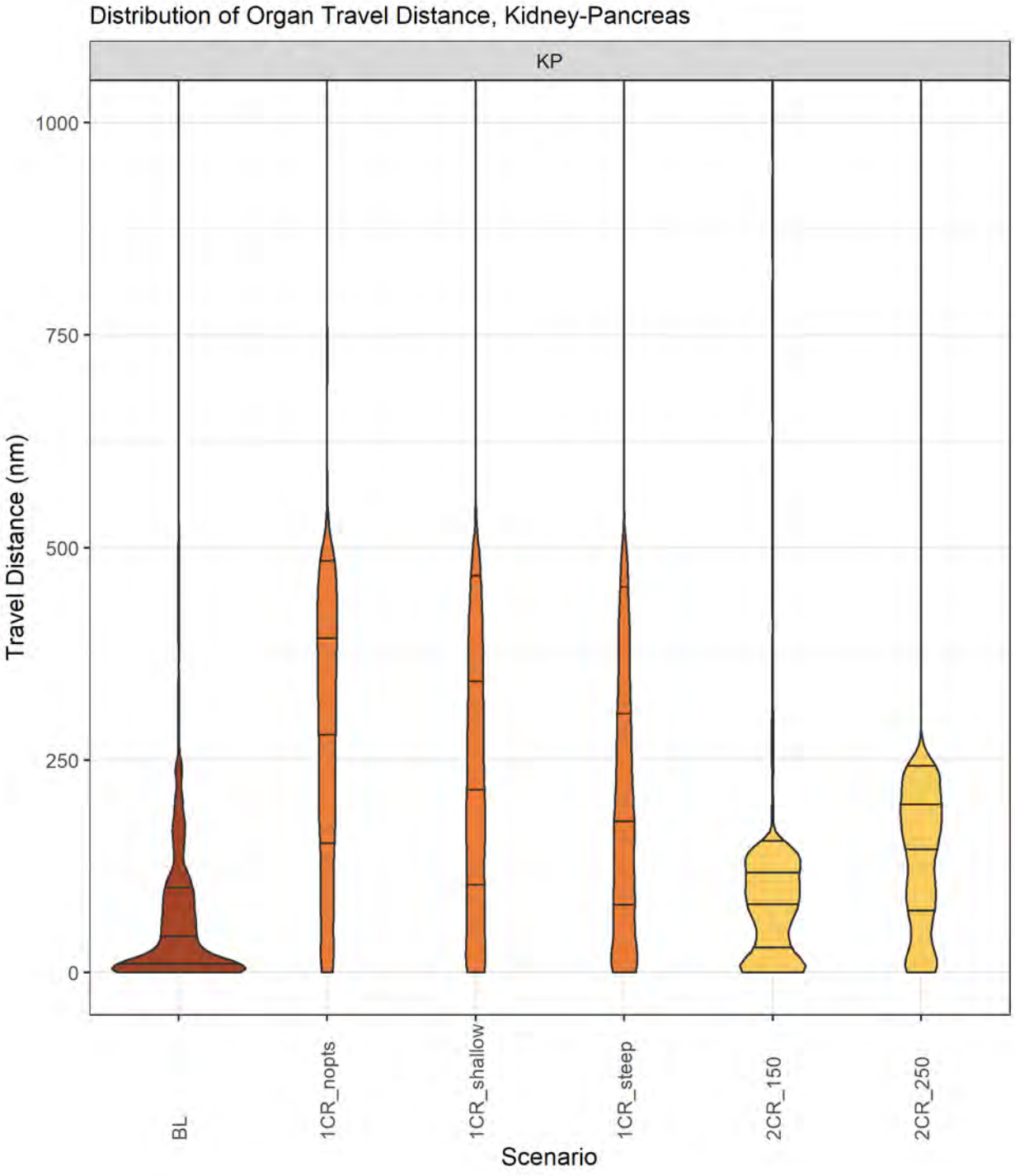
Distance is calculated as the linear distance in nautical miles between zip code centroids of the candidate's listing program and the donor hospital.

Distribution of Organ Travel Distance, Kidney-Alone



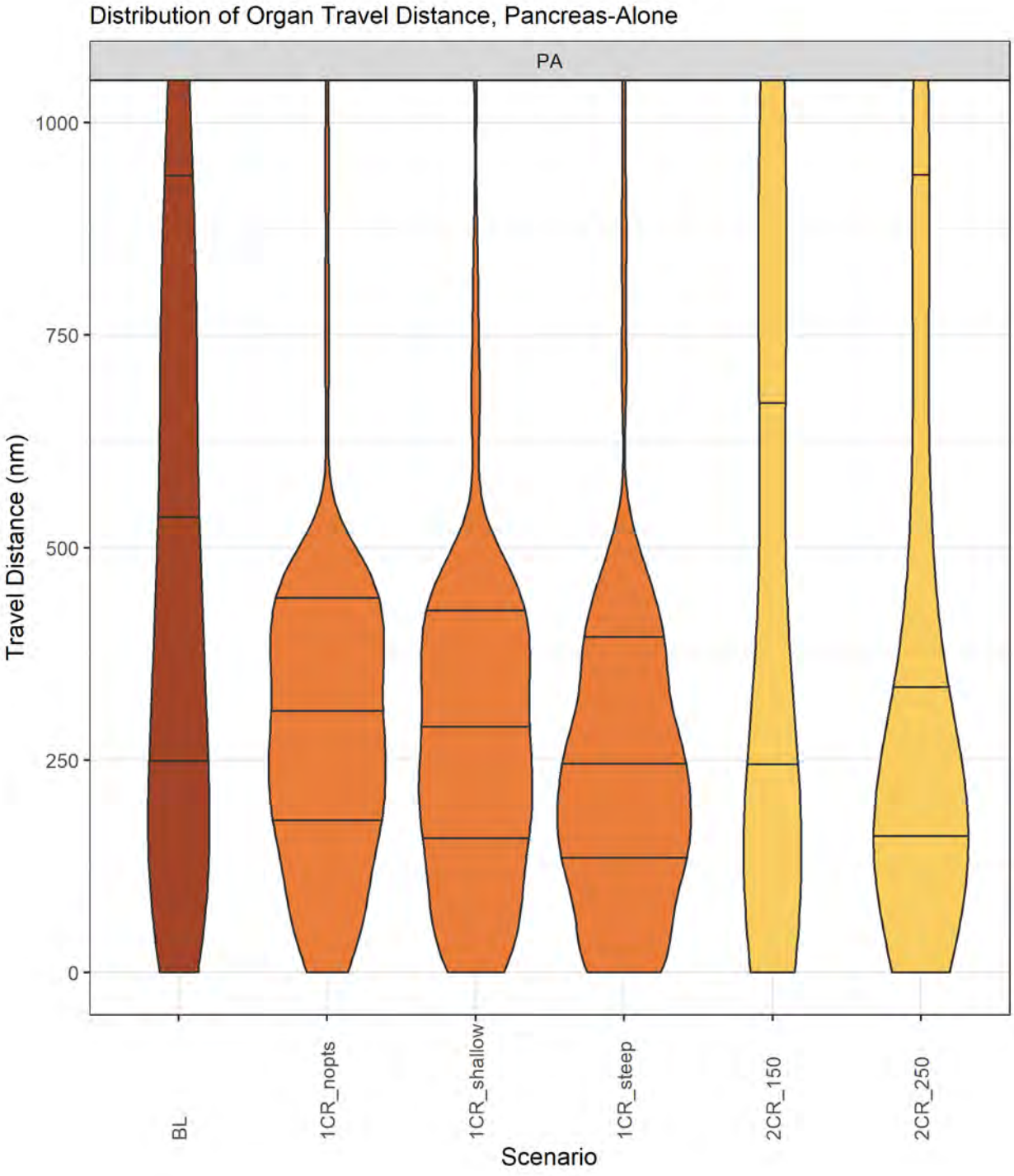
Distribution of Organ Travel Distance, Kidney-Alone

Distribution of Organ Travel Distance, Kidney-Pancreas



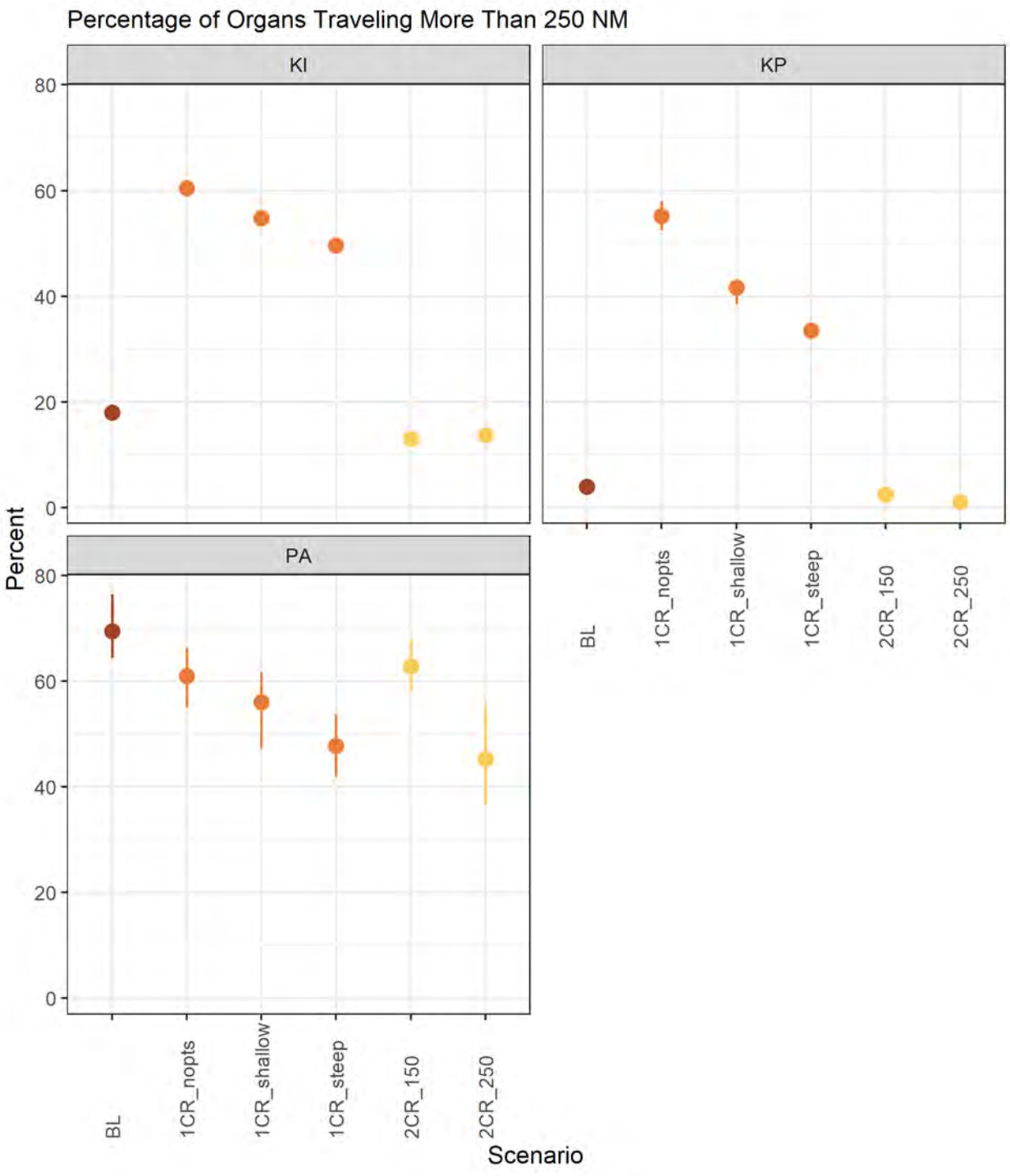
Distribution of Organ Travel Distance, Kidney-Pancreas

Distribution of Organ Travel Distance, Pancreas-Alone



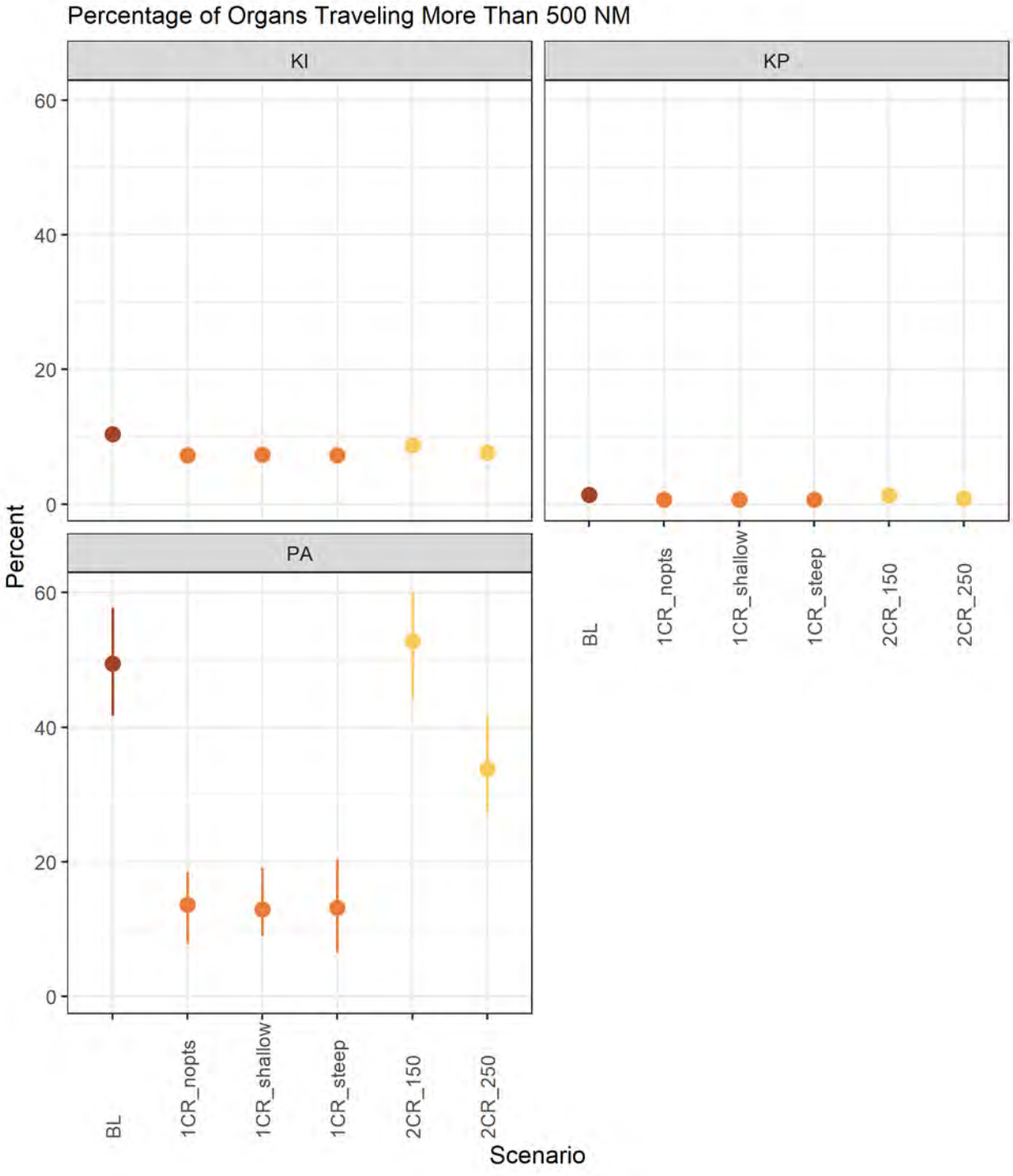
Distribution of Organ Travel Distance, Pancreas-Alone

Percentage of Organs Traveling More Than 250 NM



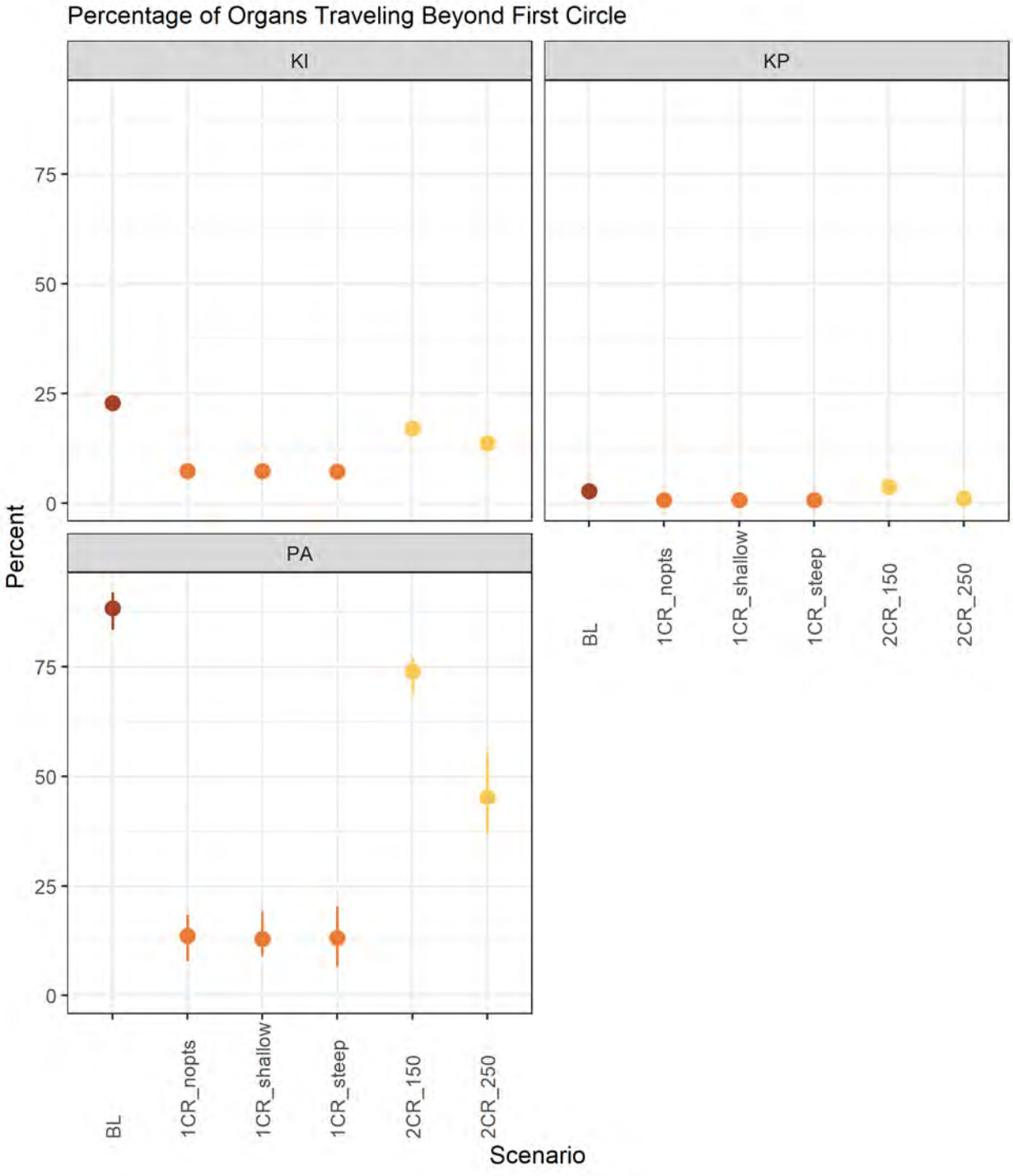
Percentage of Organs Traveling More Than 250 NM

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	7.58	58.50	191.66	173.67	981.53	377.35
1CR_nopts	13.63	163.86	303.54	343.09	420.37	841.64	345.97
1CR_shallow	8.71	134.64	276.11	323.08	405.55	831.83	347.07
1CR_steep	5.58	109.96	247.48	304.21	388.71	826.57	345.72
2CR_150	0.00	23.45	89.24	187.21	137.75	965.67	382.91
2CR_250	3.33	76.57	162.62	232.30	221.96	868.53	361.75

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	4.07	29.60	75.20	93.40	236.41	154.76
1CR_nopts	11.72	147.81	277.53	275.10	395.83	482.78	206.10
1CR_shallow	3.58	91.00	207.11	227.83	339.74	469.23	208.26
1CR_steep	2.01	69.57	169.52	199.45	300.68	452.84	199.32
2CR_150	0.02	24.41	80.17	96.47	119.78	147.59	205.18
2CR_250	2.93	70.61	146.09	145.14	199.86	242.31	171.24

Distribution of Travel Distance: Pancreas-Alone Transplants

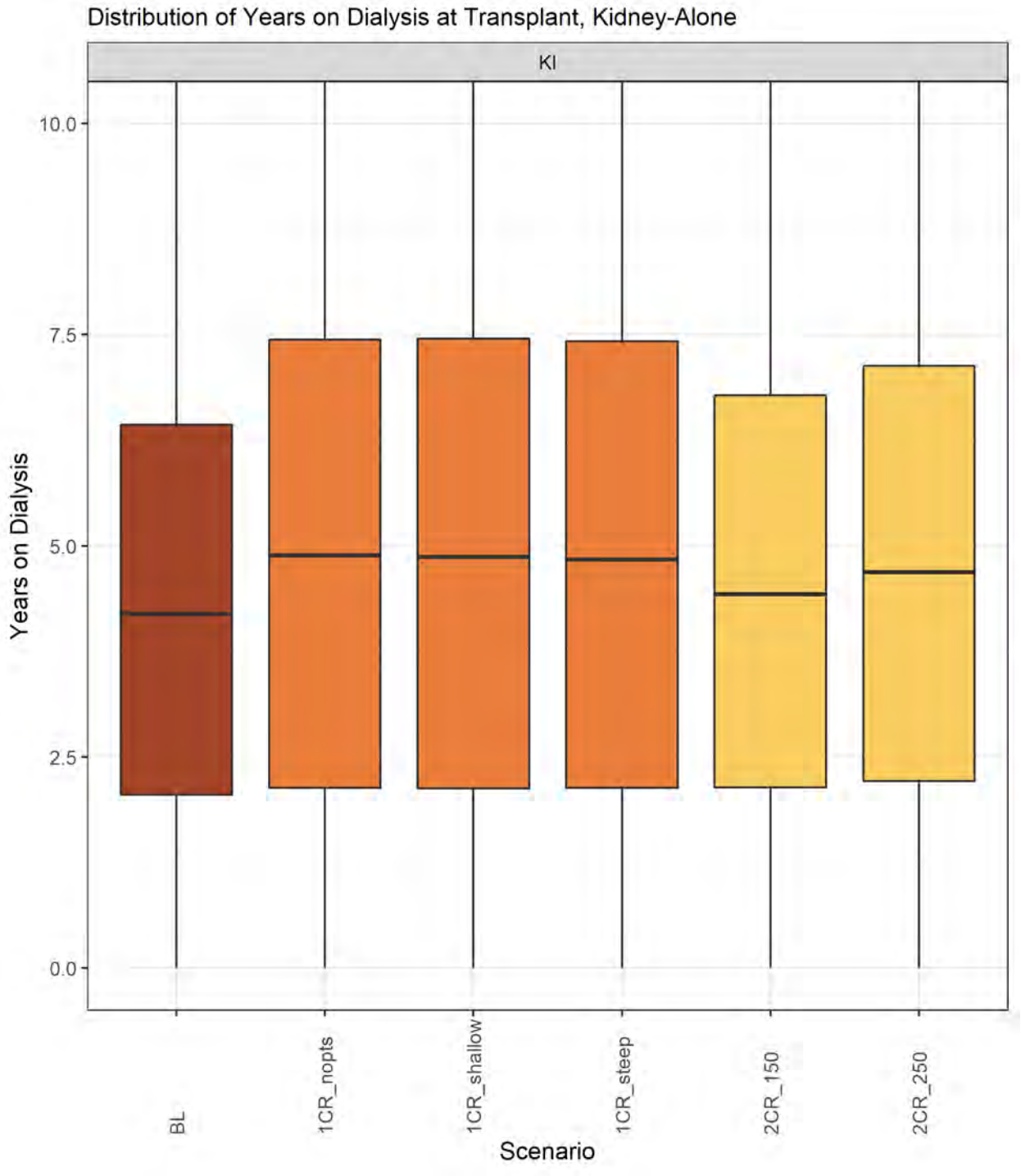
Recipient - Donor Distance Statistics (in NM), Pancreas Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	20.07	207.45	495.34	659.21	898.23	1855.04	633.57
1CR_nopts	45.02	176.29	306.66	500.02	436.52	1879.93	721.32
1CR_shallow	22.82	151.67	284.51	456.17	421.93	1782.34	689.59
1CR_steep	9.20	125.68	239.16	432.64	386.88	1693.87	705.64
2CR_150	13.97	148.84	555.71	755.94	1137.47	2033.95	775.55
2CR_250	19.76	143.71	248.07	607.17	864.09	2043.26	777.87

Time on Dialysis

Distribution of Time on Dialysis at Transplant

Distribution of Years on Dialysis at Transplant, Kidney-Alone



Distribution of Years on Dialysis at Transplant, Kidney-Alone

Years on Dialysis at Transplant, Kidney-Alone Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	0	2.05	4.19	4.61	6.43	10.67	3.63
1CR_nopts	0	2.13	4.89	5.23	7.44	11.99	4.06
1CR_shallow	0	2.13	4.87	5.22	7.45	11.97	4.06
1CR_steep	0	2.13	4.84	5.21	7.42	11.97	4.06
2CR_150	0	2.14	4.43	4.83	6.78	11.05	3.76
2CR_250	0	2.21	4.69	5.07	7.13	11.52	3.91

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	0.0071 (0.0064,0.0076)	0.11 (0.09,0.14)	2 (0.17,8.31)
1CR_nopts	0.002 (0.0019,0.0022)	0.12 (0.09,0.14)	0.21 (0.02,1.2)
1CR_shallow	0.0019 (0.0016,0.0021)	0.11 (0.09,0.13)	0.15 (0.03,0.44)
1CR_steep	0.0016 (0.0015,0.0018)	0.13 (0.1,0.16)	0.23 (0.03,1.24)
2CR_150	0.009 (0.0078,0.0101)	0.13 (0.1,0.16)	0.55 (0.13,1.6)
2CR_250	0.0021 (0.0021,0.0022)	0.16 (0.12,0.2)	1.48 (0.02,10.99)

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	53.9 (52.1,56.9)	427.5 (414.4,438)	299.2 (279.3,312.4)	209 (189.3,234.1)	304.3 (222.7,534.1)
1CR_nopts	91.4 (90.1,93.7)	414.9 (399,435.2)	322.7 (304.3,331.6)	233 (224.5,247.6)	453.4 (375.4,631.1)
1CR_shallow	88.4 (84.4,91.2)	418.1 (404.9,434.4)	325.1 (318.4,337.6)	232.4 (208.4,255.2)	463.1 (349.1,522.1)
1CR_steep	86.4 (83.9,90.6)	409.7 (379,439.6)	319.8 (310.9,335.3)	226 (195.4,242.9)	443.2 (359.6,533.7)
2CR_150	39.4 (38.6,40.6)	417.3 (376.9,449.9)	305.3 (283.7,324)	213.5 (185.1,234.9)	392.9 (238.8,587.2)
2CR_250	60.1 (57,62.4)	414.7 (392.9,444.7)	317.4 (300.3,329.4)	214.5 (178.5,236.1)	418.2 (343.3,541)

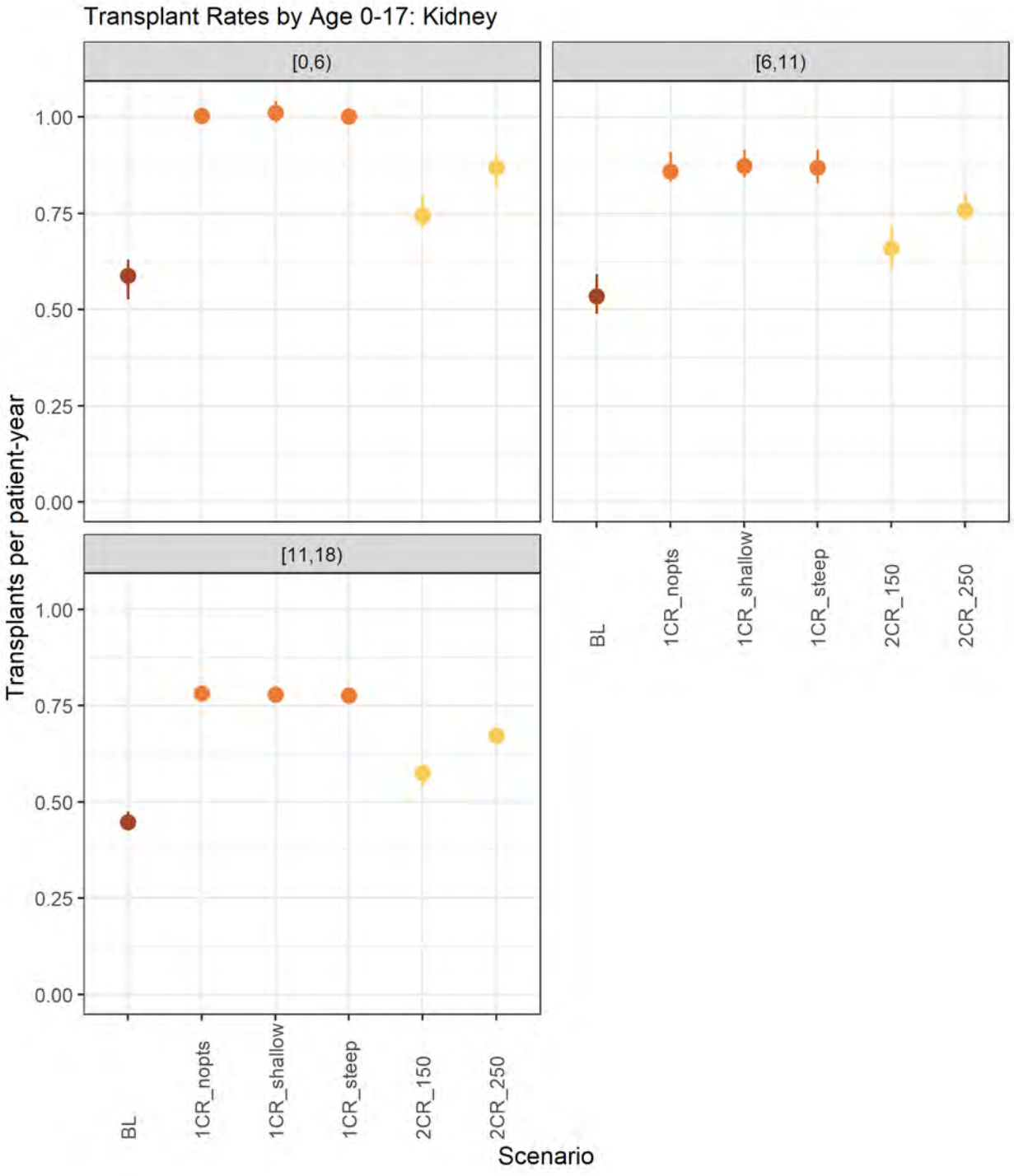
Subgroup Analyses

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

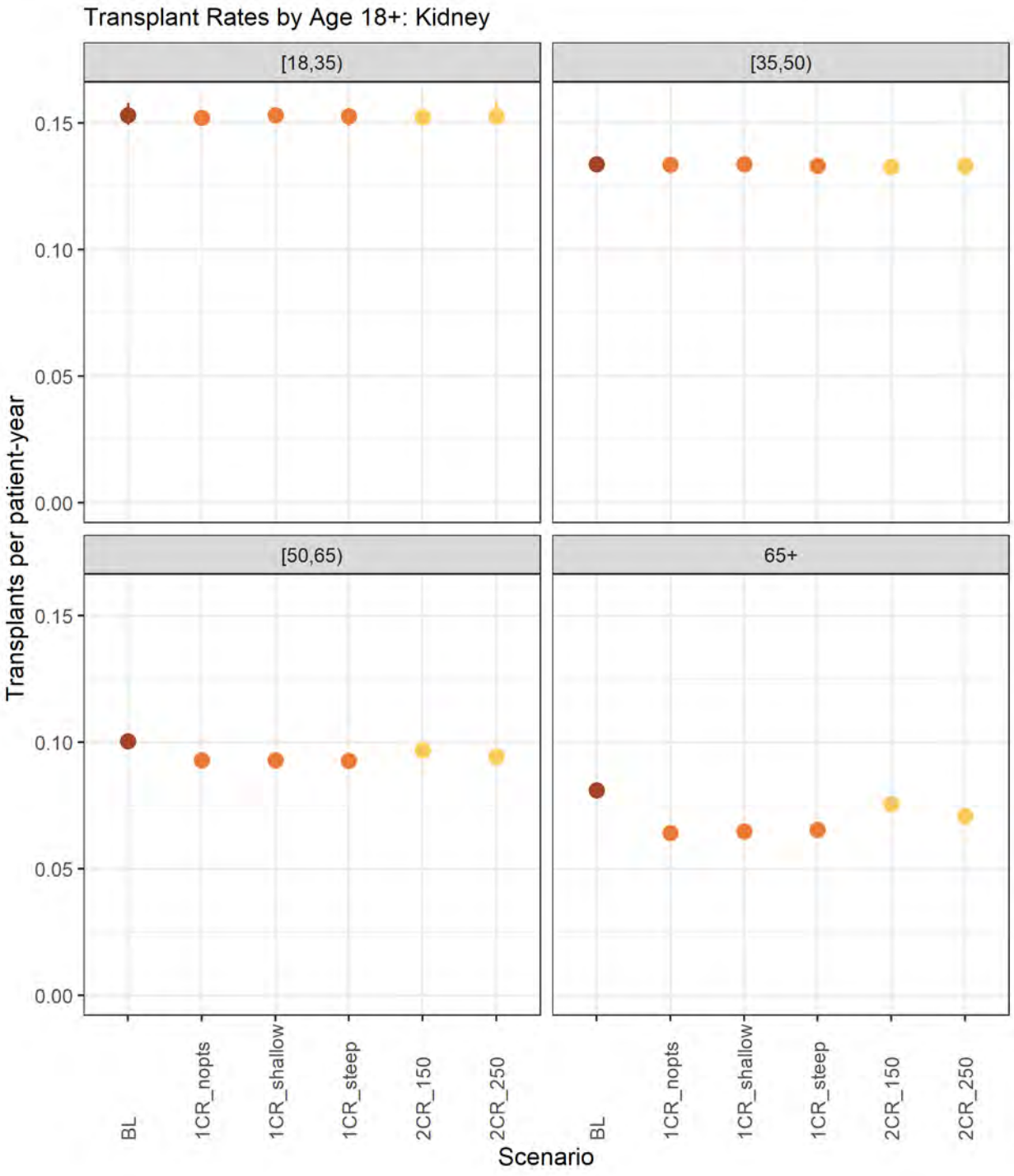
Transplant Rates

Transplant Rates: Age 0-17

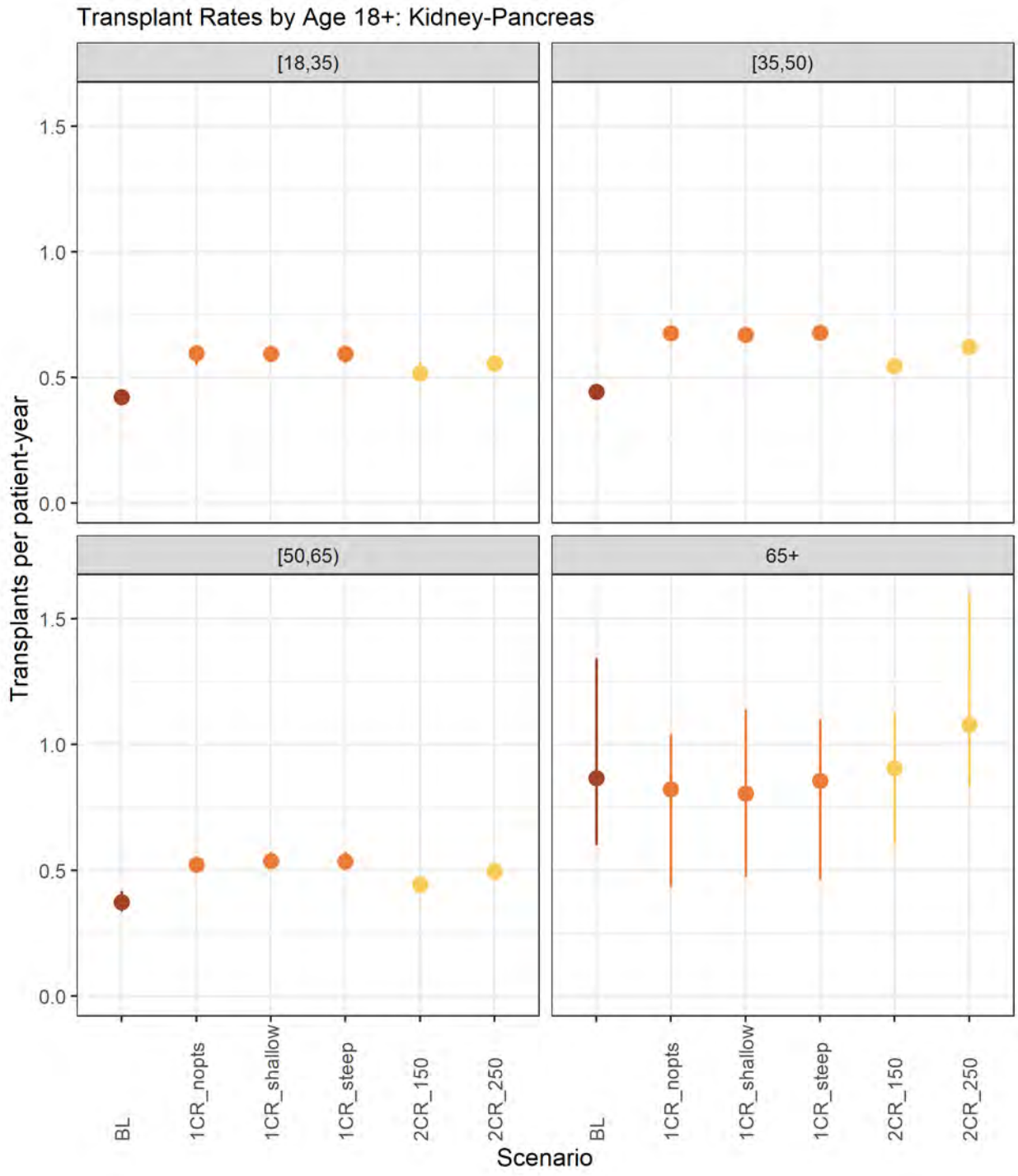


Transplant Rates by Age 0-17: Kidney

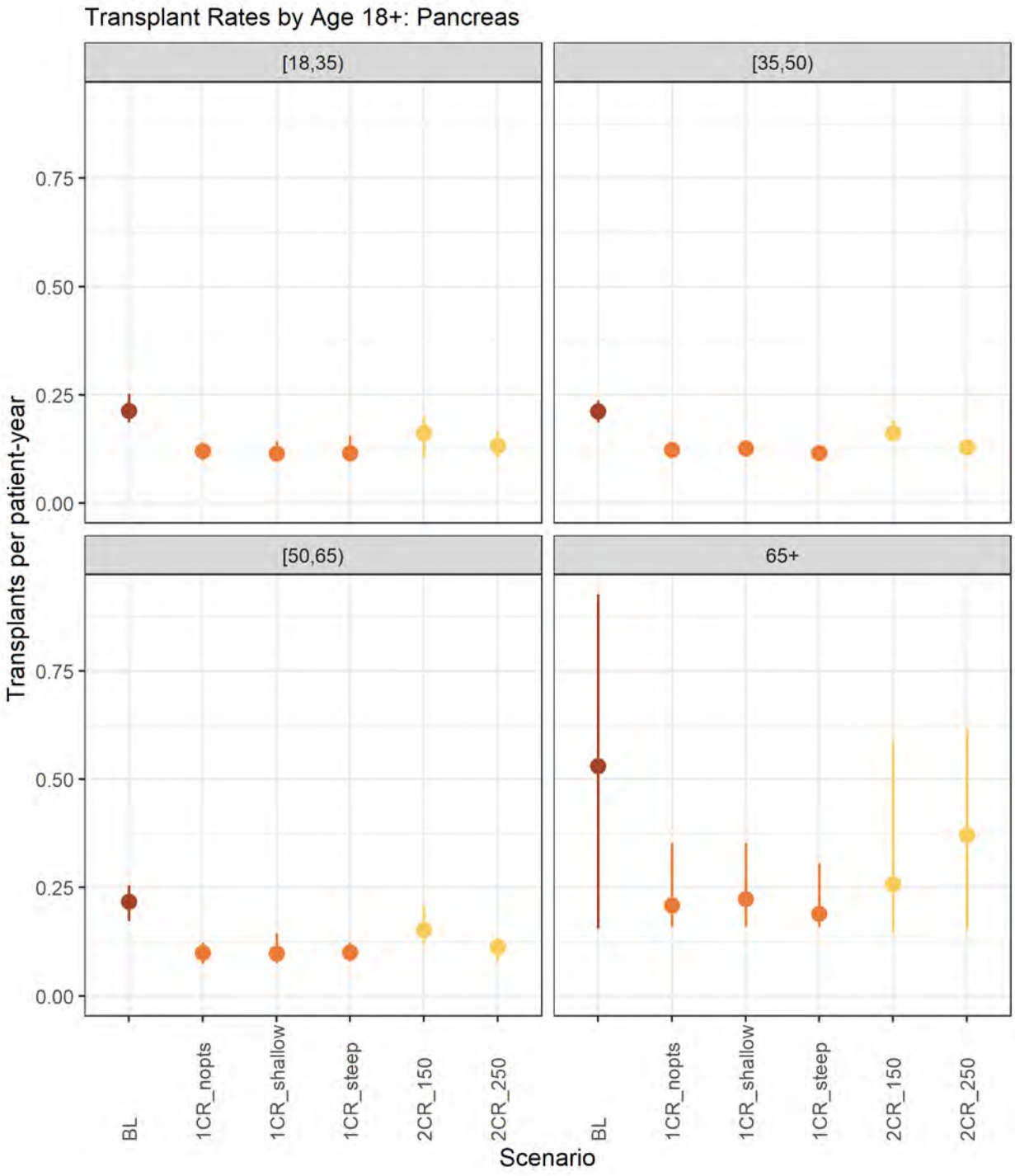
Transplant Rates: Age 18+



Transplant Rates by Age 18+: Kidney

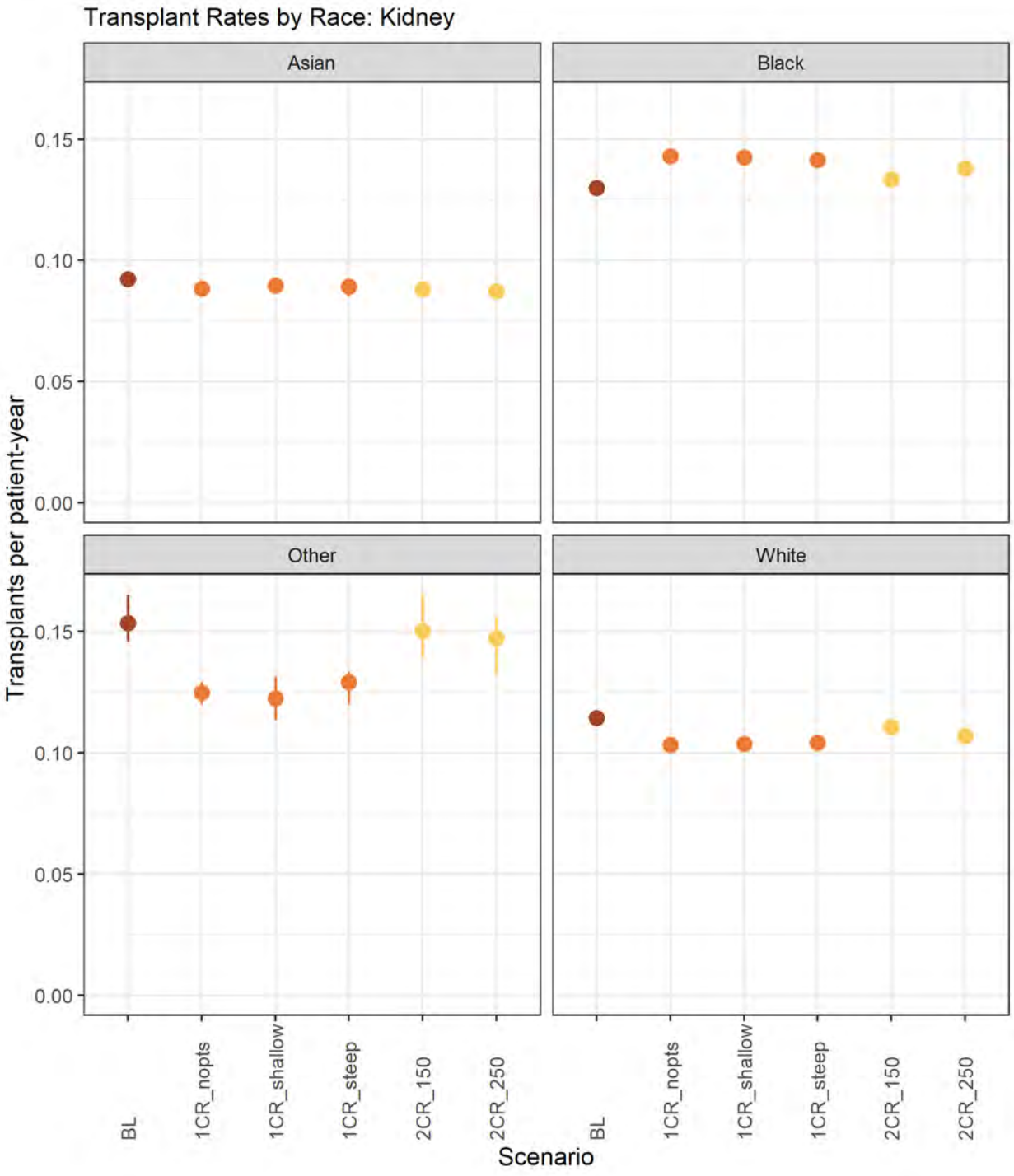


Transplant Rates by Age 18+: Kidney-Pancreas

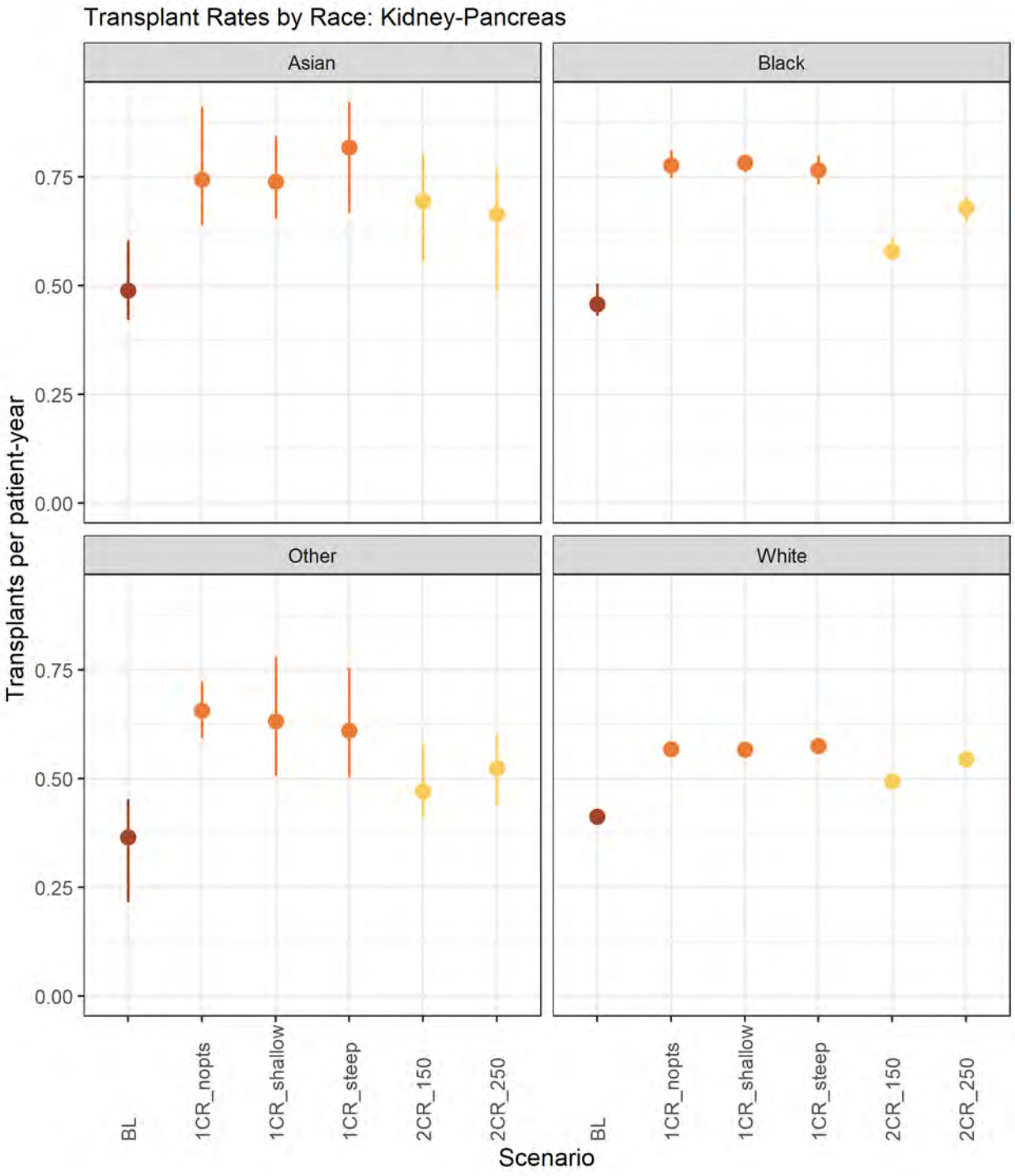


Transplant Rates by Age 18+: Pancreas

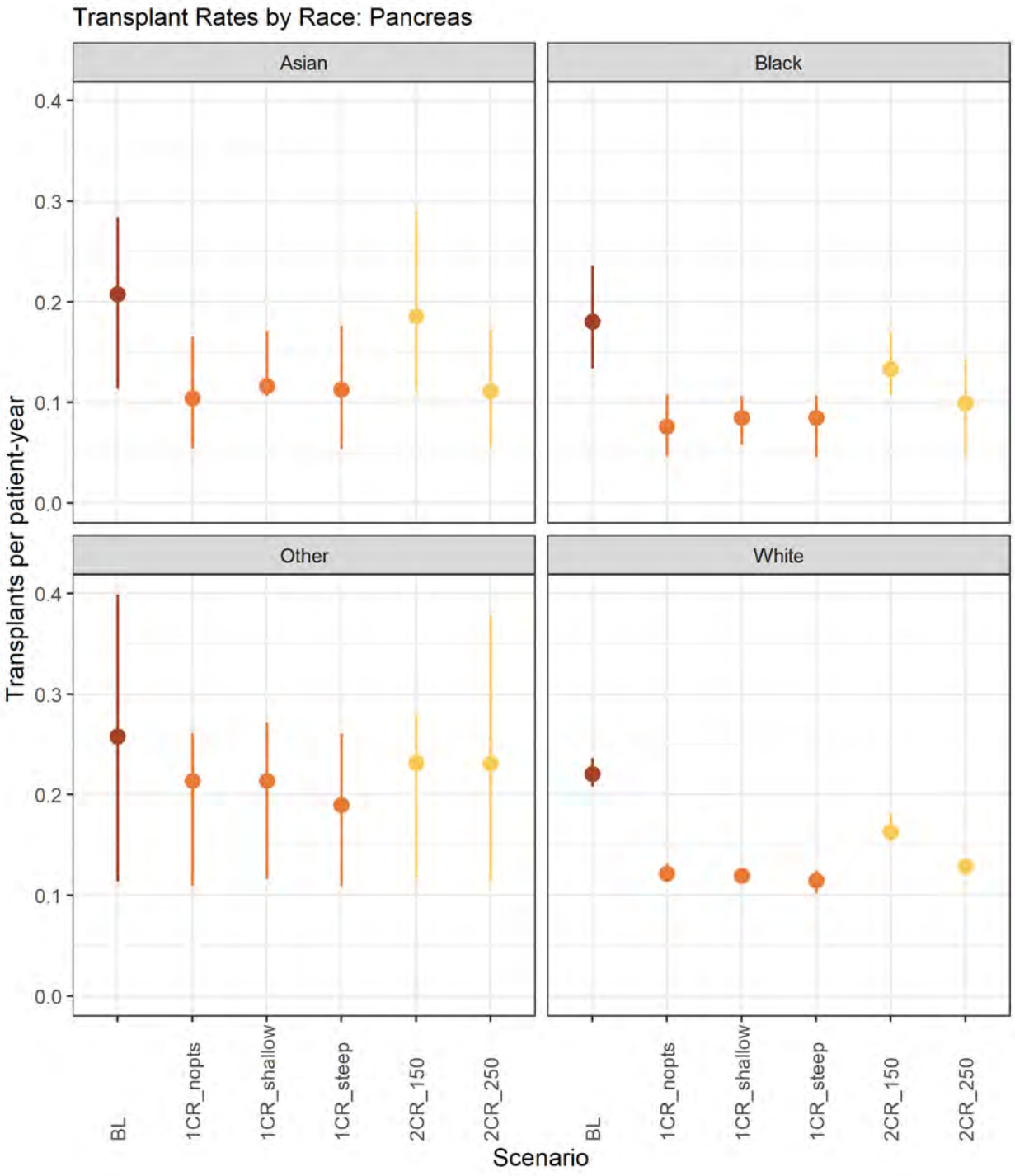
Transplant Rates: Race



Transplant Rates by Race: Kidney

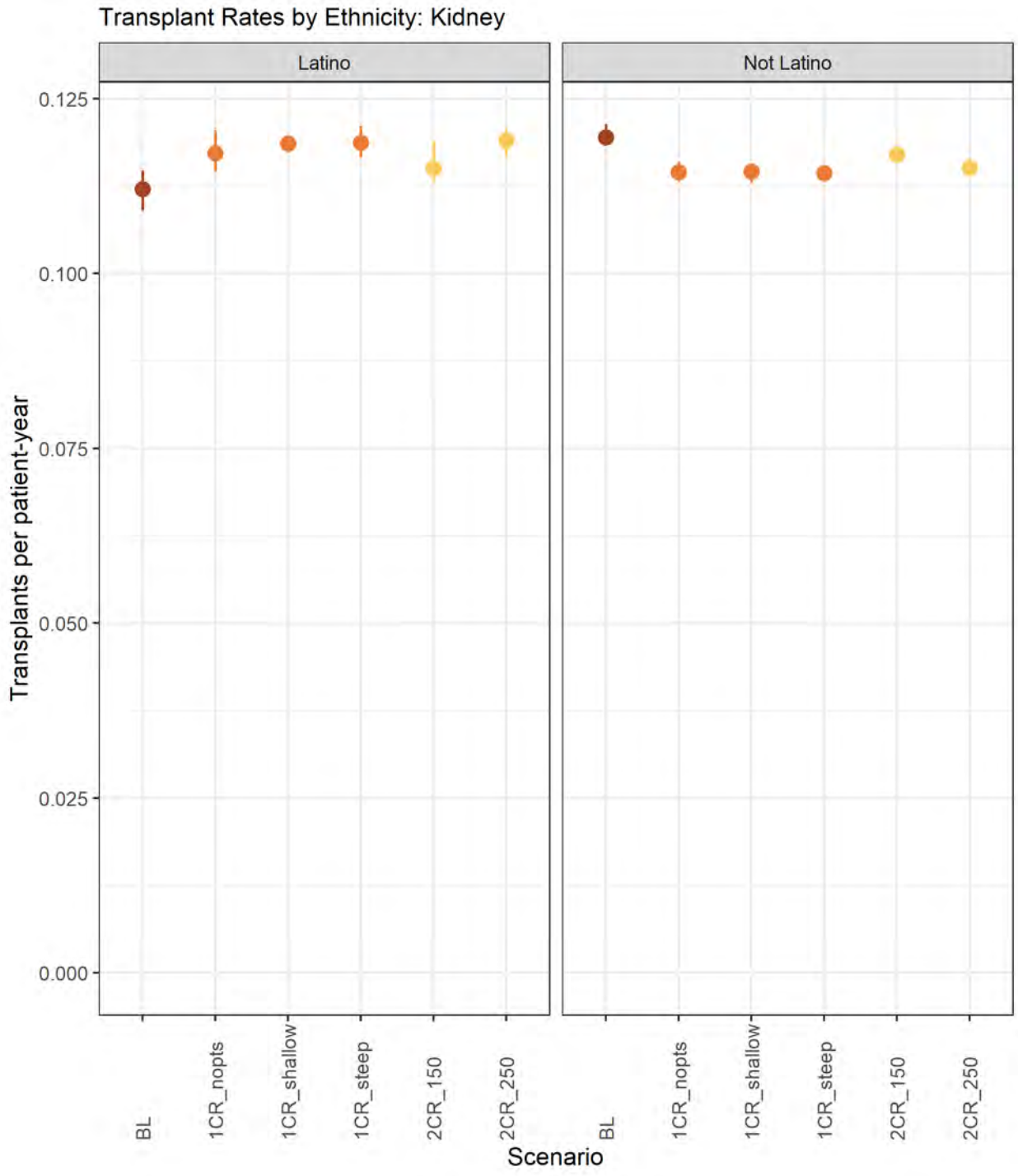


Transplant Rates by Race: Kidney-Pancreas

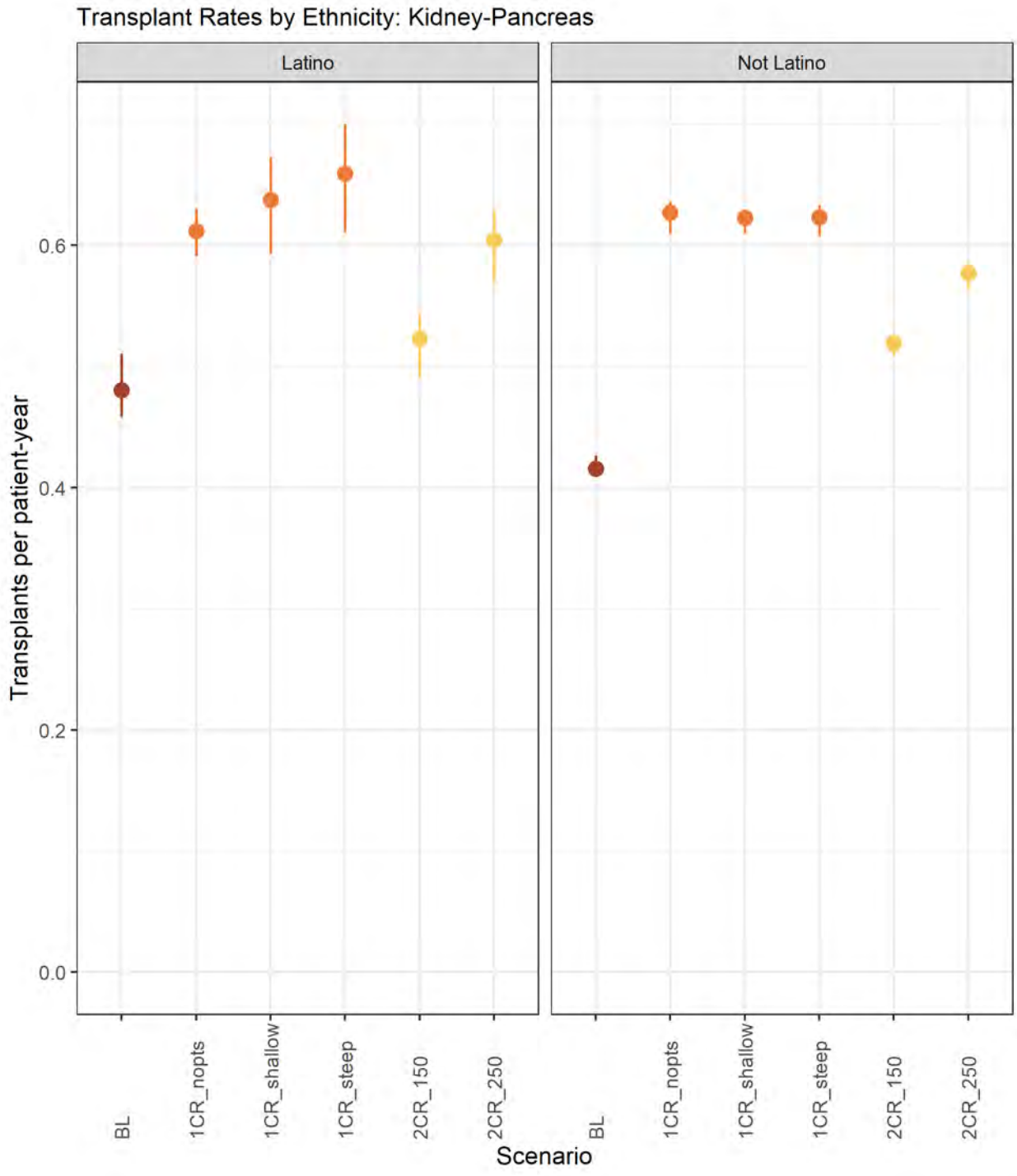


Transplant Rates by Race: Pancreas

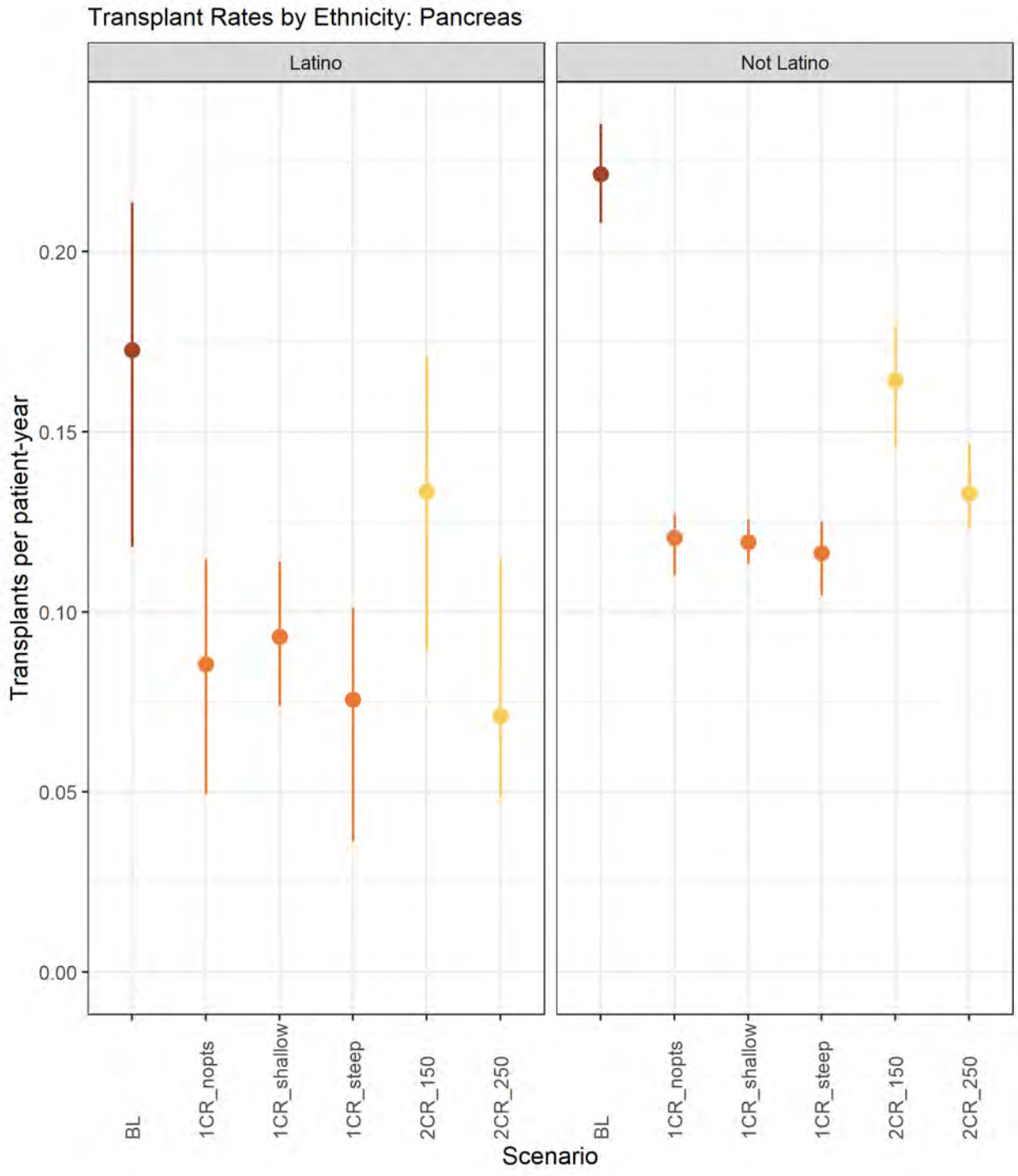
Transplant Rates: Ethnicity



Transplant Rates by Ethnicity: Kidney

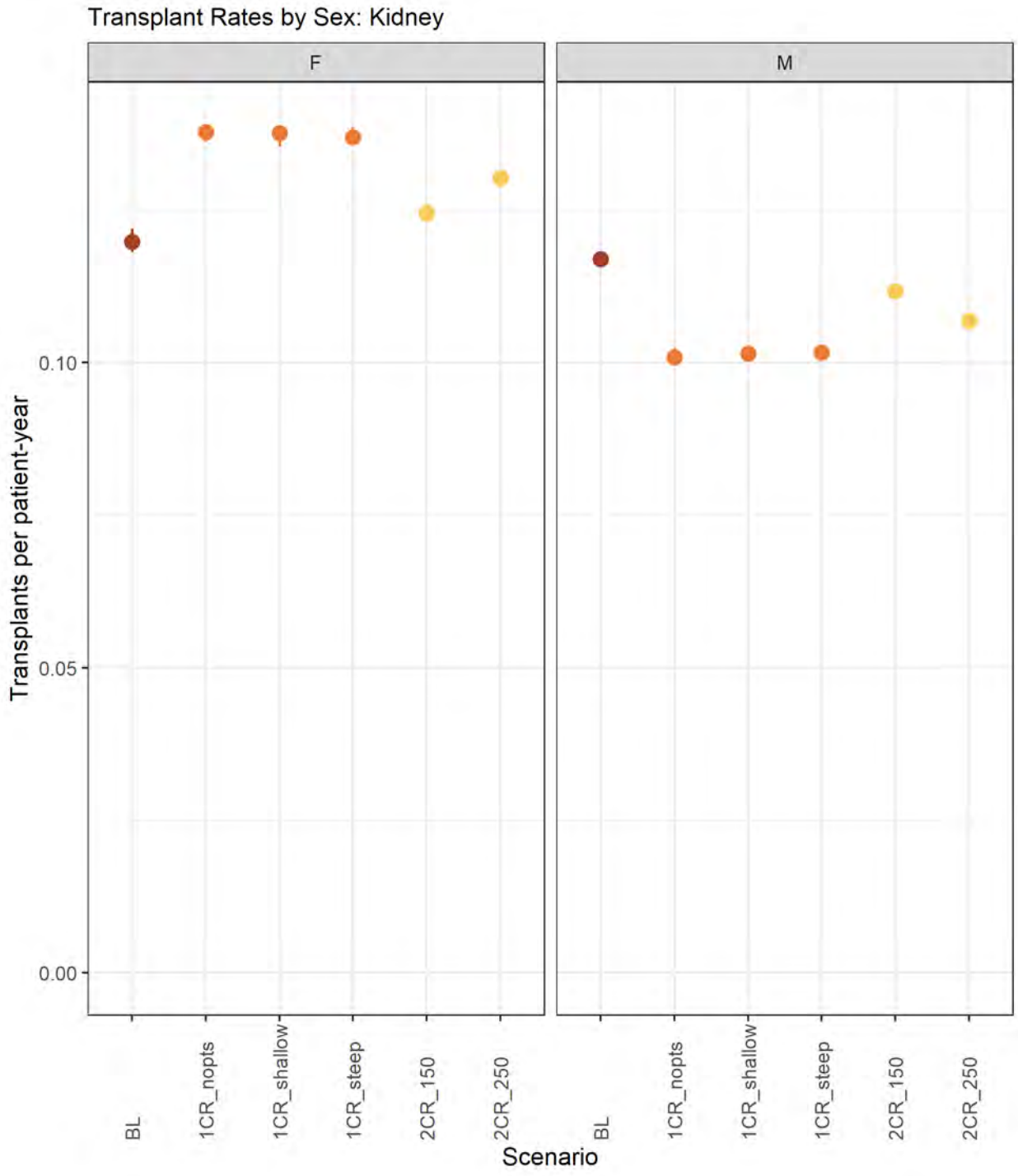


Transplant Rates by Ethnicity: Kidney-Pancreas

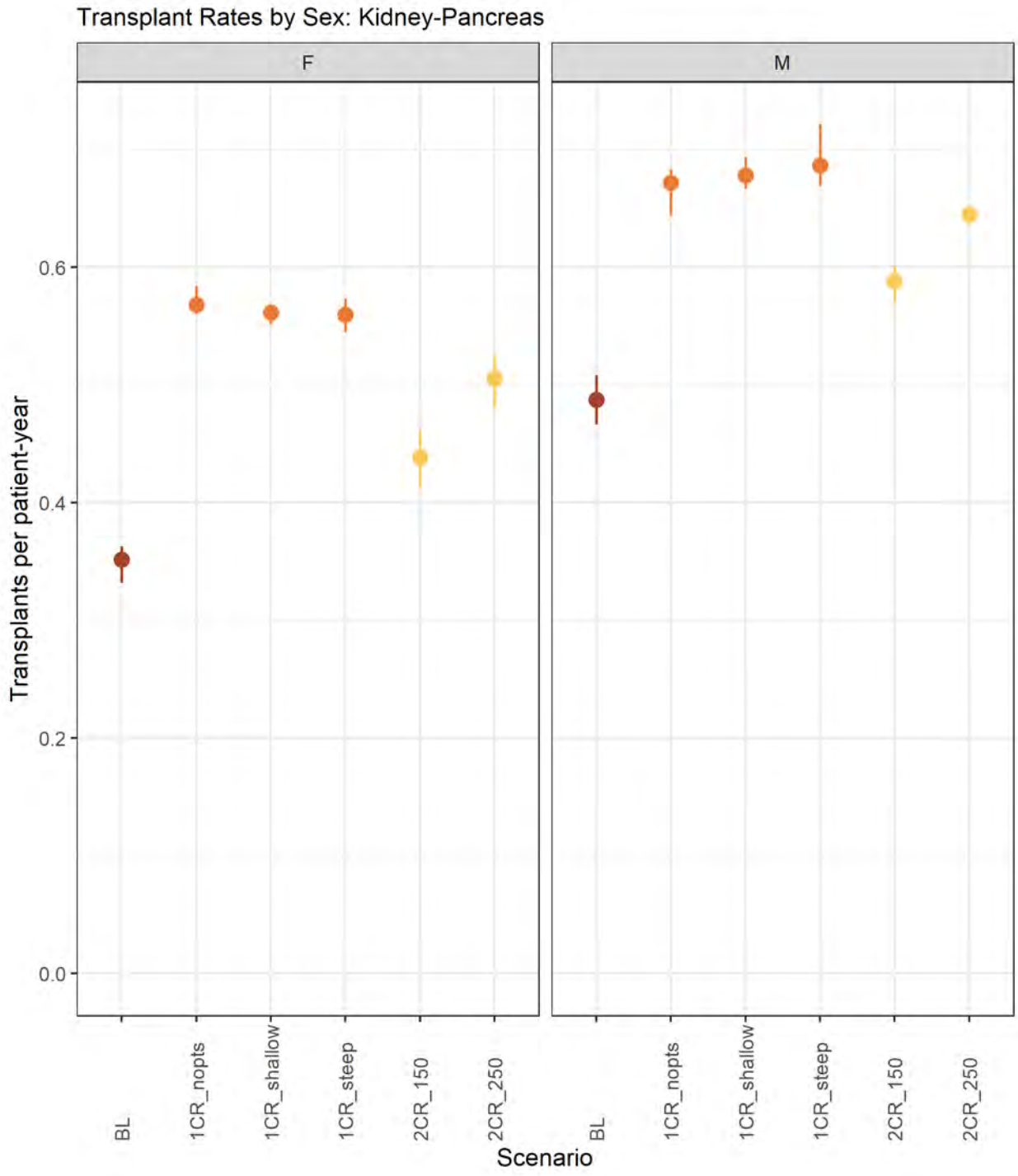


Transplant Rates by Ethnicity: Pancreas

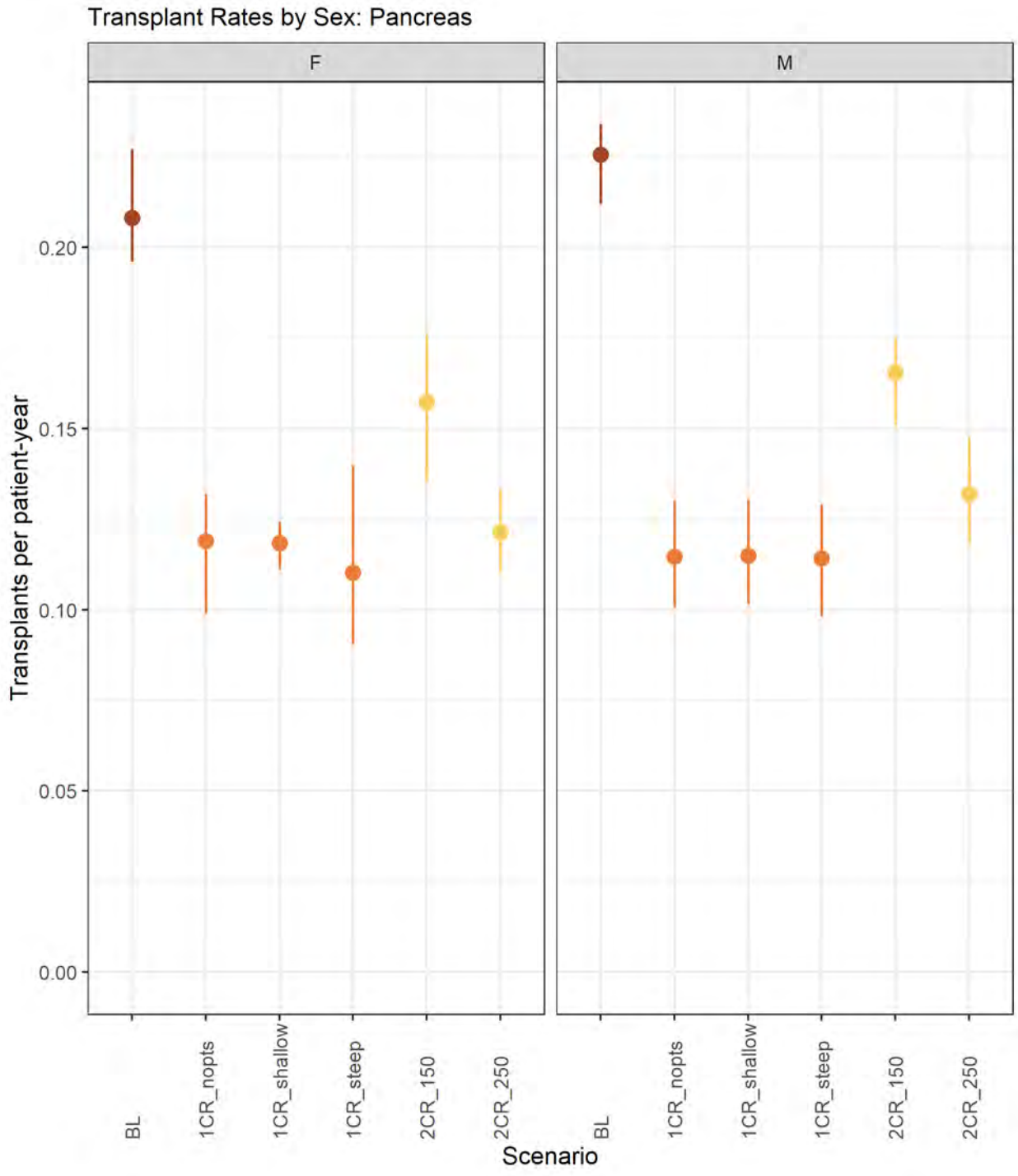
Transplant Rates: Sex



Transplant Rates by Sex: Kidney

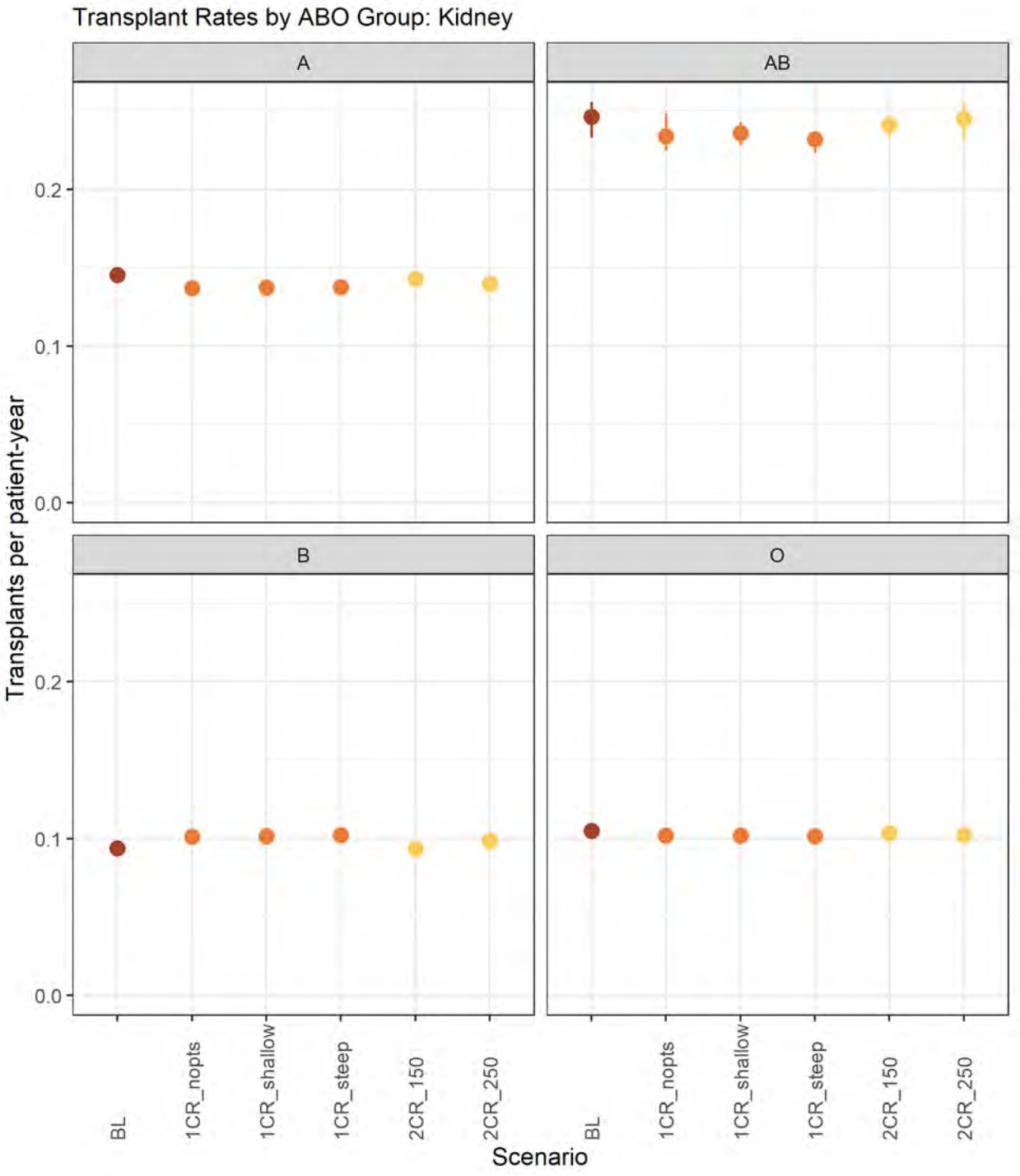


Transplant Rates by Sex: Kidney-Pancreas

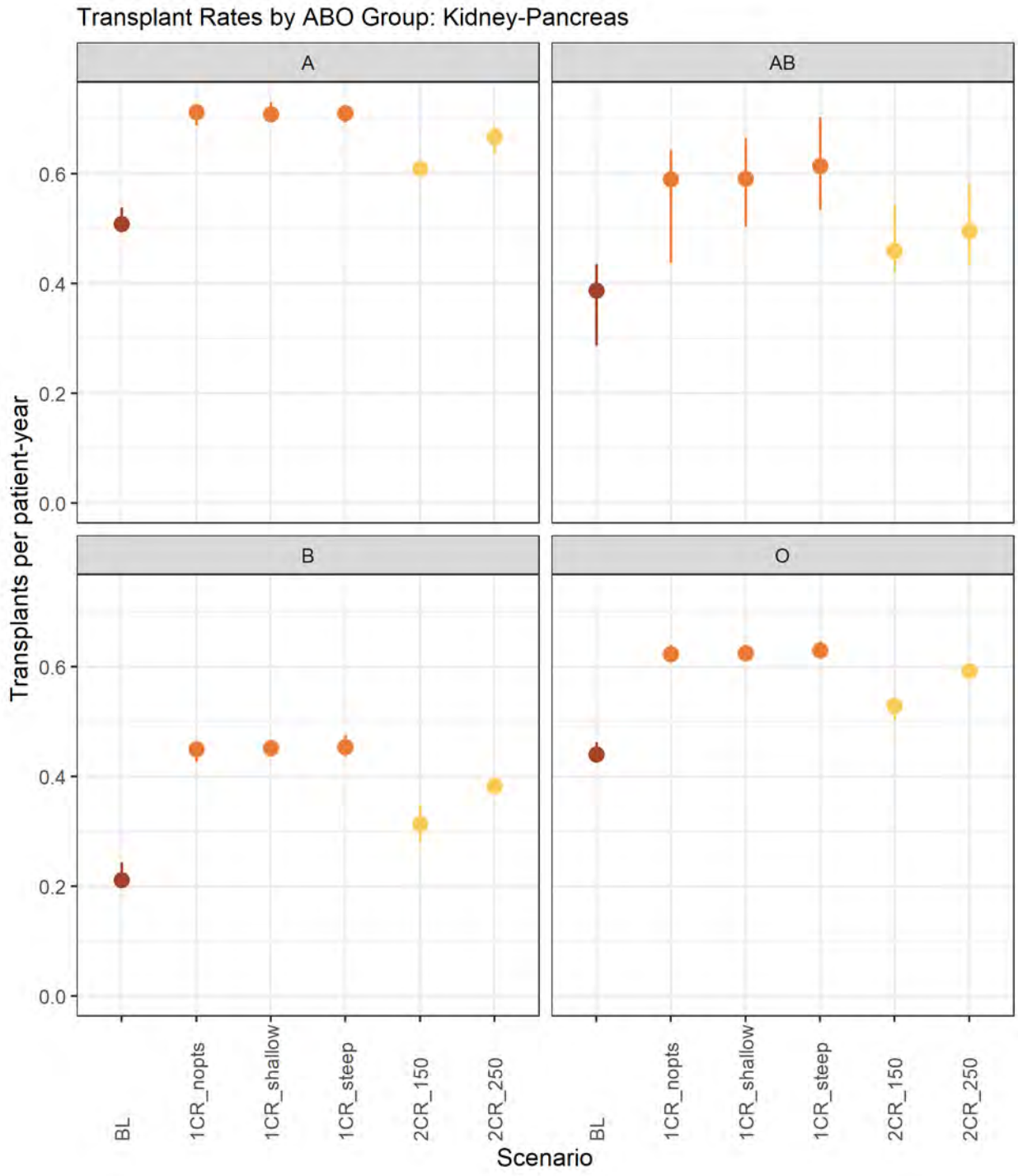


Transplant Rates by Sex: Pancreas

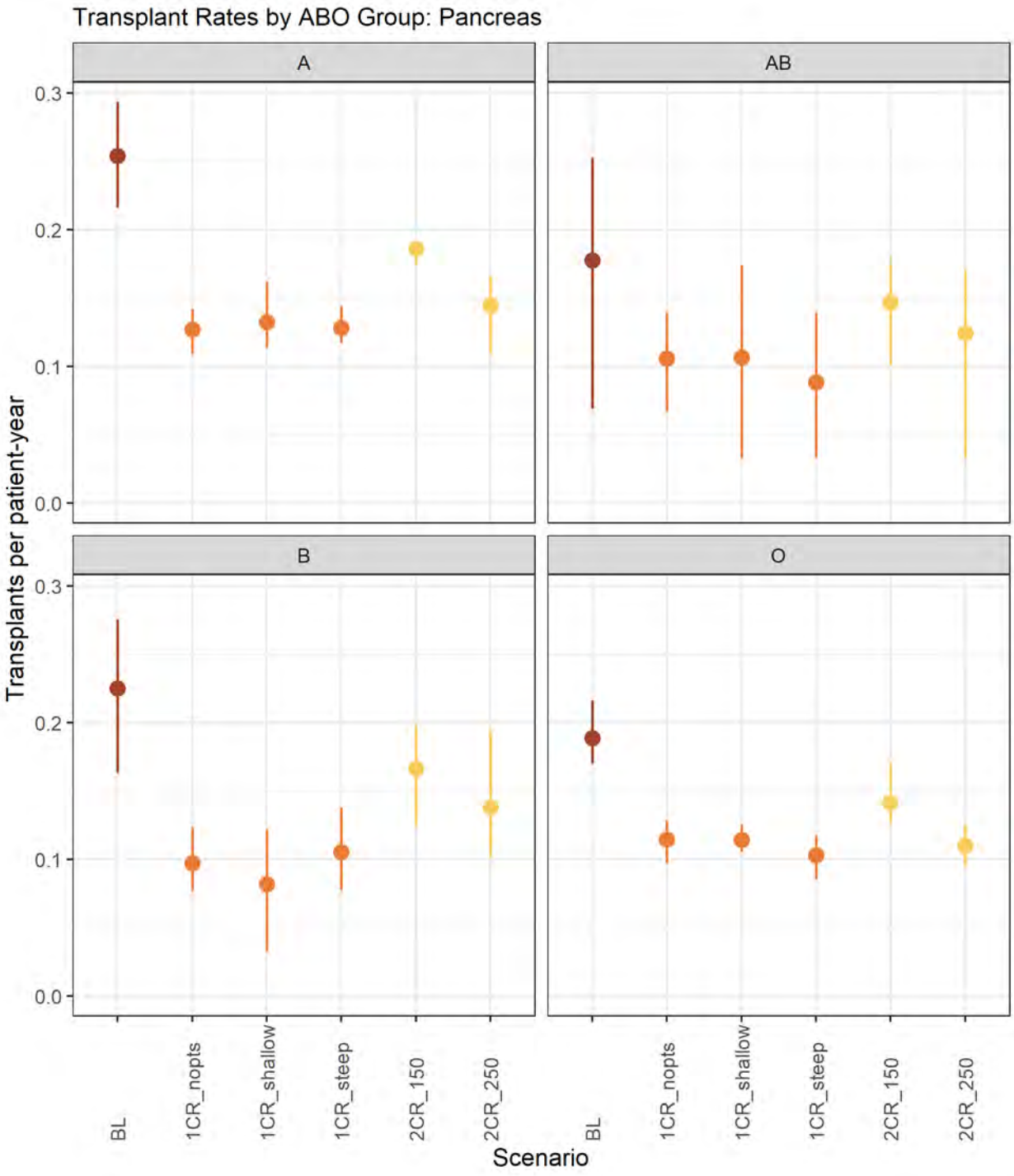
Transplant Rates: ABO Group



Transplant Rates by ABO Group: Kidney

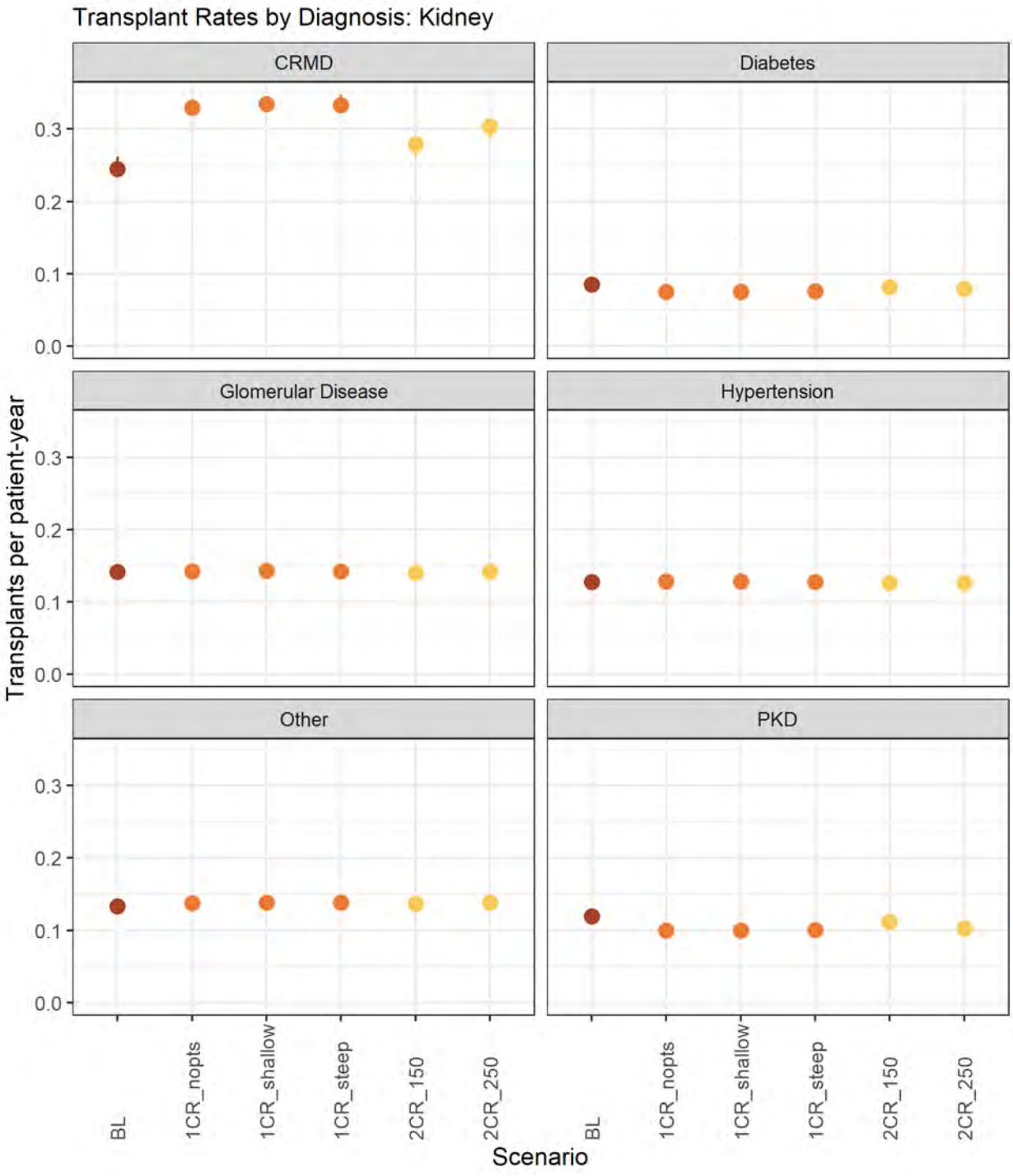


Transplant Rates by ABO Group: Kidney-Pancreas

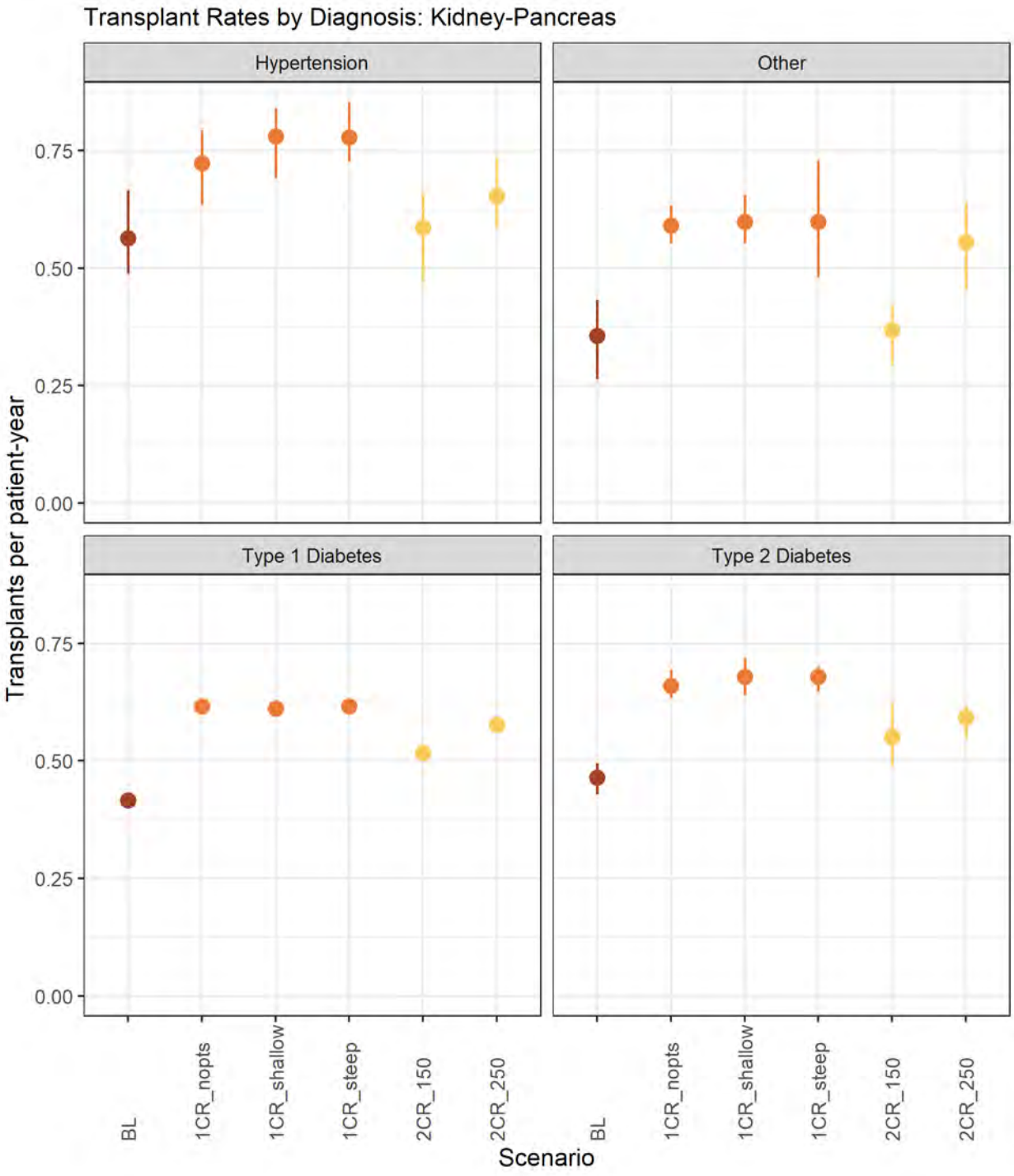


Transplant Rates by ABO Group: Pancreas

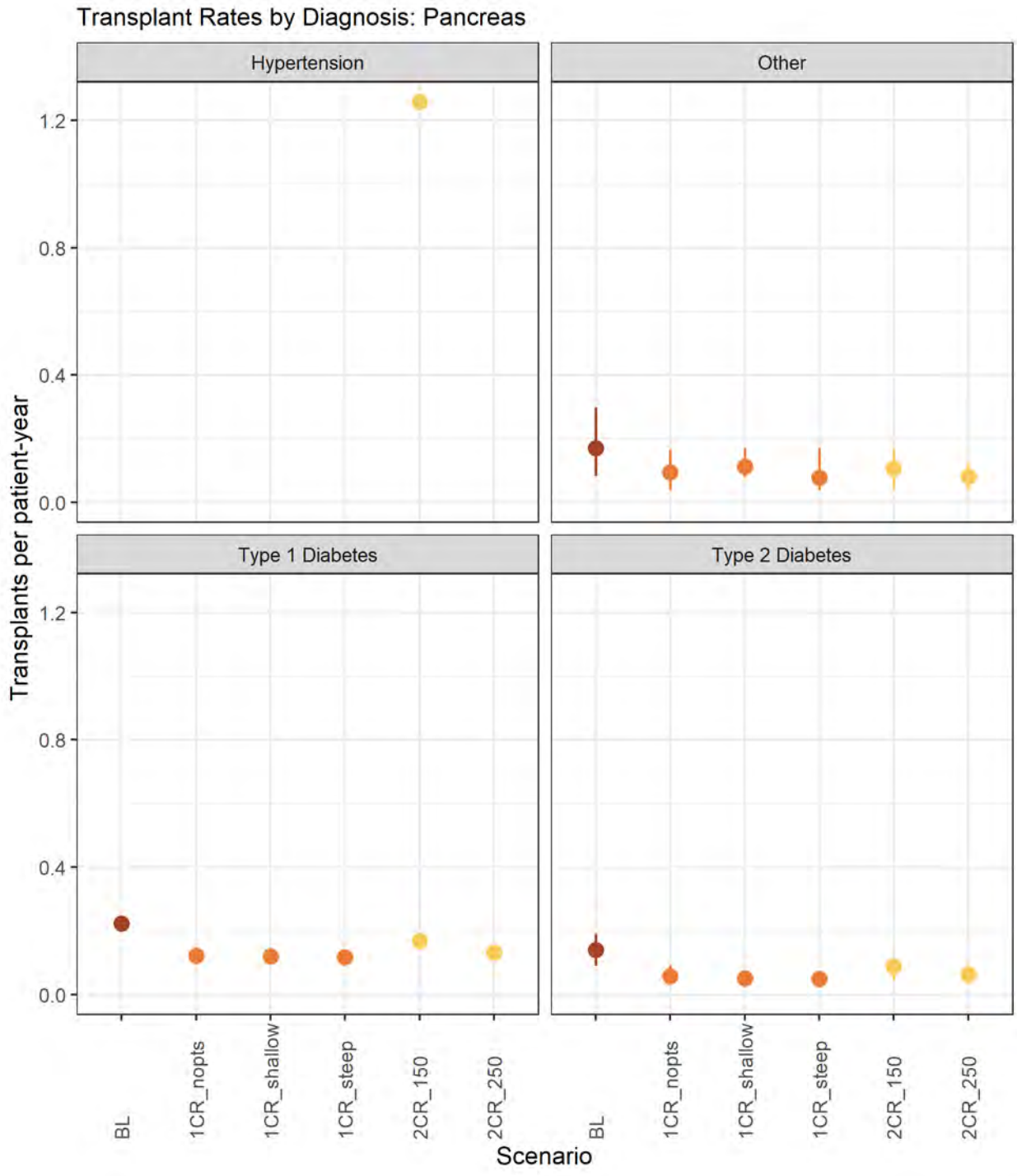
Transplant Rates: Diagnosis



Transplant Rates by Diagnosis: Kidney

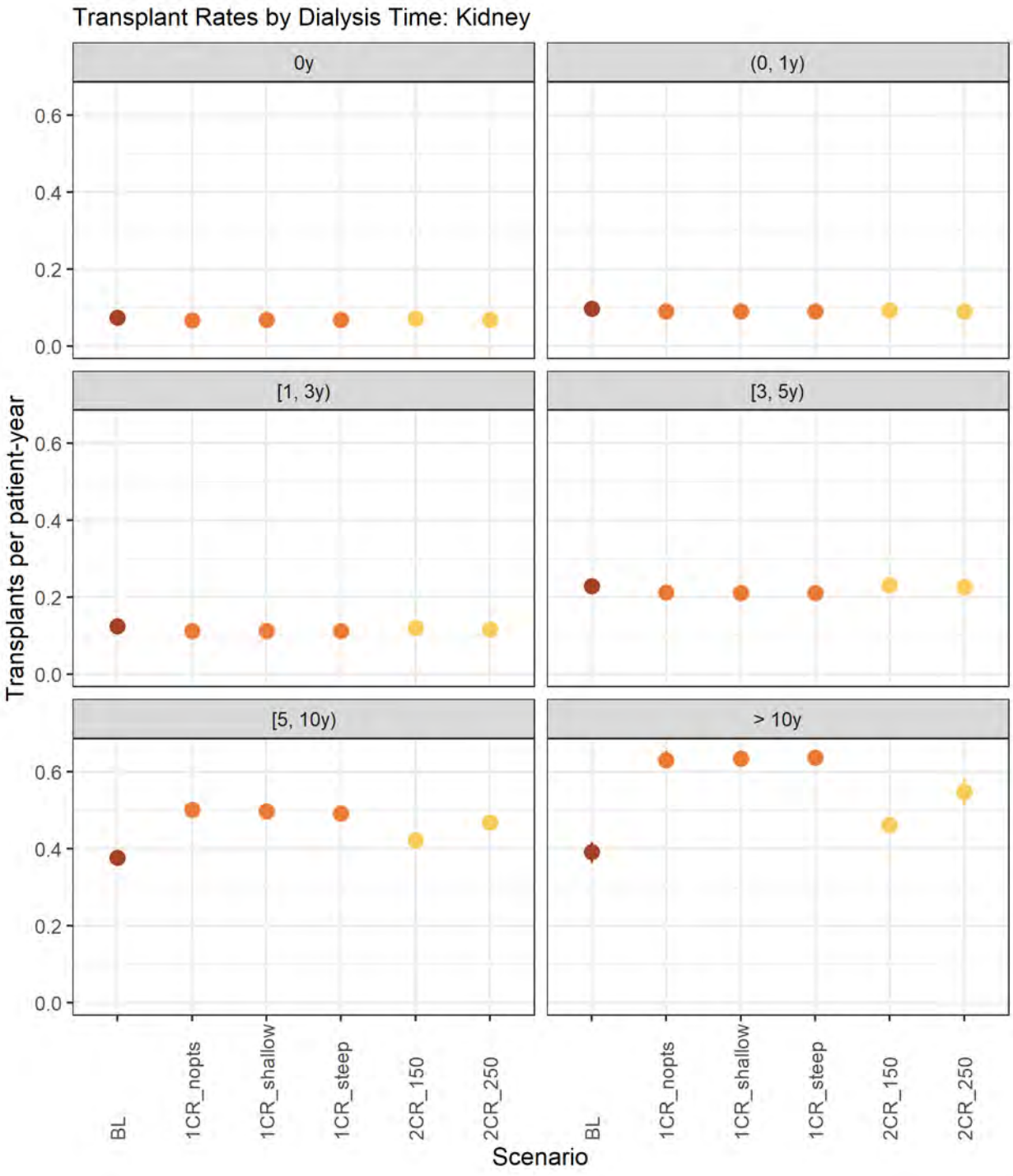


Transplant Rates by Diagnosis: Kidney-Pancreas



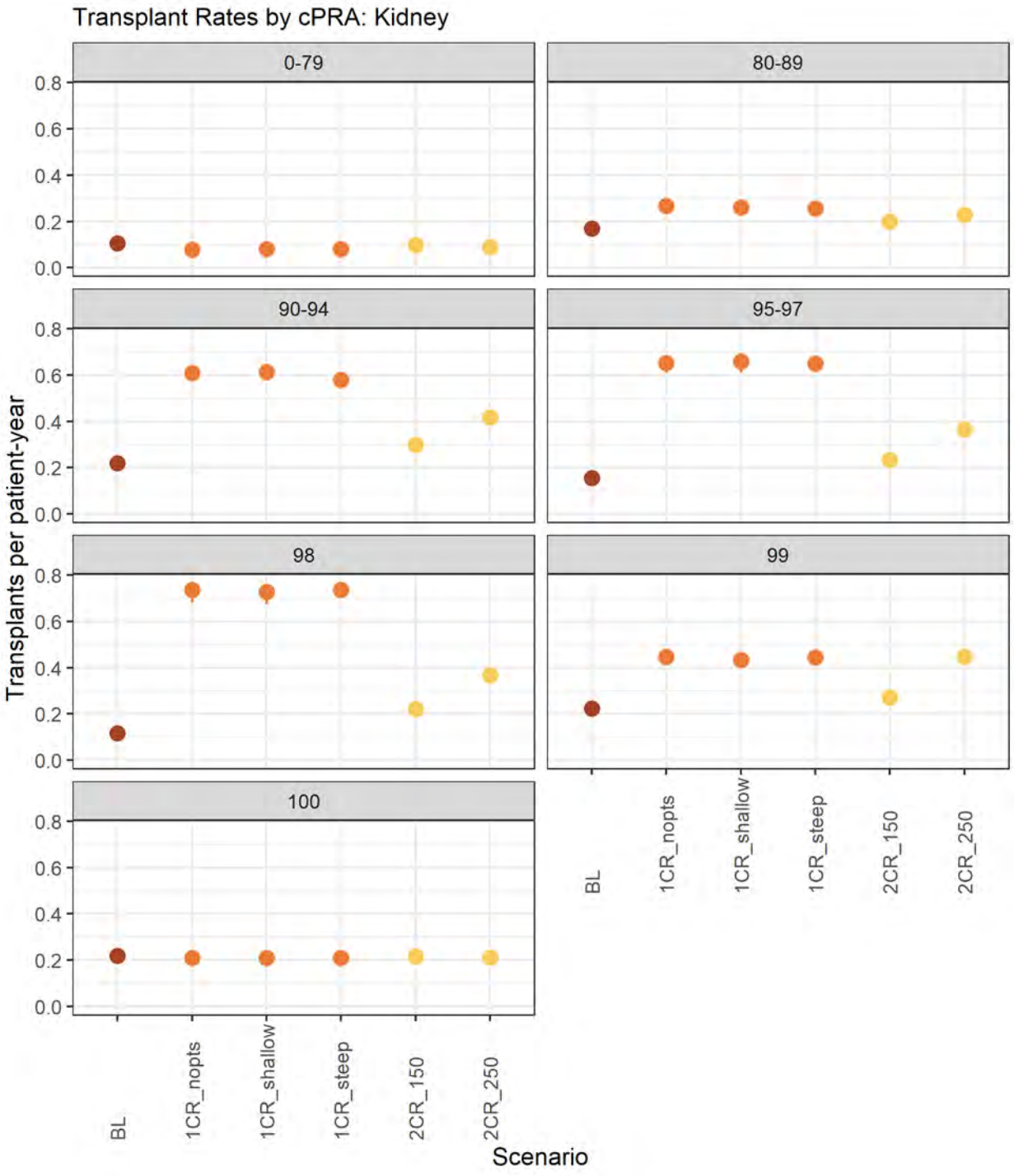
Transplant Rates by Diagnosis: Pancreas

Transplant Rates: Dialysis Time

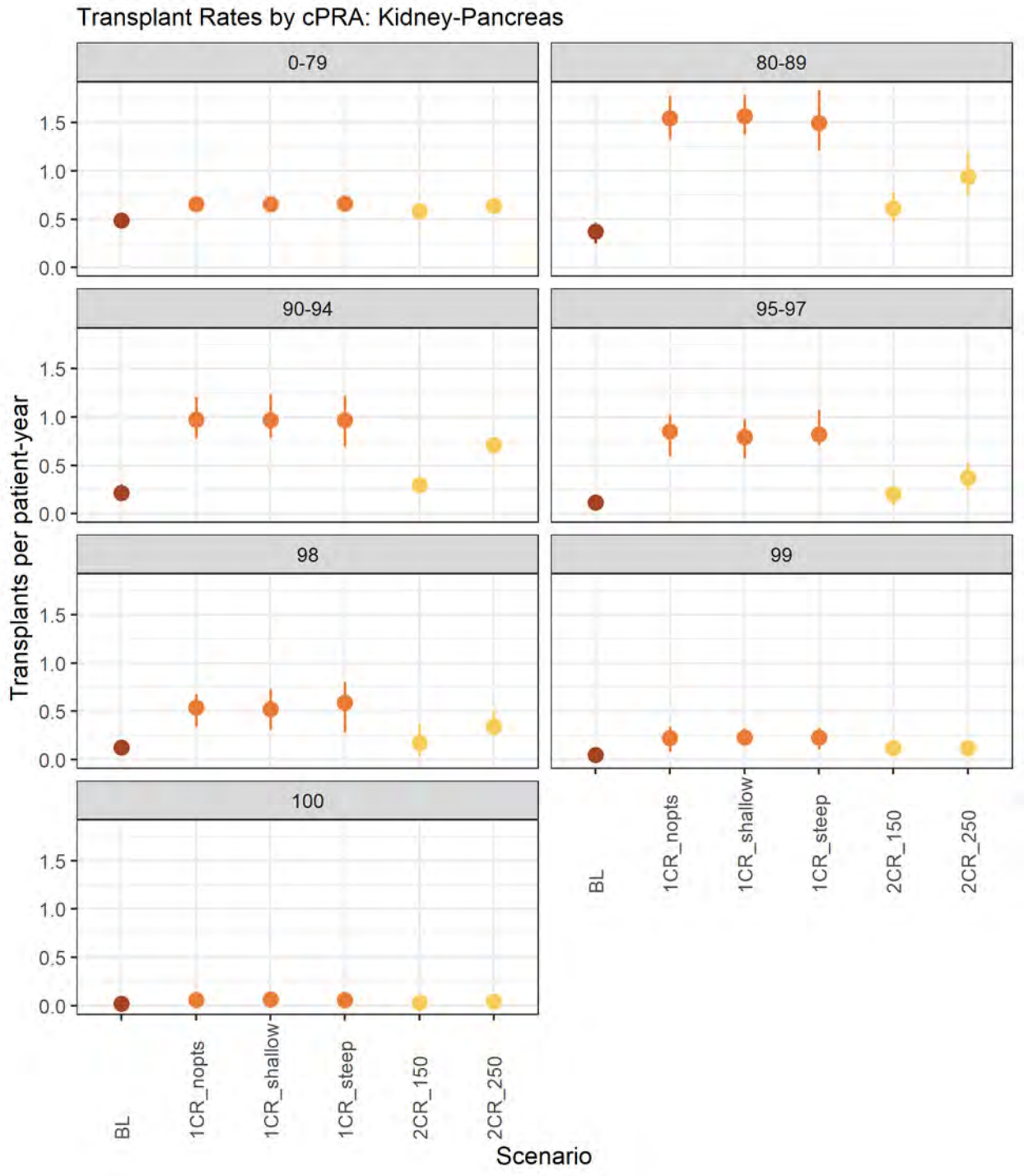


Transplant Rates by Dialysis Time: Kidney

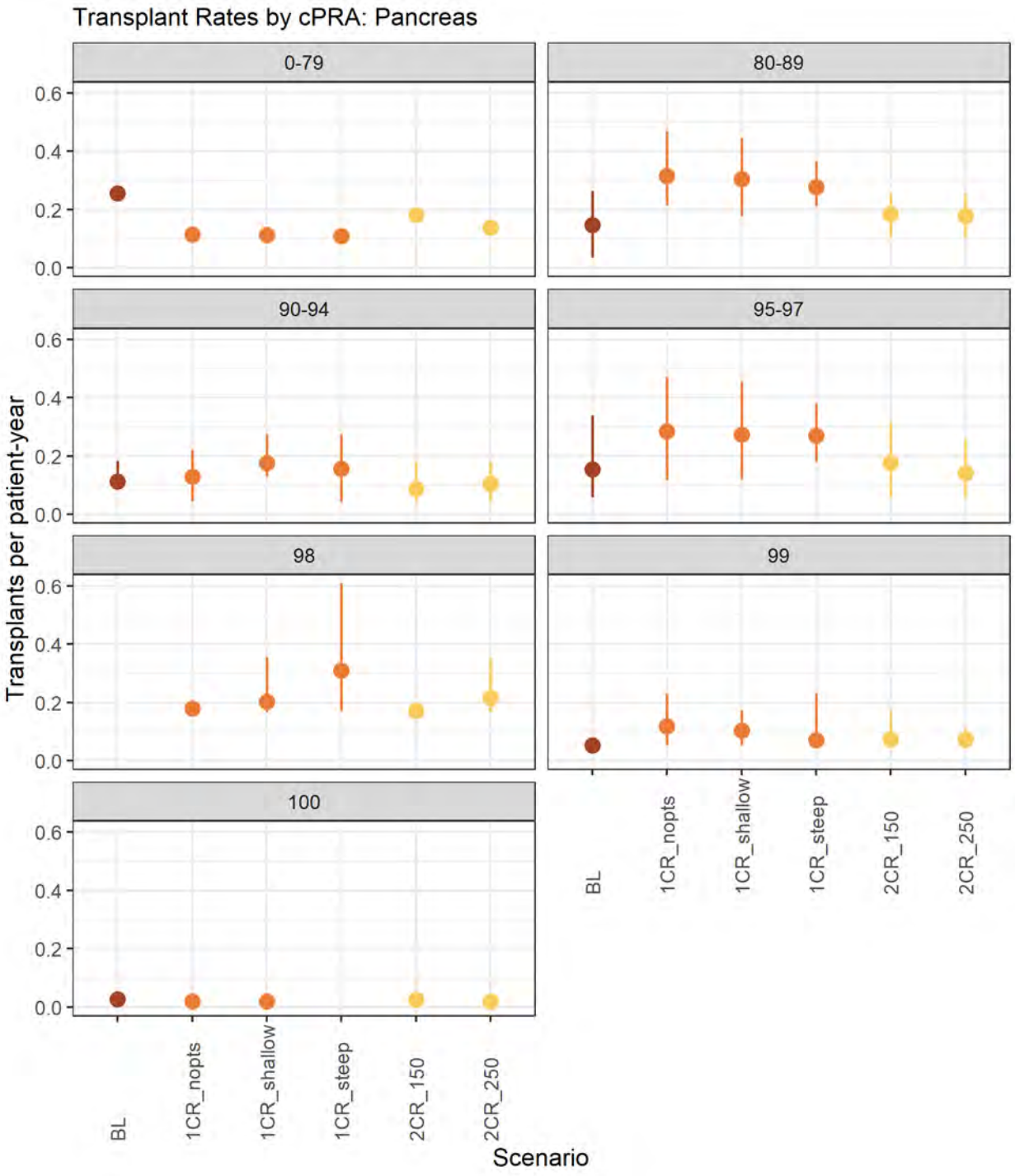
Transplant Rates: cPRA



Transplant Rates by cPRA: Kidney

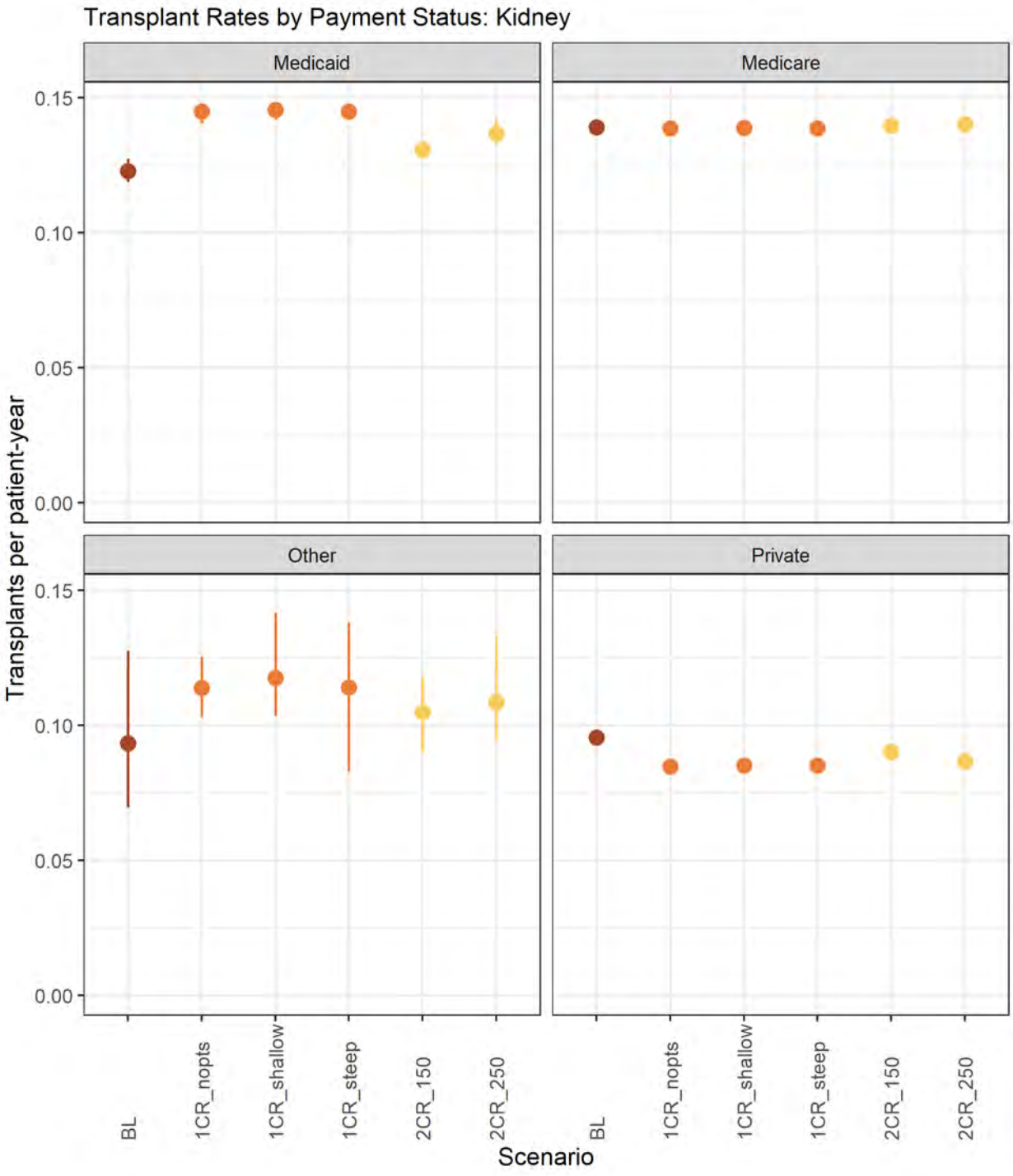


Transplant Rates by cPRA: Kidney-Pancreas

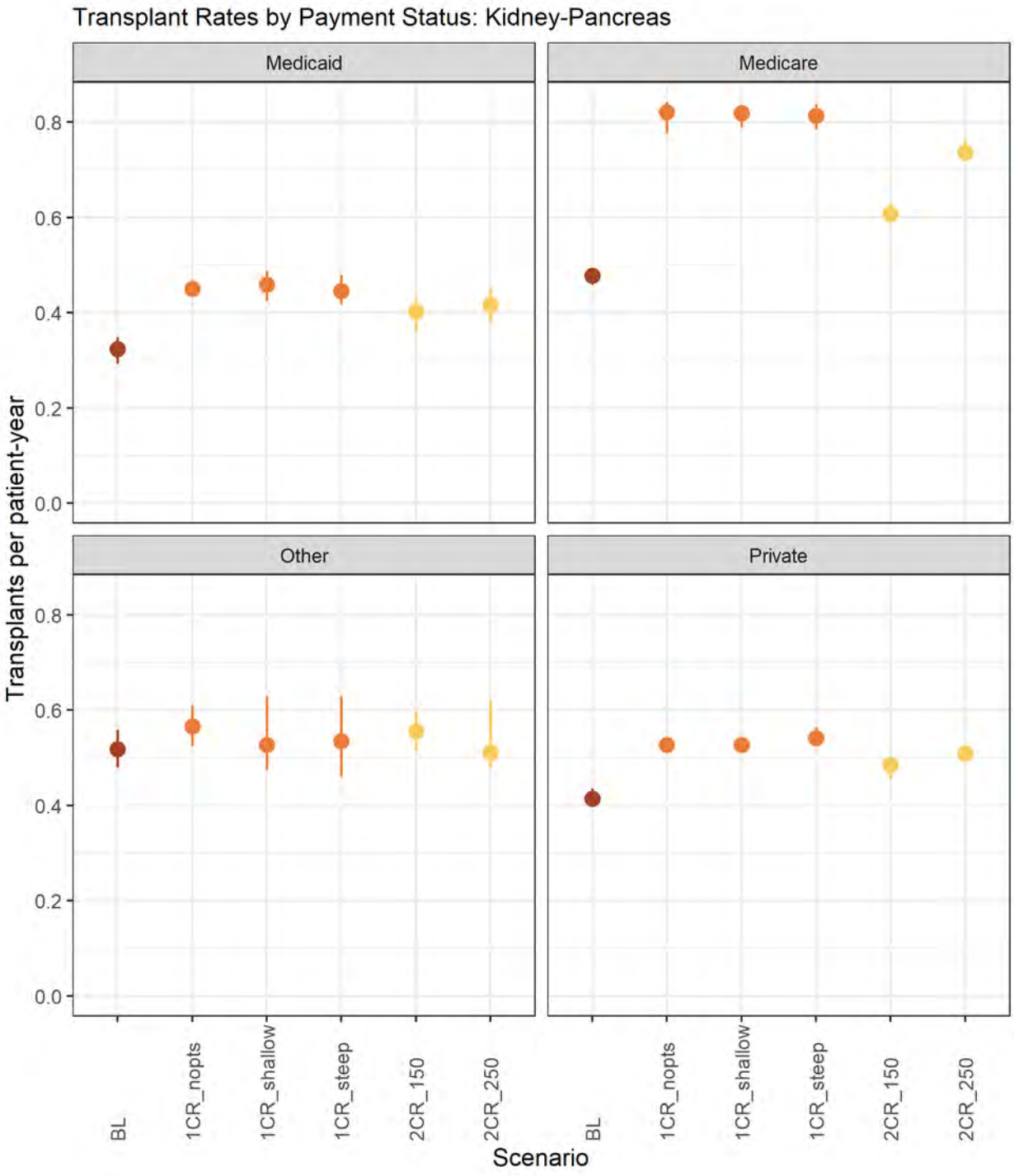


Transplant Rates by cPRA: Pancreas

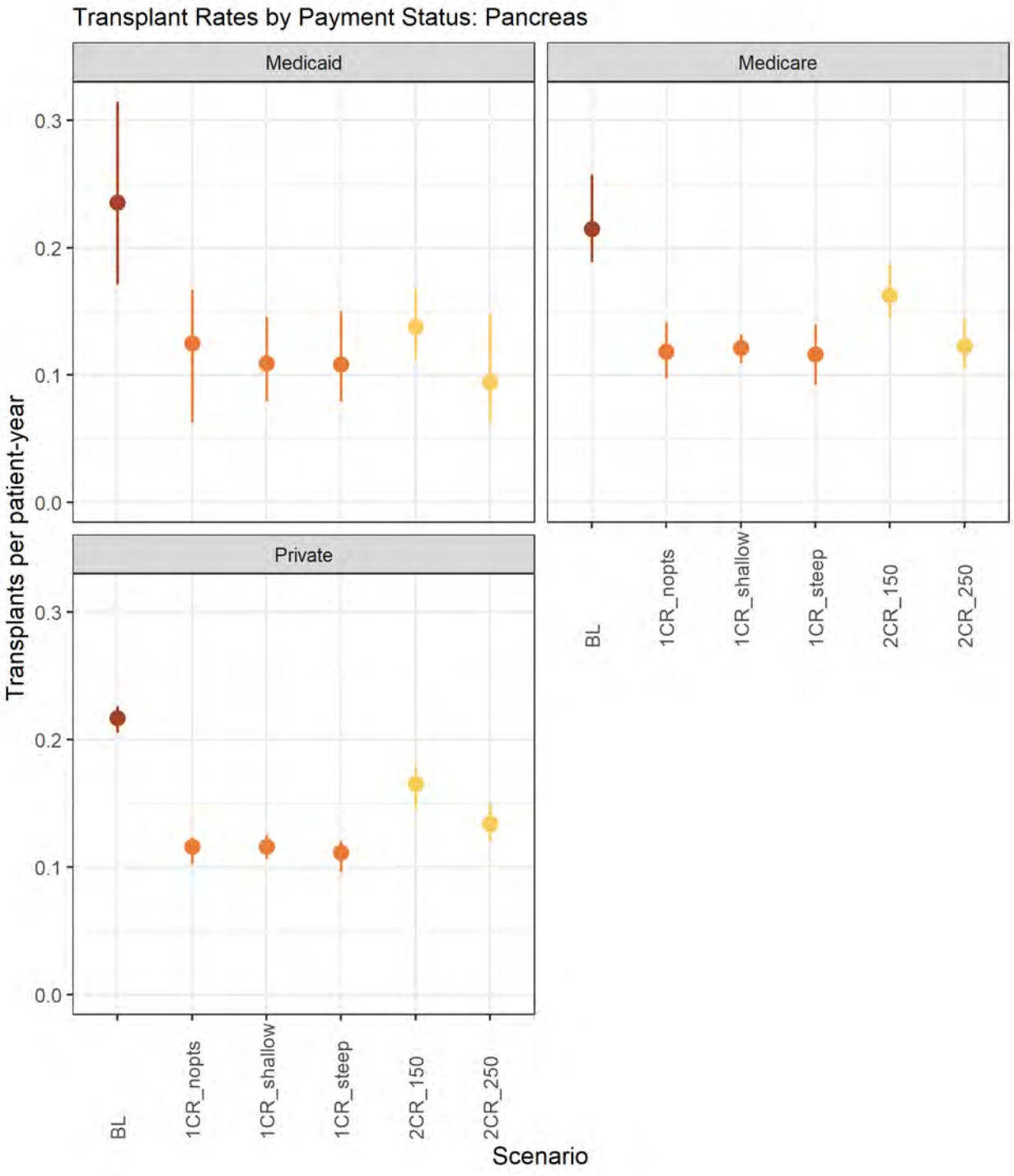
Transplant Rates: Payment Status



Transplant Rates by Payment Status: Kidney

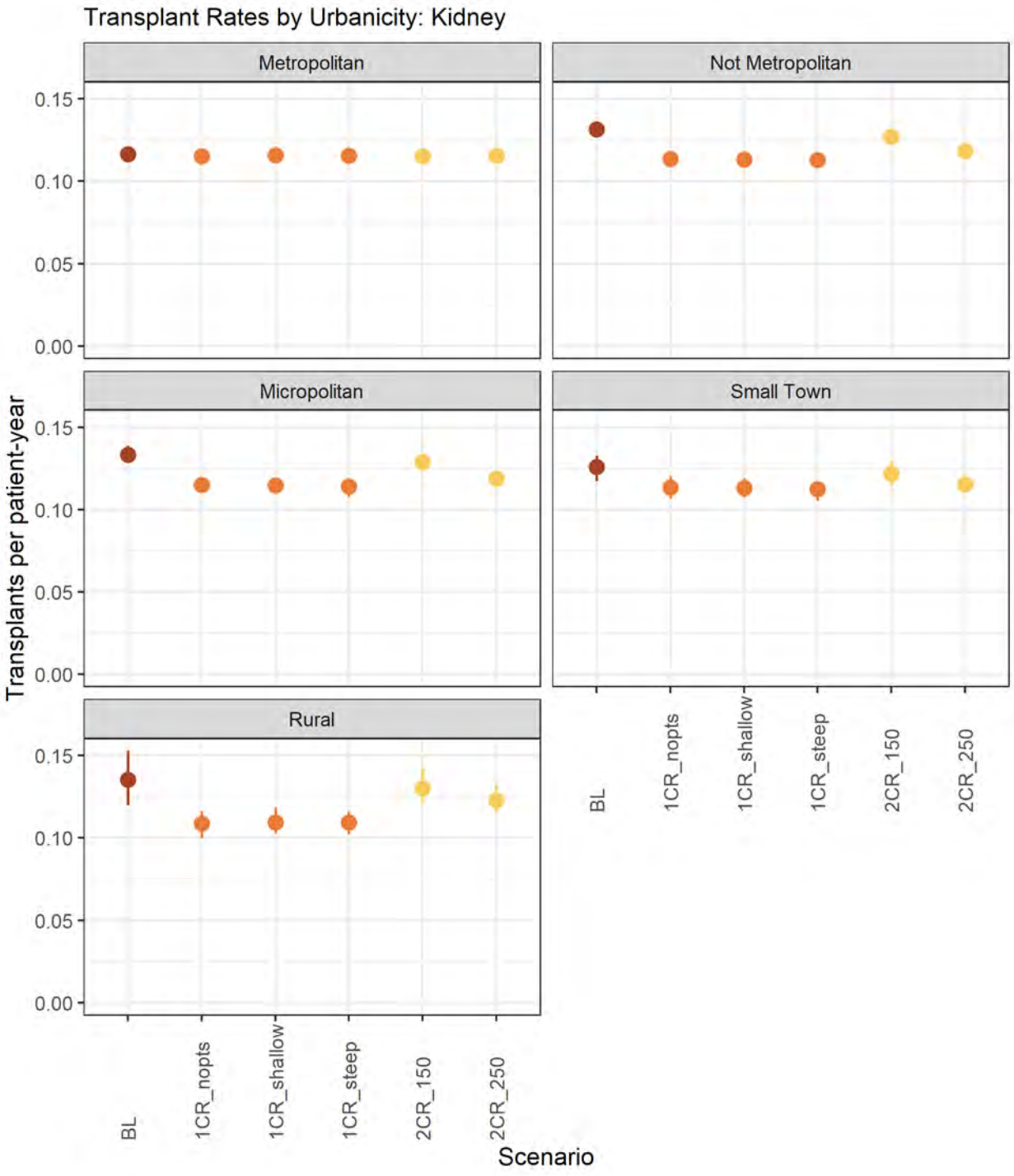


Transplant Rates by Payment Status: Kidney-Pancreas

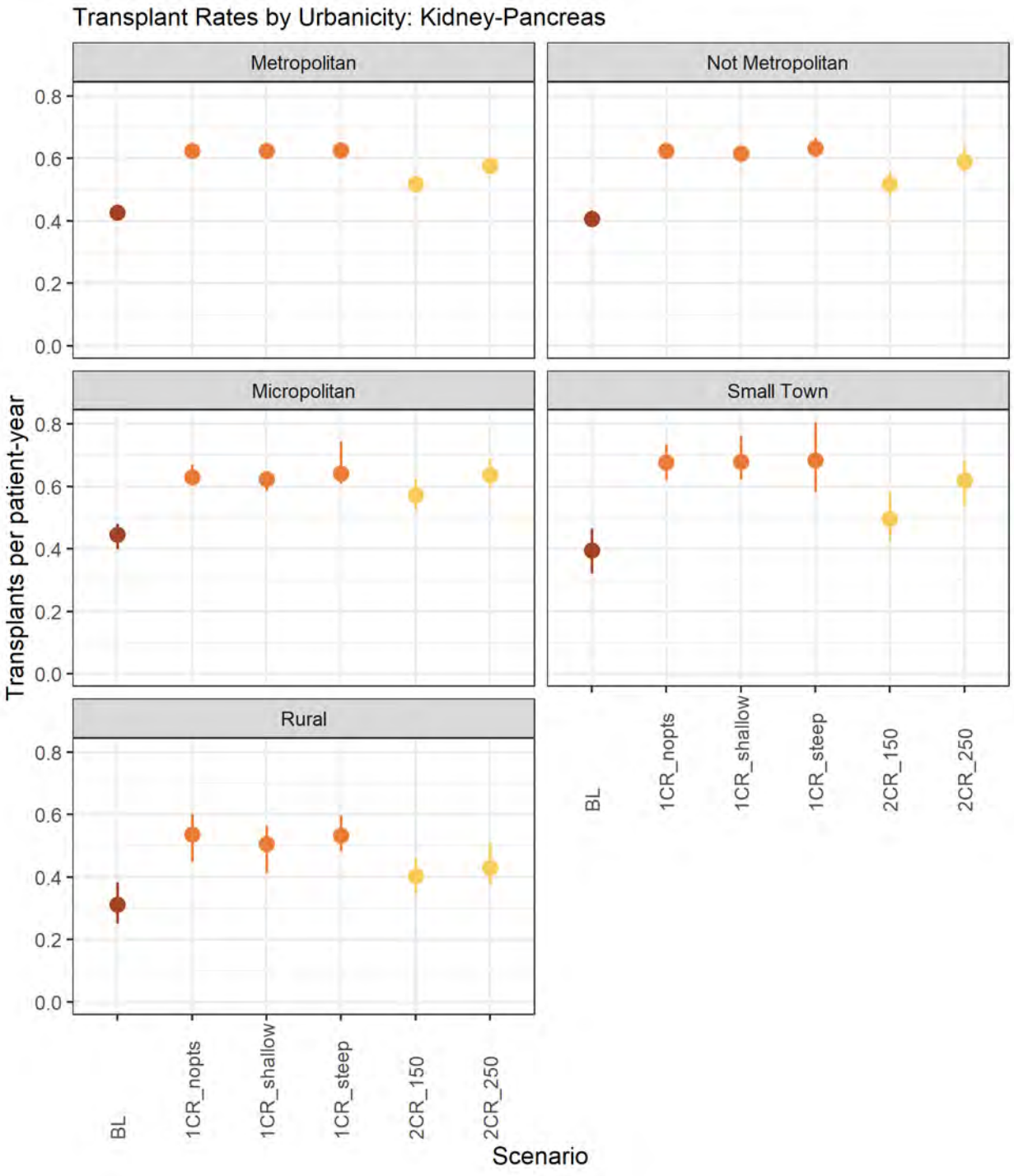


Transplant Rates by Payment Status: Pancreas

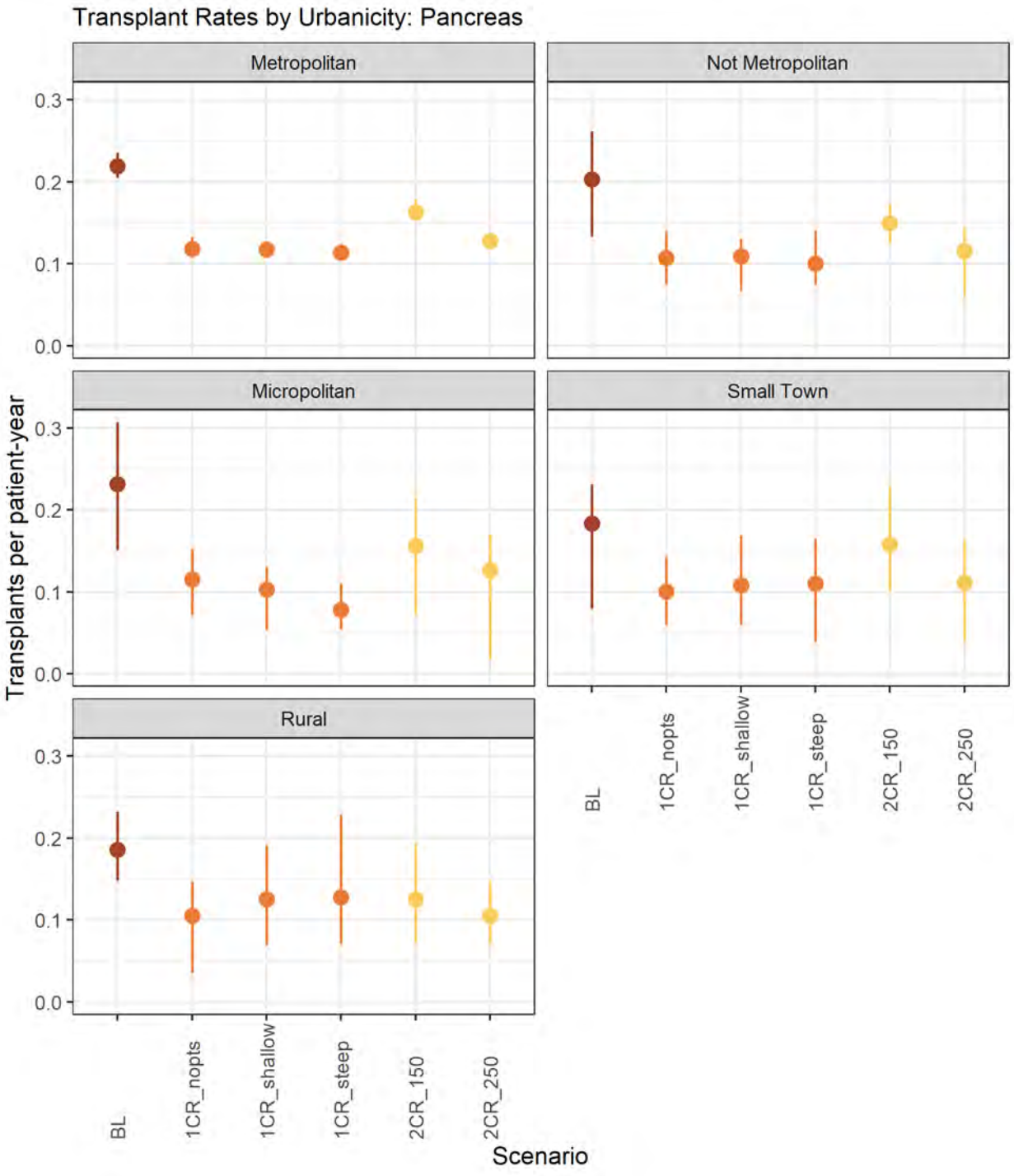
Transplant Rates: Urbanicity



Transplant Rates by Urbanicity: Kidney

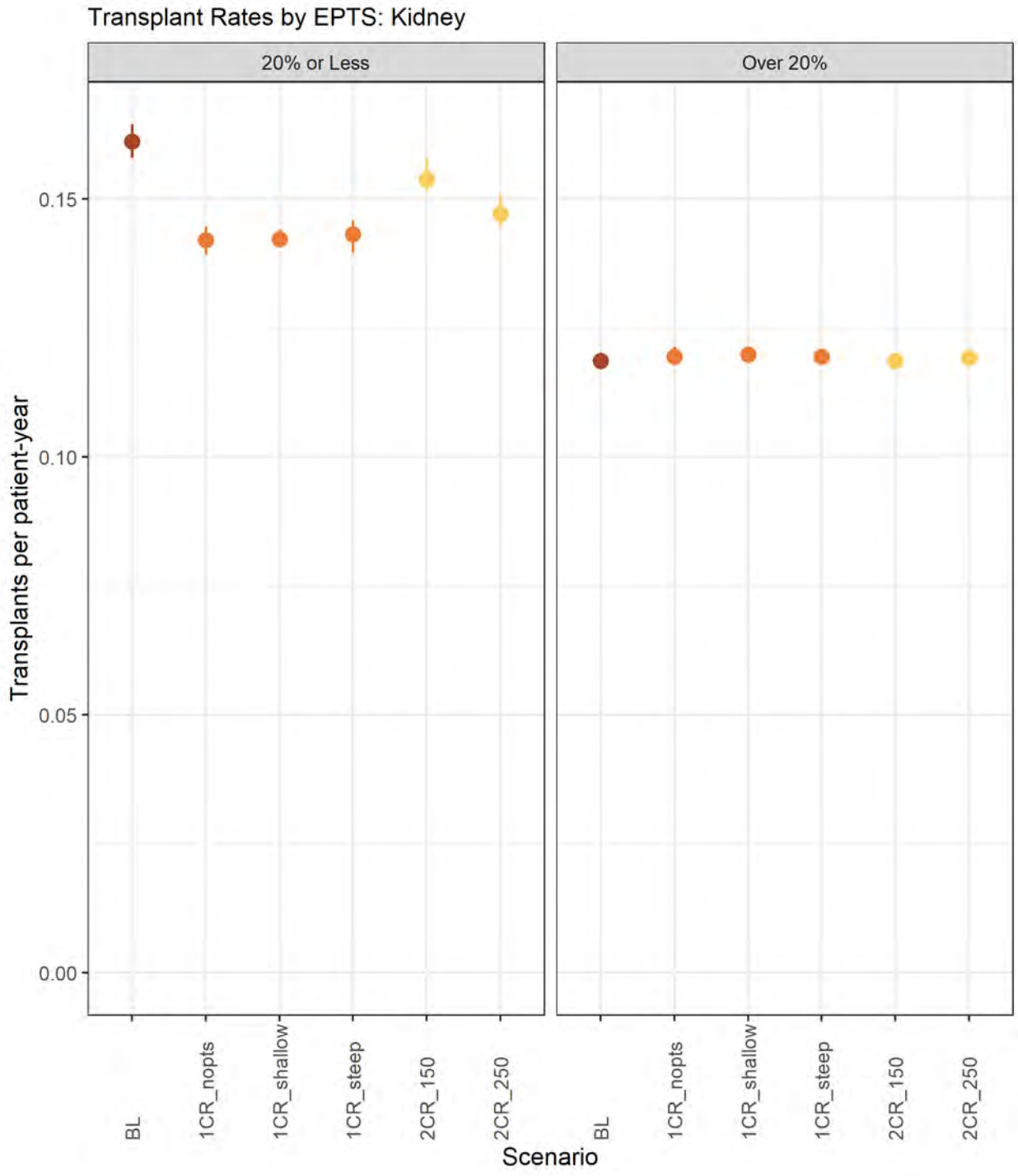


Transplant Rates by Urbanicity: Kidney-Pancreas



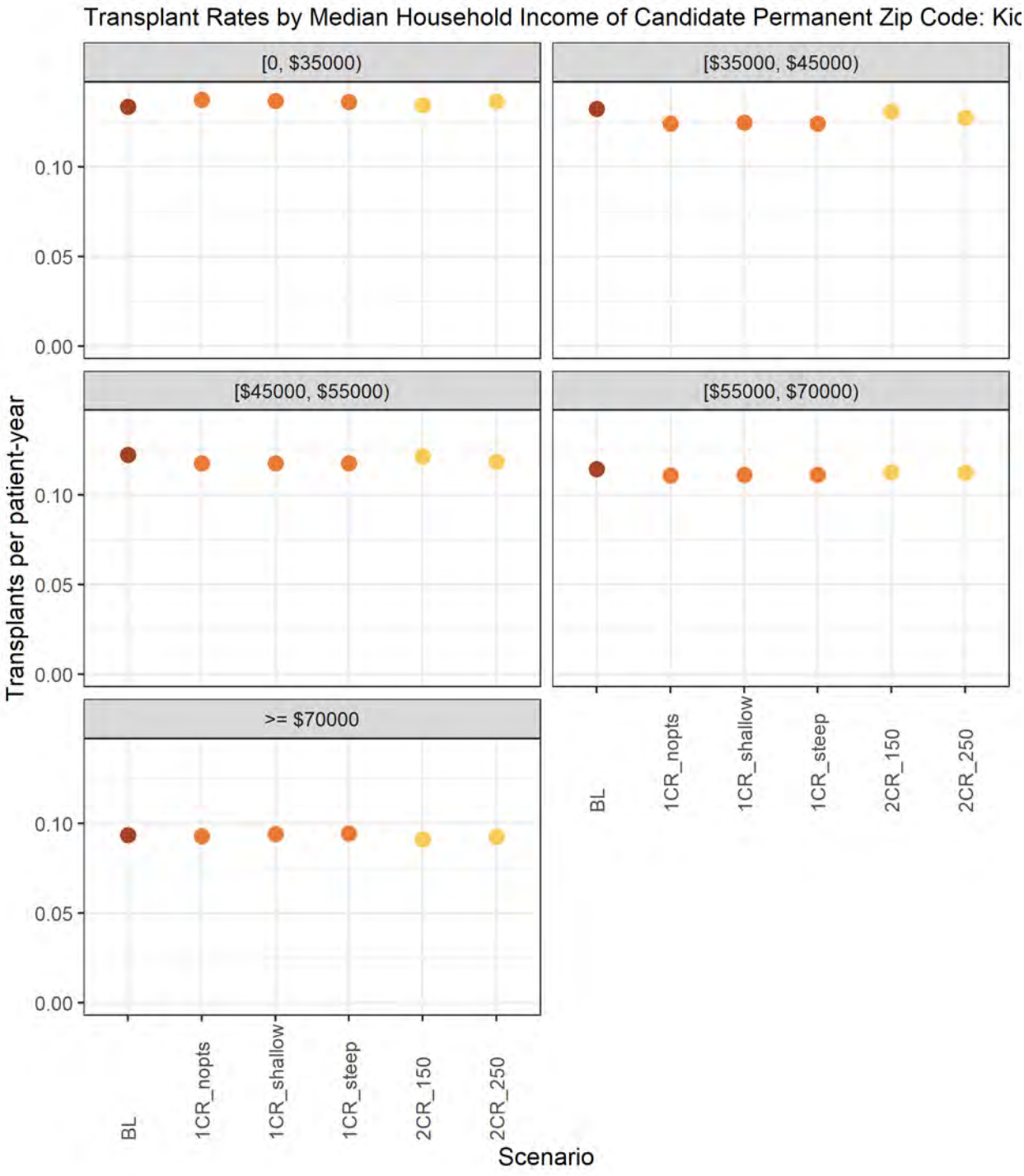
Transplant Rates by Urbanicity: Pancreas

Transplant Rates: EPTS

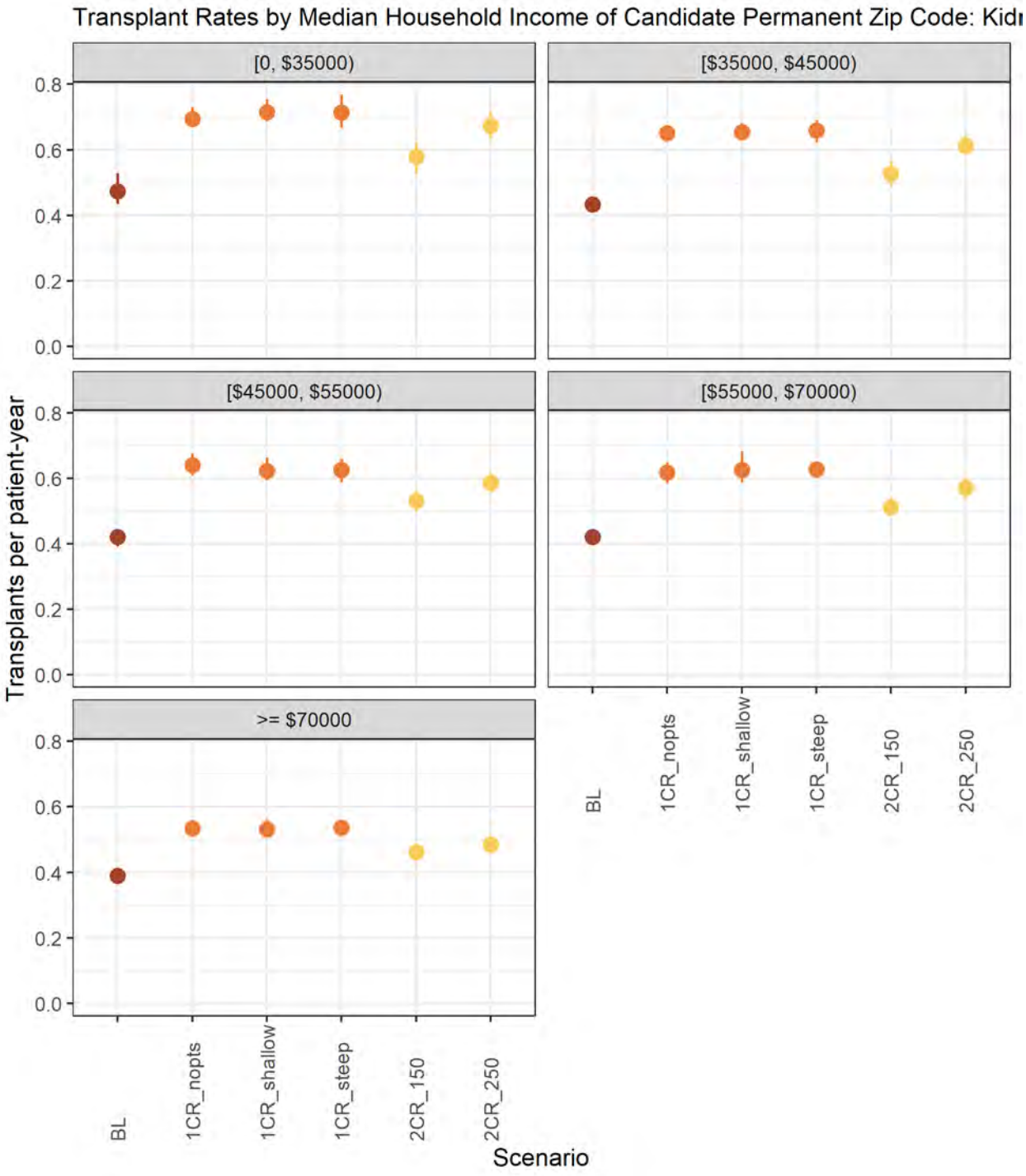


Transplant Rates by EPTS: Kidney

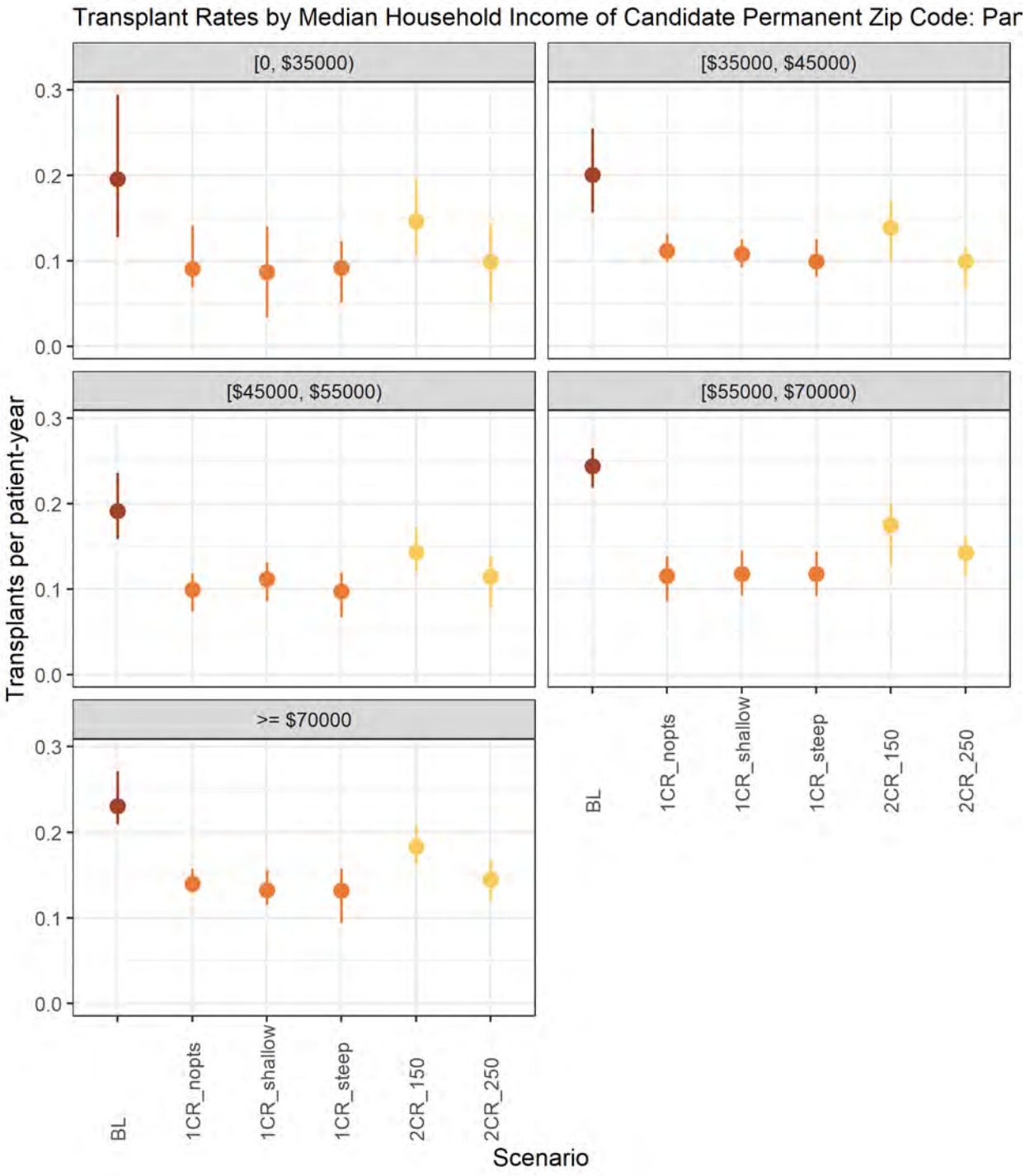
Transplant Rates: Median Household Income of Candidate Permanent Zip Code



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



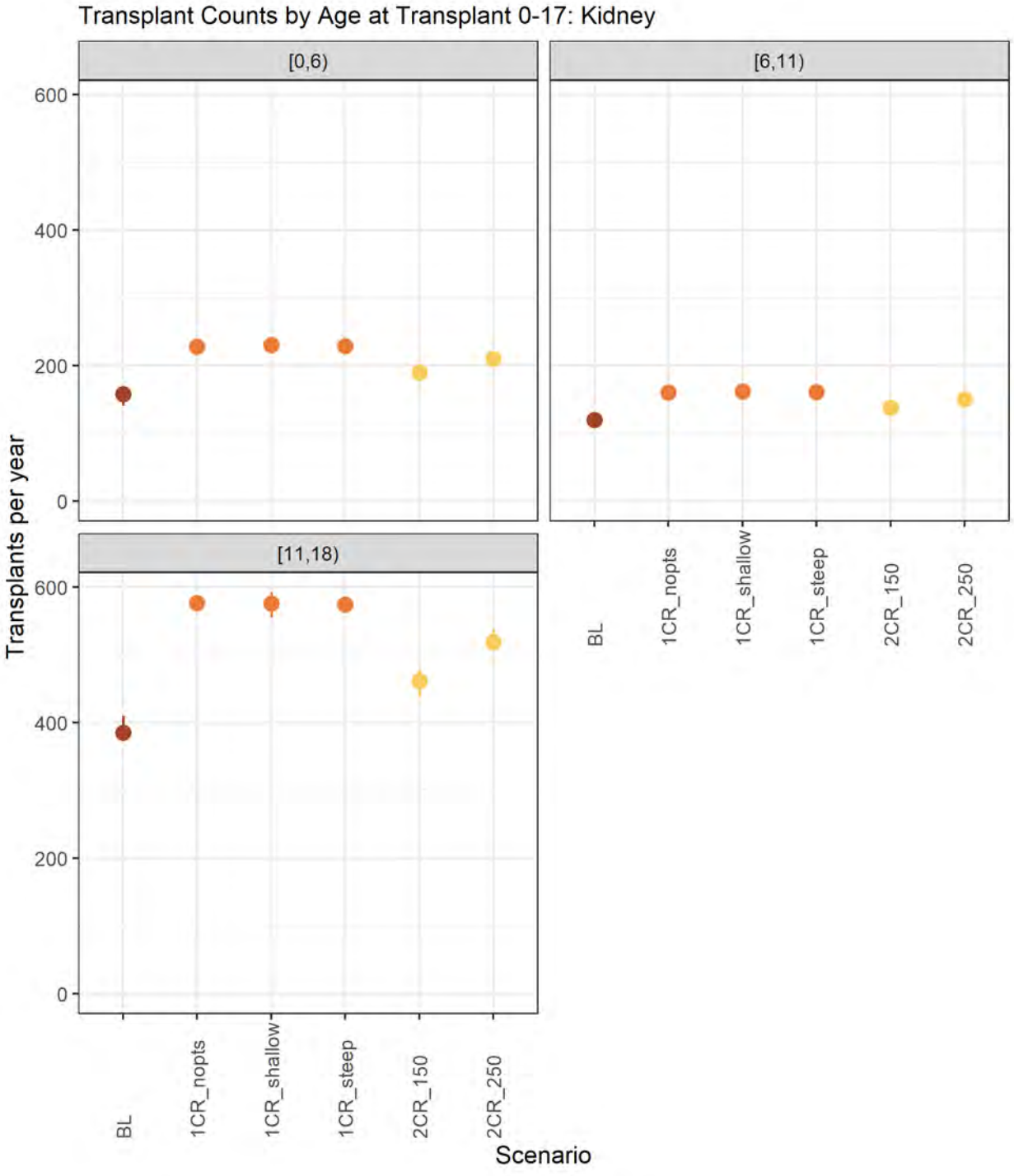
Transplant Rates by Median Household Income of Candidate Permanent Zip Code: Kidney-Pancreas



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

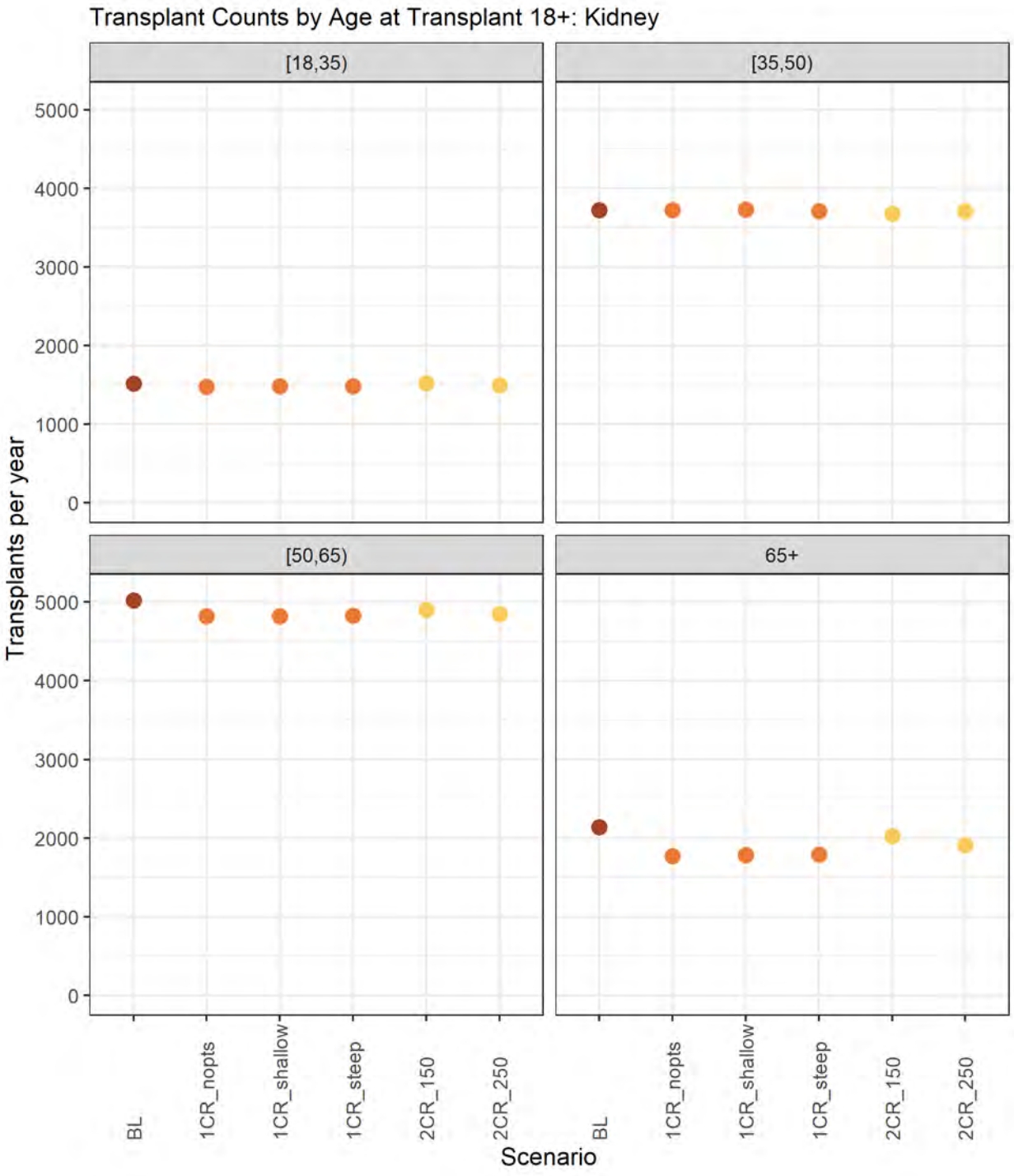
Transplant Counts

Transplant Counts: Age at Transplant 0-17

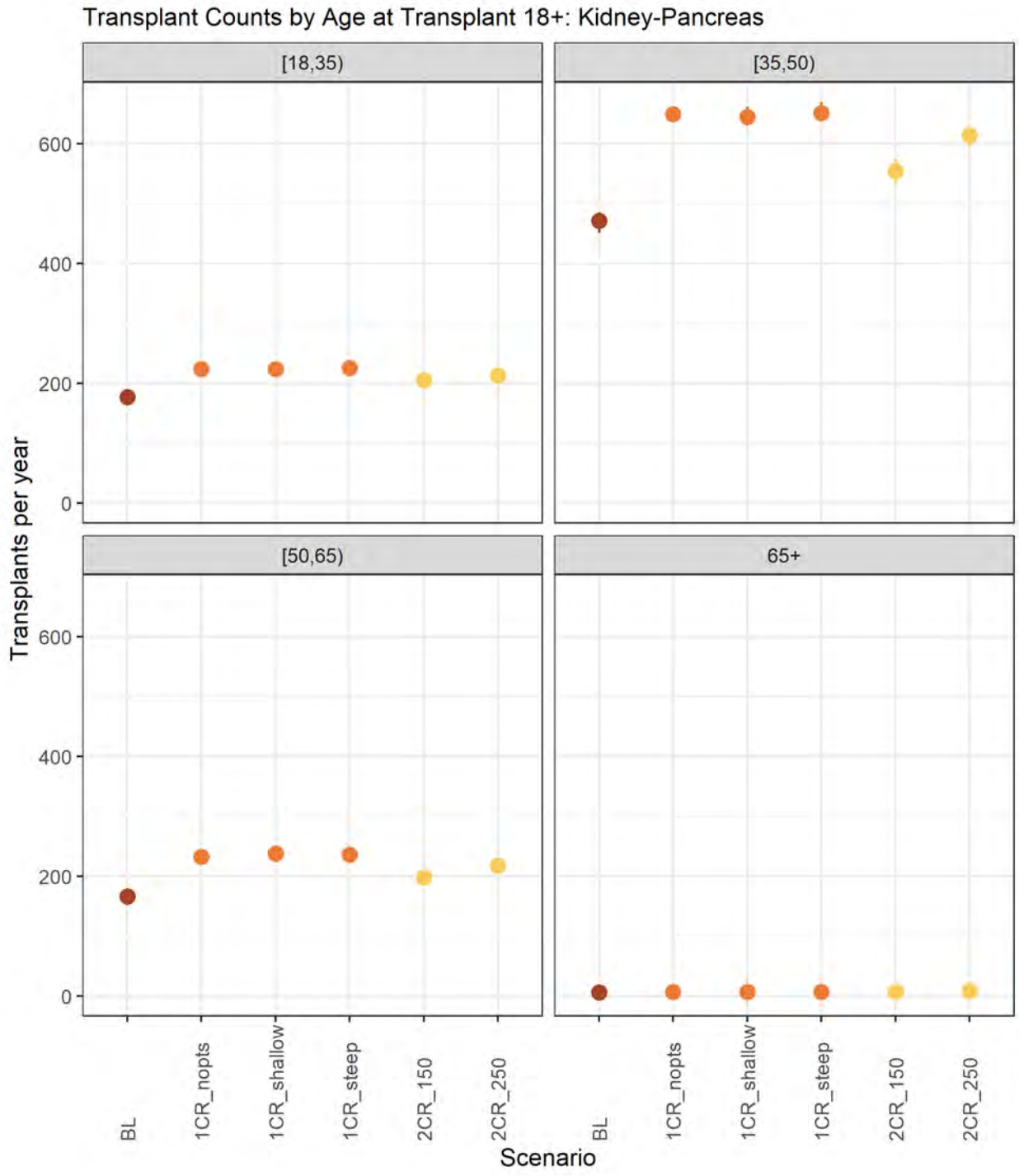


Transplant Counts by Age at Transplant 0-17: Kidney

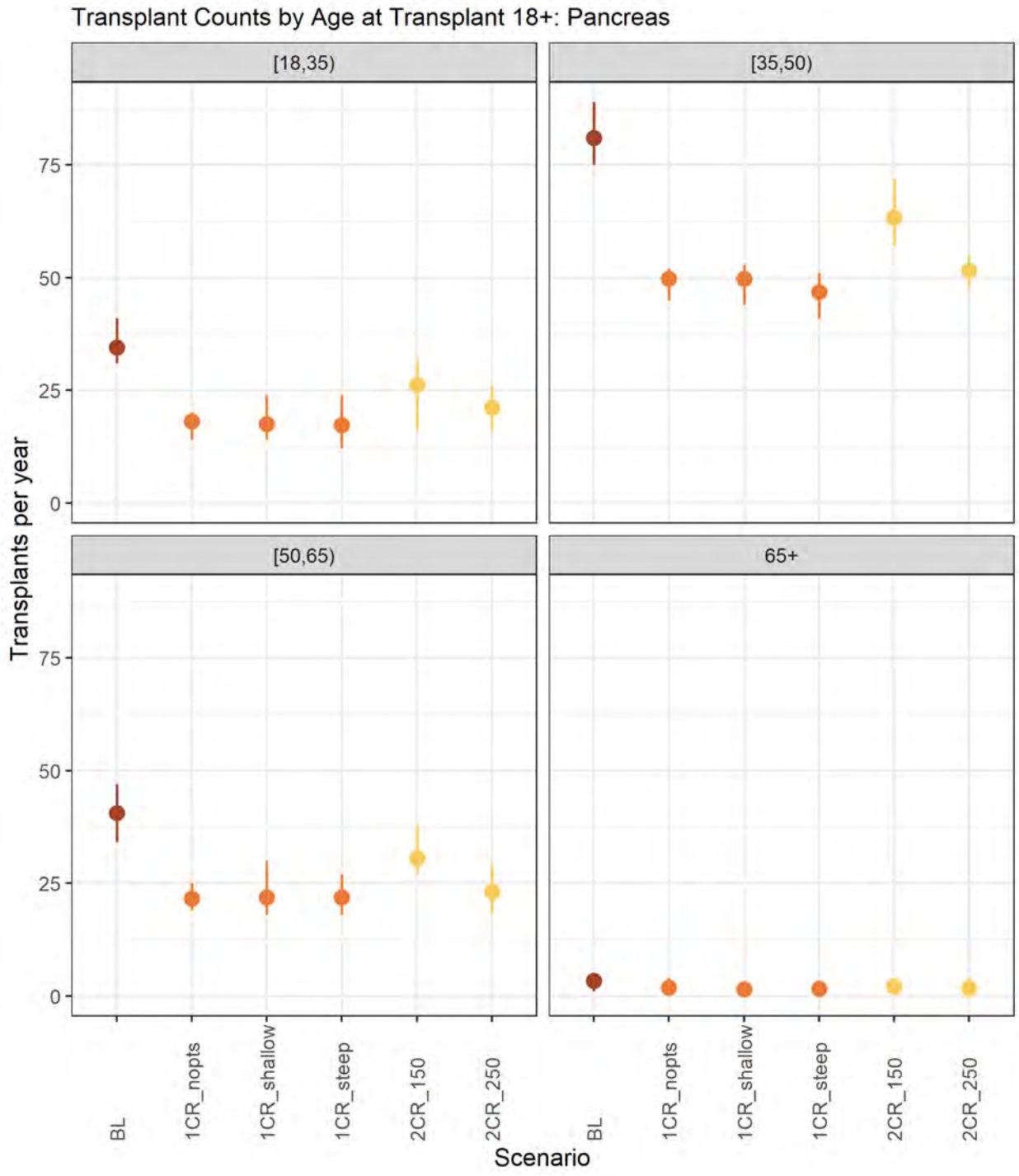
Transplant Counts: Age at Transplant 18+



Transplant Counts by Age at Transplant 18+: Kidney

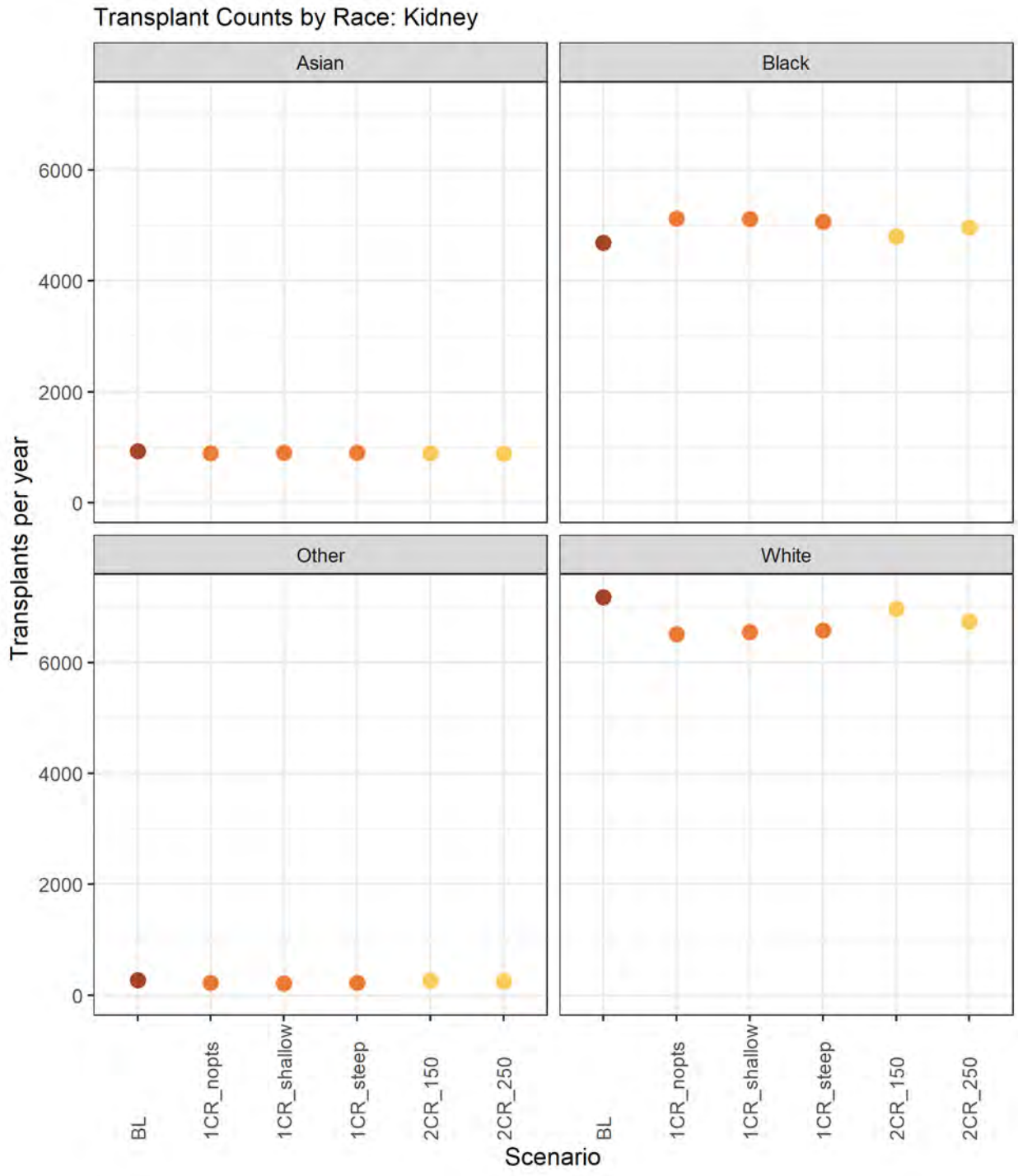


Transplant Counts by Age at Transplant 18+: Kidney-Pancreas

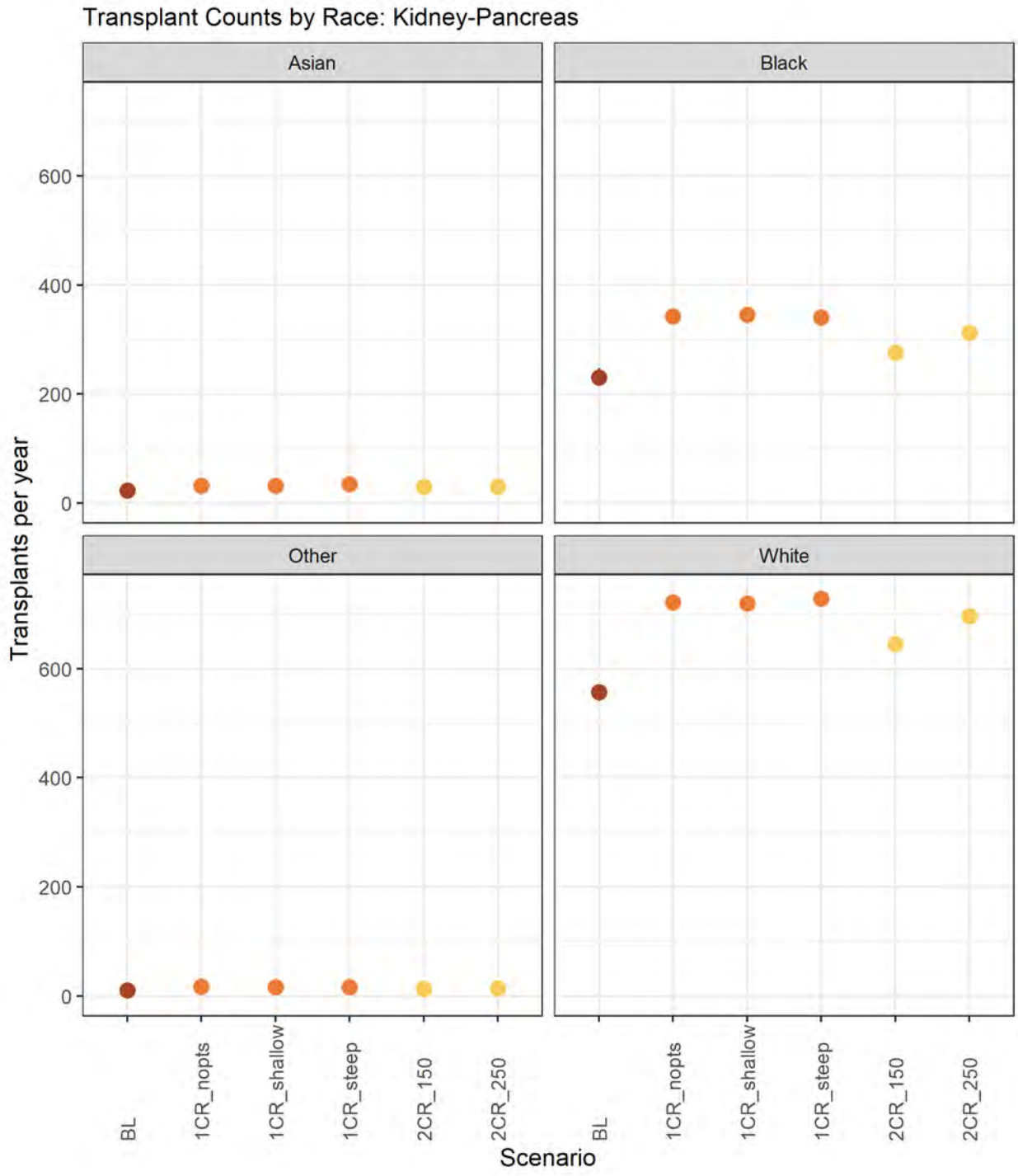


Transplant Counts by Age at Transplant 18+: Pancreas

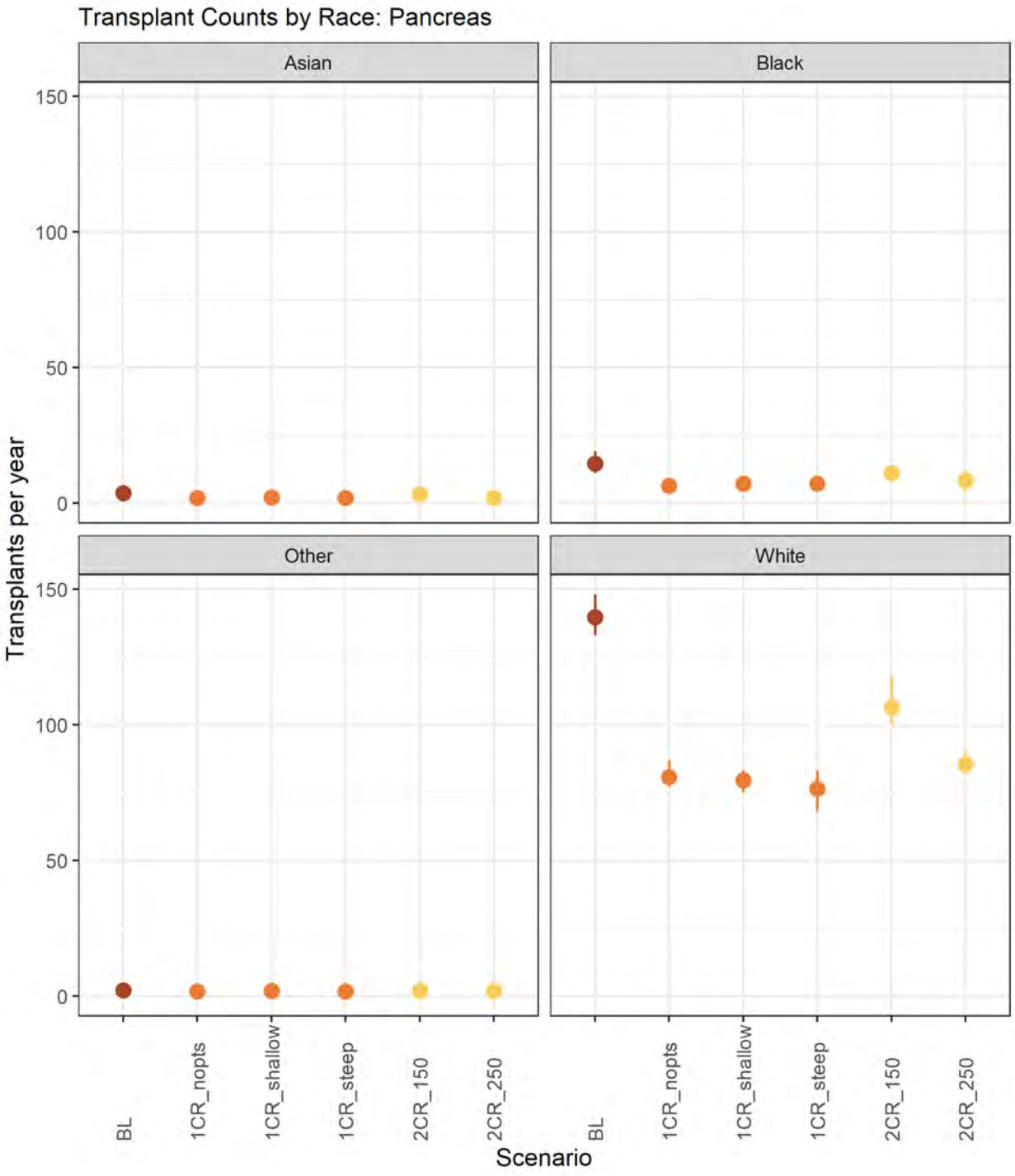
Transplant Counts: Race



Transplant Counts by Race: Kidney

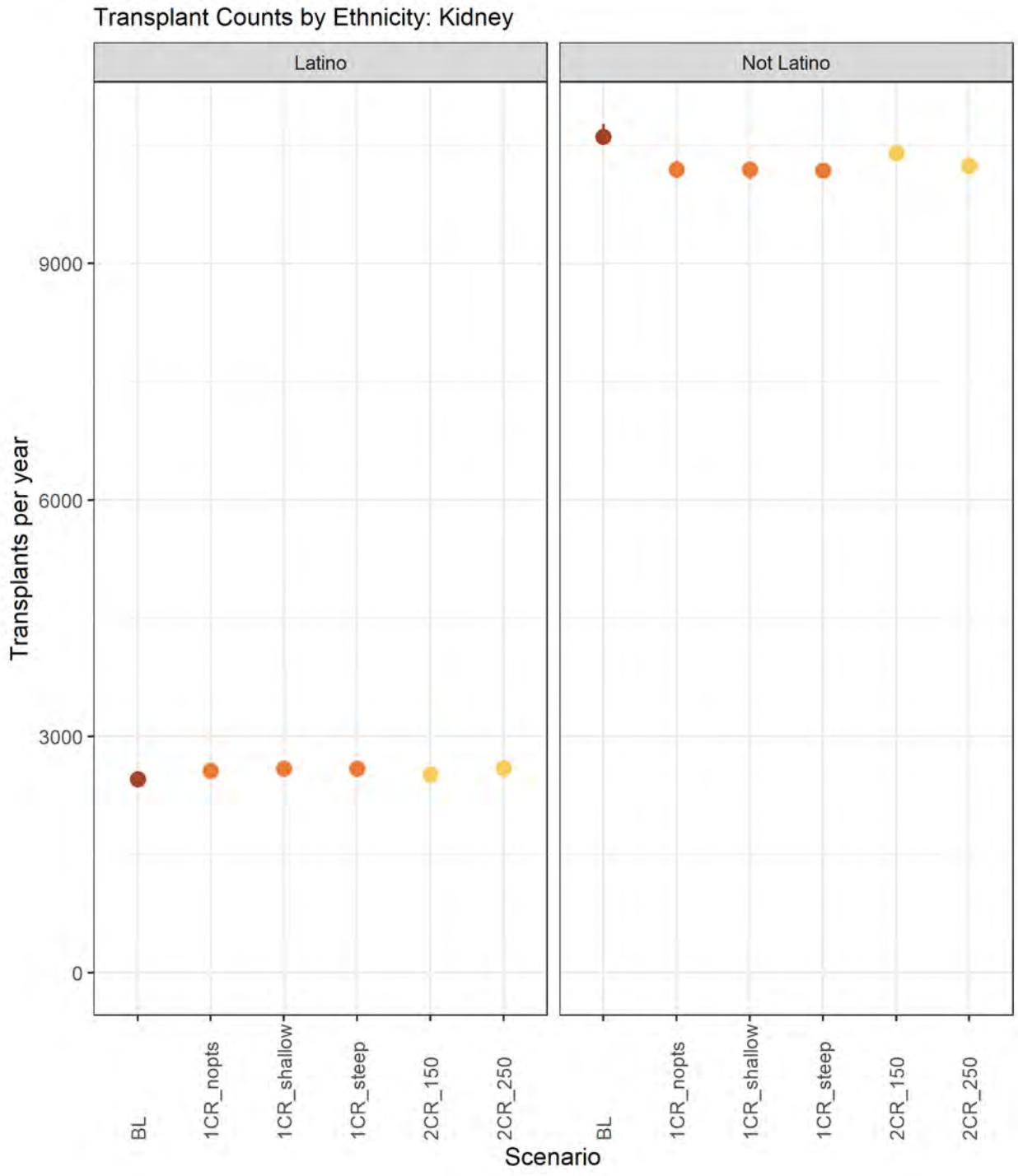


Transplant Counts by Race: Kidney-Pancreas

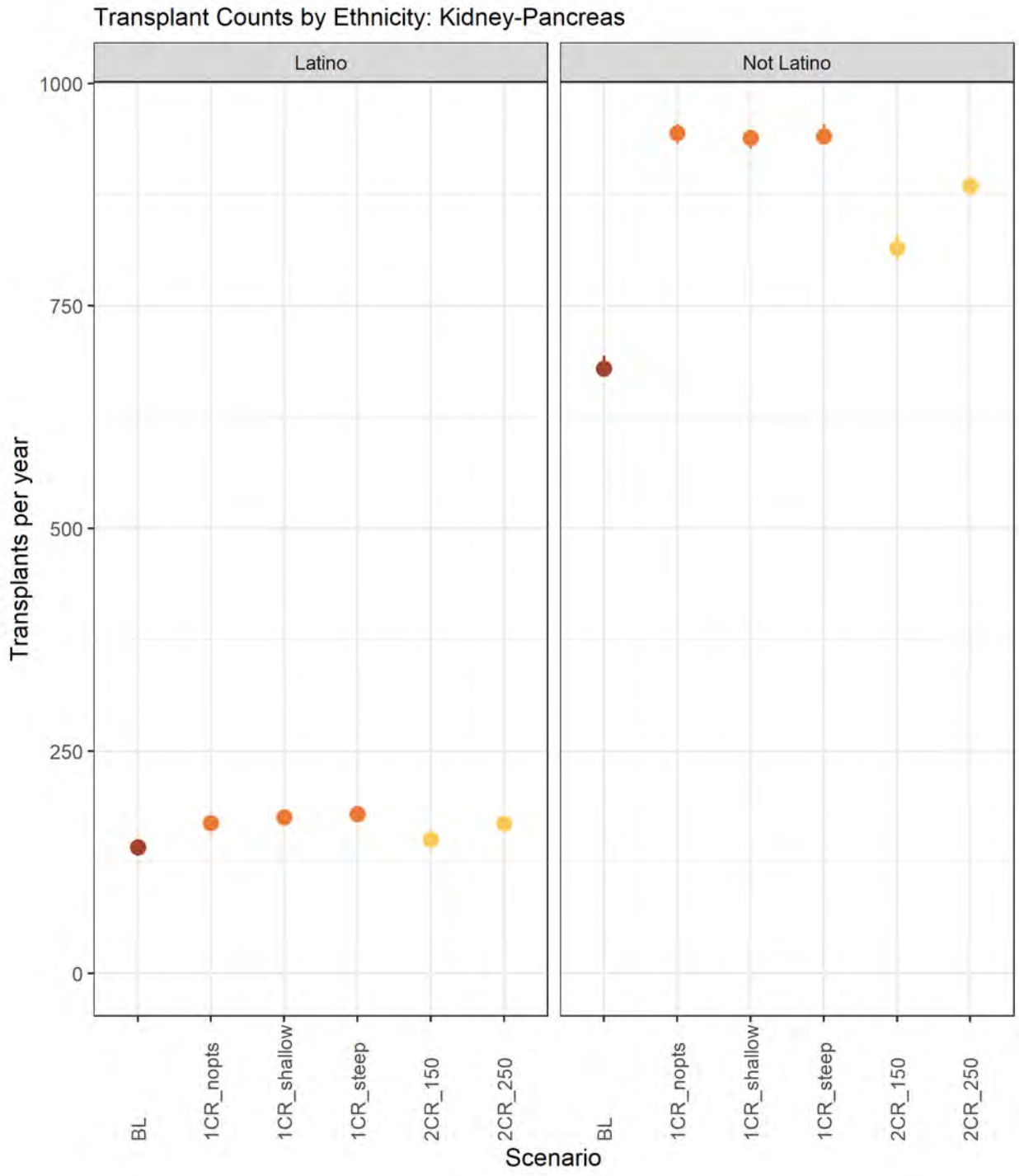


Transplant Counts by Race: Pancreas

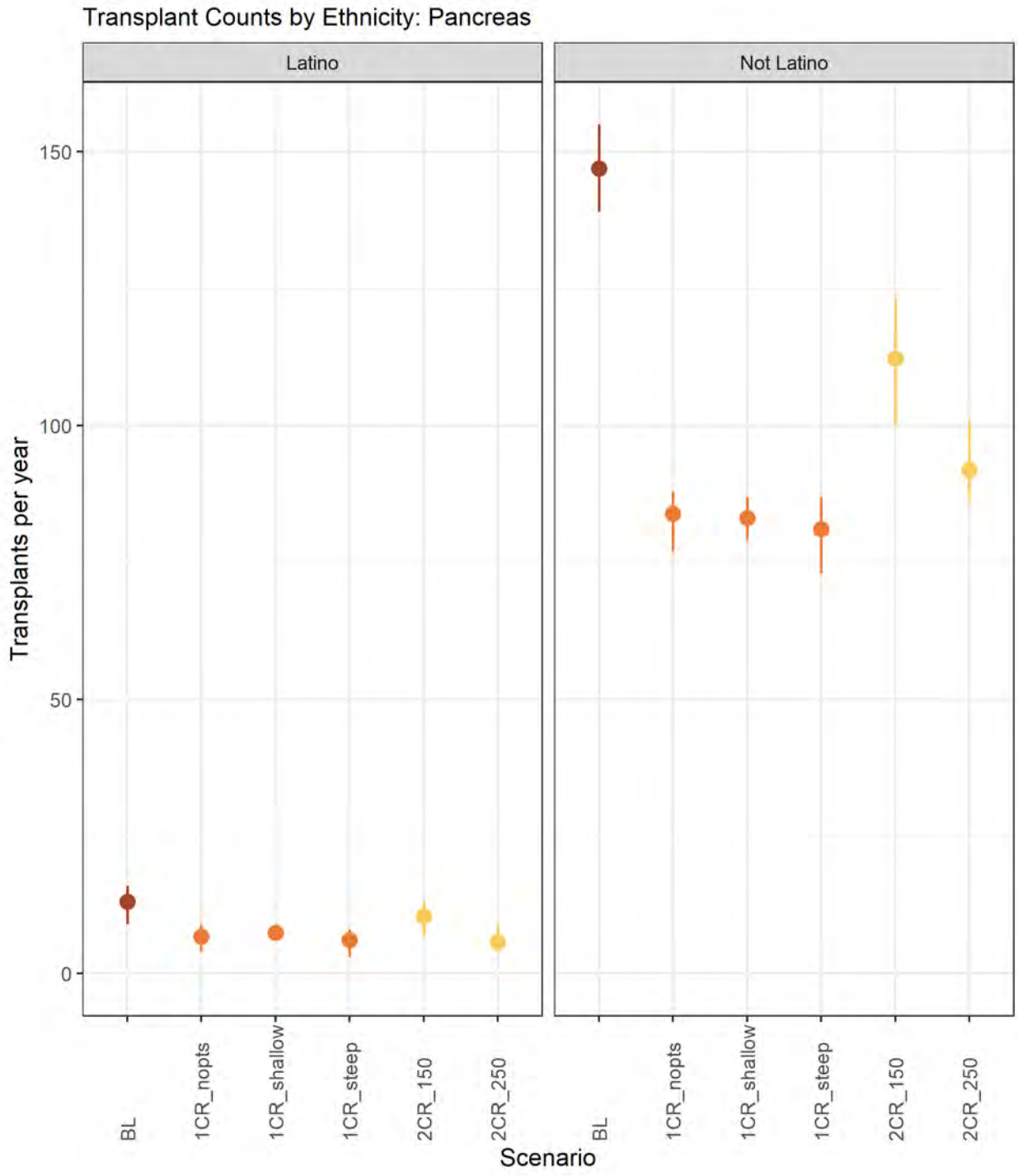
Transplant Counts: Ethnicity



Transplant Counts by Ethnicity: Kidney

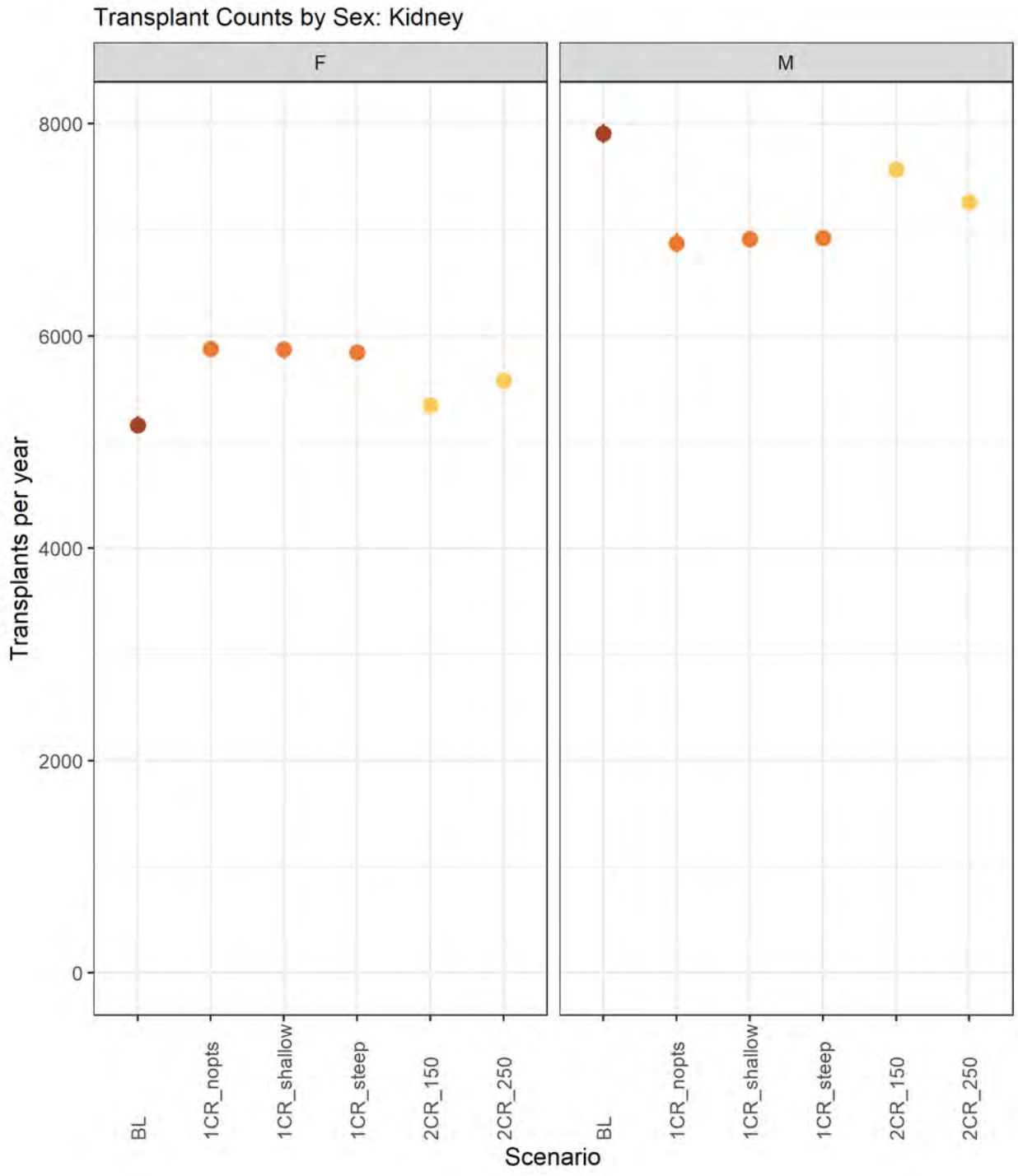


Transplant Counts by Ethnicity: Kidney-Pancreas

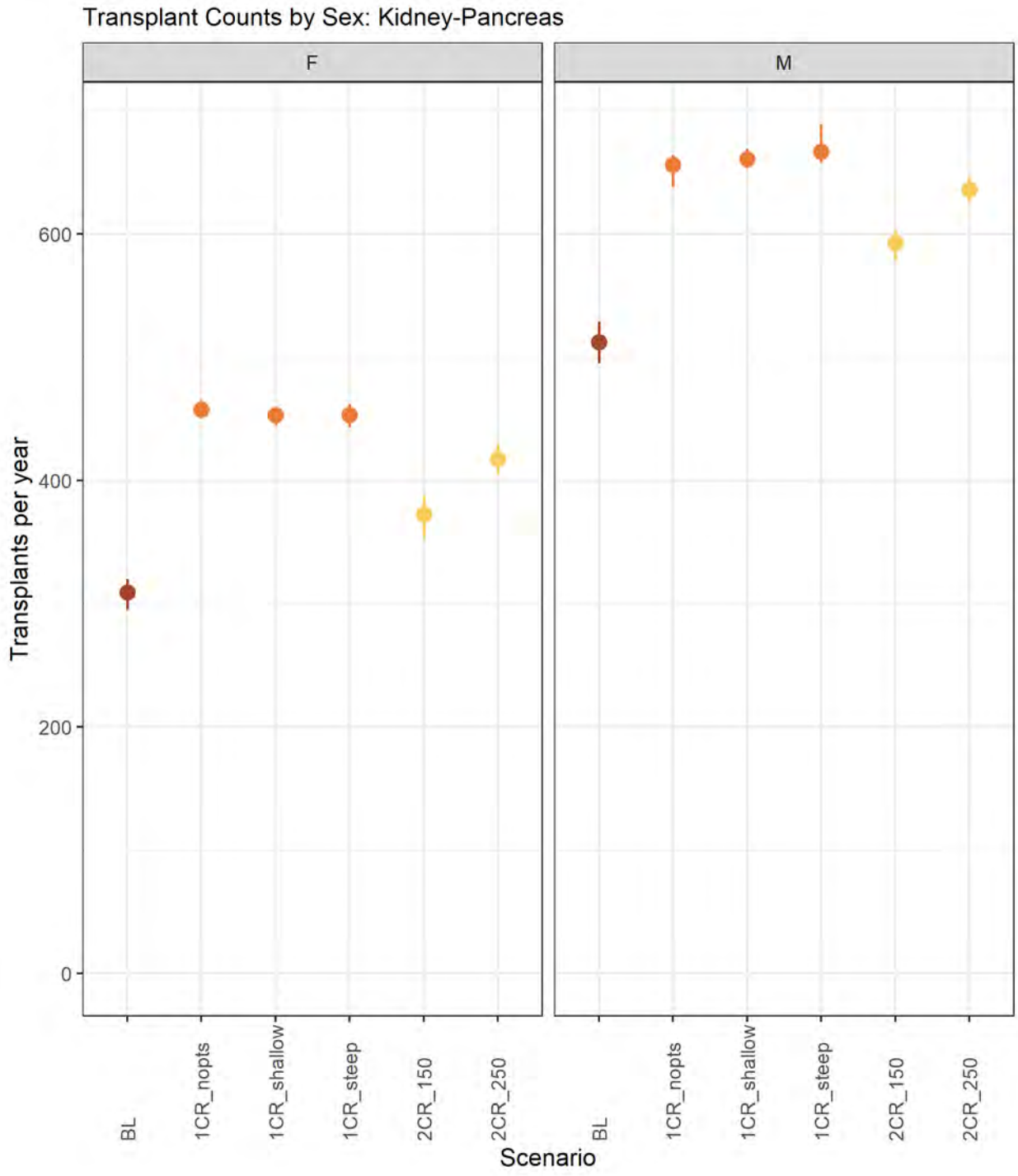


Transplant Counts by Ethnicity: Pancreas

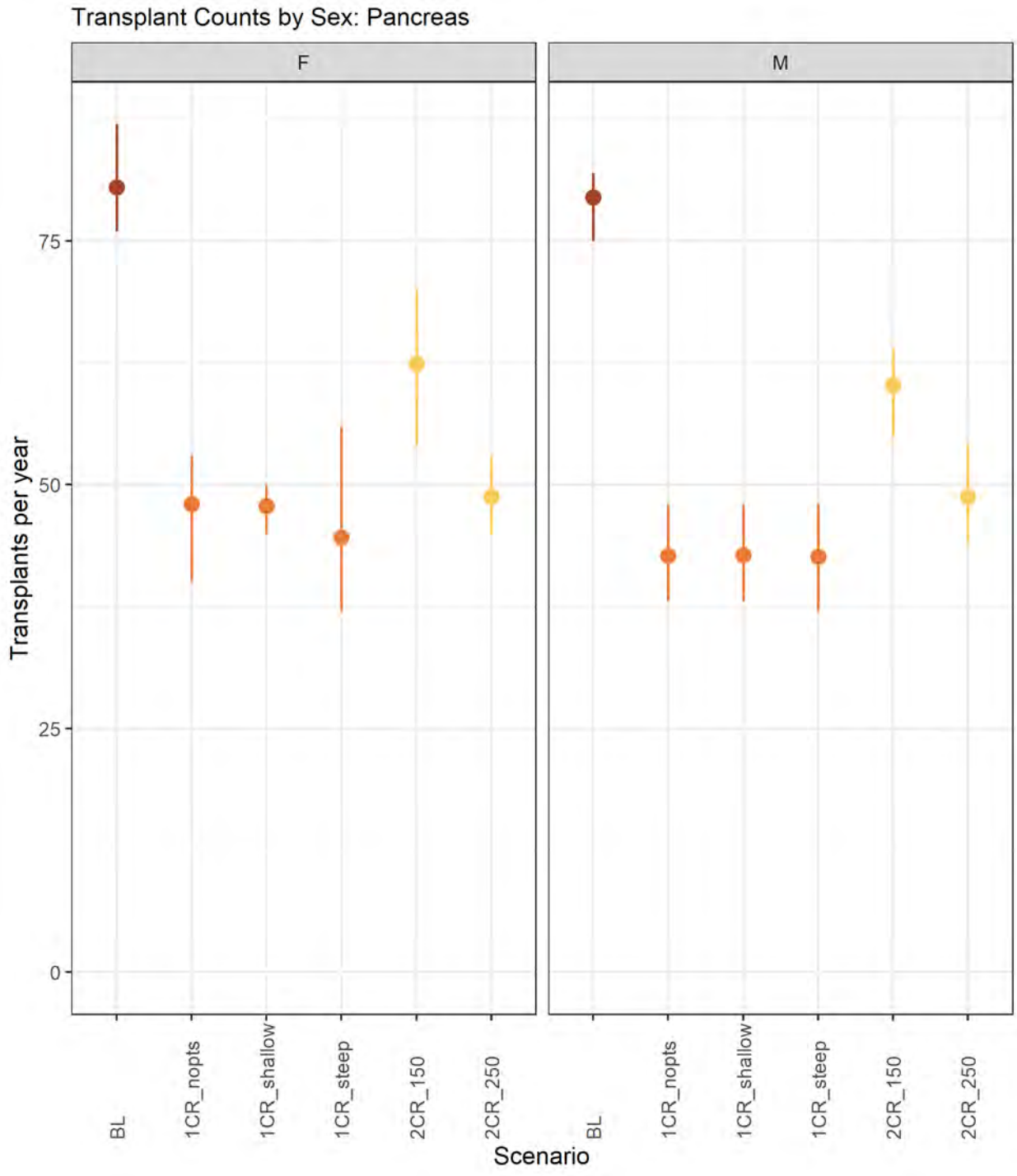
Transplant Counts: Sex



Transplant Counts by Sex: Kidney

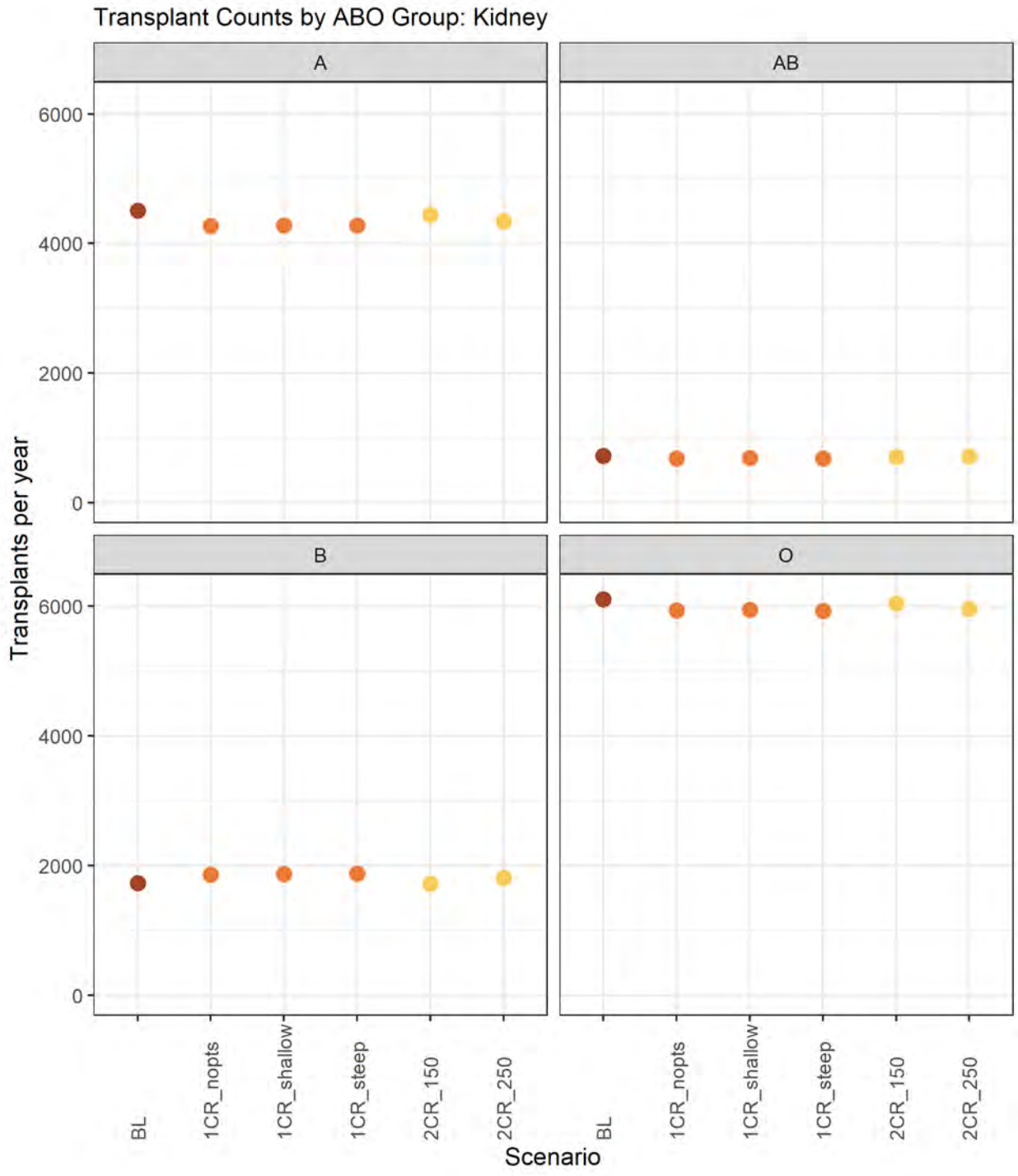


Transplant Counts by Sex: Kidney-Pancreas

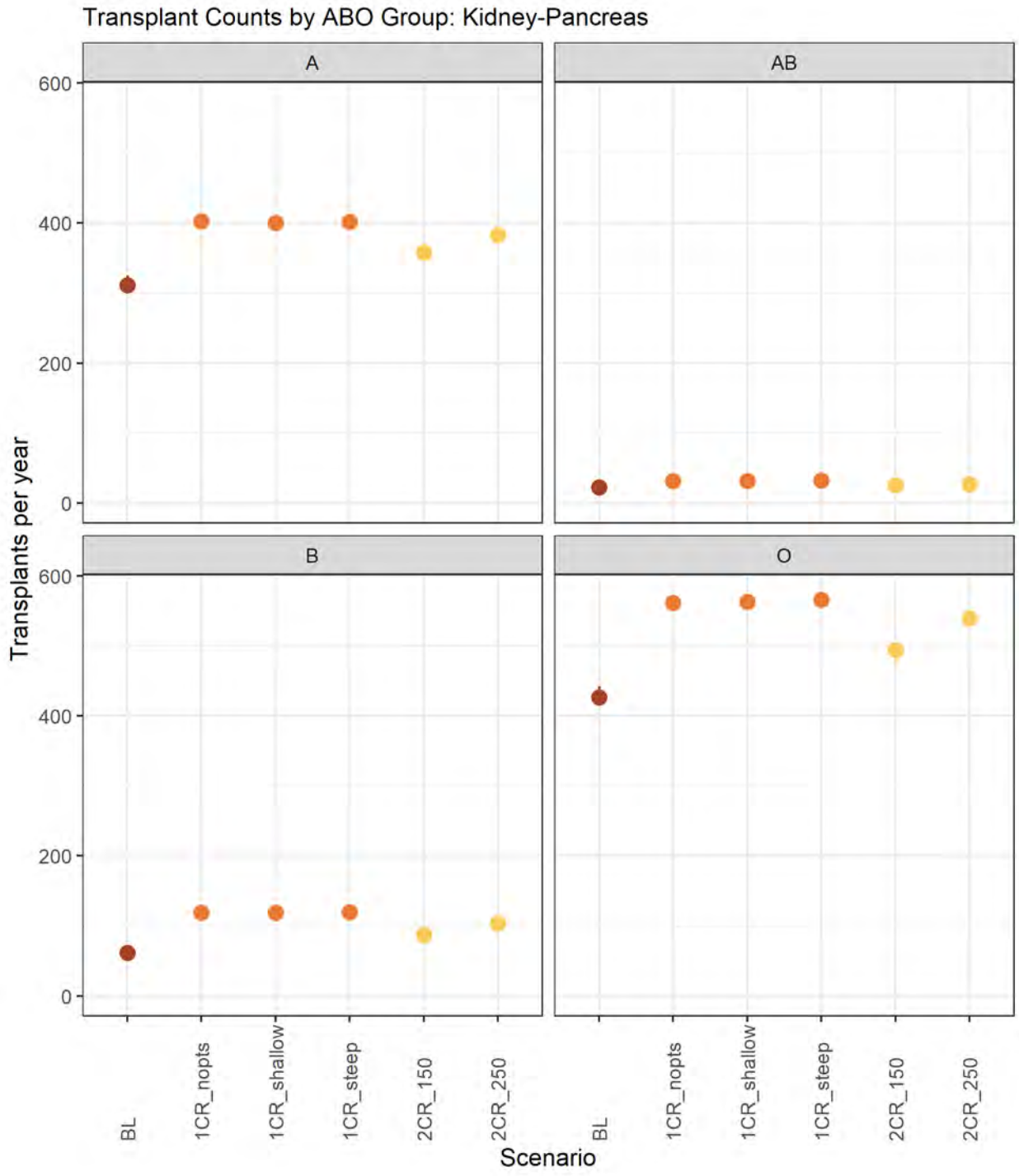


Transplant Counts by Sex: Pancreas

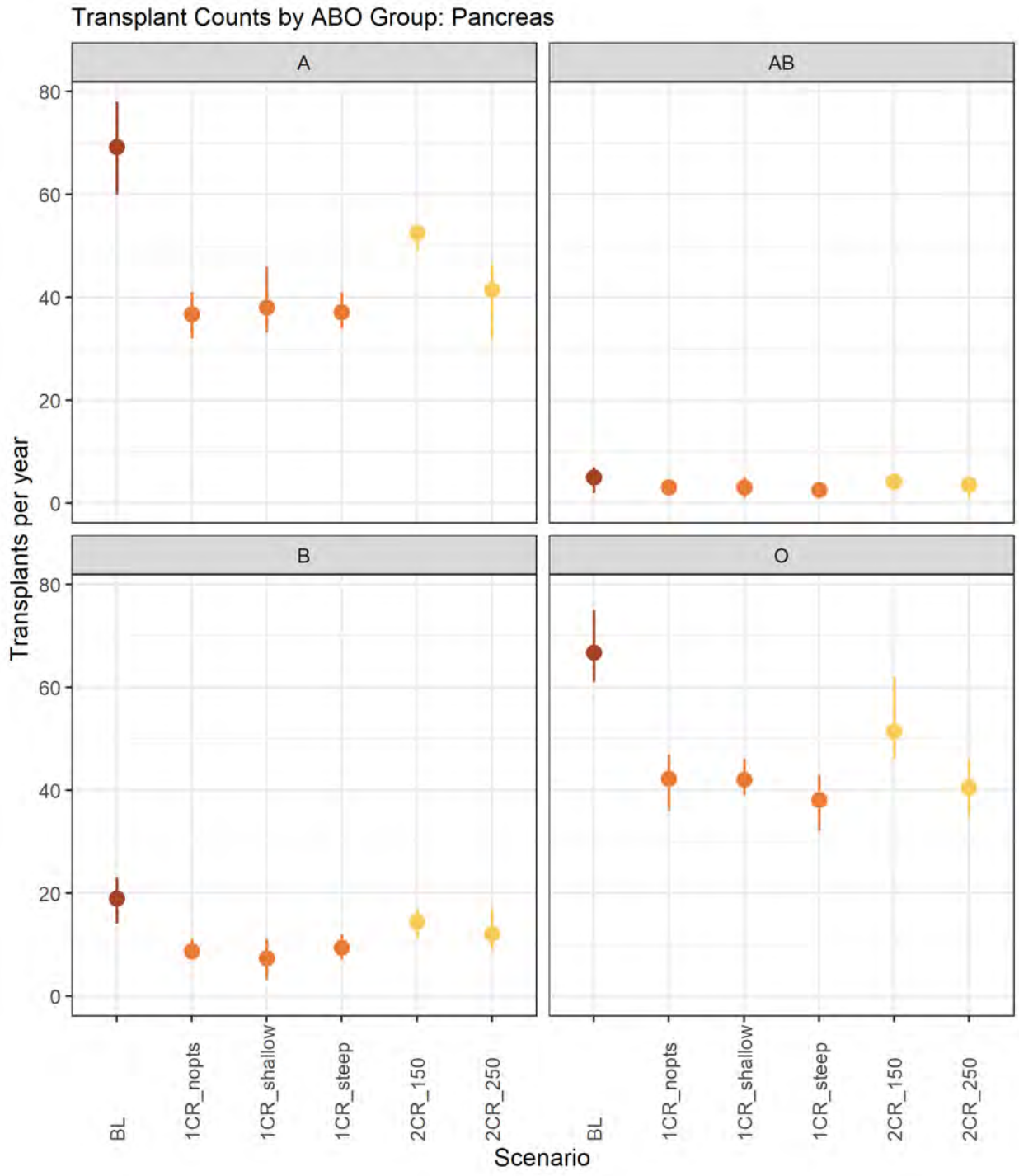
Transplant Counts: ABO Group



Transplant Counts by ABO Group: Kidney

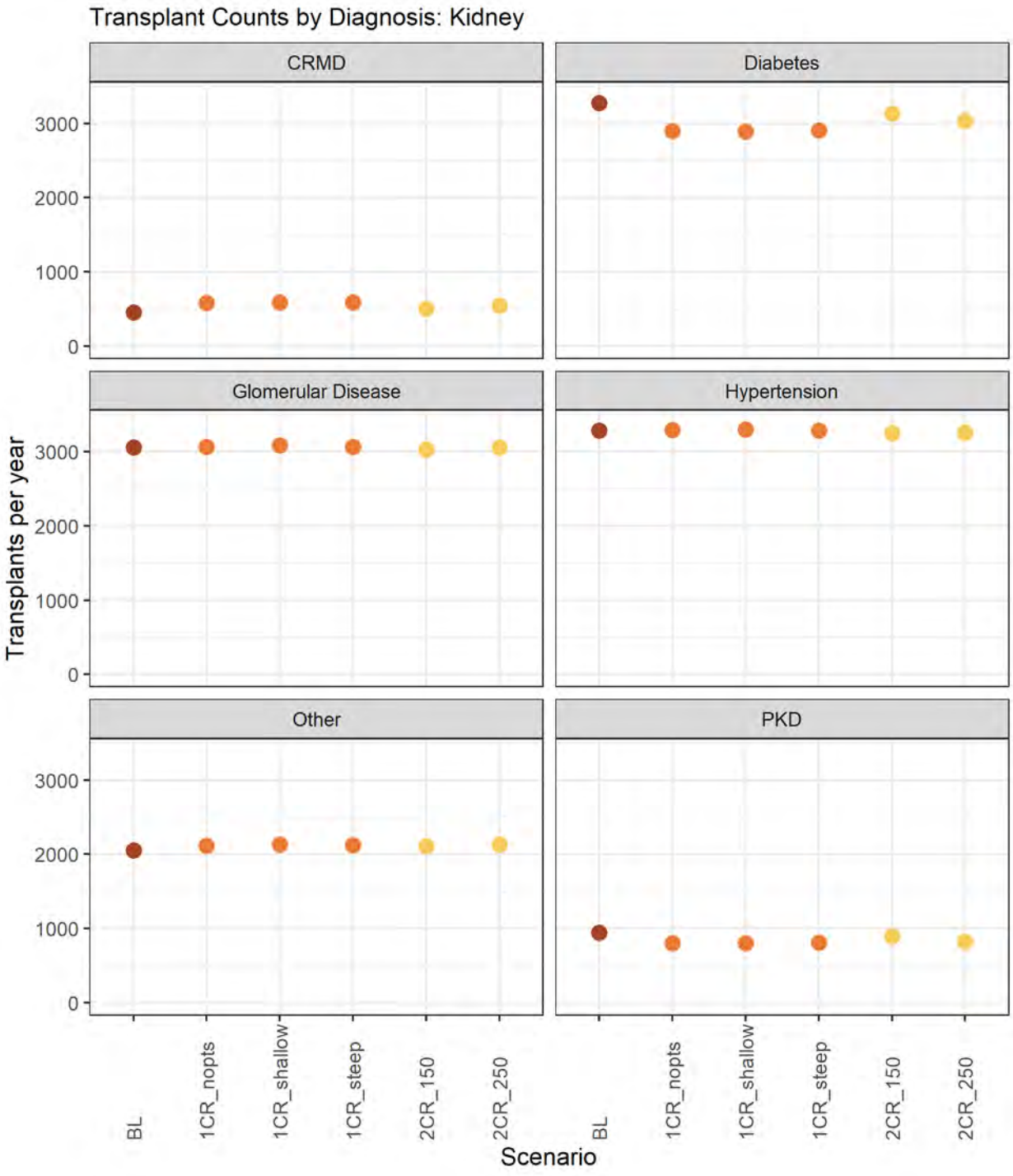


Transplant Counts by ABO Group: Kidney-Pancreas

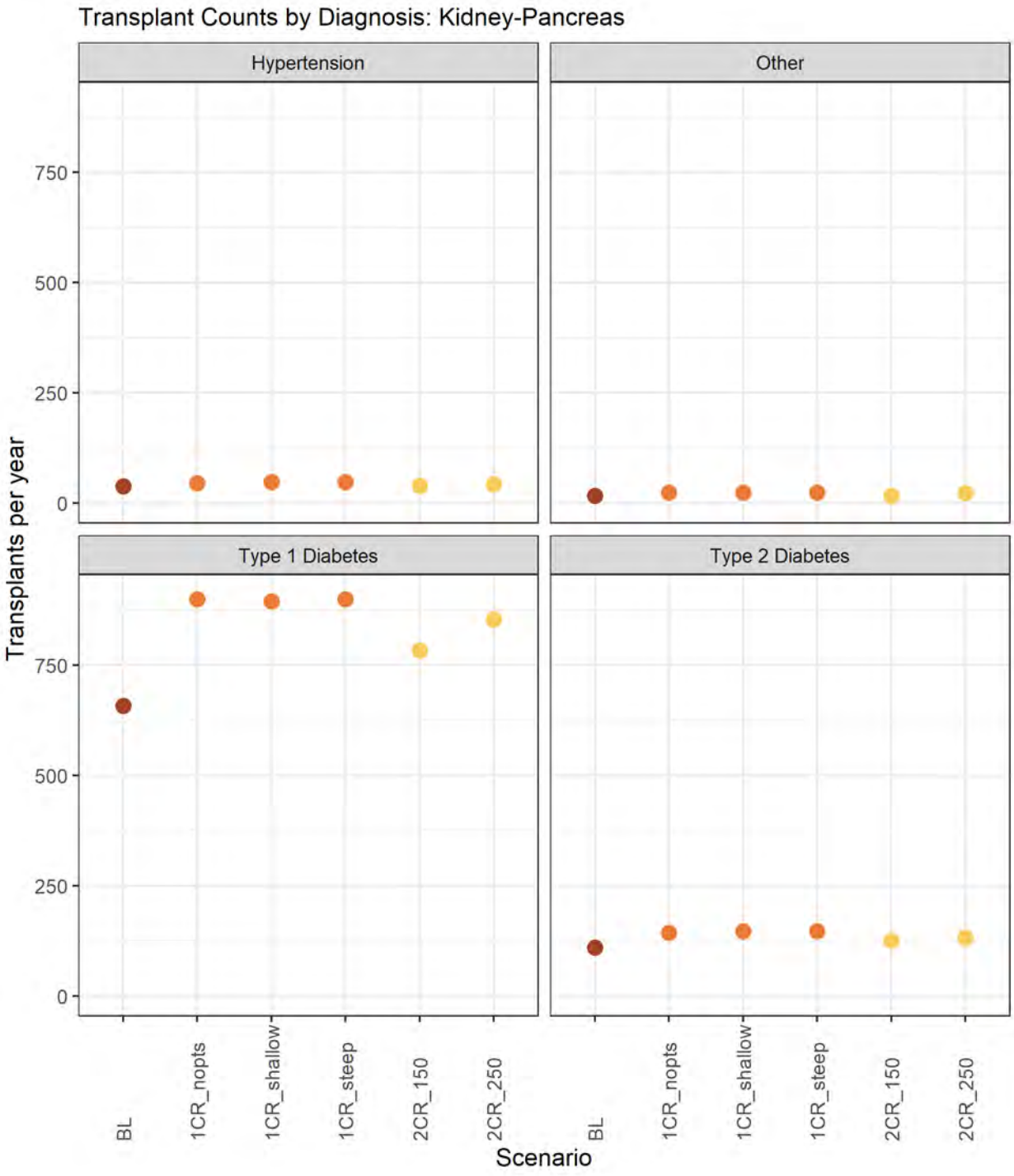


Transplant Counts by ABO Group: Pancreas

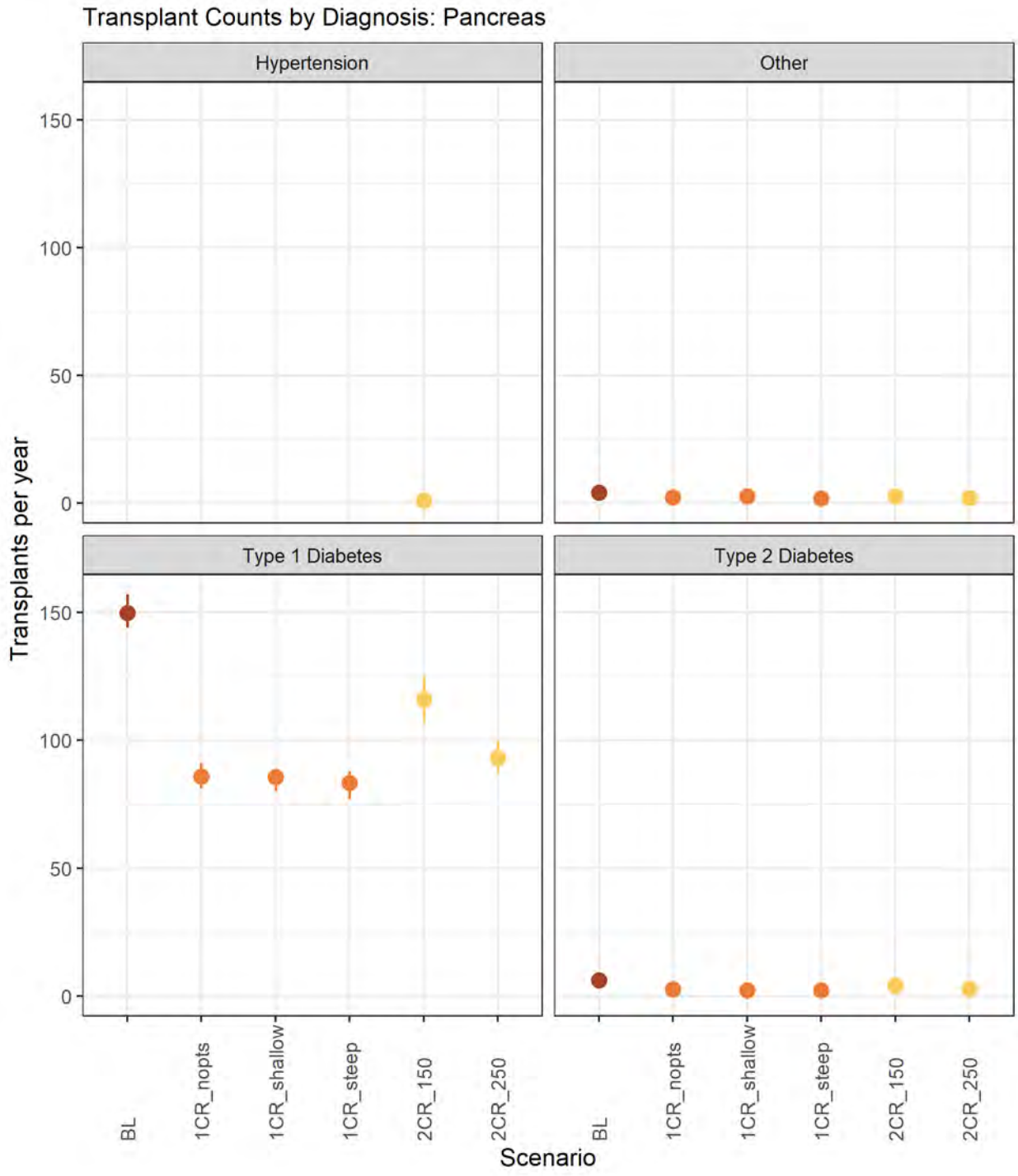
Transplant Counts: Diagnosis



Transplant Counts by Diagnosis: Kidney

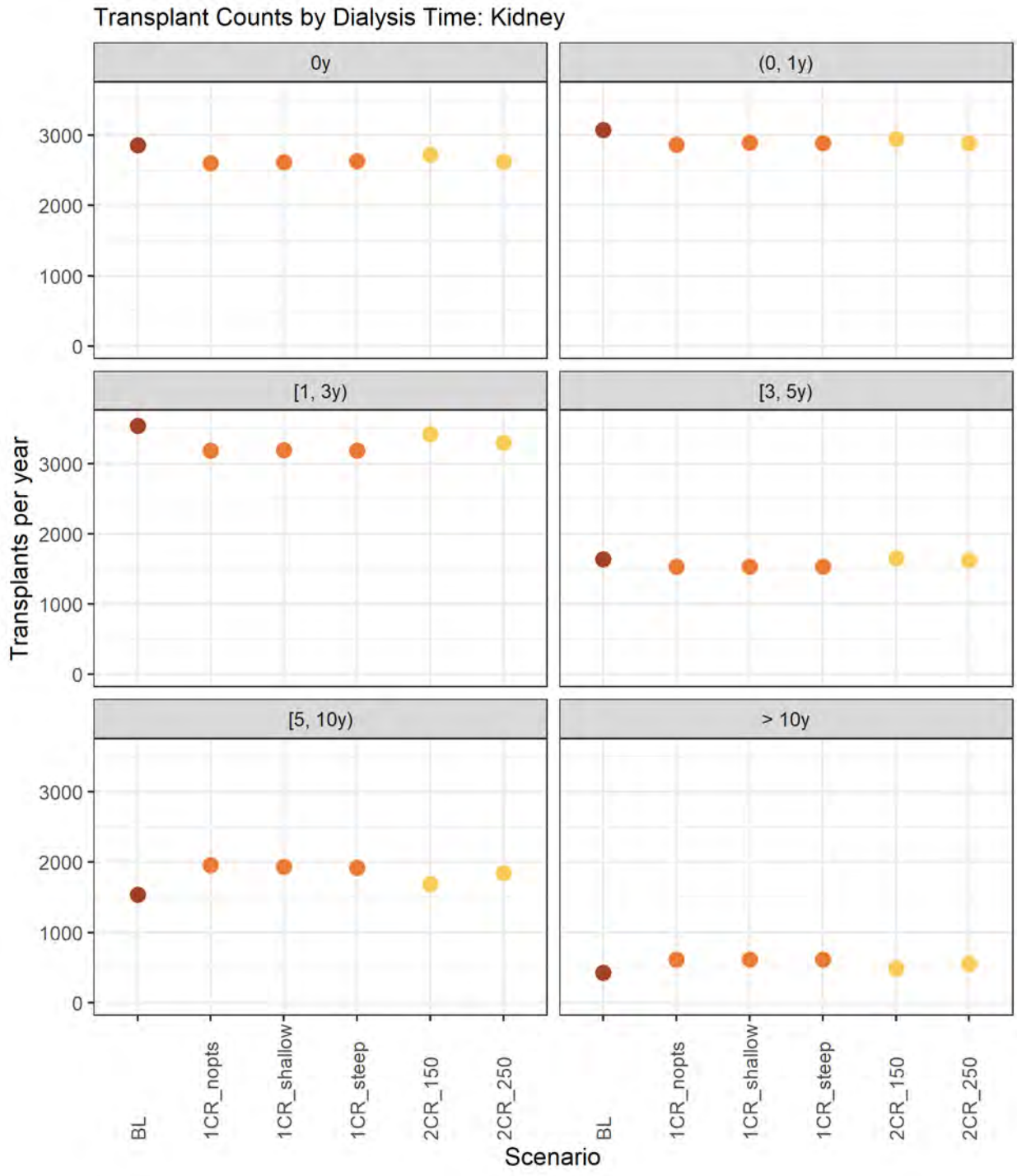


Transplant Counts by Diagnosis: Kidney-Pancreas



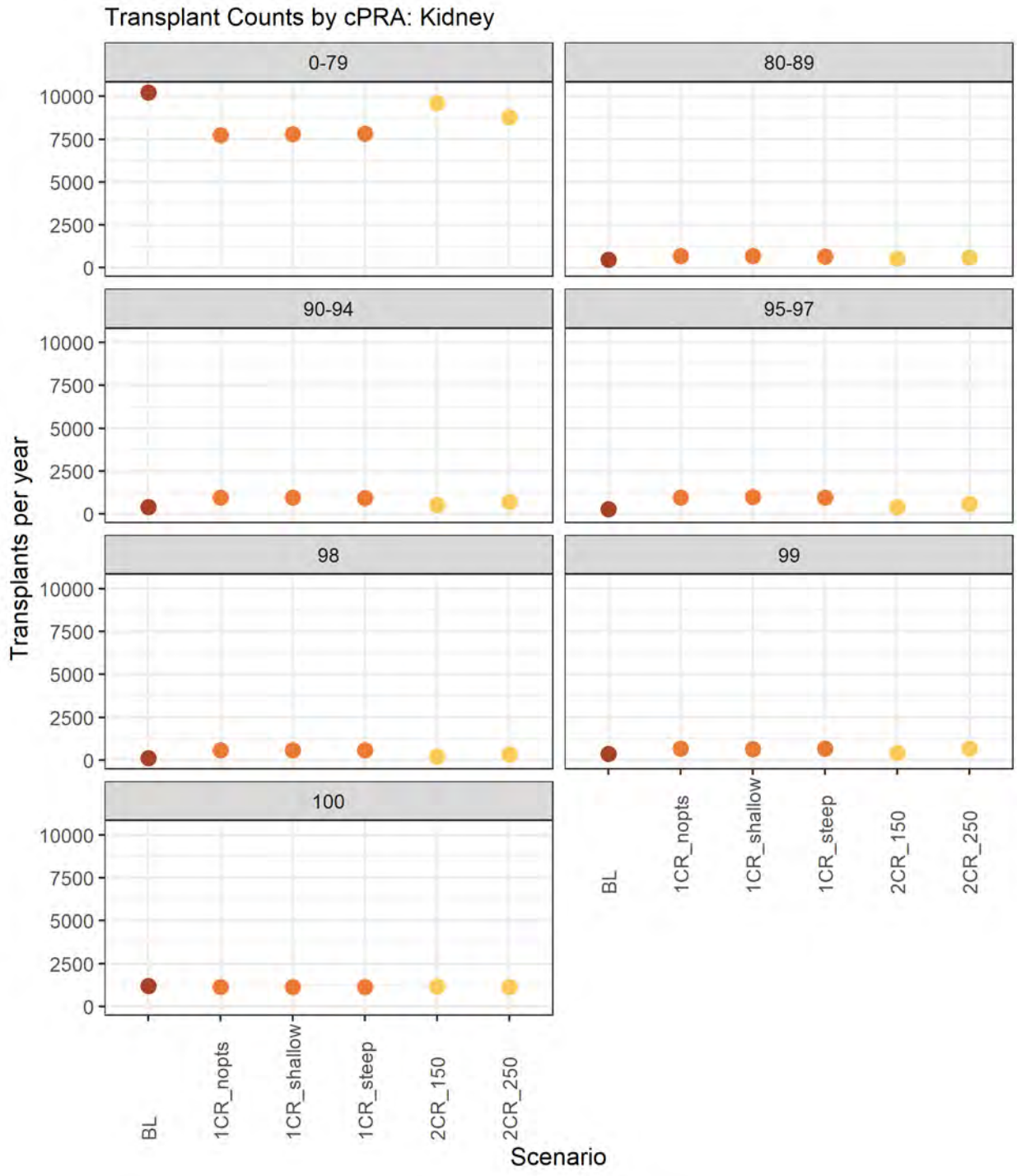
Transplant Counts by Diagnosis: Pancreas

Transplant Counts: Dialysis Time

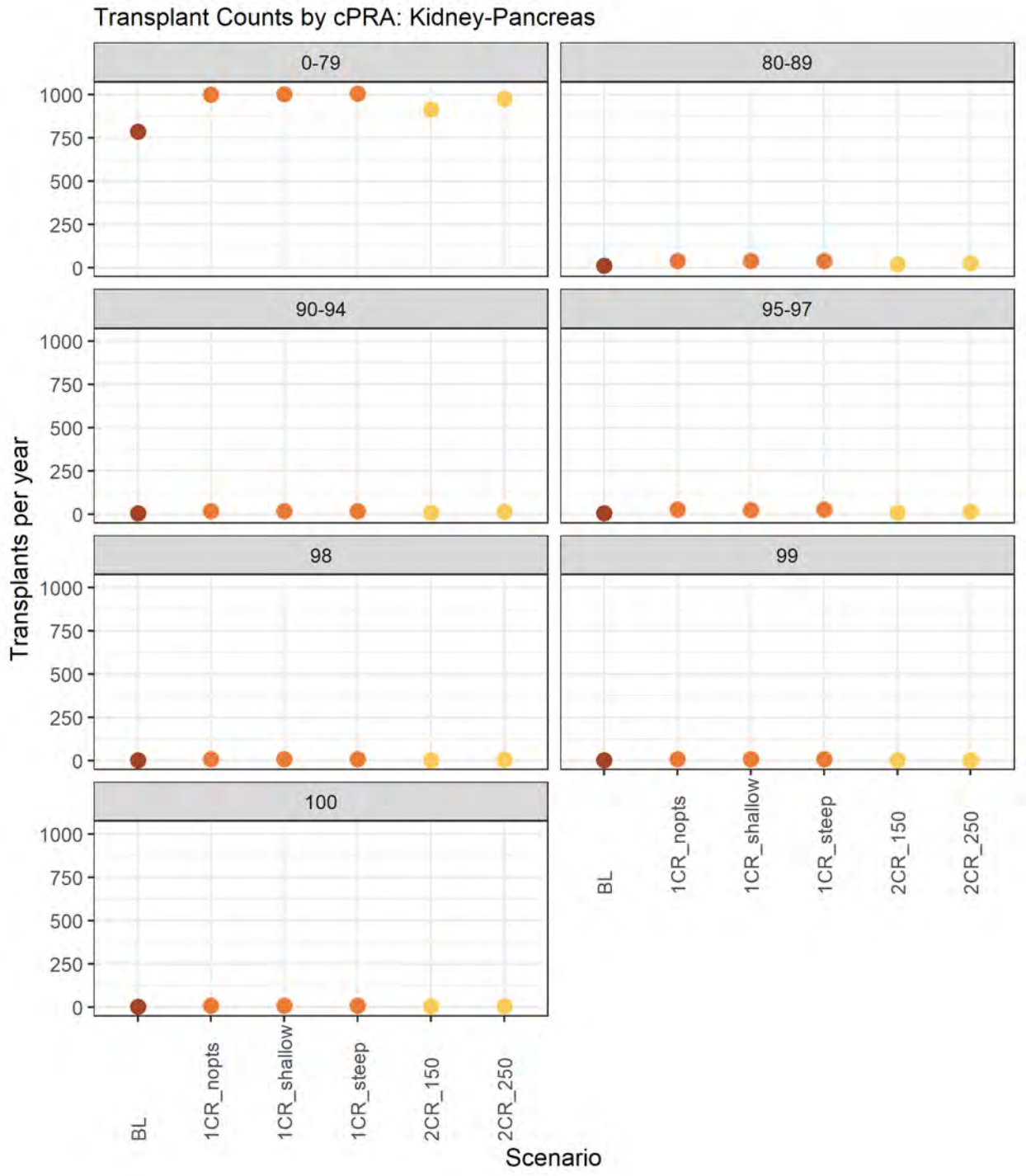


Transplant Counts by Dialysis Time: Kidney

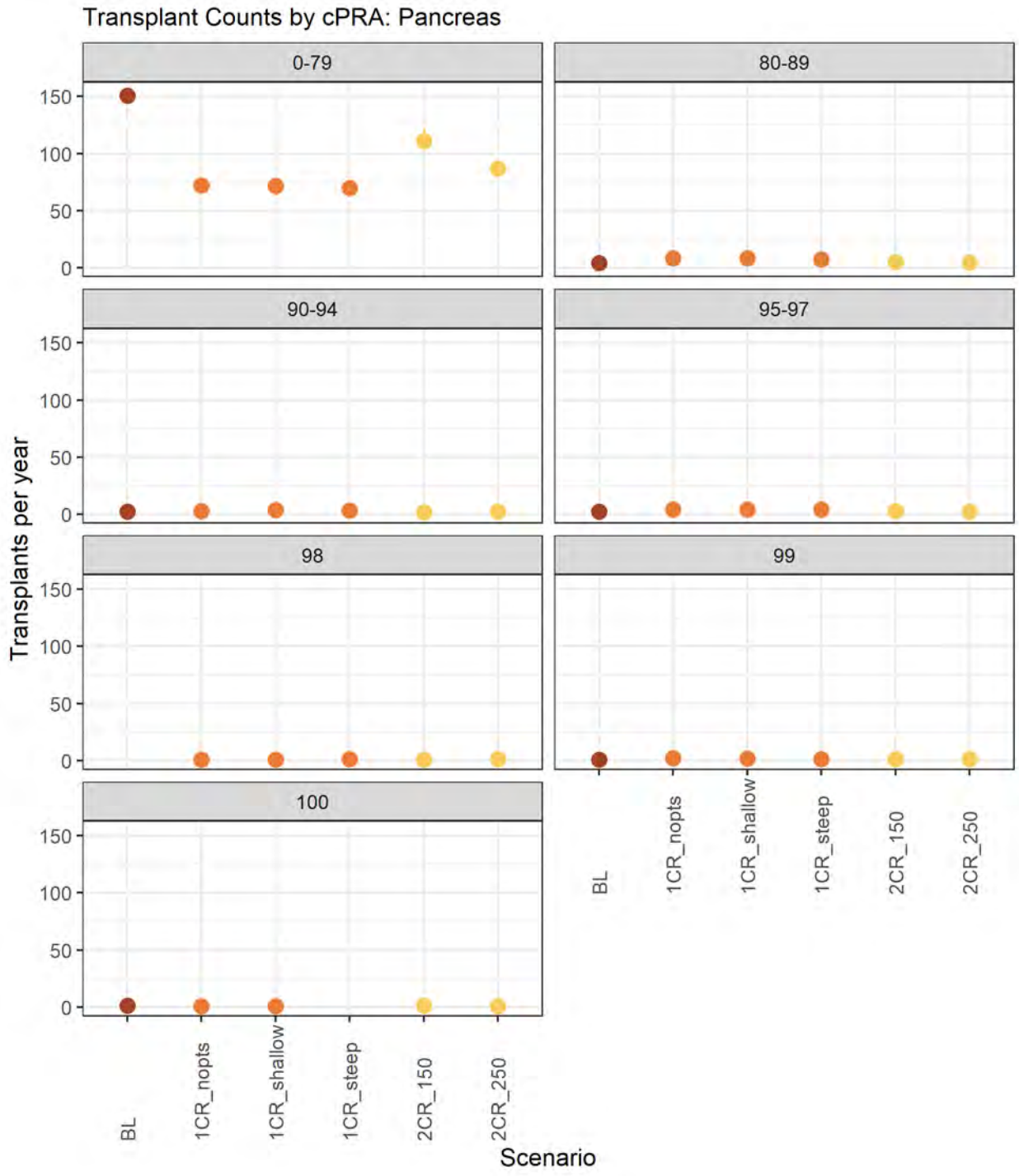
Transplant Counts: cPRA



Transplant Counts by cPRA: Kidney

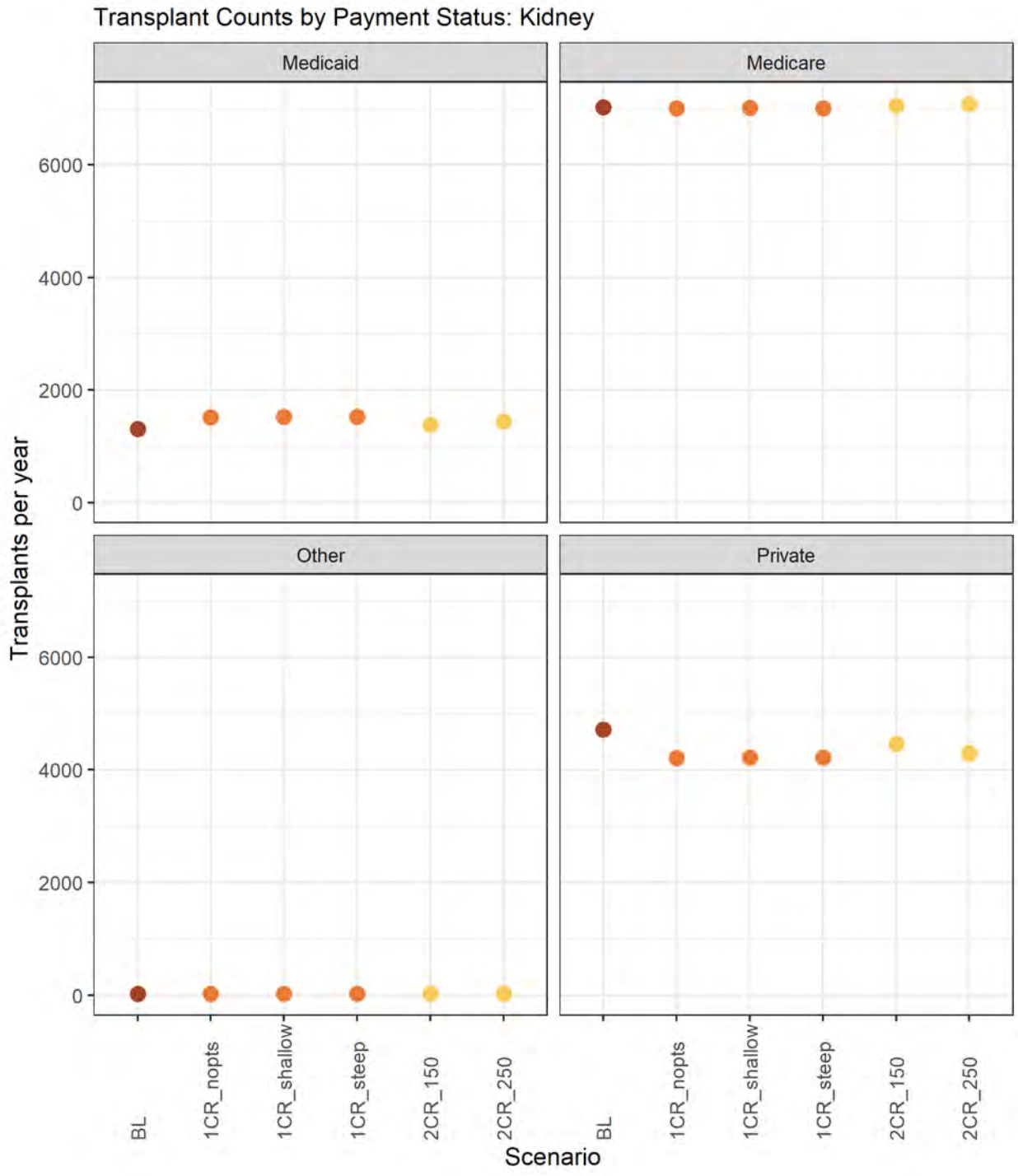


Transplant Counts by cPRA: Kidney-Pancreas

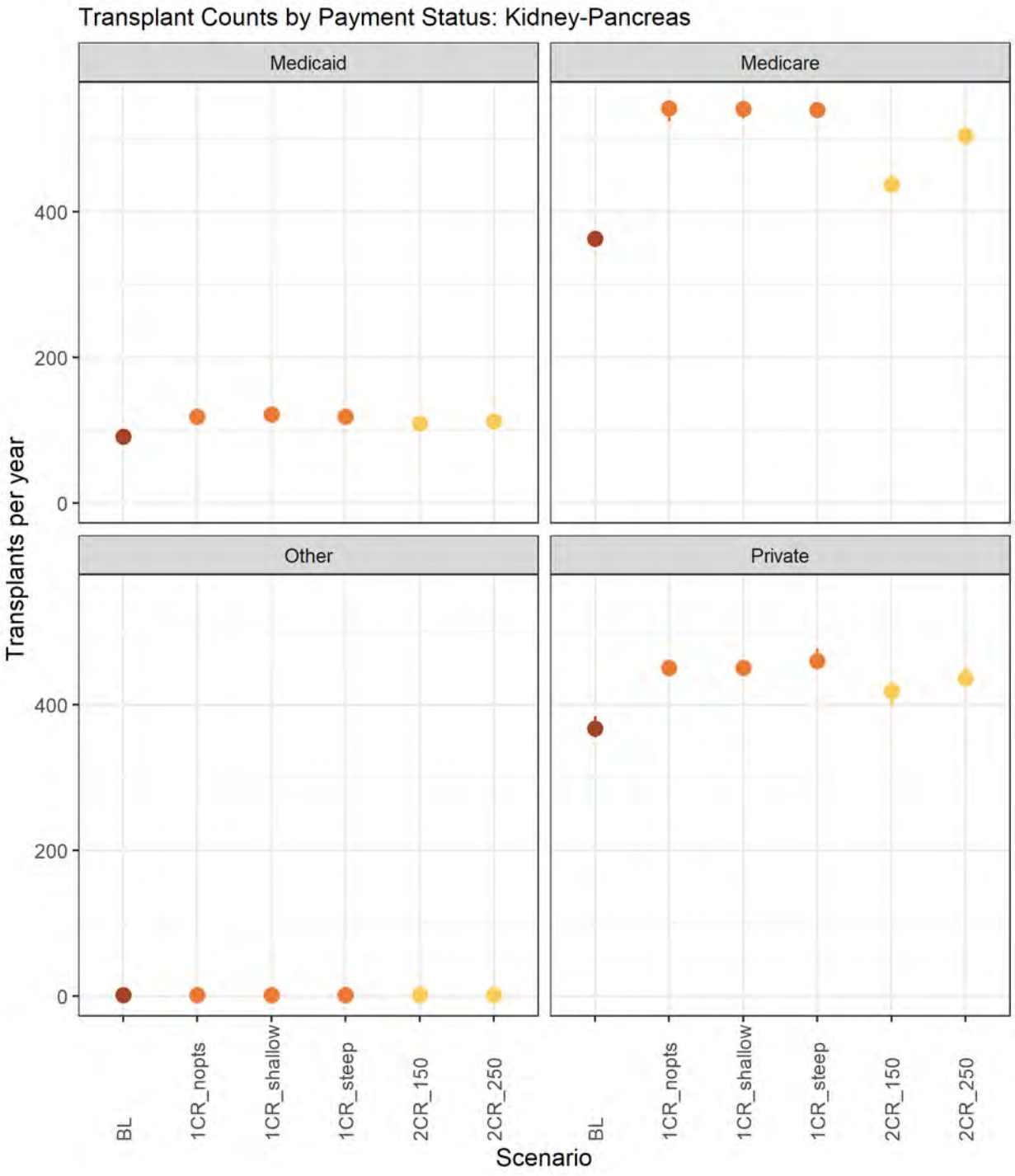


Transplant Counts by cPRA: Pancreas

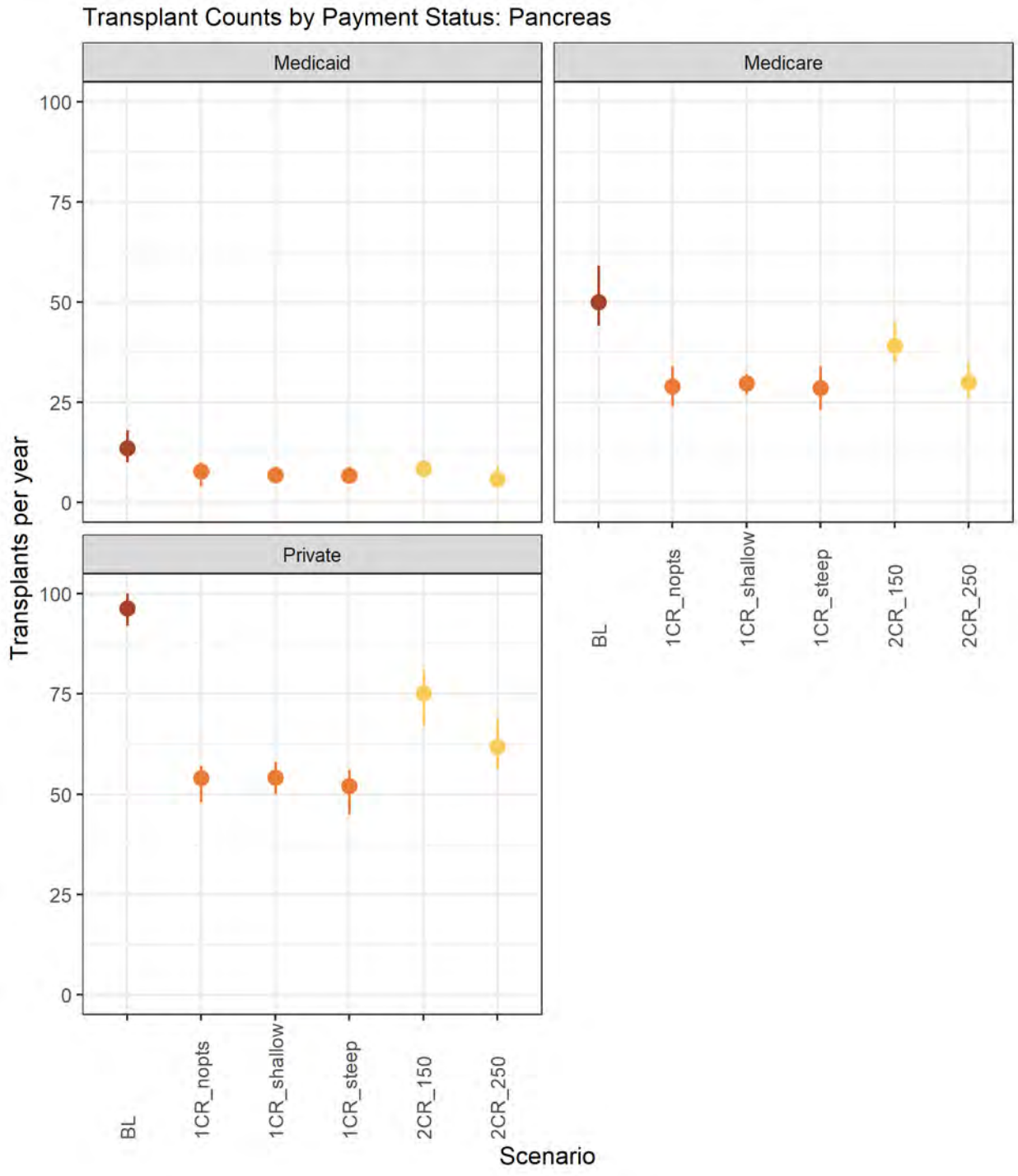
Transplant Counts: Payment Status



Transplant Counts by Payment Status: Kidney

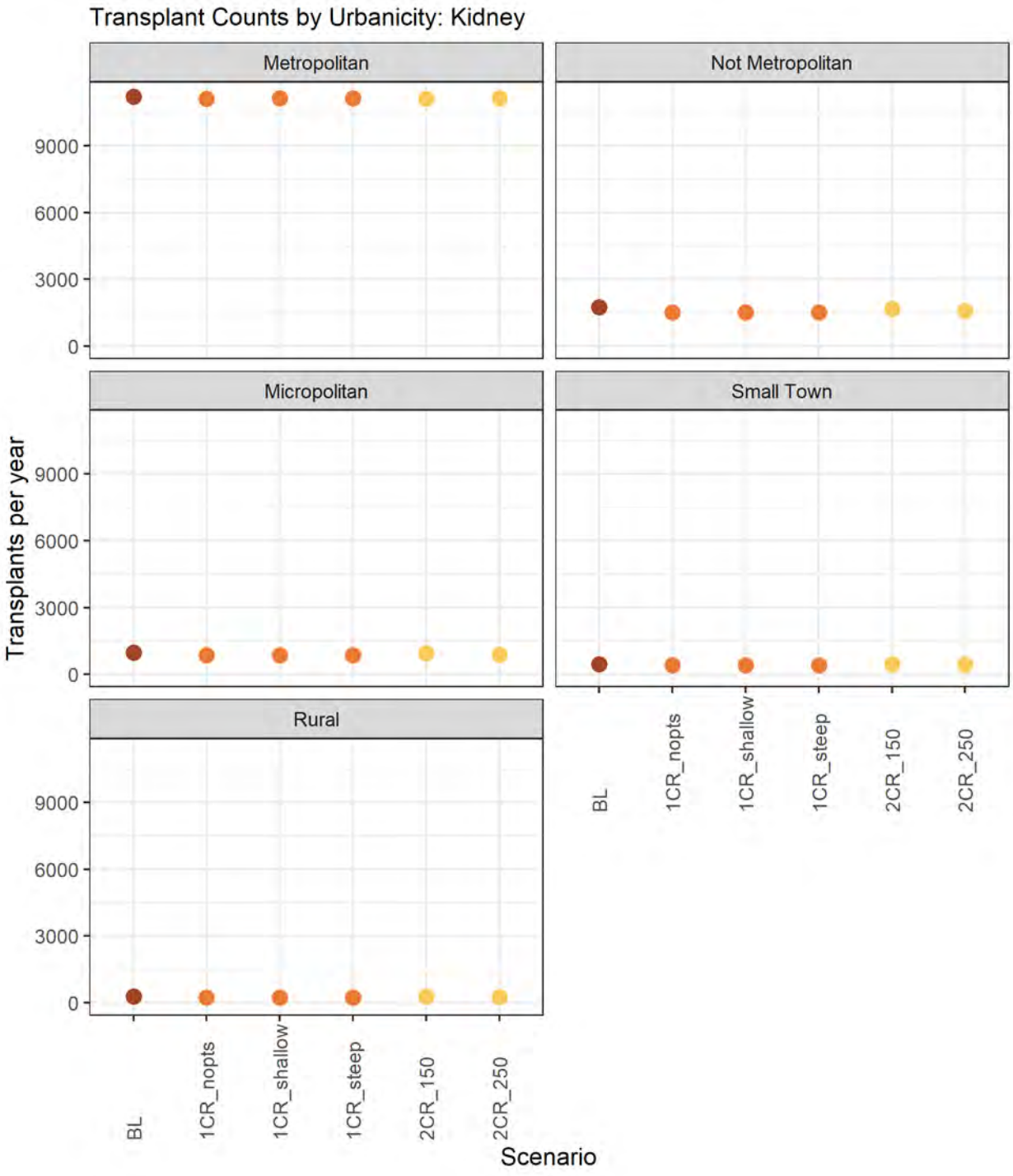


Transplant Counts by Payment Status: Kidney-Pancreas

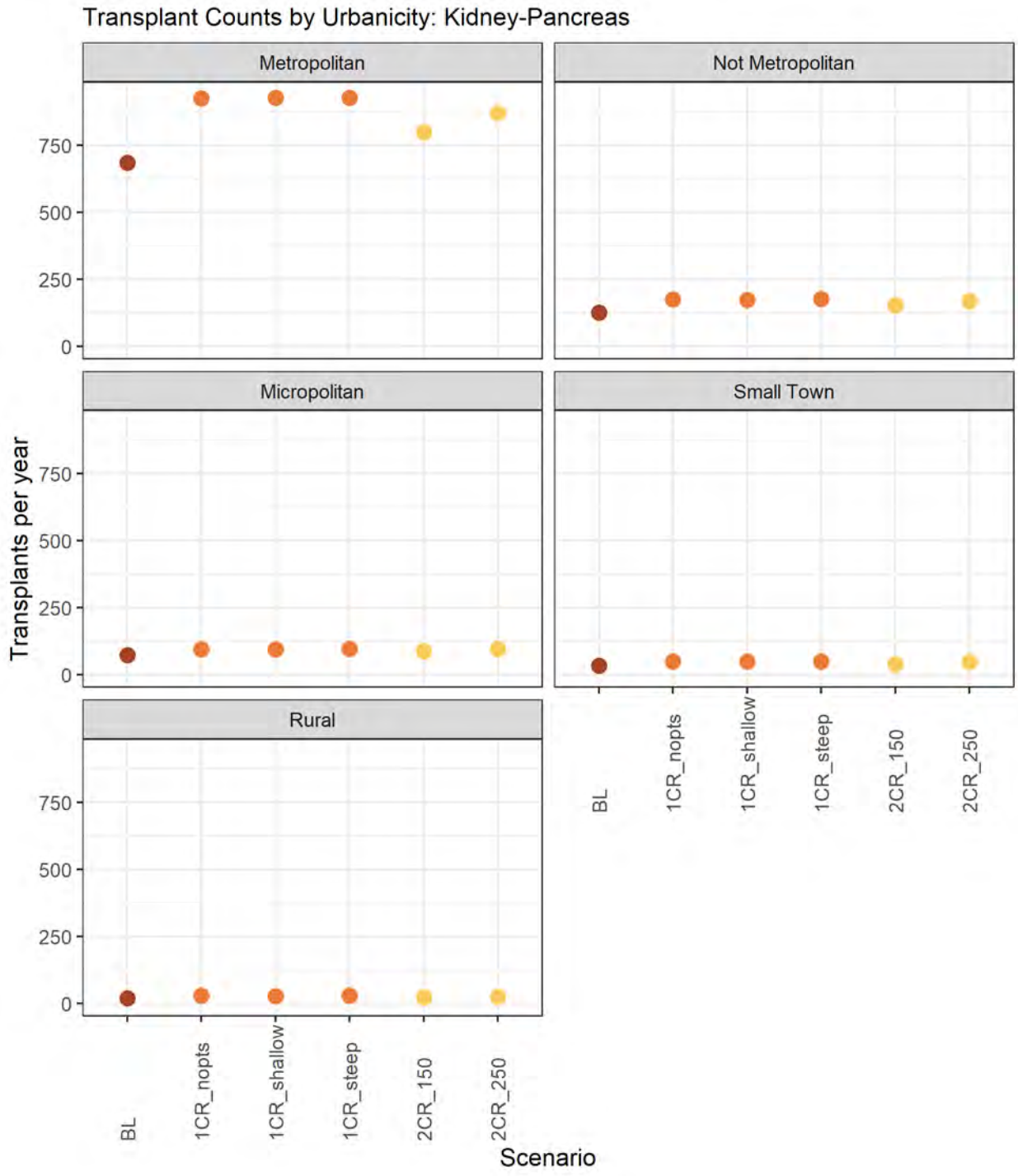


Transplant Counts by Payment Status: Pancreas

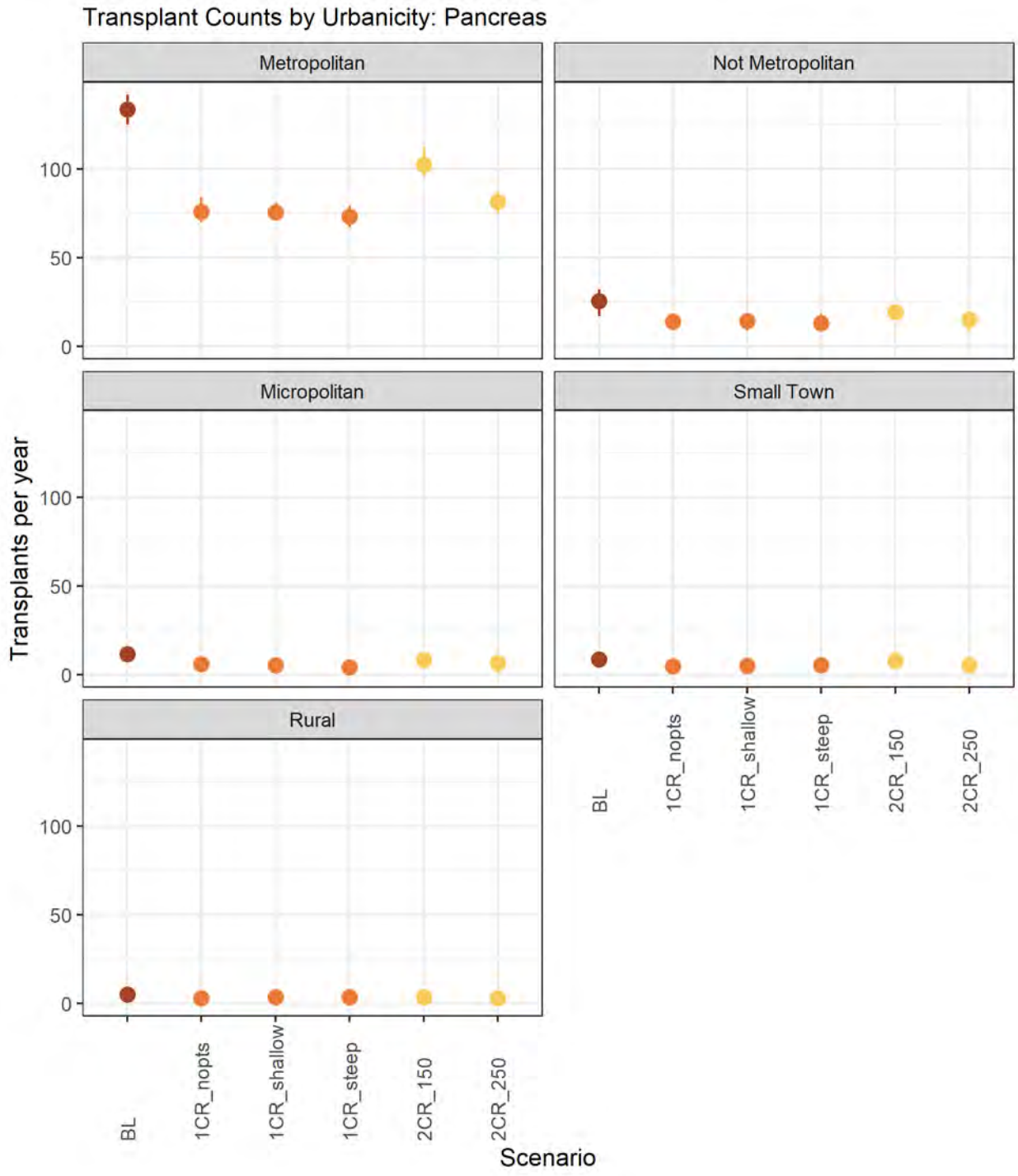
Transplant Counts: Urbanicity



Transplant Counts by Urbanicity: Kidney

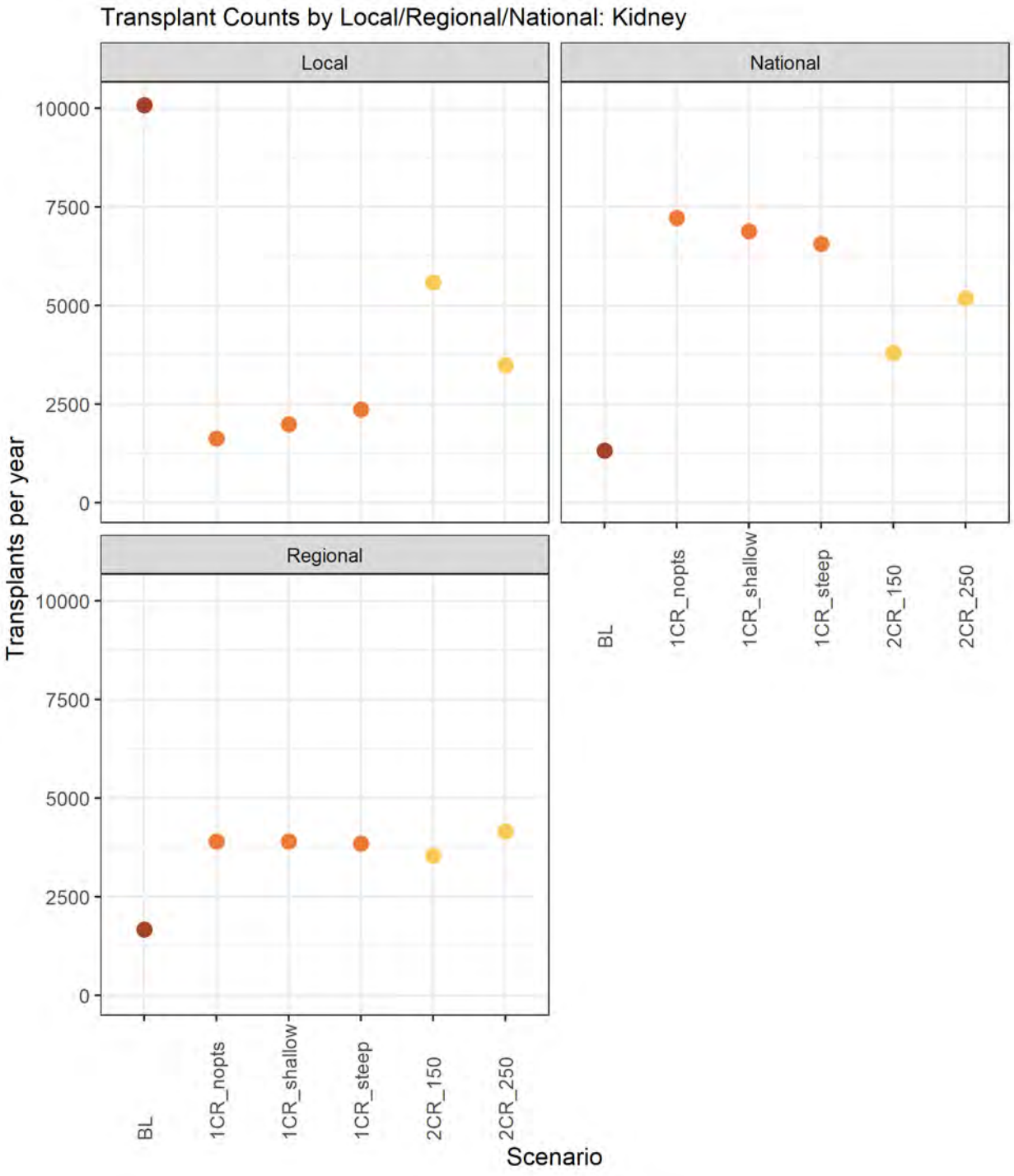


Transplant Counts by Urbanicity: Kidney-Pancreas

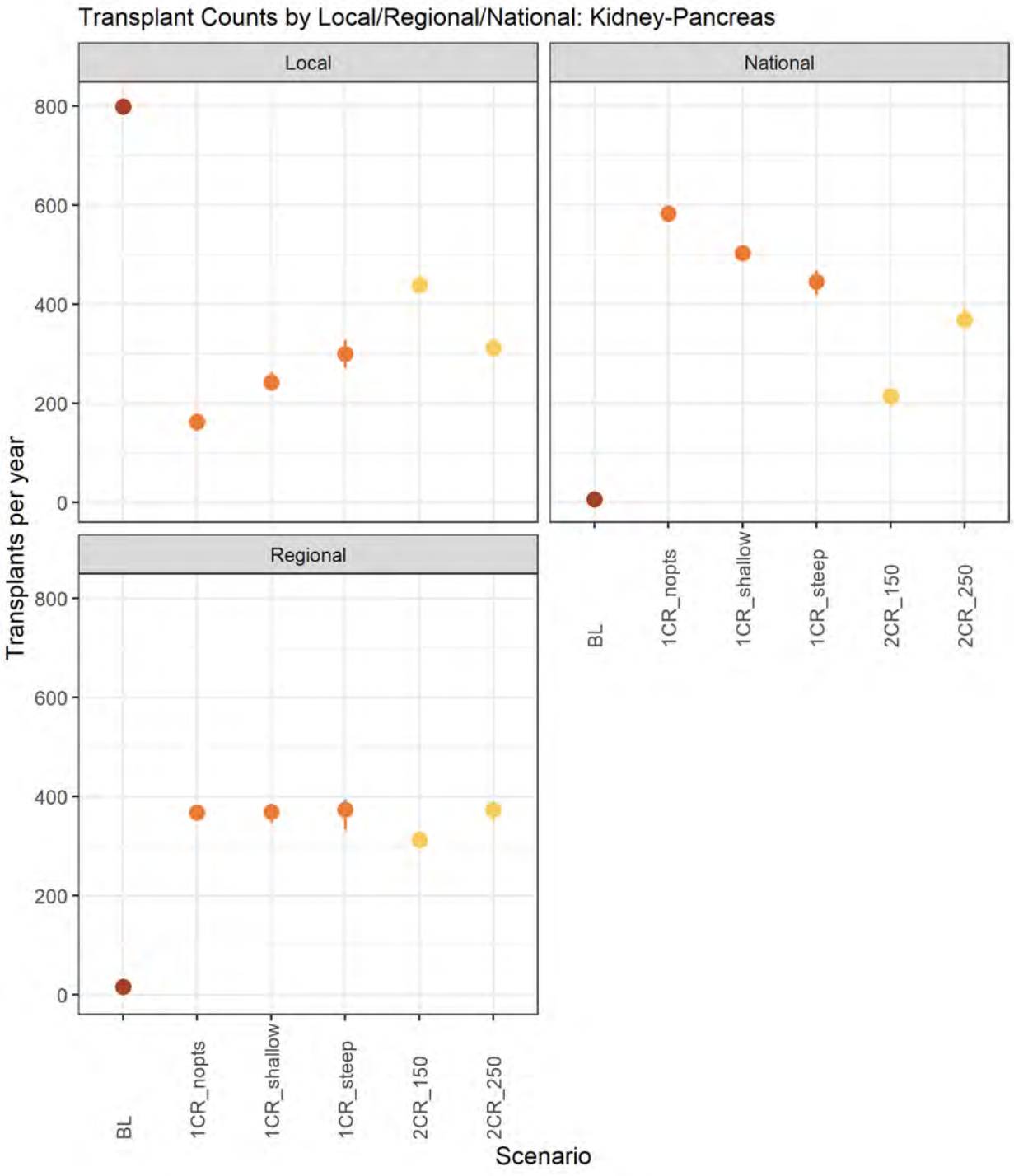


Transplant Counts by Urbanicity: Pancreas

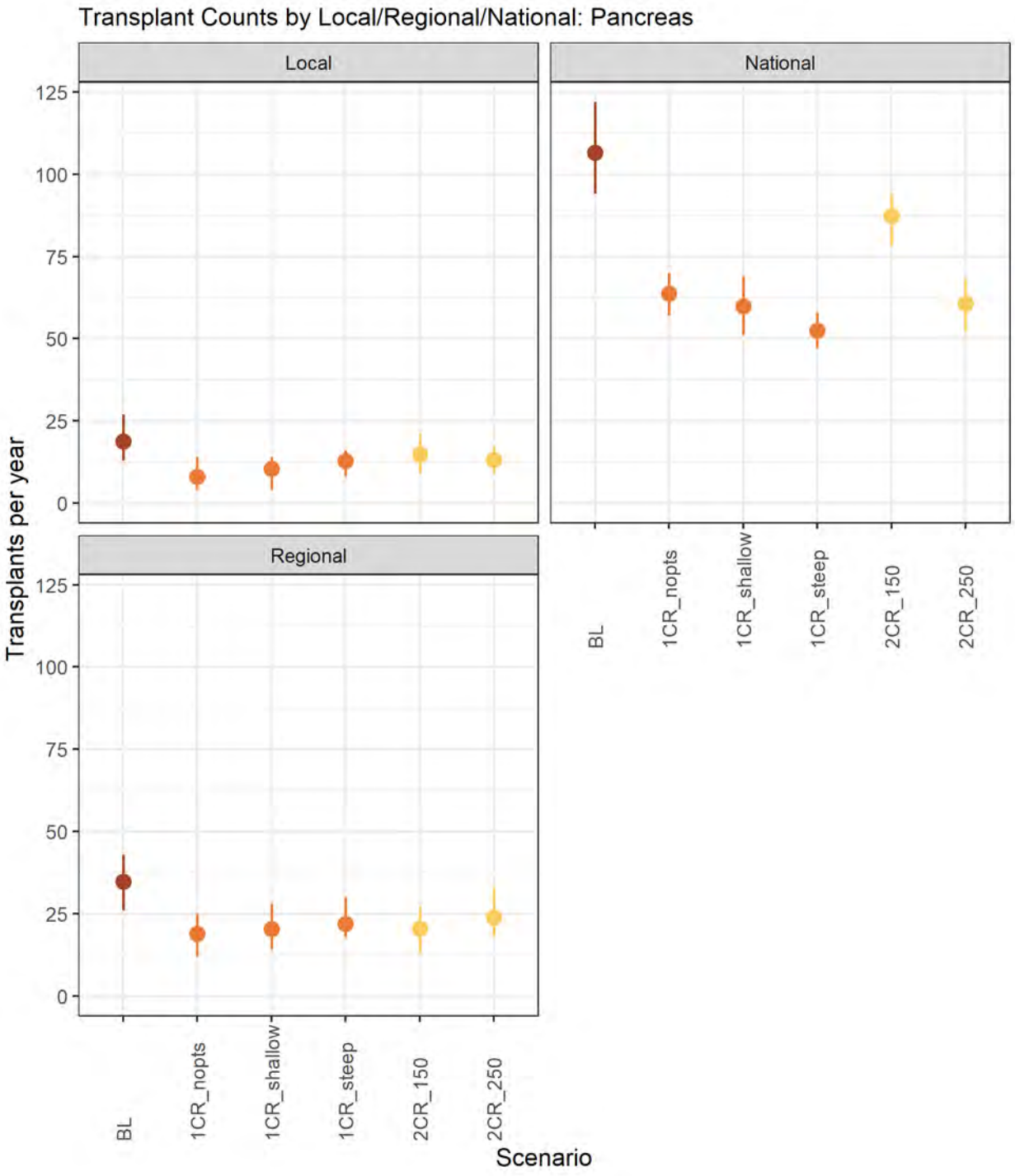
Transplant Counts: Local/Regional/National



Transplant Counts by Local/Regional/National: Kidney

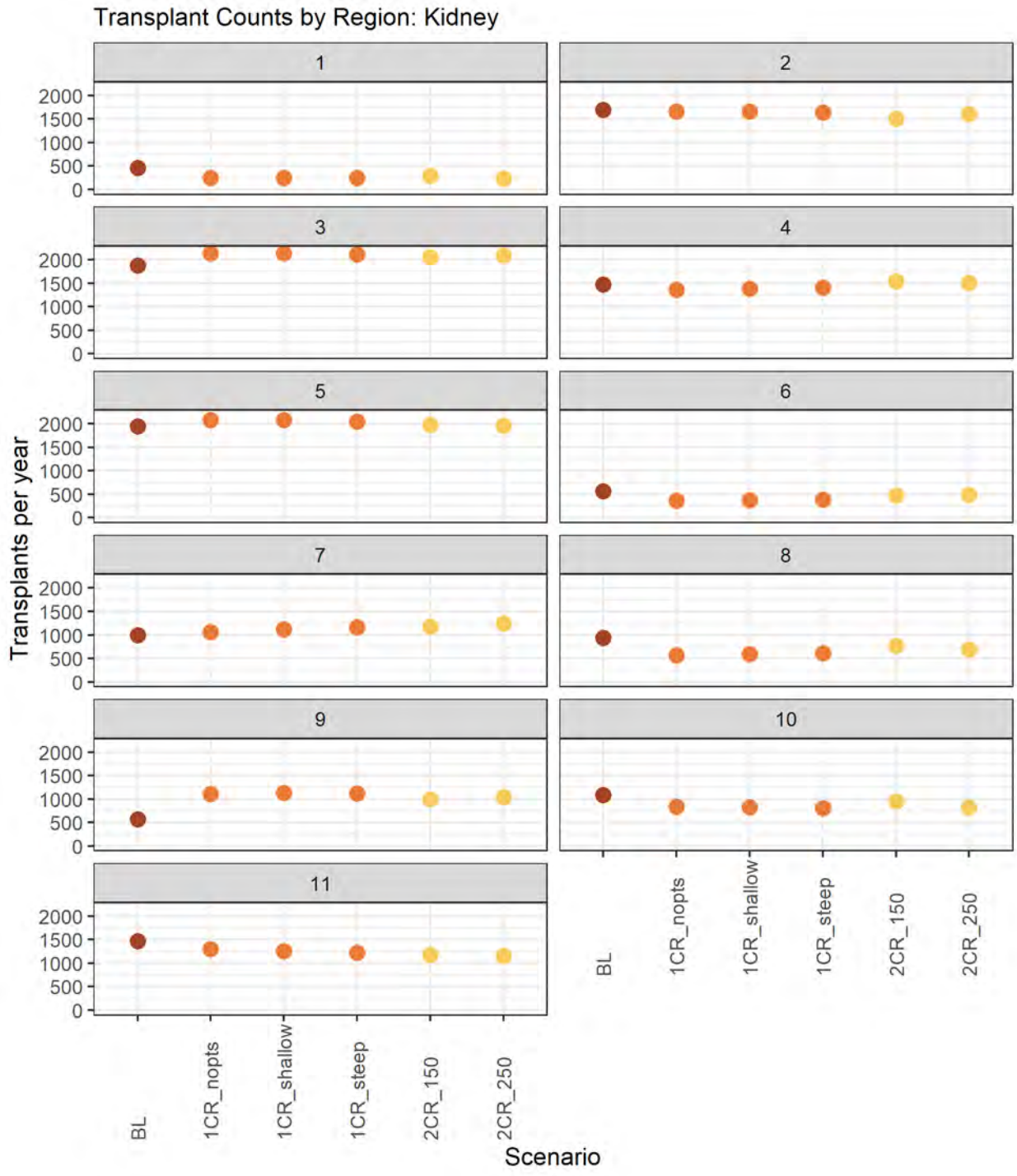


Transplant Counts by Local/Regional/National: Kidney-Pancreas

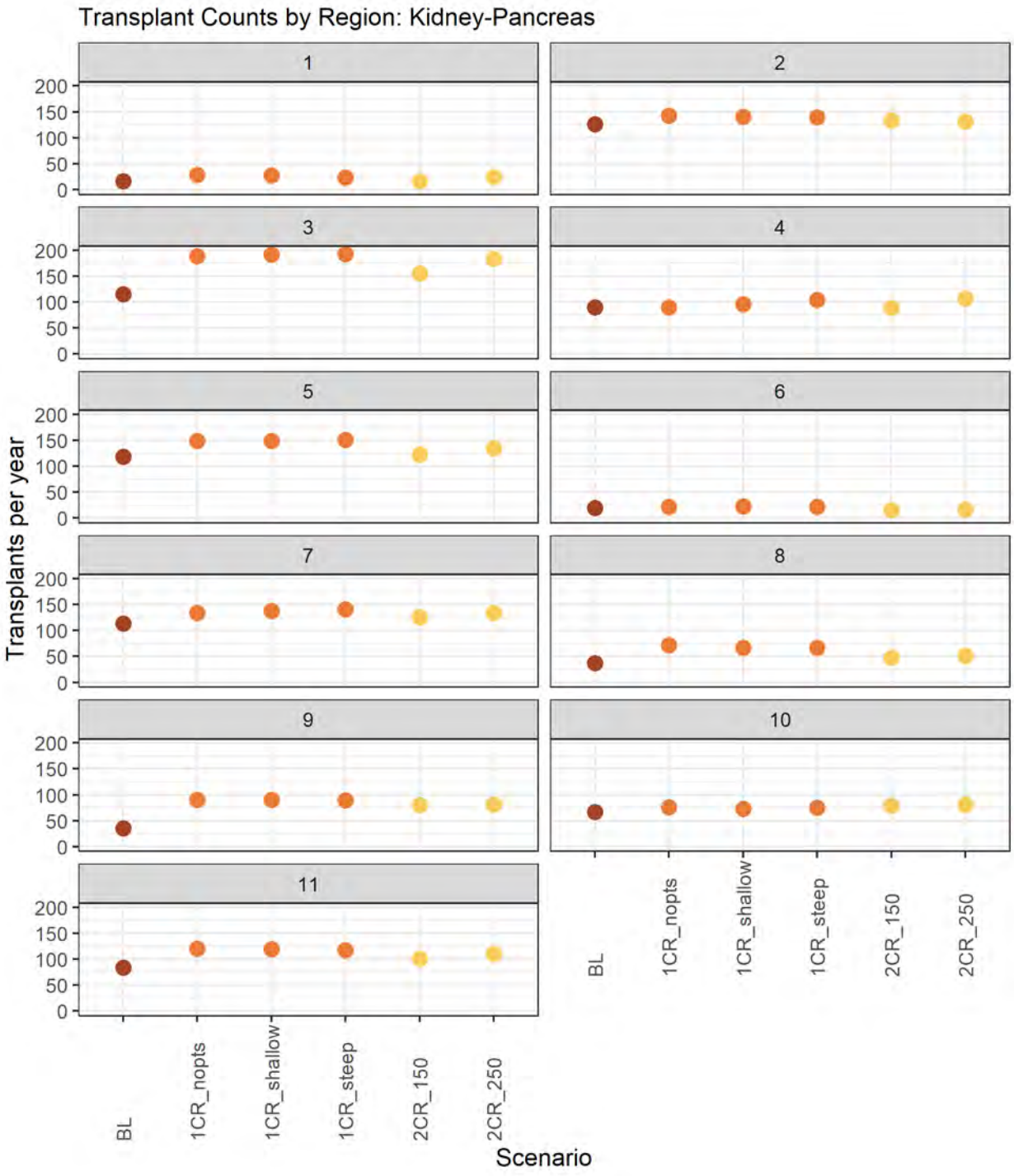


Transplant Counts by Local/Regional/National: Pancreas

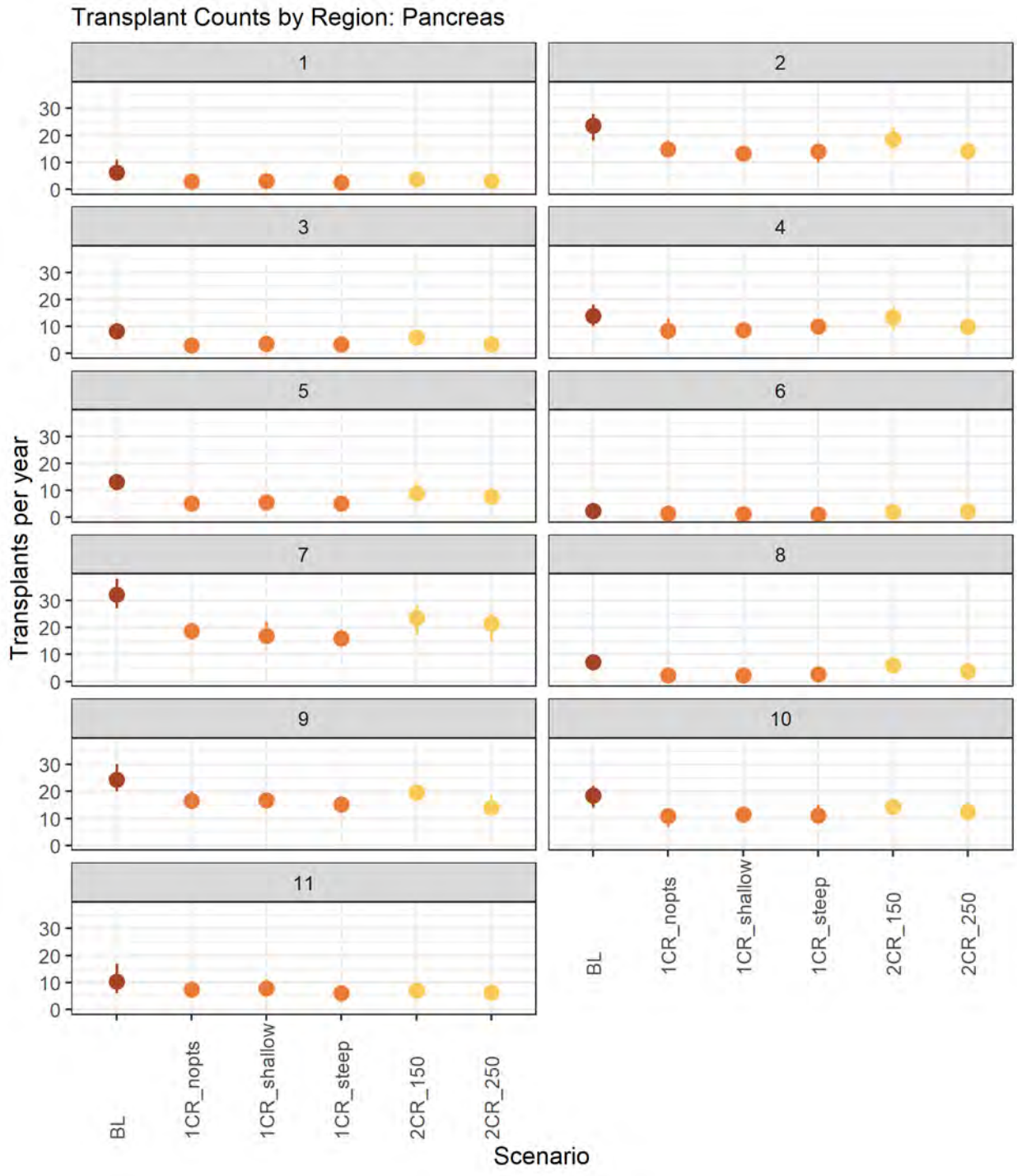
Transplant Counts: Region



Transplant Counts by Region: Kidney

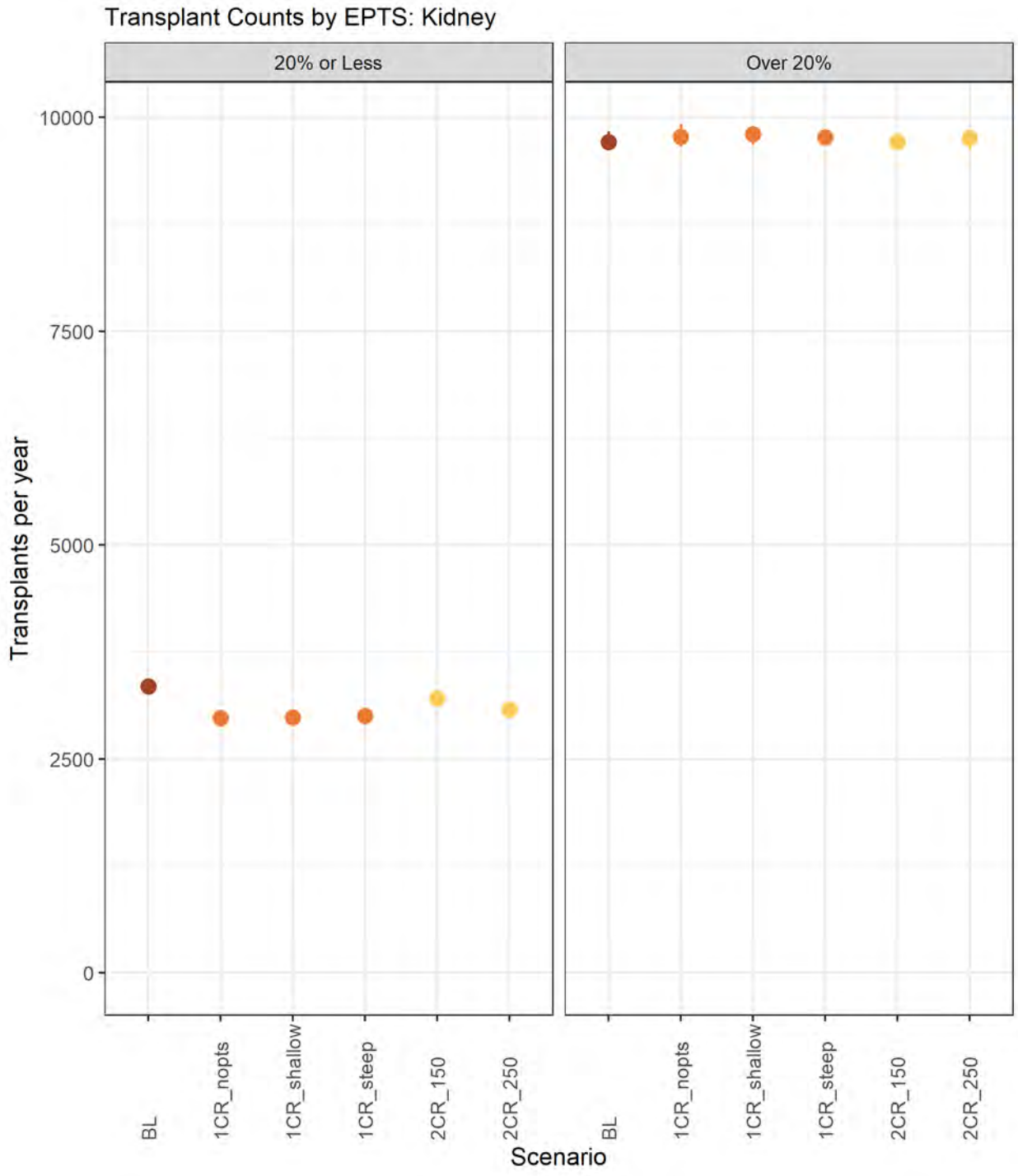


Transplant Counts by Region: Kidney-Pancreas



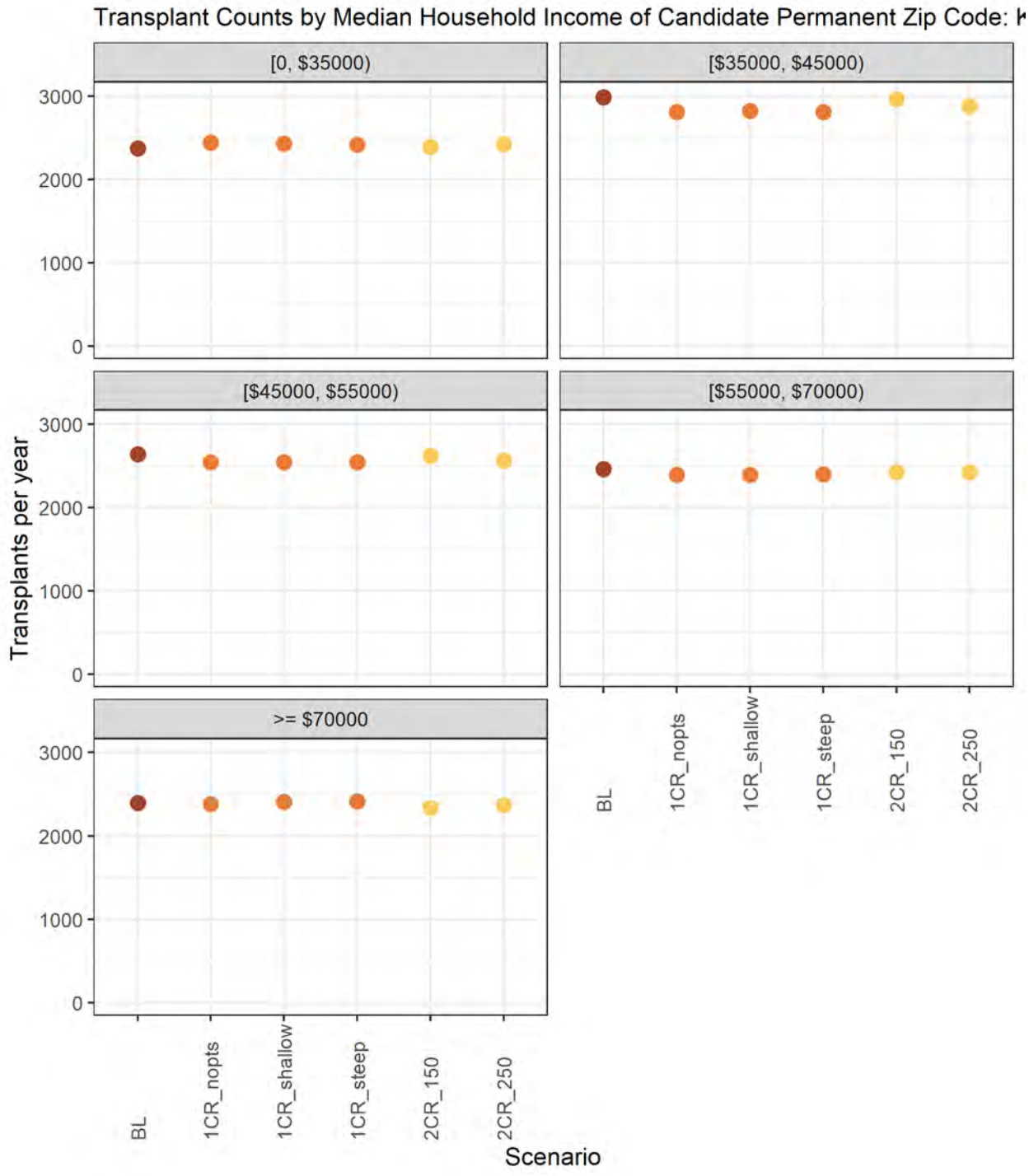
Transplant Counts by Region: Pancreas

Transplant Counts: EPTS

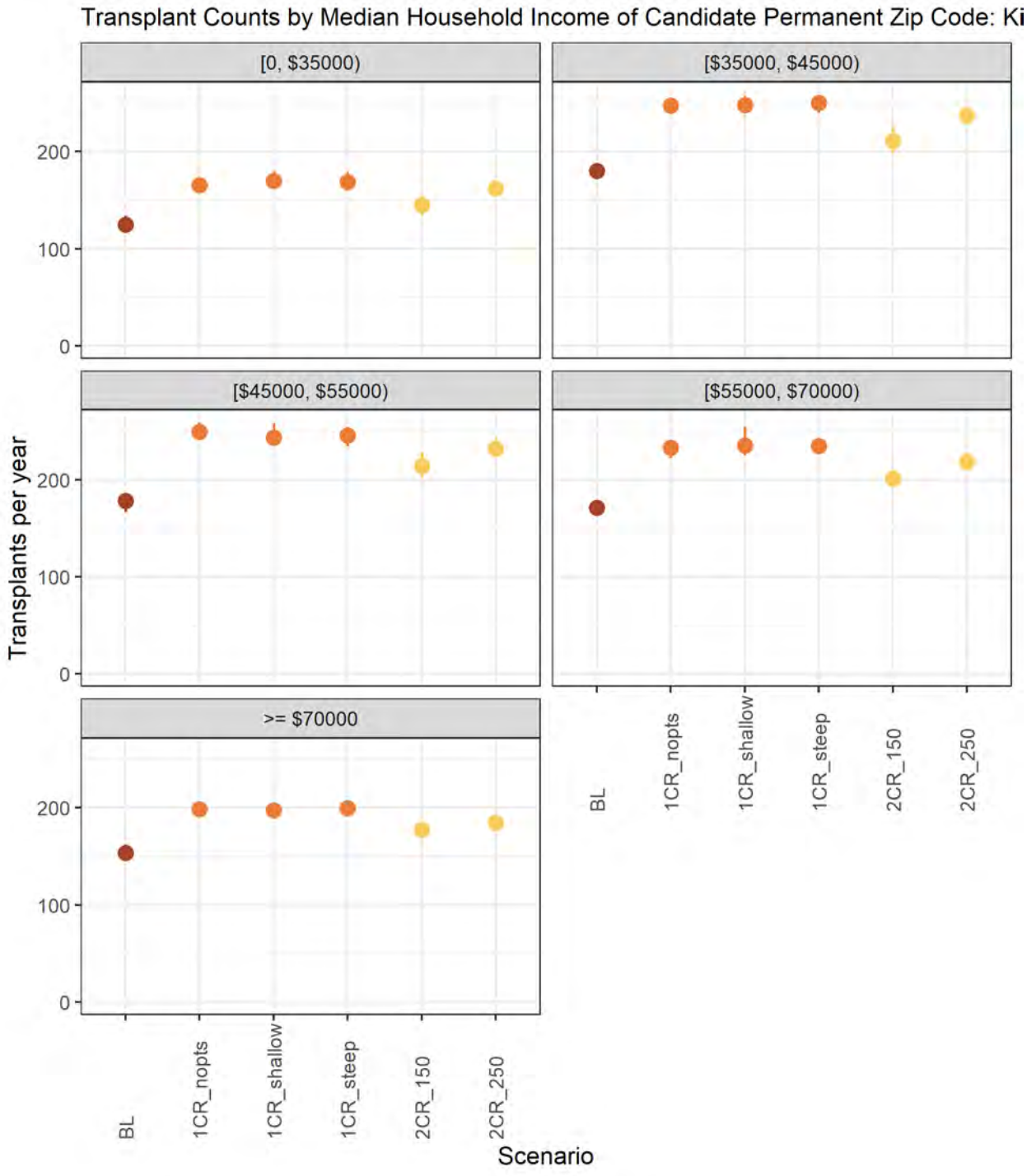


Transplant Counts by EPTS: Kidney

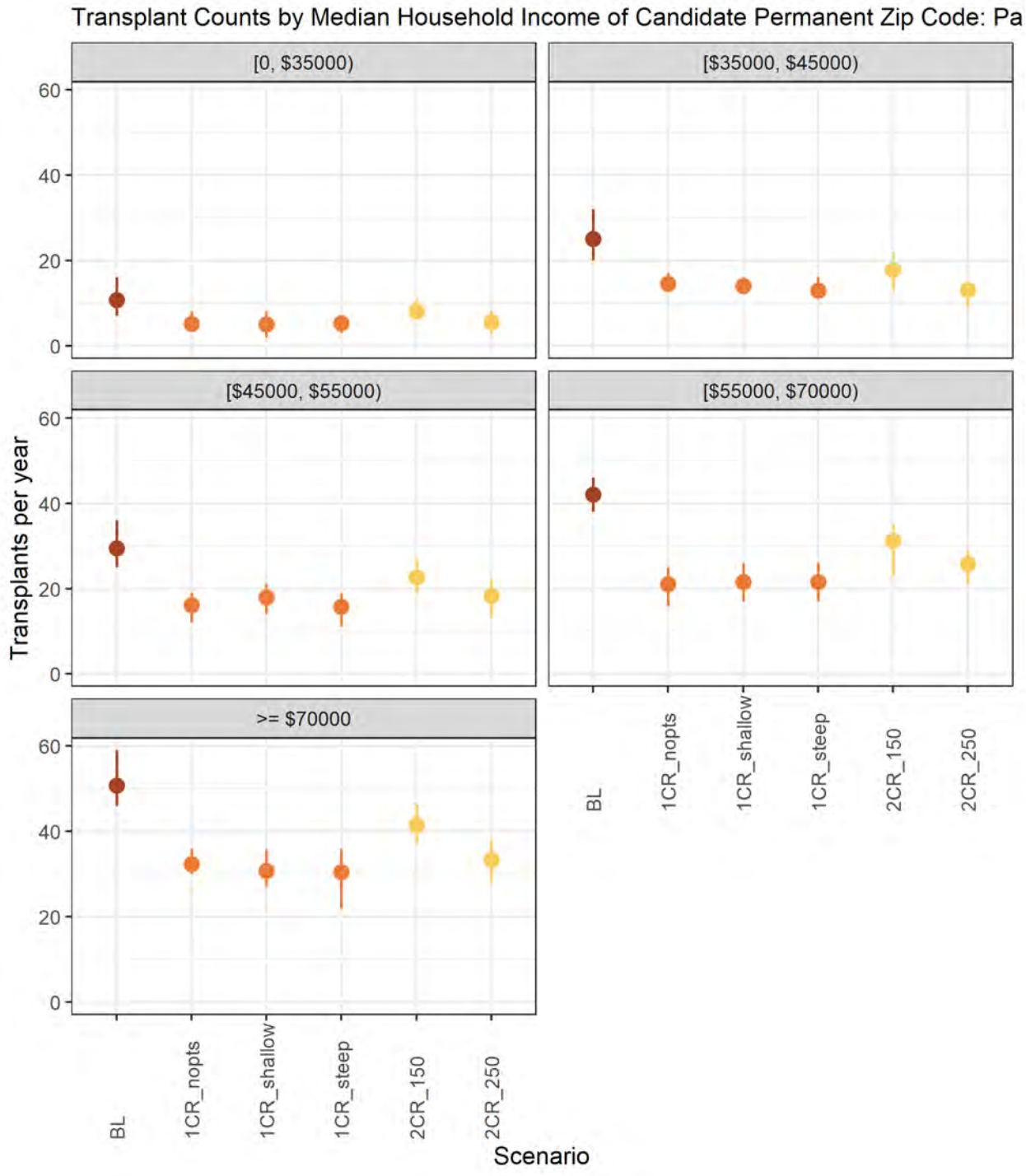
Transplant Counts: Median Household Income of Candidate Permanent Zip Code



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

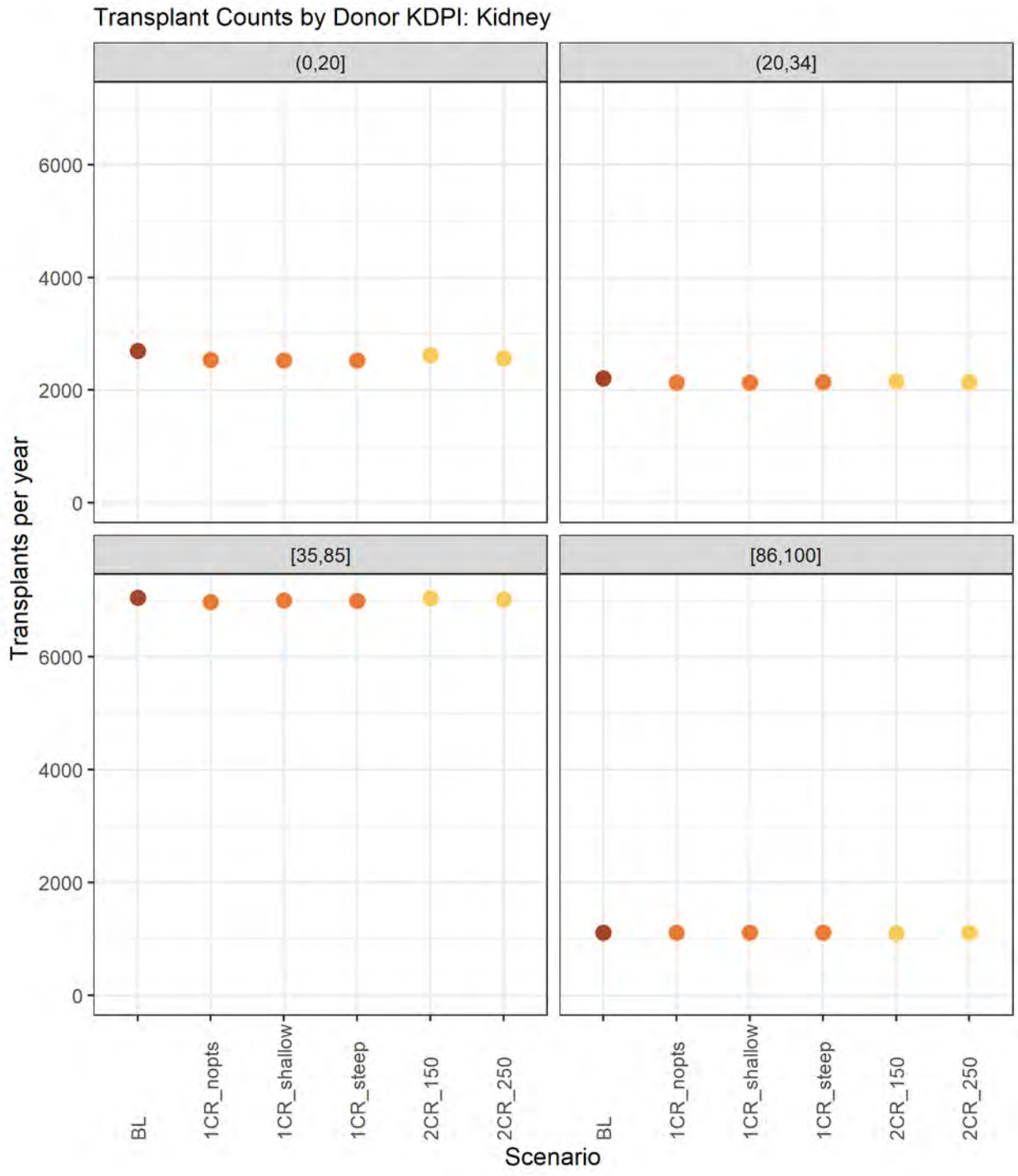


Transplant Counts by Median Household Income of Candidate Permanent Zip Code: Kidney-Pancreas



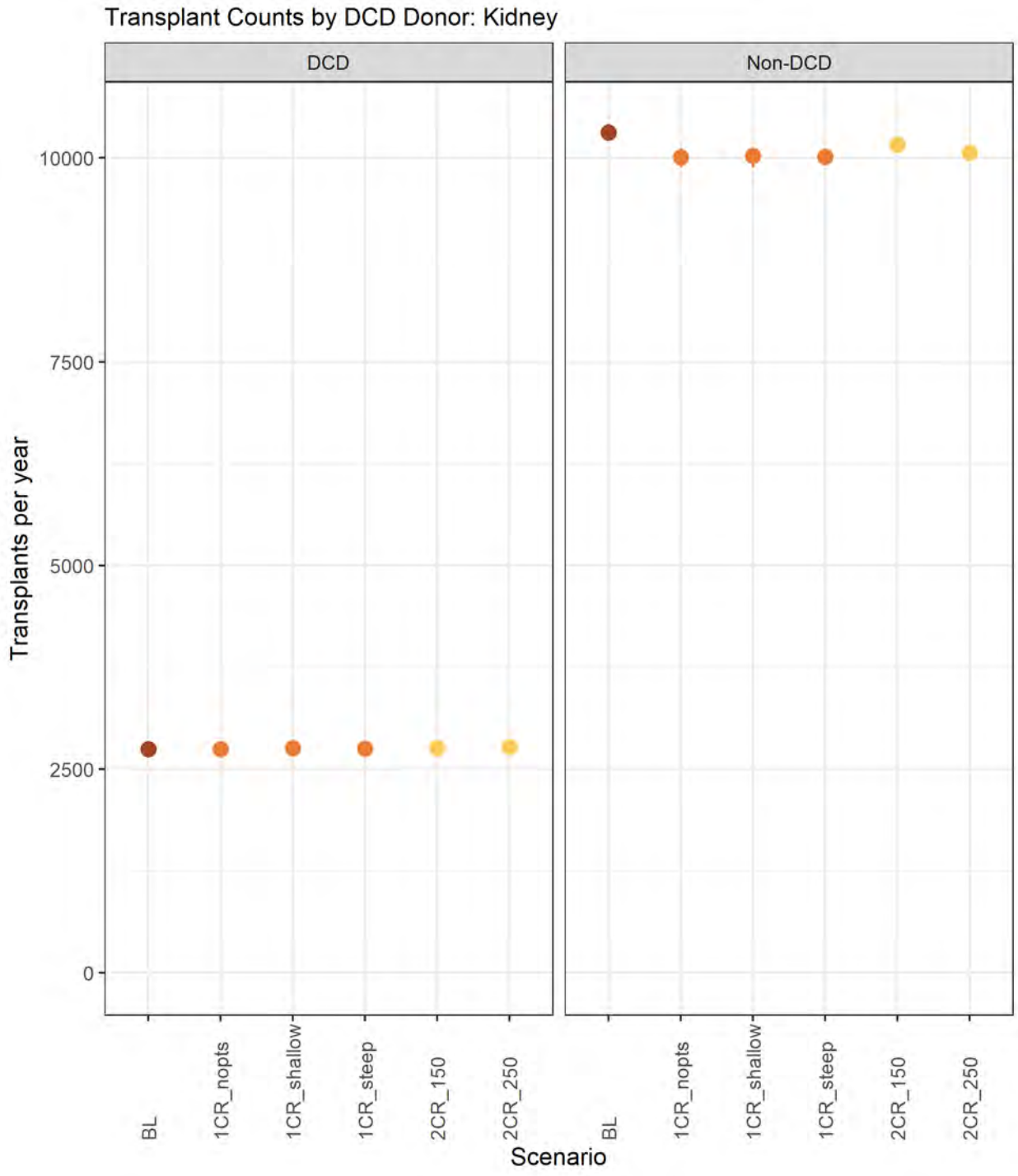
Transplant Counts by Median Household Income of Candidate Permanent Zip Code: Pancreas

Transplant Counts: Donor KDPI



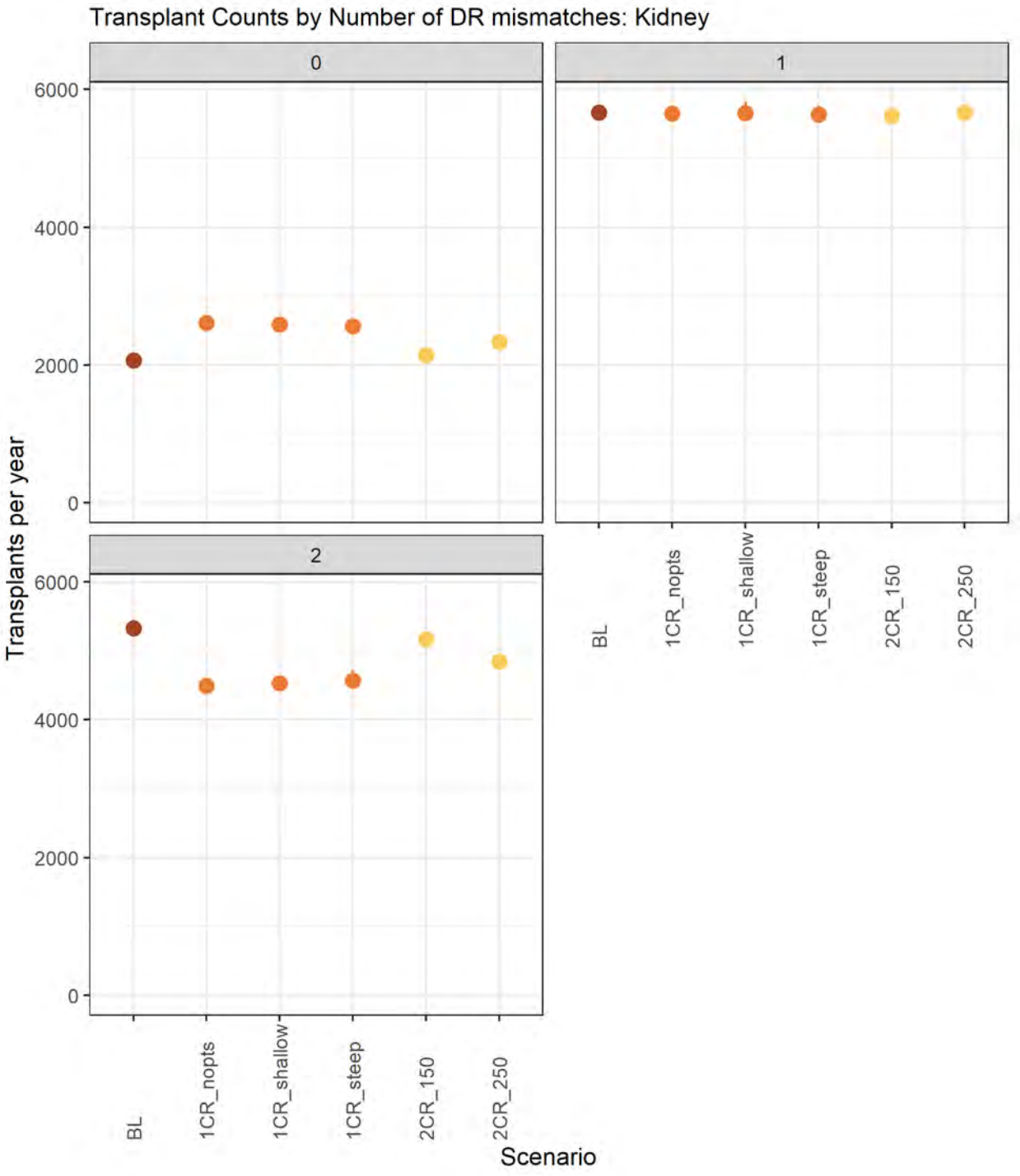
Transplant Counts by Donor KDPI: Kidney

Transplant Counts: DCD Donor



Transplant Counts by DCD Donor: Kidney

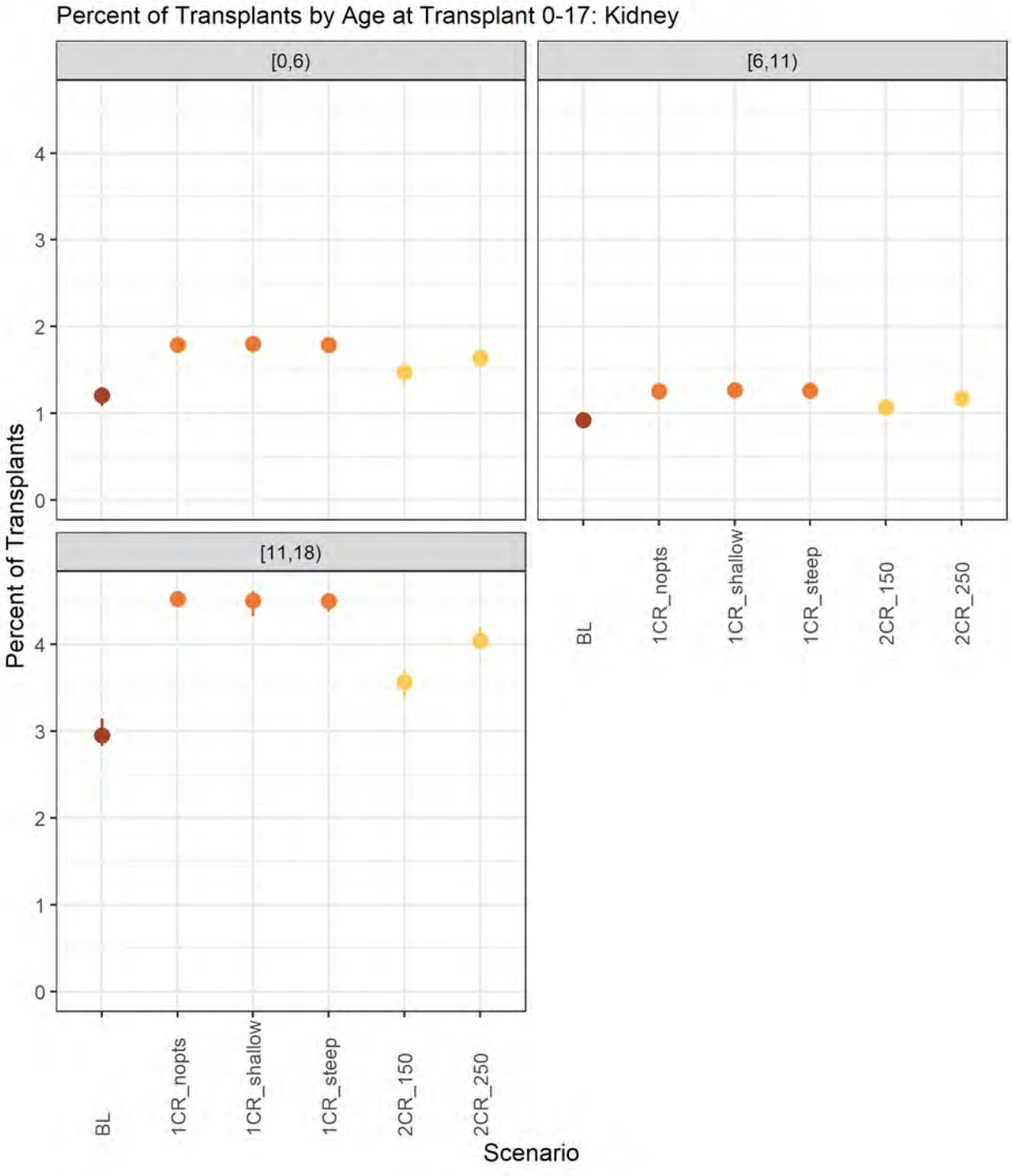
Transplant Counts: Number of DR mismatches



Transplant Counts by Number of DR mismatches: Kidney

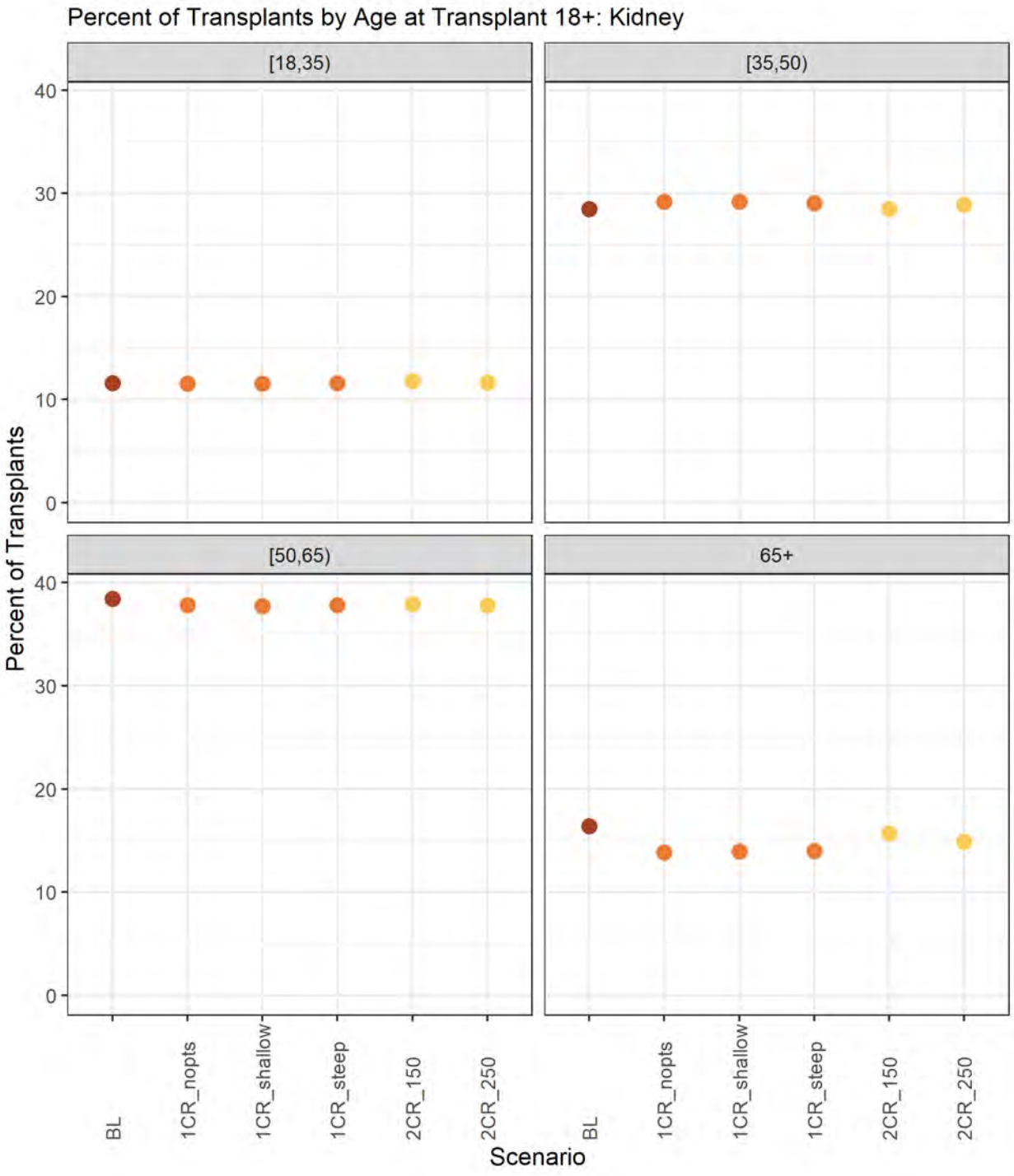
Transplant Percentages

Transplant Percentages: Age at Transplant 0-17

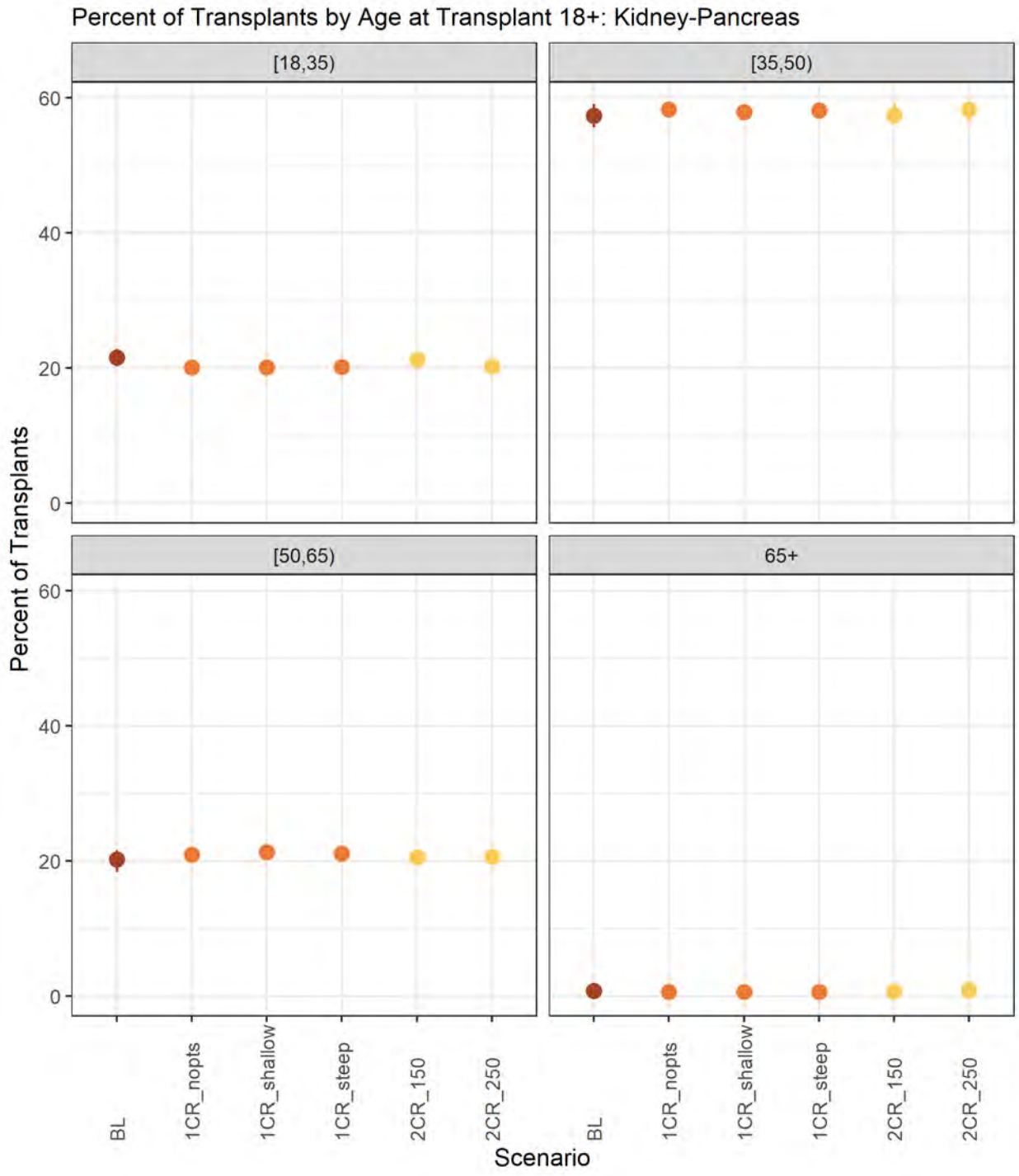


Percent of Transplants by Age at Transplant 0-17: Kidney

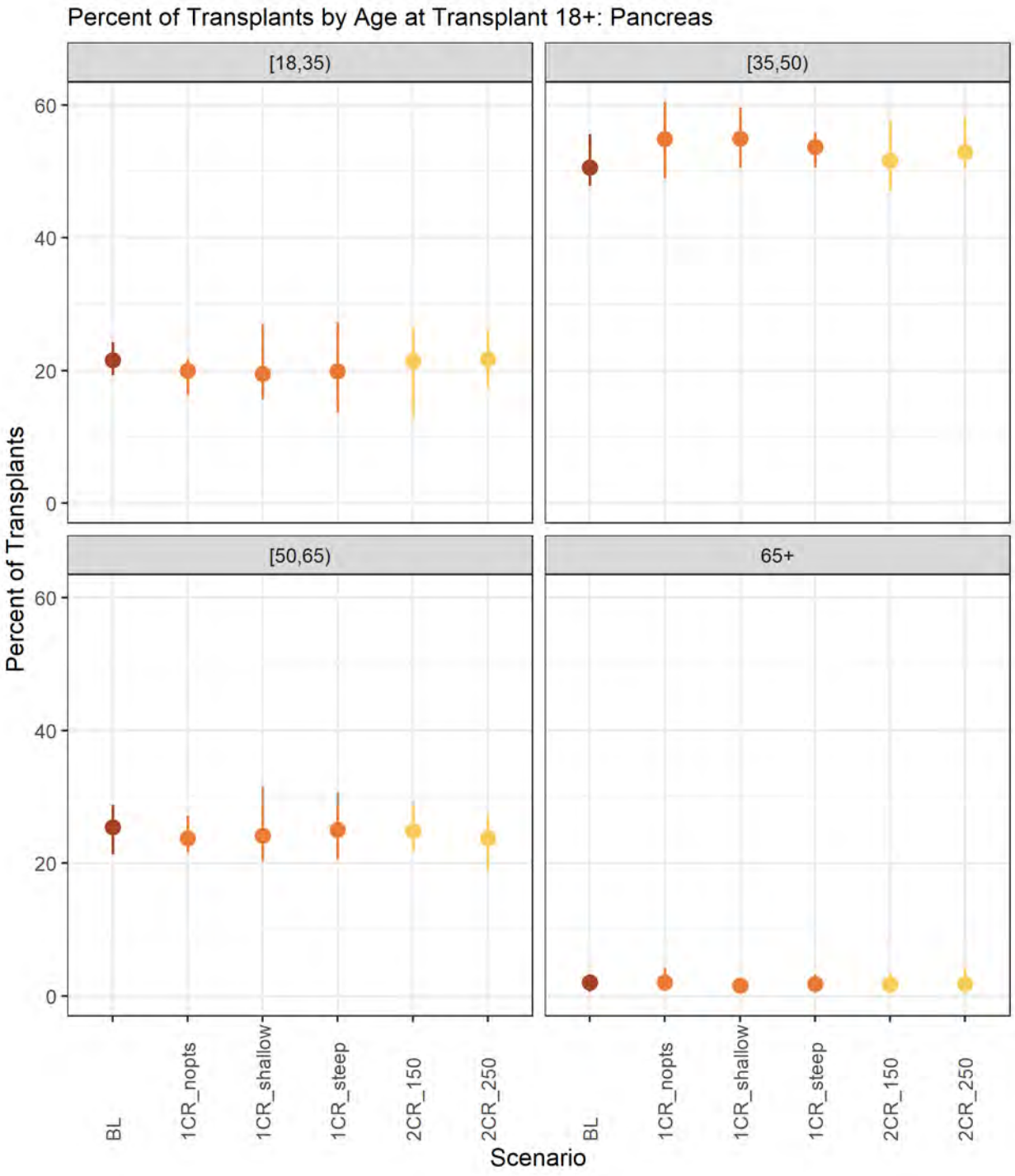
Transplant Percentages: Age at Transplant 18+



Percent of Transplants by Age at Transplant 18+: Kidney

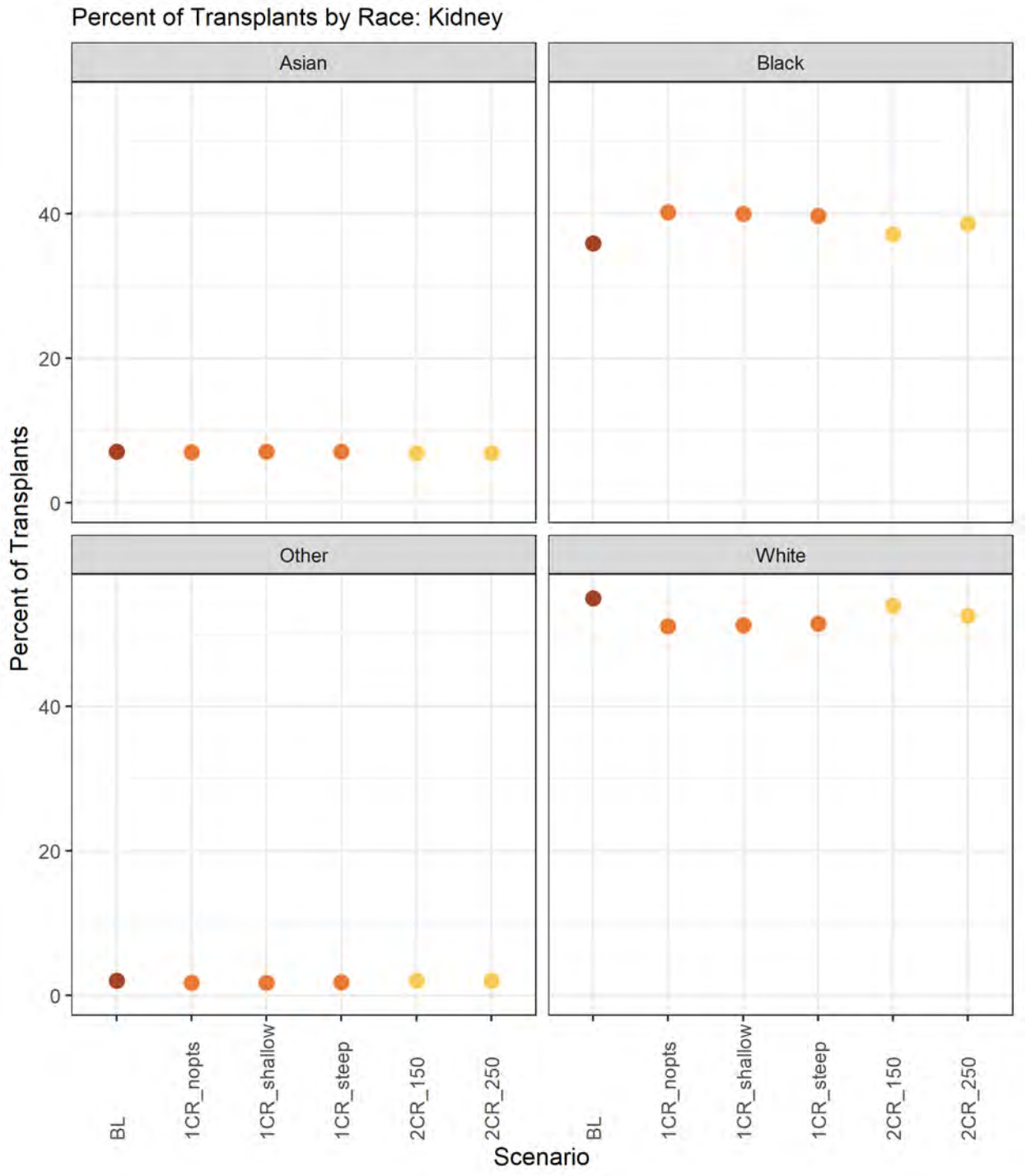


Percent of Transplants by Age at Transplant 18+: Kidney-Pancreas

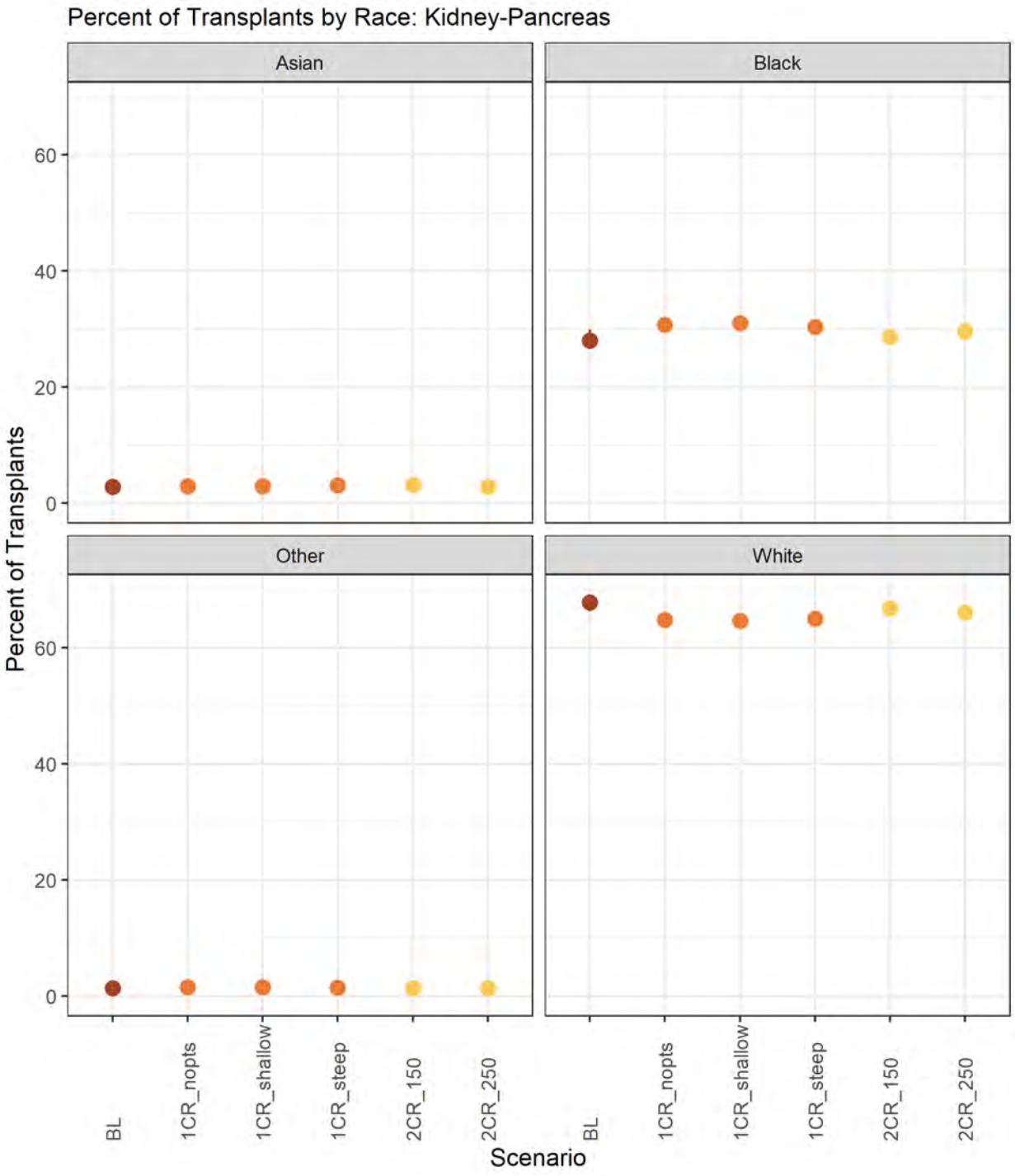


Percent of Transplants by Age at Transplant 18+: Pancreas

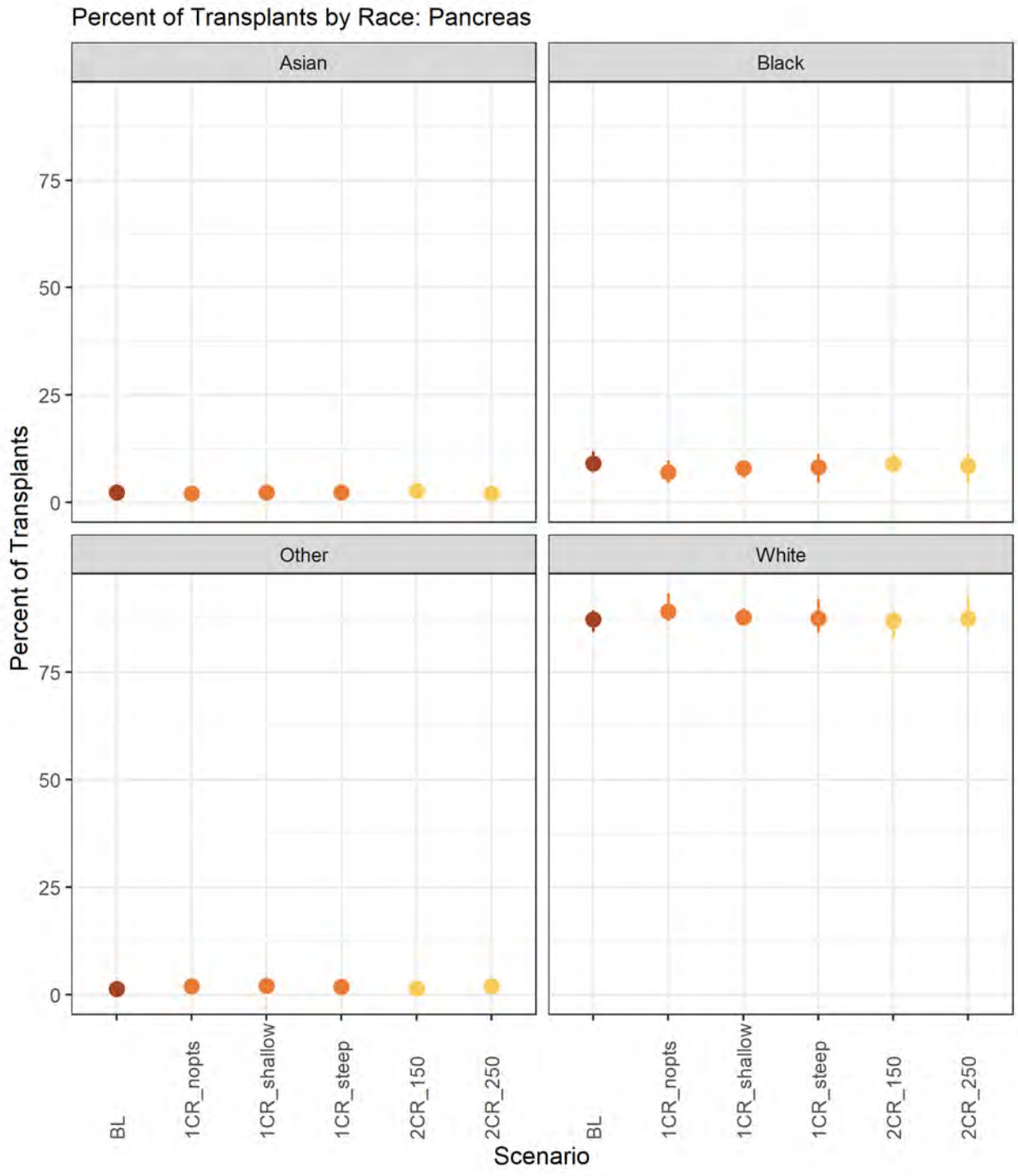
Transplant Percentages: Race



Percent of Transplants by Race: Kidney

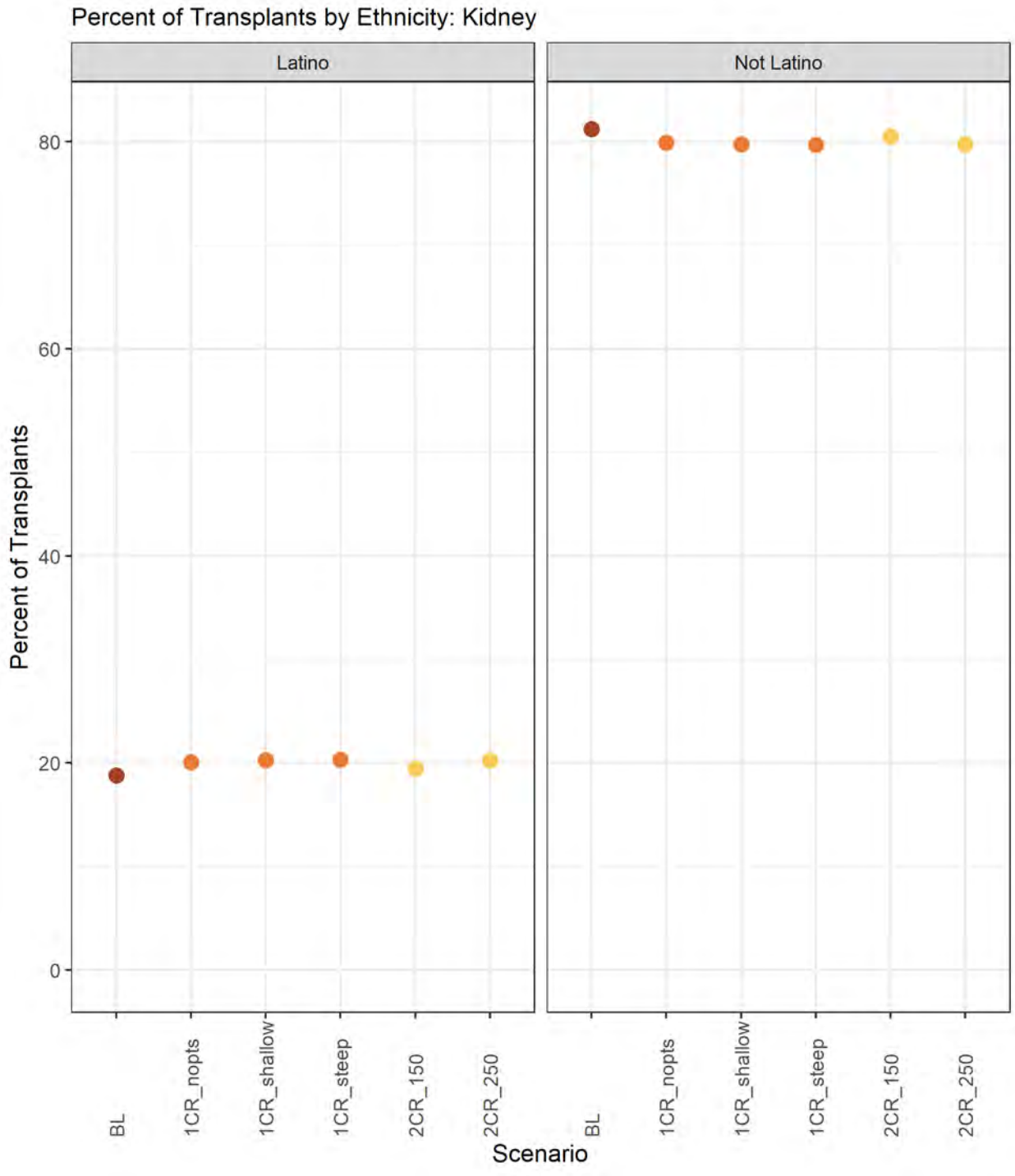


Percent of Transplants by Race: Kidney-Pancreas

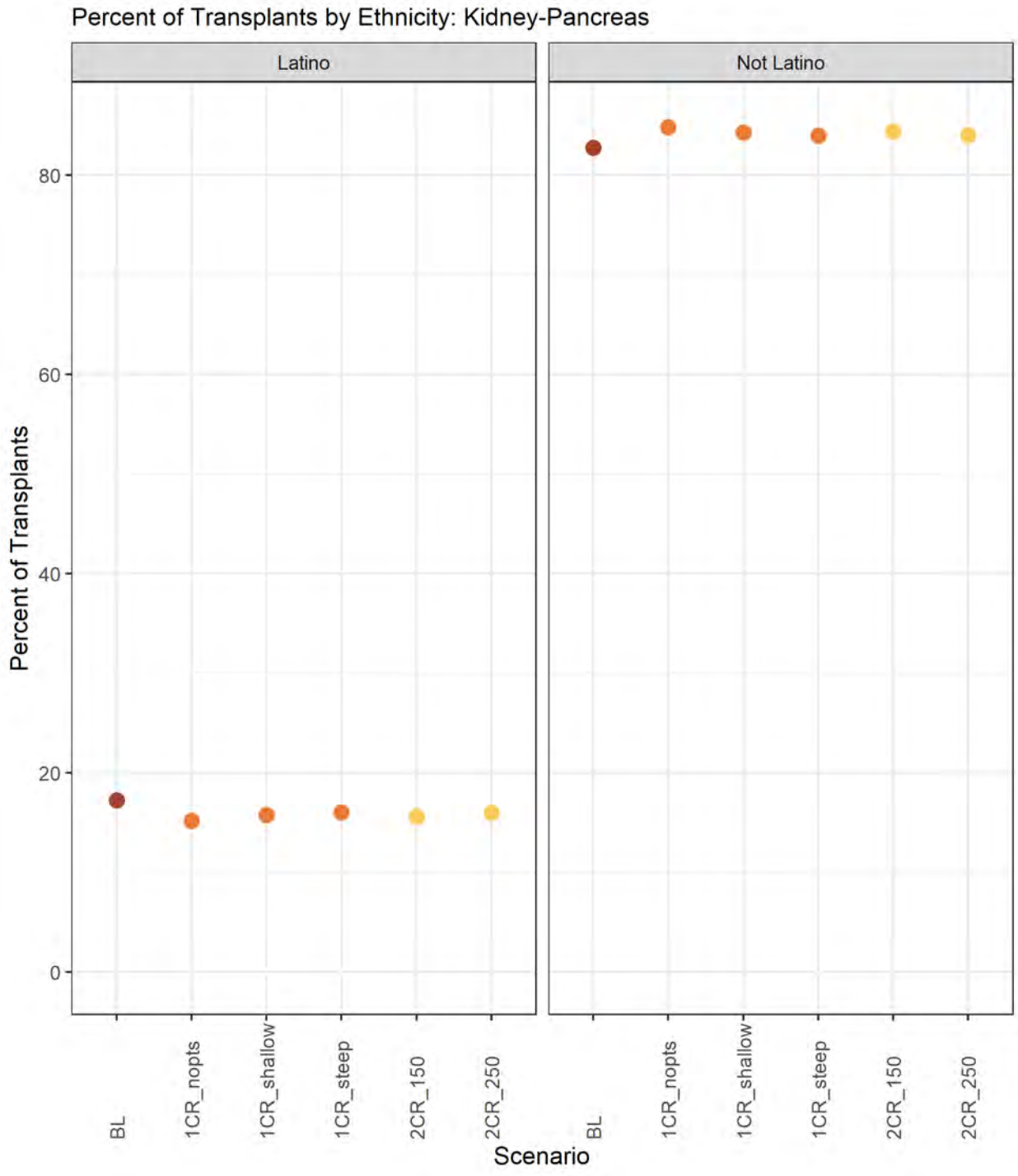


Percent of Transplants by Race: Pancreas

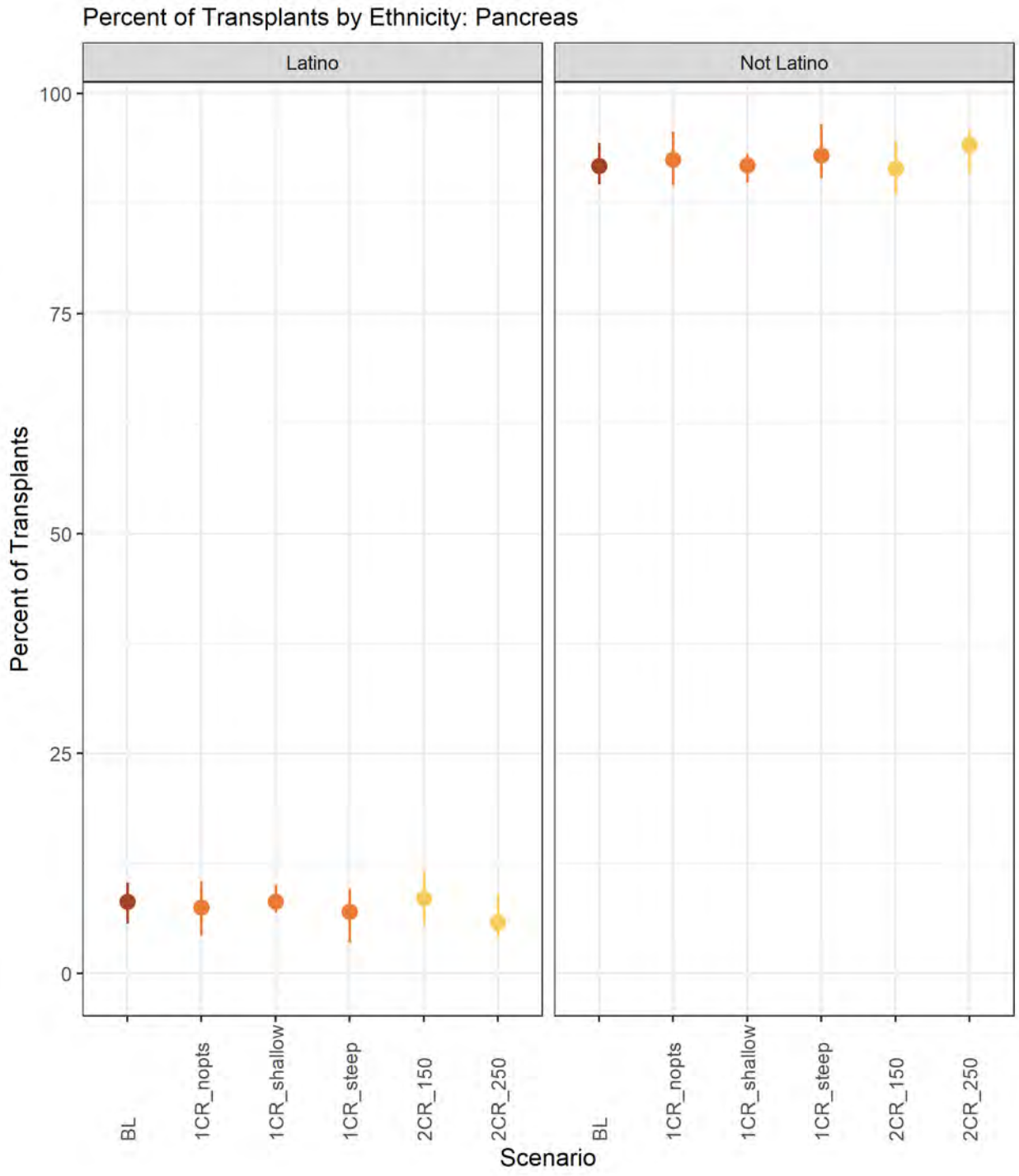
Transplant Percentages: Ethnicity



Percent of Transplants by Ethnicity: Kidney

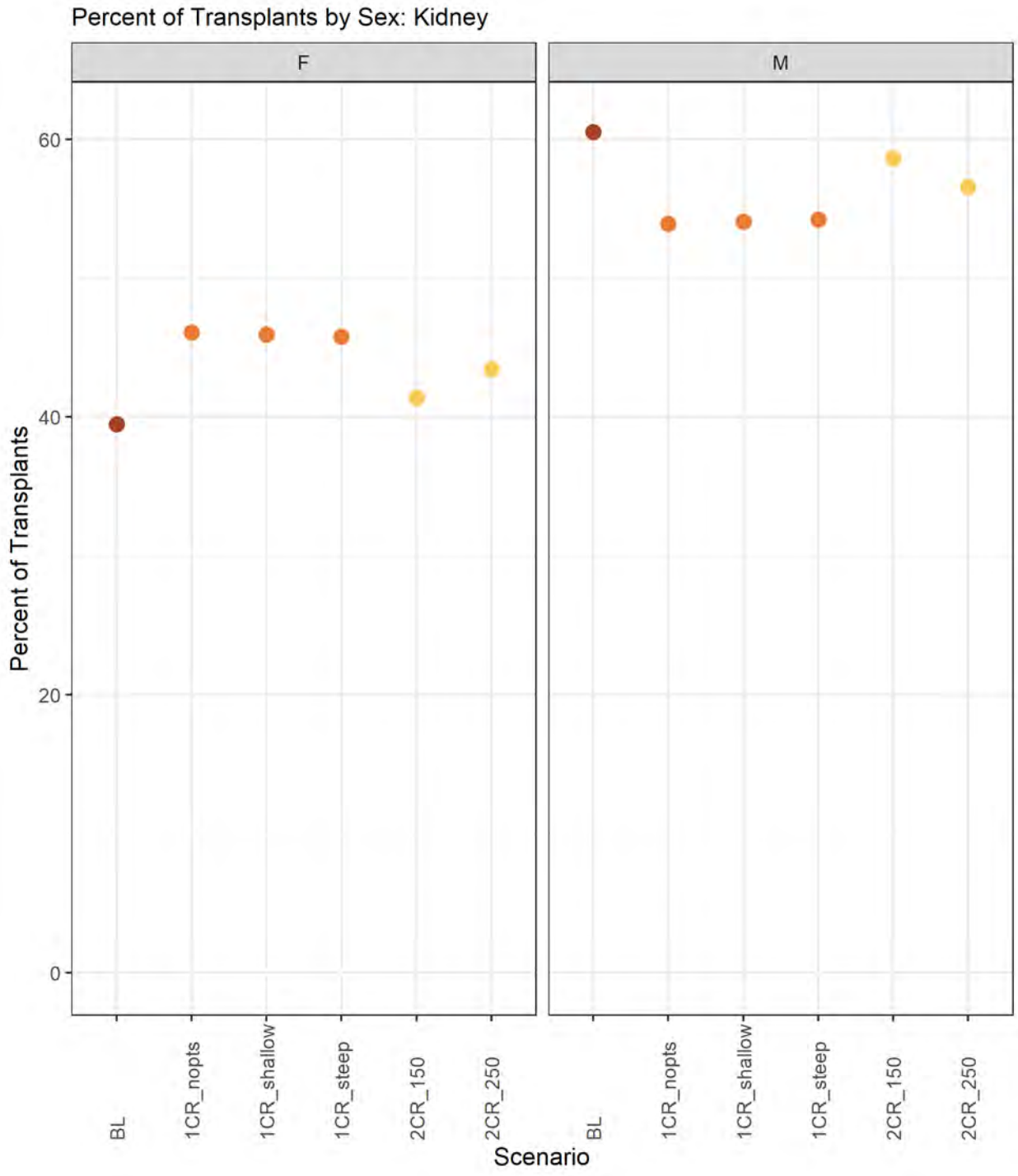


Percent of Transplants by Ethnicity: Kidney-Pancreas

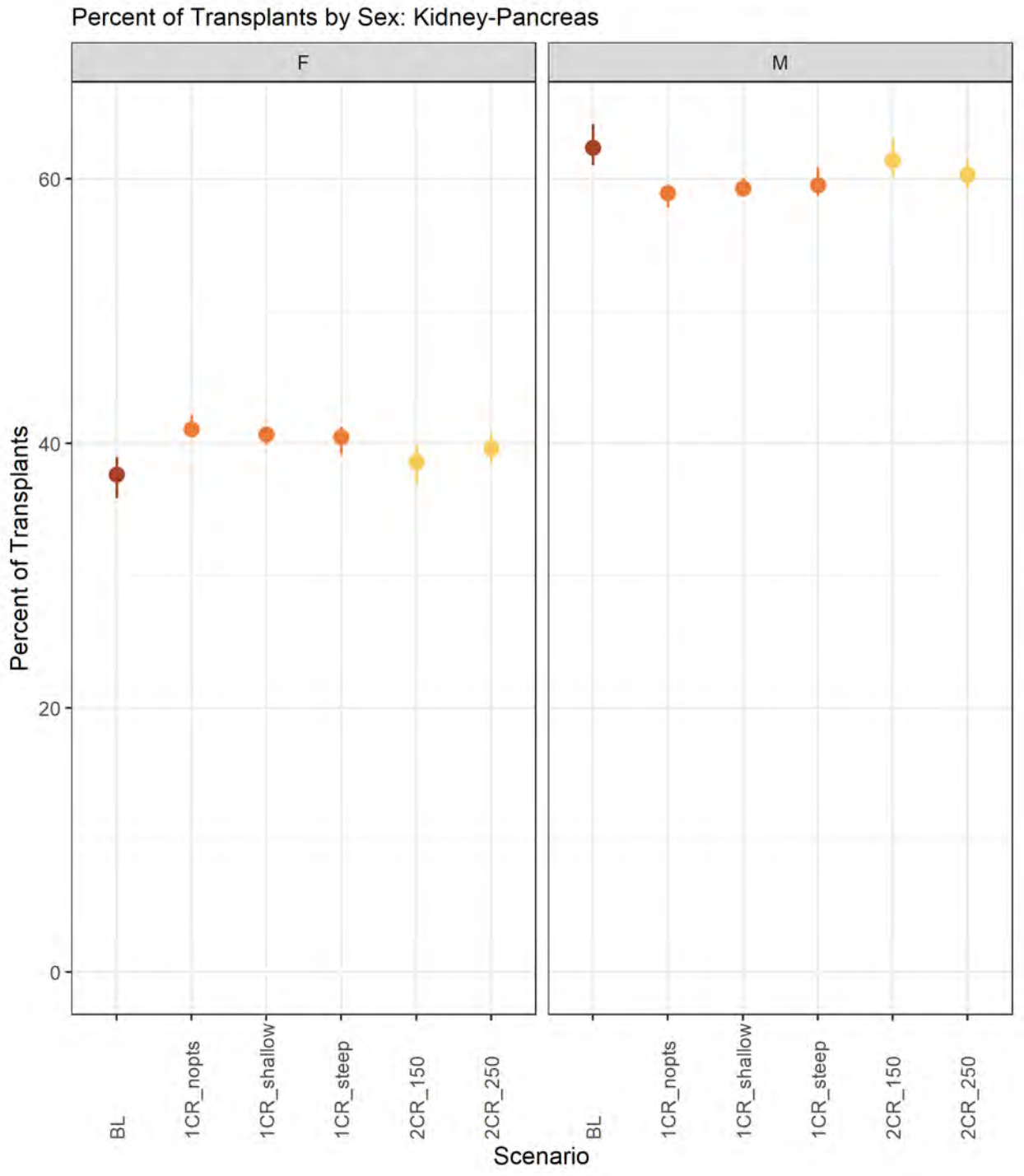


Percent of Transplants by Ethnicity: Pancreas

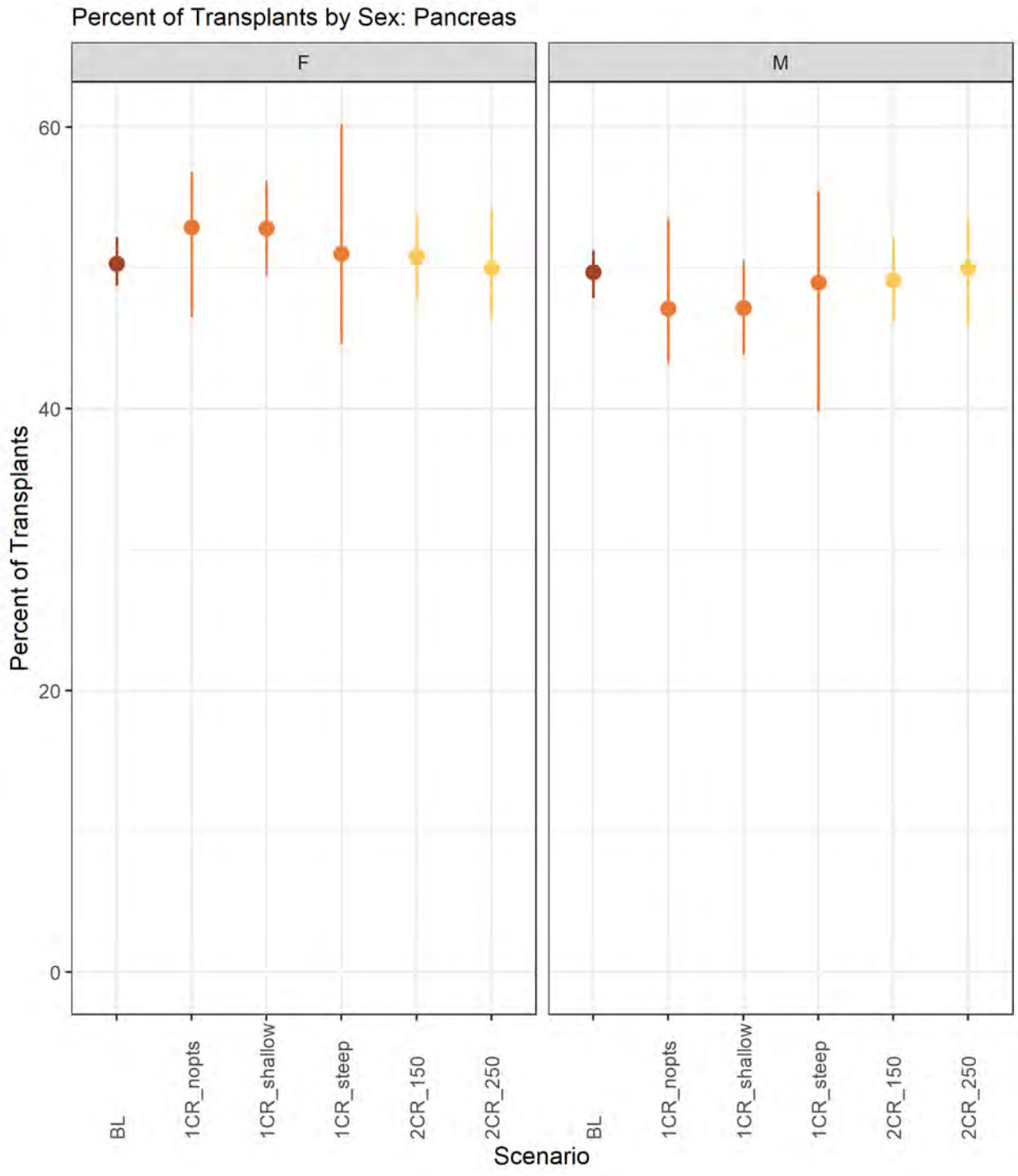
Transplant Percentages: Sex



Percent of Transplants by Sex: Kidney

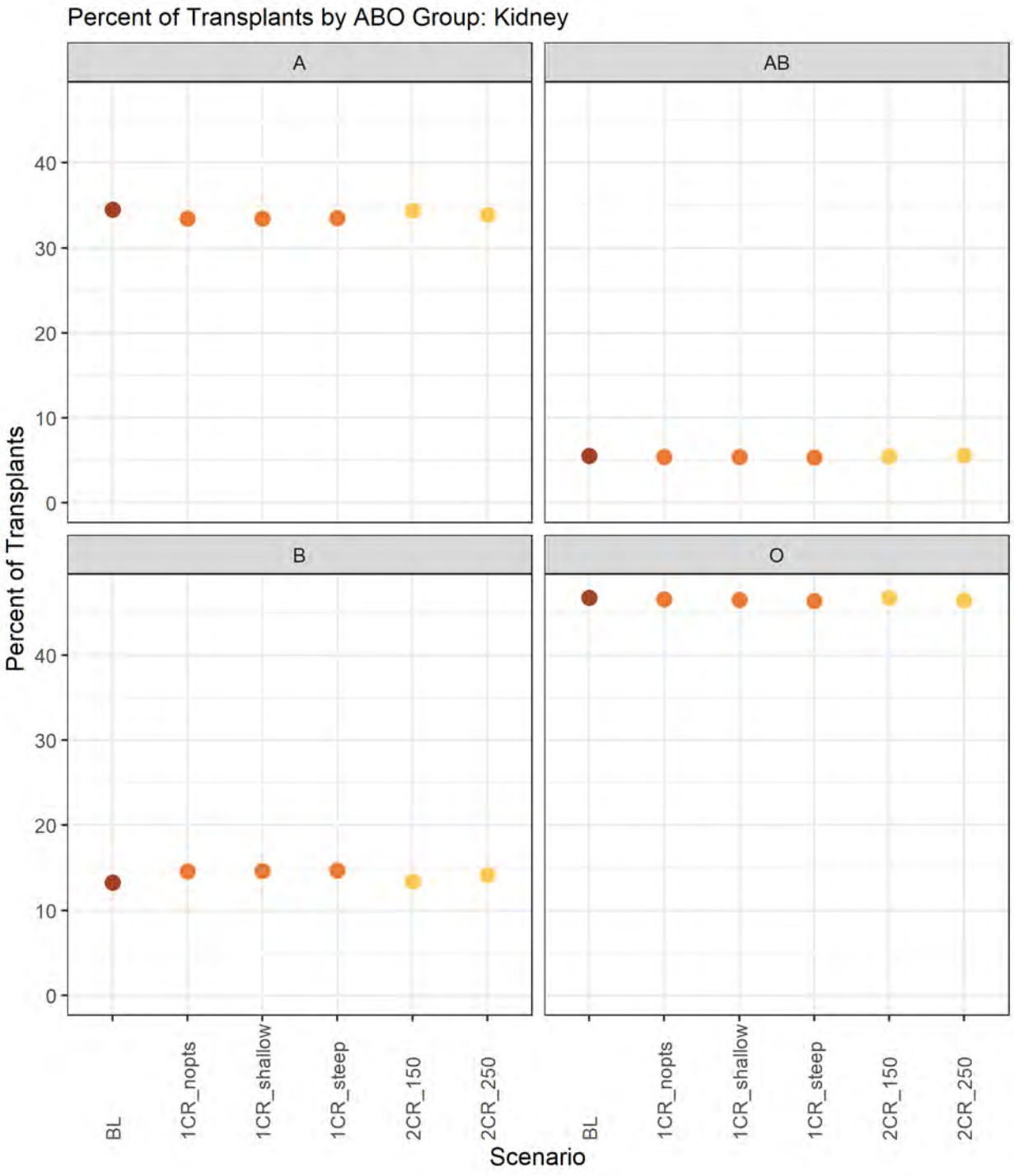


Percent of Transplants by Sex: Kidney-Pancreas

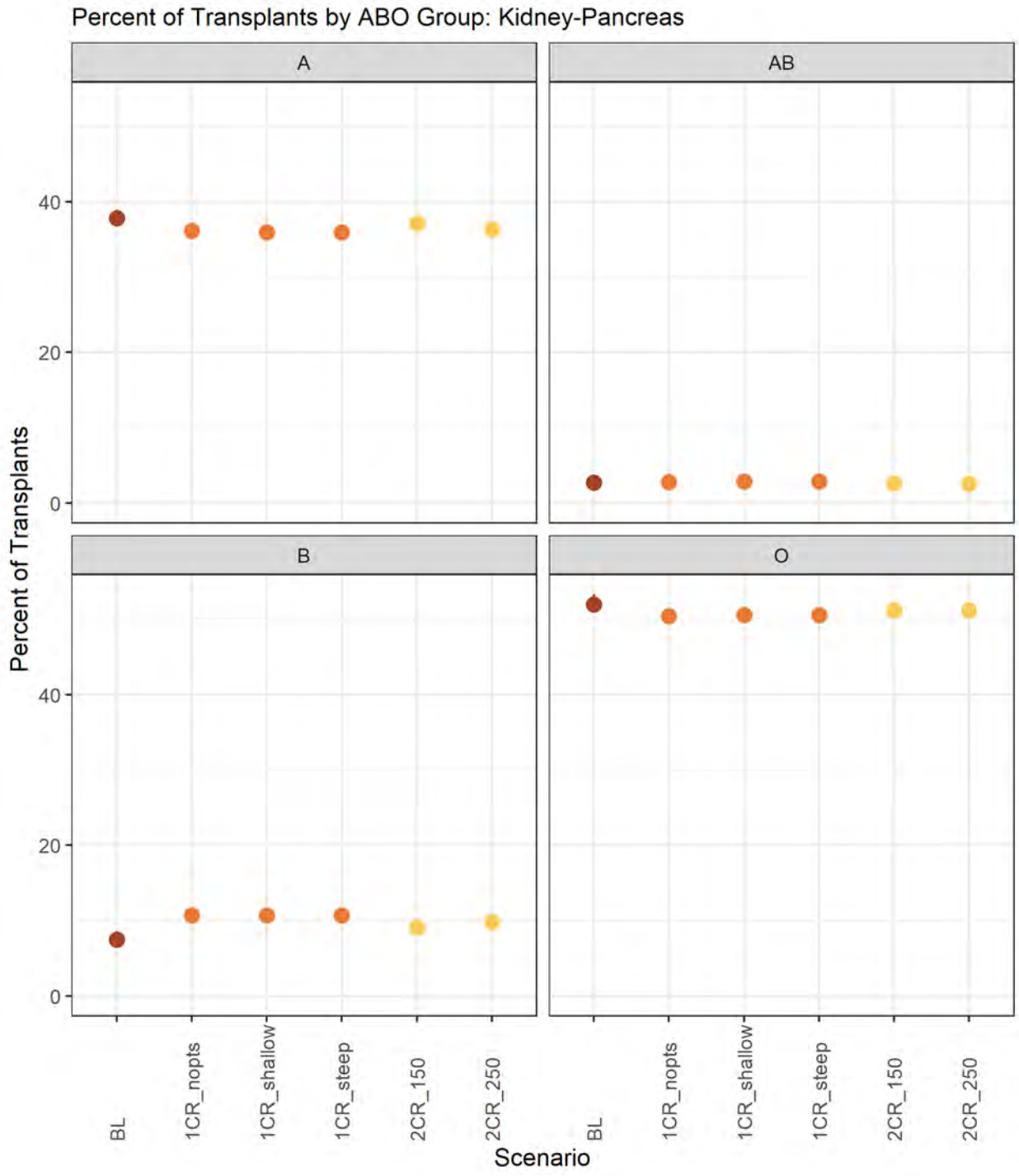


Percent of Transplants by Sex: Pancreas

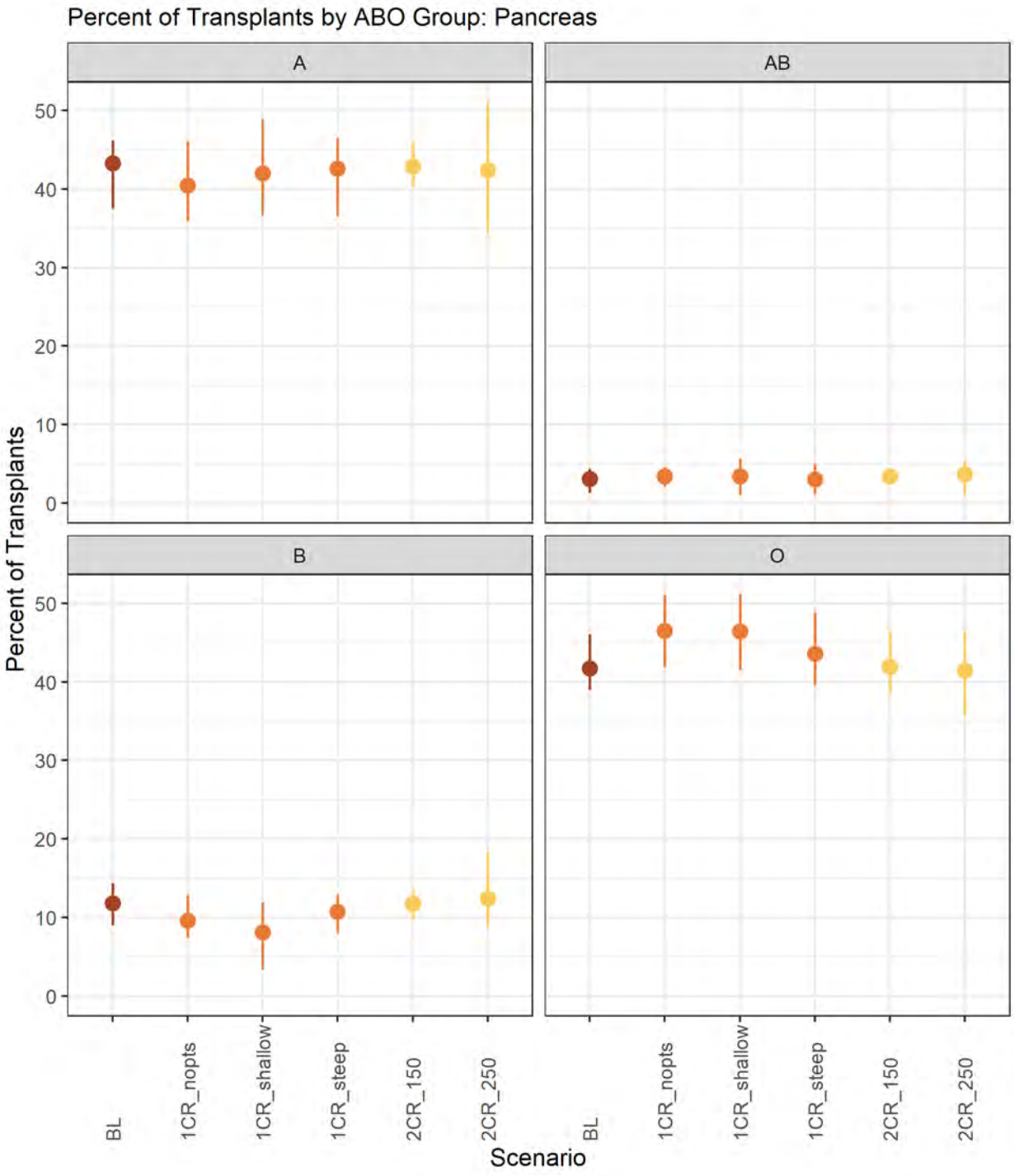
Transplant Percentages: ABO Group



Percent of Transplants by ABO Group: Kidney

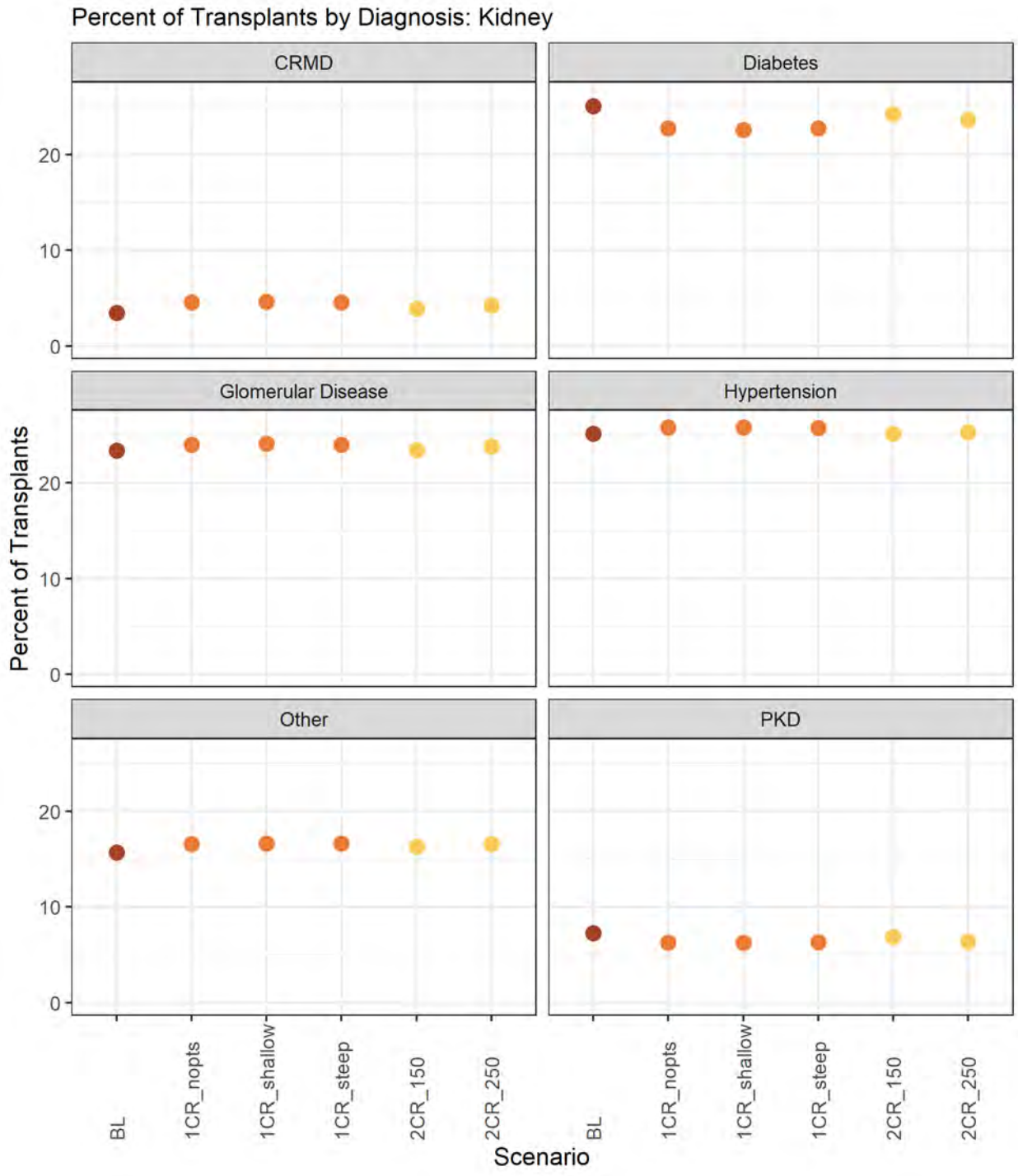


Percent of Transplants by ABO Group: Kidney-Pancreas

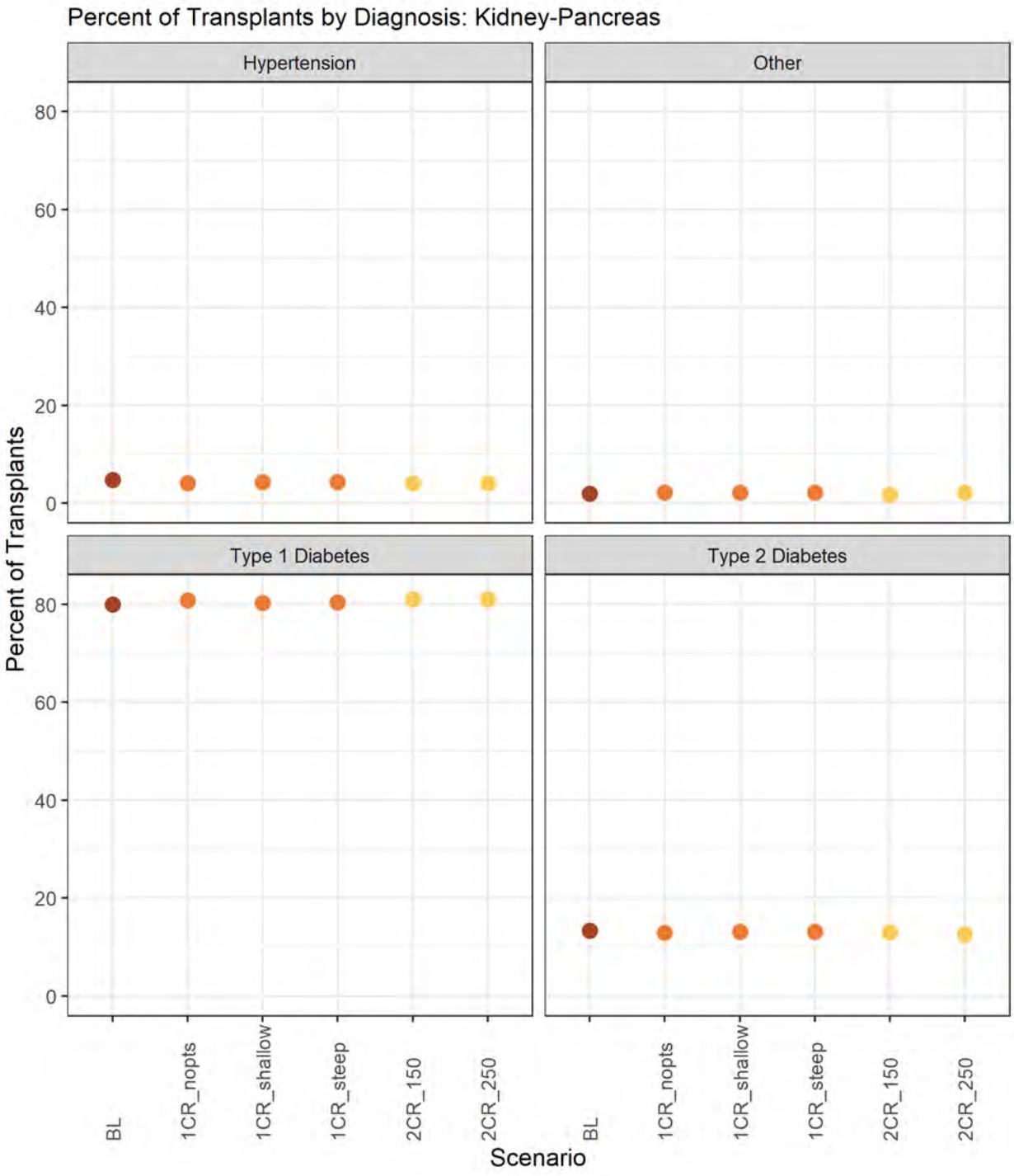


Percent of Transplants by ABO Group: Pancreas

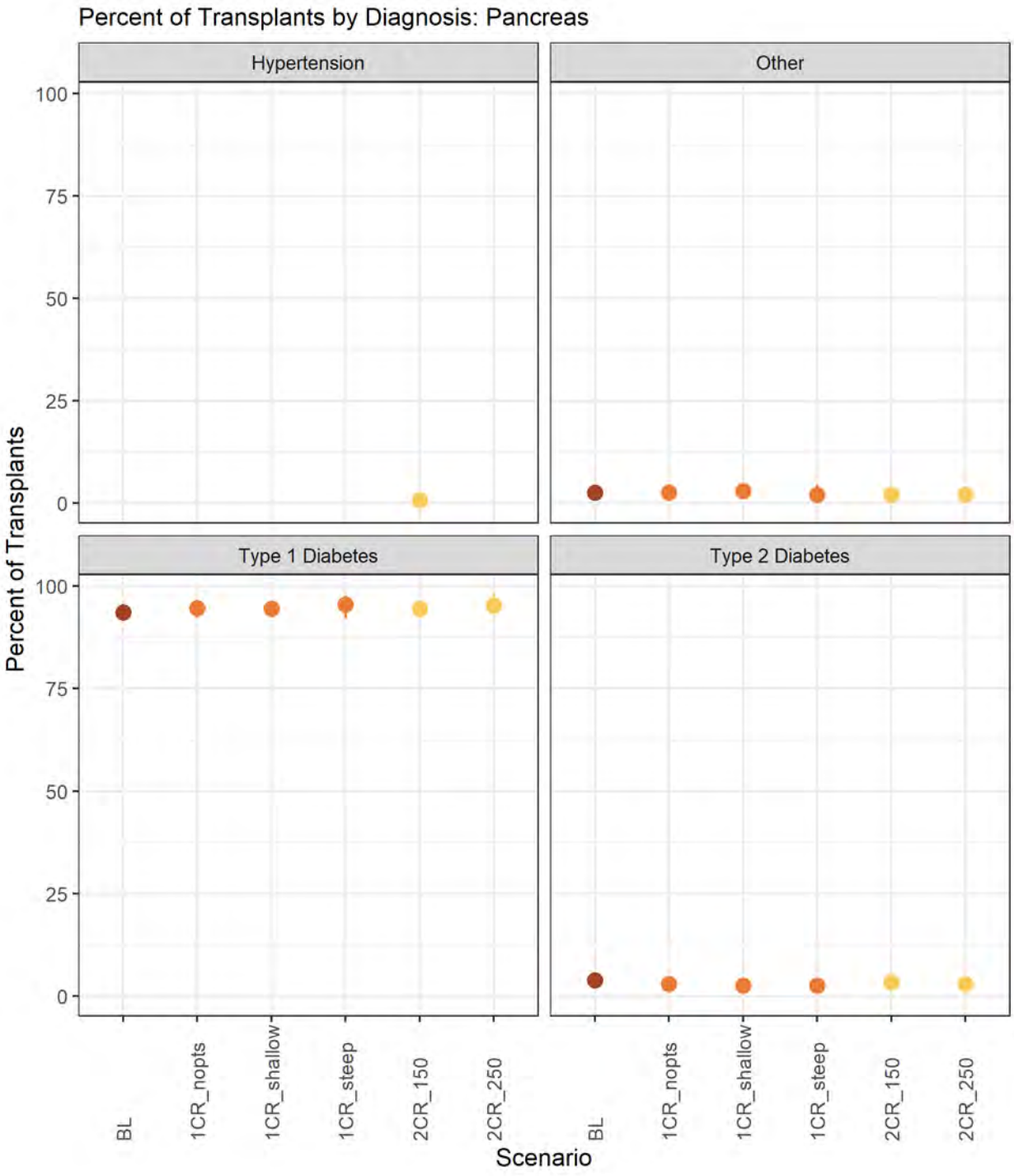
Transplant Percentages: Diagnosis



Percent of Transplants by Diagnosis: Kidney

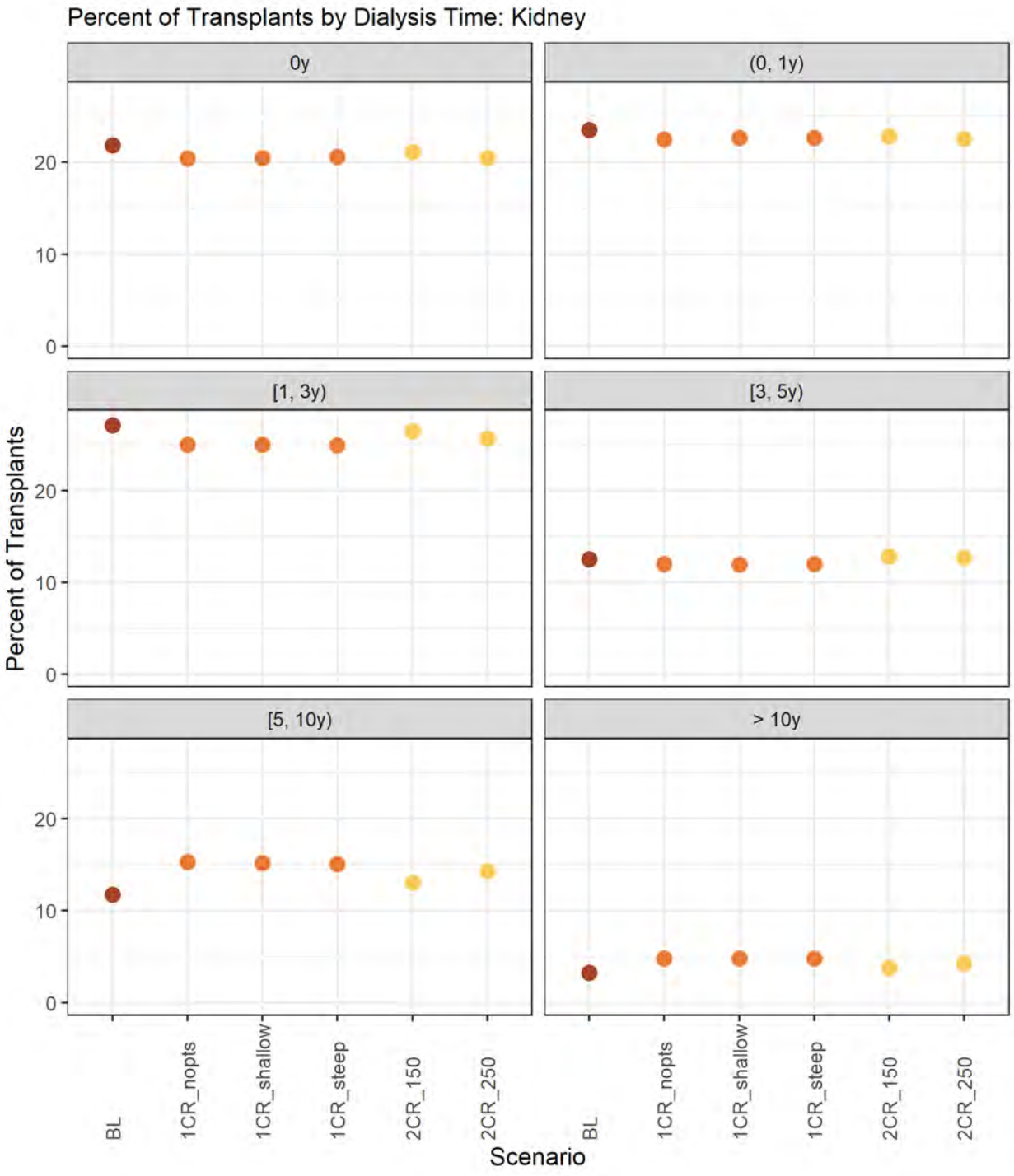


Percent of Transplants by Diagnosis: Kidney-Pancreas



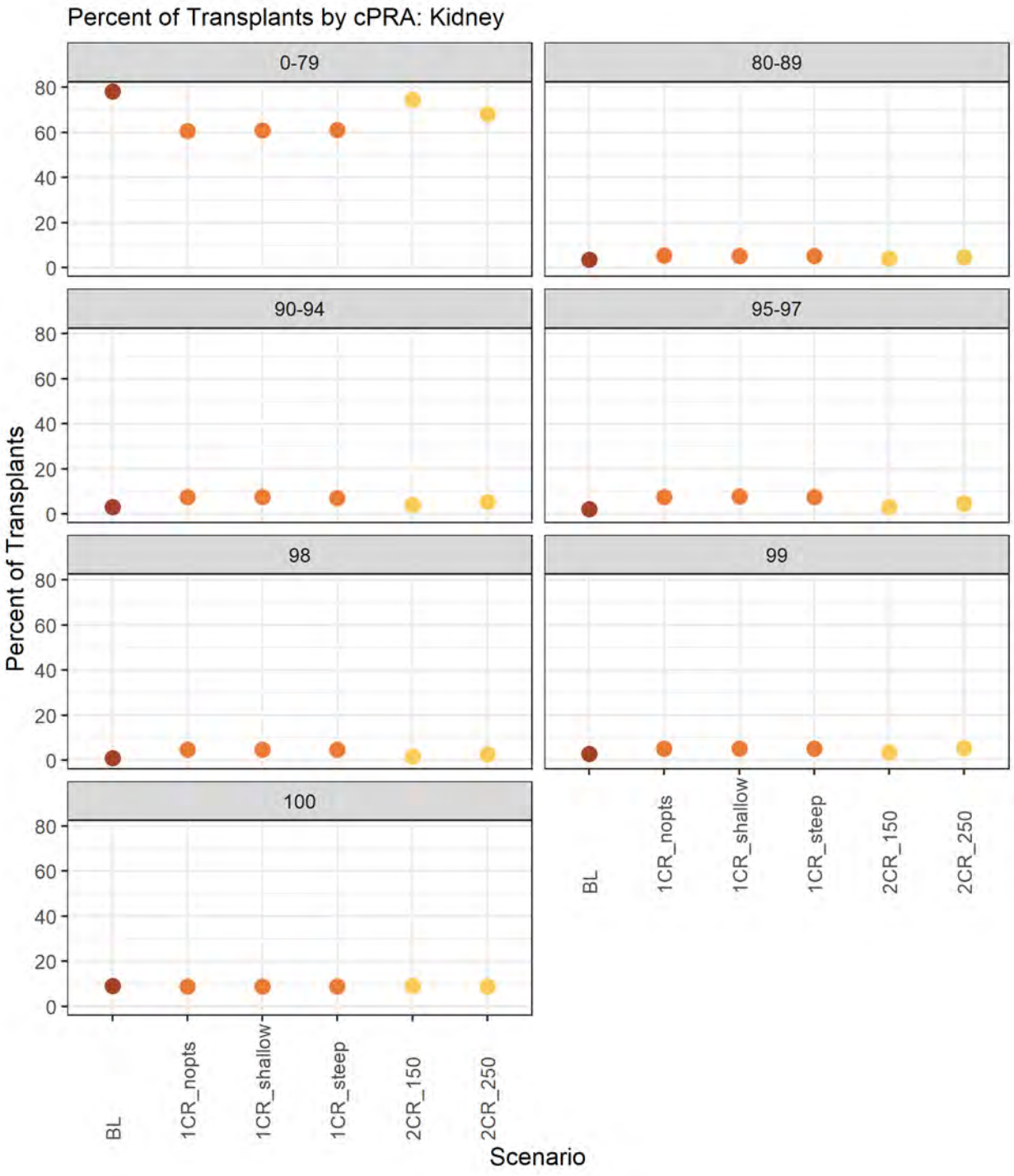
Percent of Transplants by Diagnosis: Pancreas

Transplant Percentages: Dialysis Time

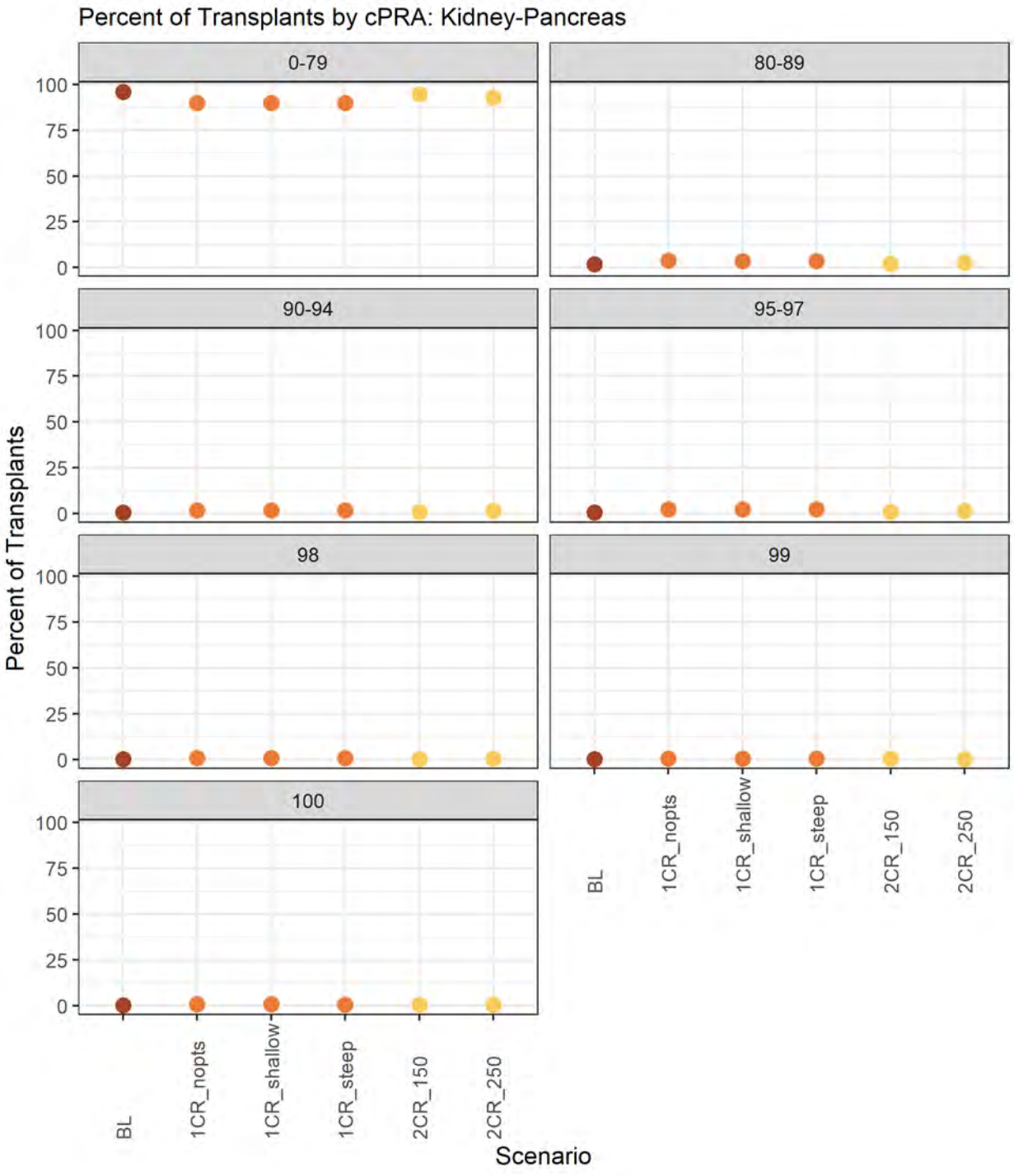


Percent of Transplants by Dialysis Time: Kidney

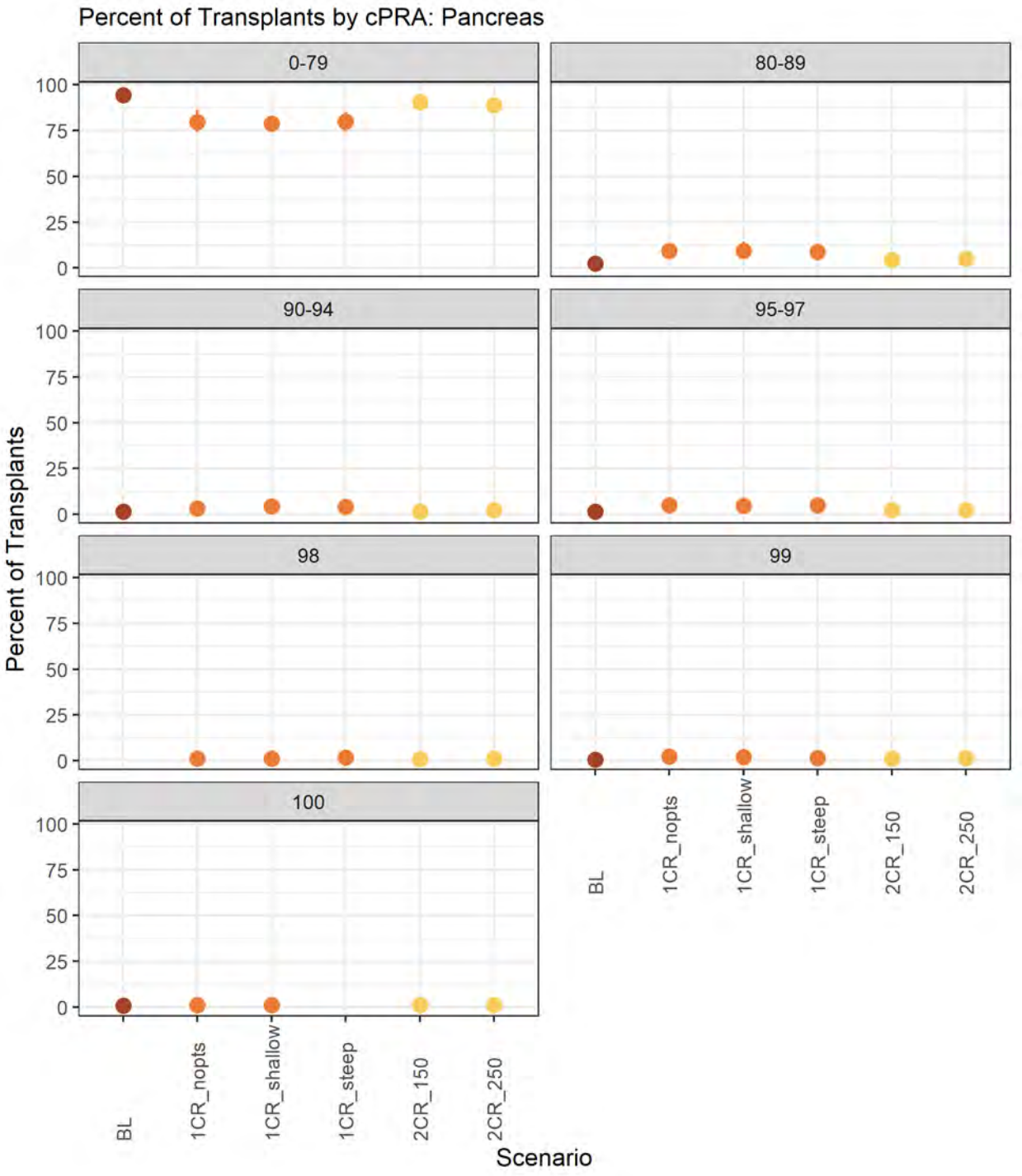
Transplant Percentages: cPRA



Percent of Transplants by cPRA: Kidney

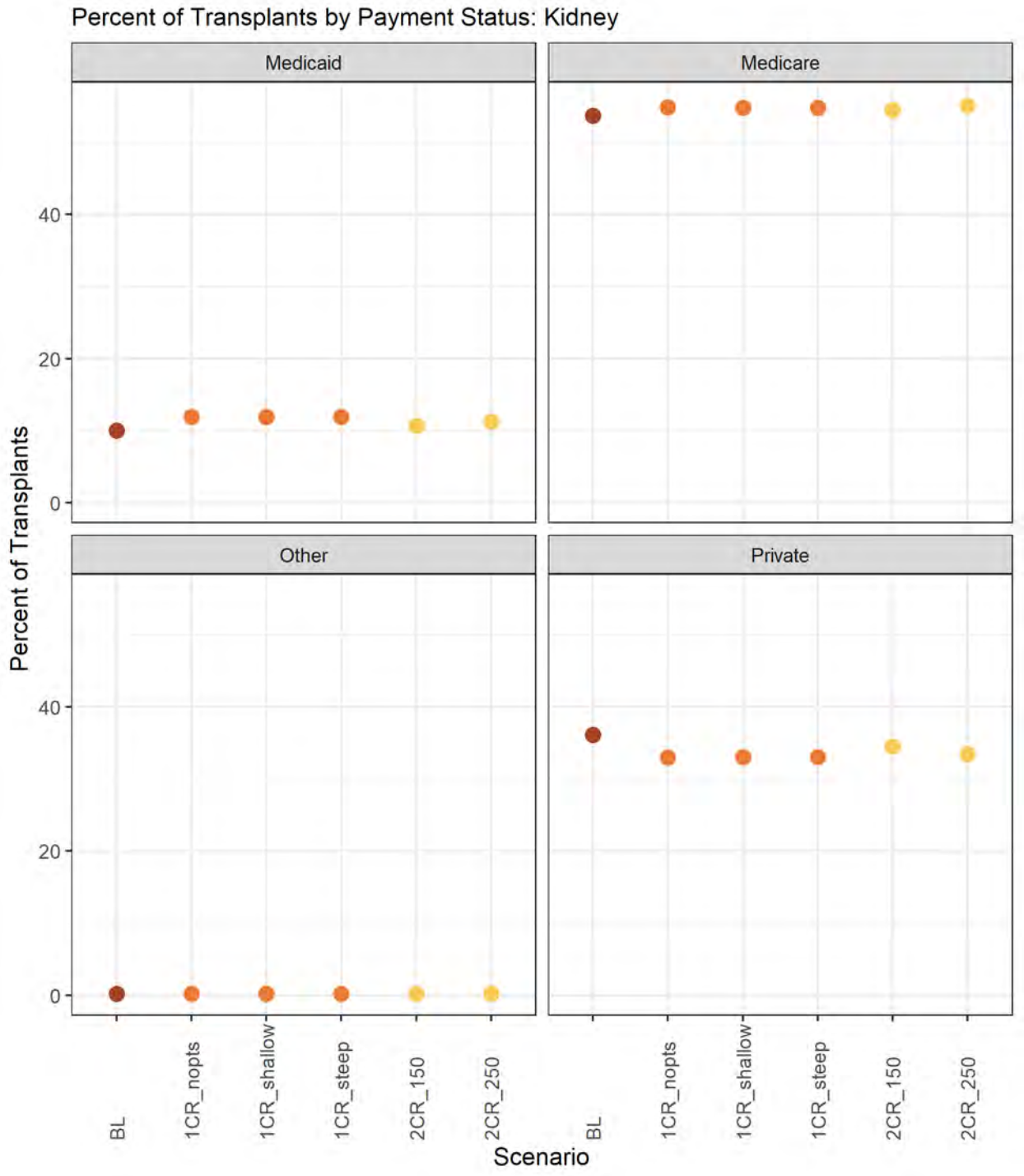


Percent of Transplants by cPRA: Kidney-Pancreas

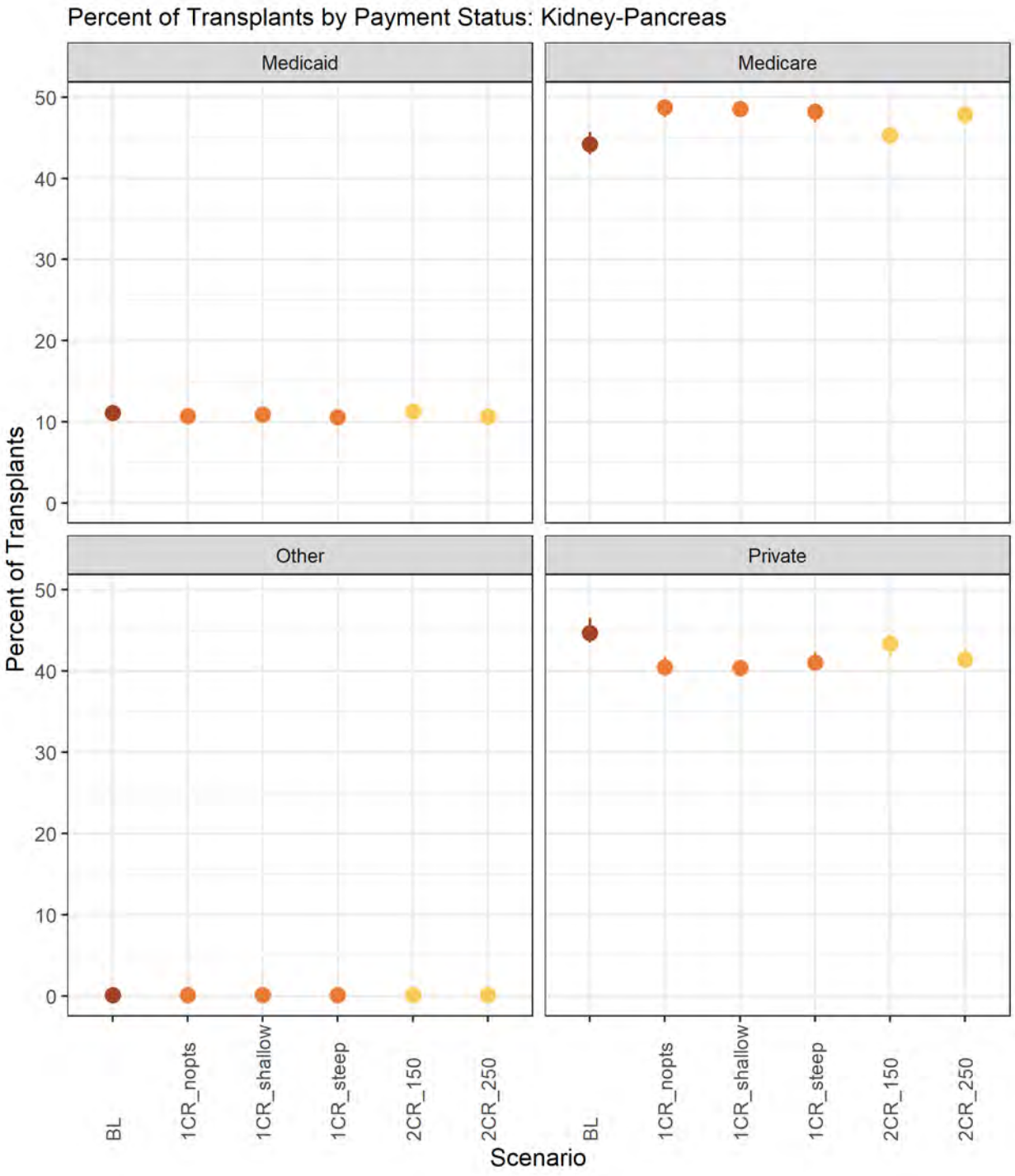


Percent of Transplants by cPRA: Pancreas

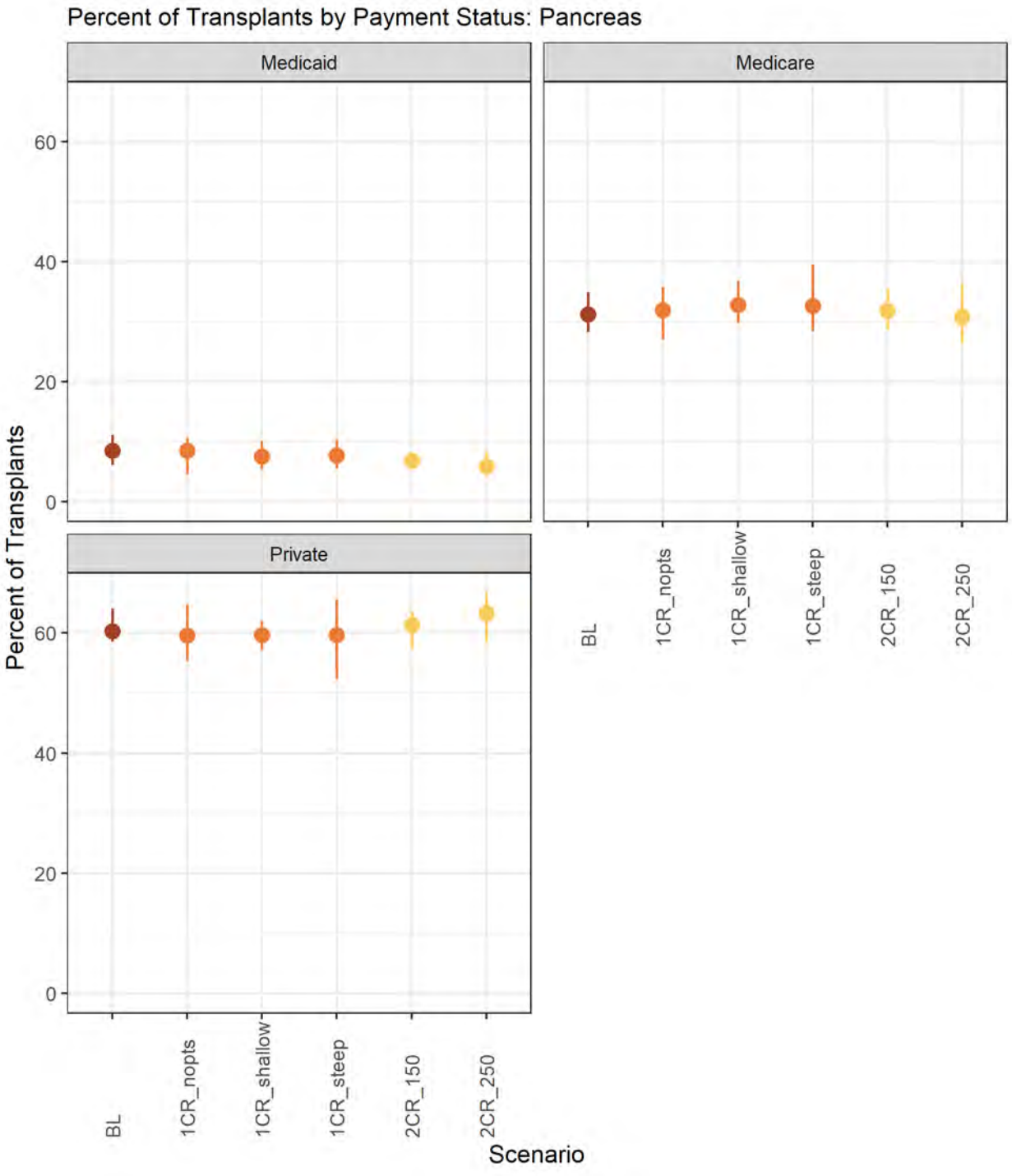
Transplant Percentages: Payment Status



Percent of Transplants by Payment Status: Kidney

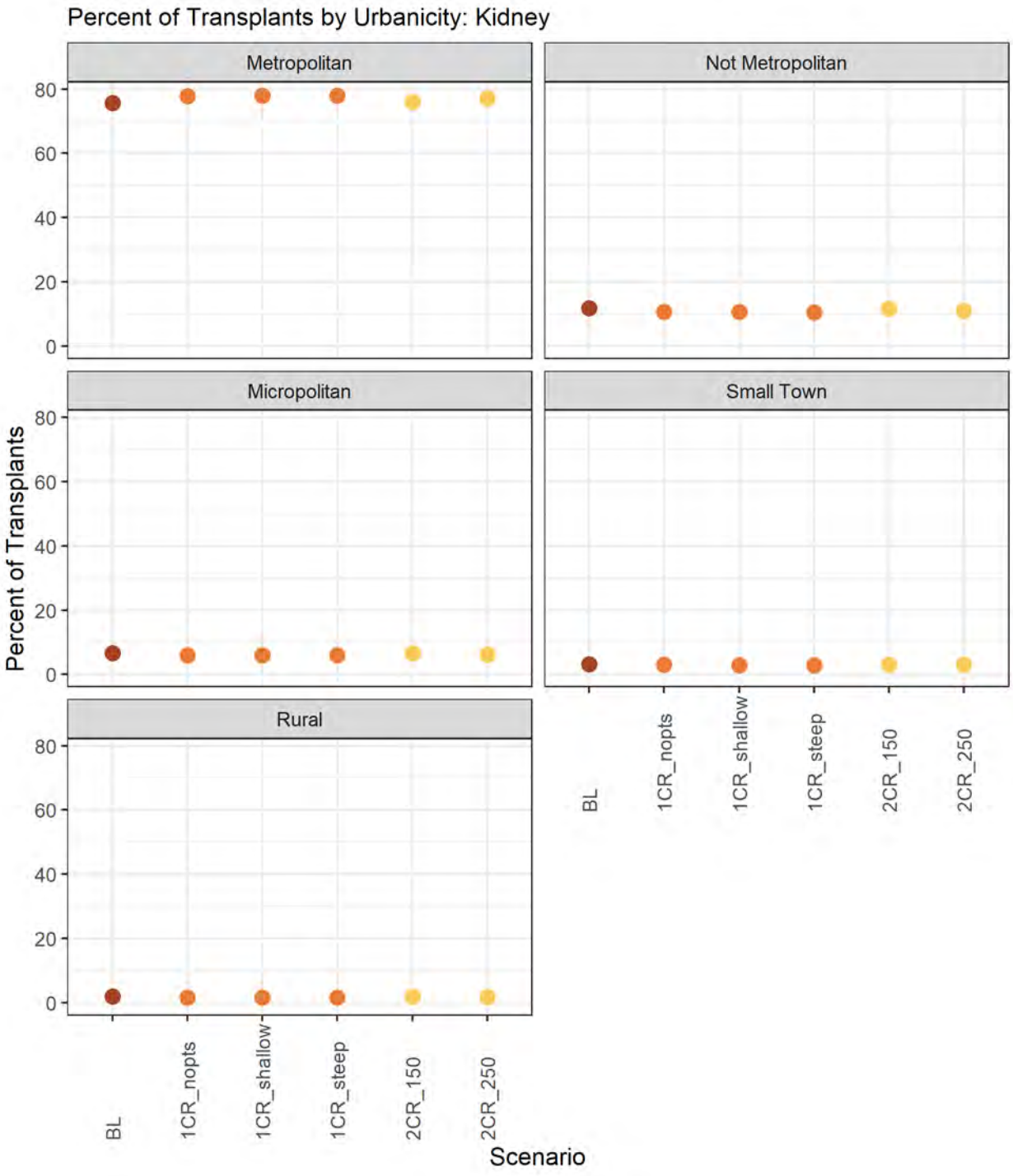


Percent of Transplants by Payment Status: Kidney-Pancreas

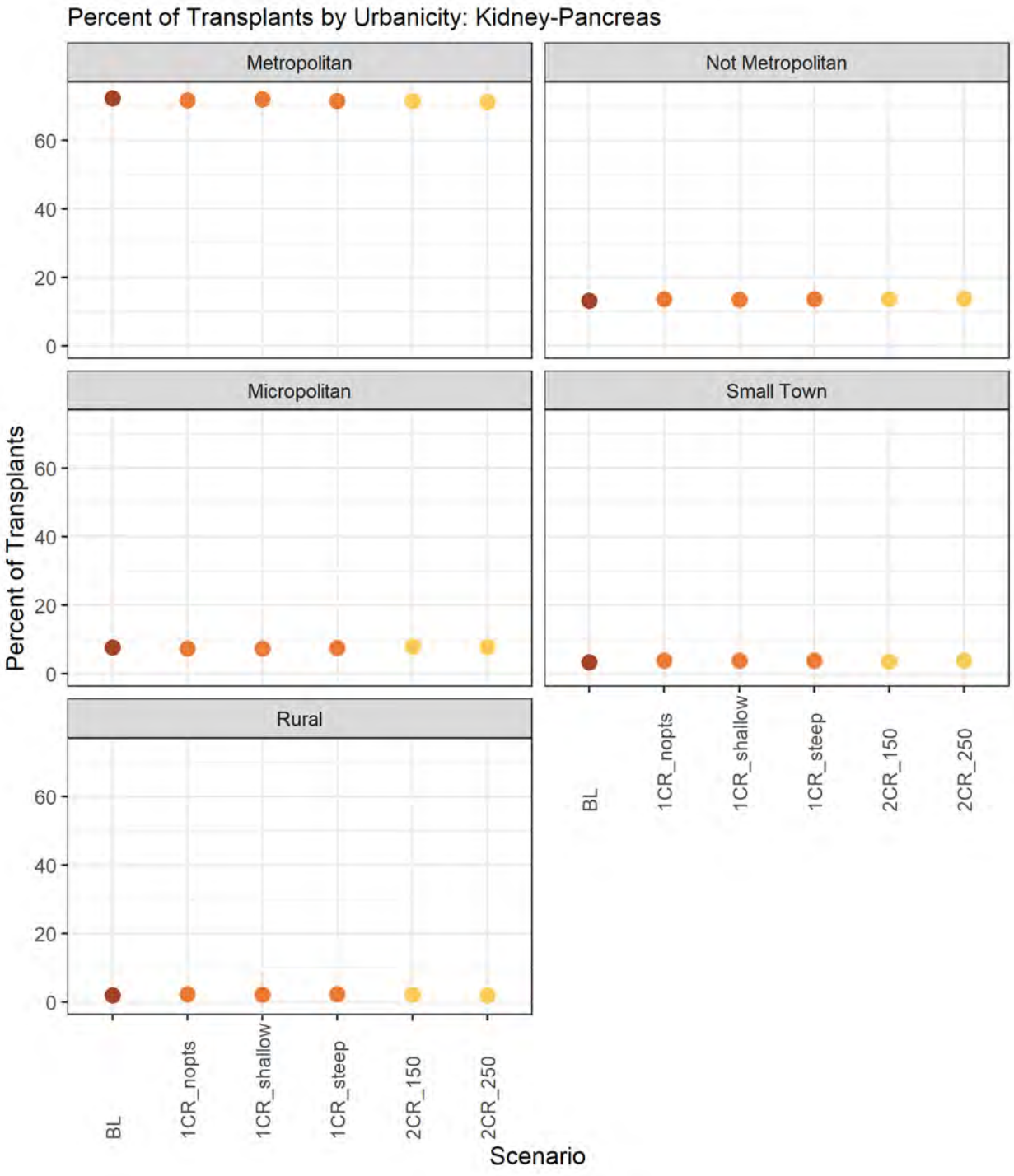


Percent of Transplants by Payment Status: Pancreas

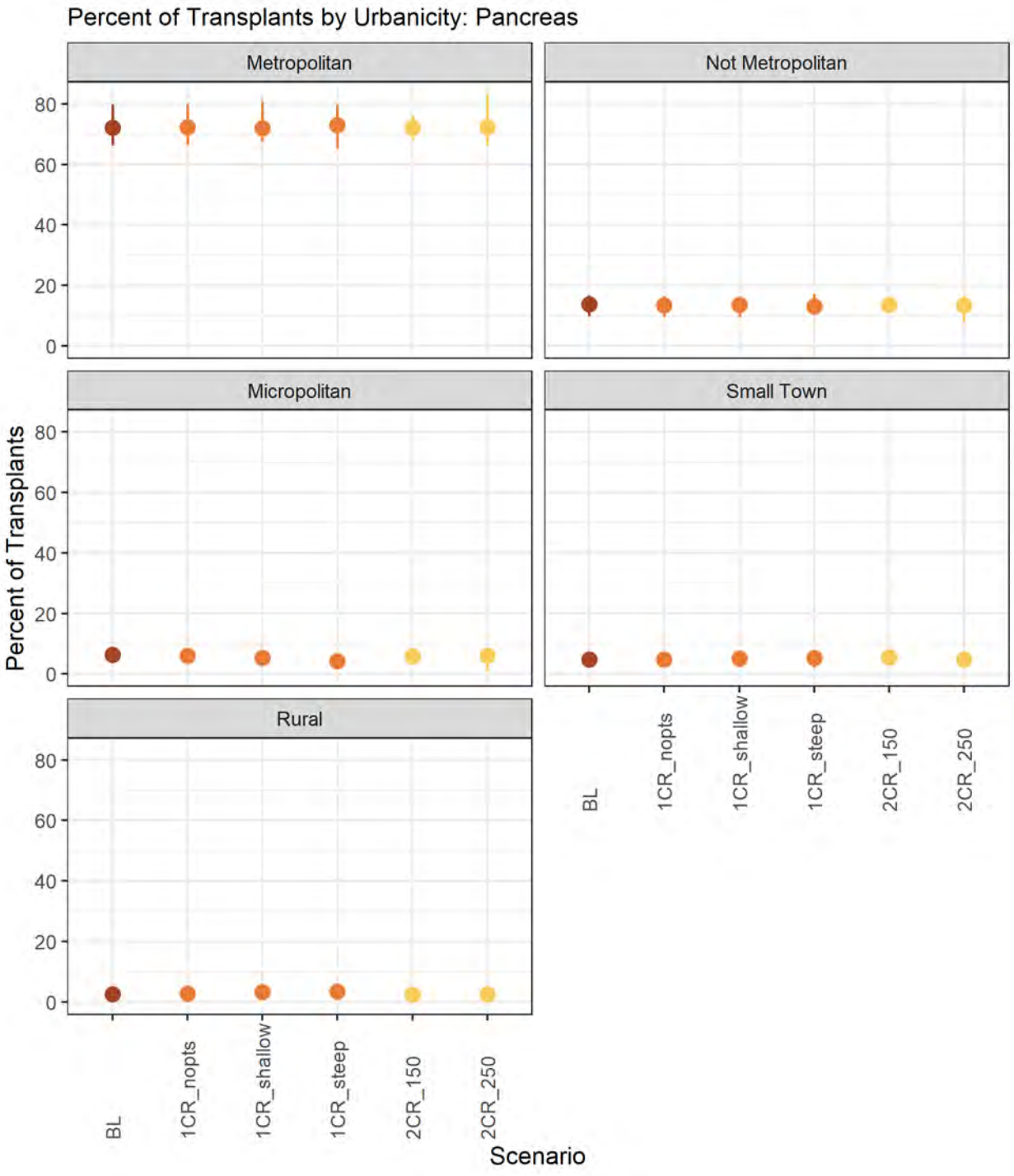
Transplant Percentages: Urbanicity



Percent of Transplants by Urbanicity: Kidney

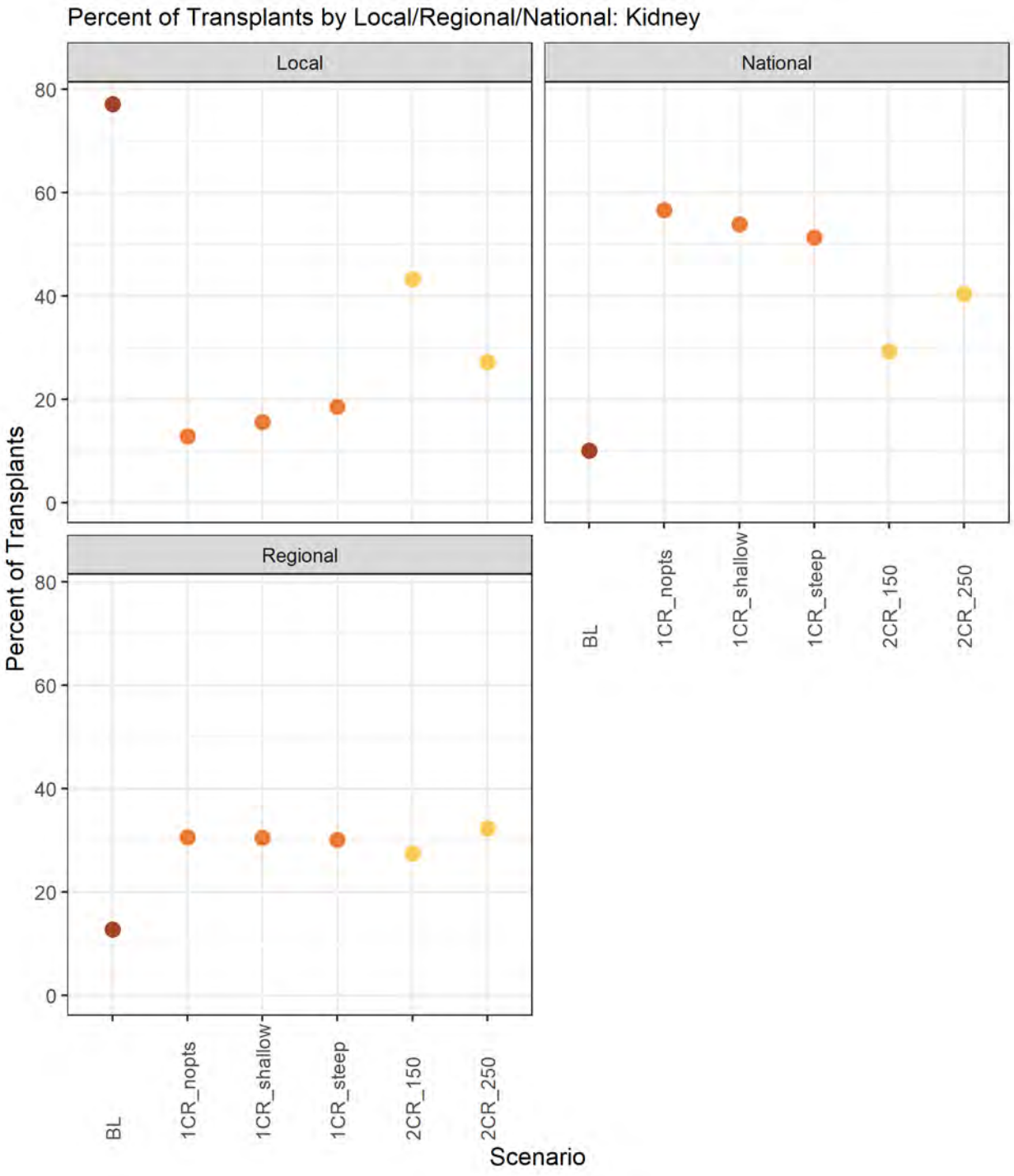


Percent of Transplants by Urbanicity: Kidney-Pancreas

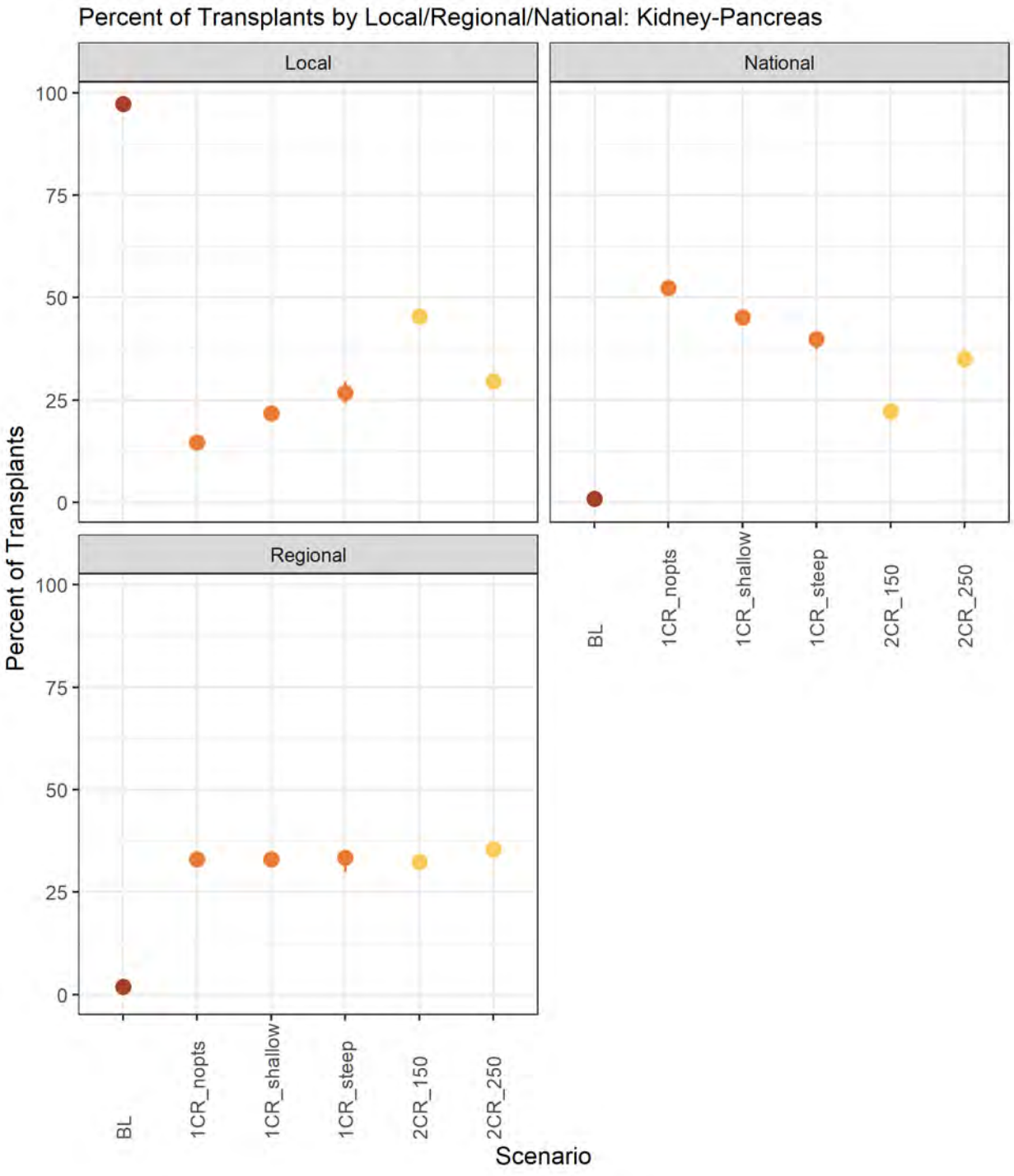


Percent of Transplants by Urbanicity: Pancreas

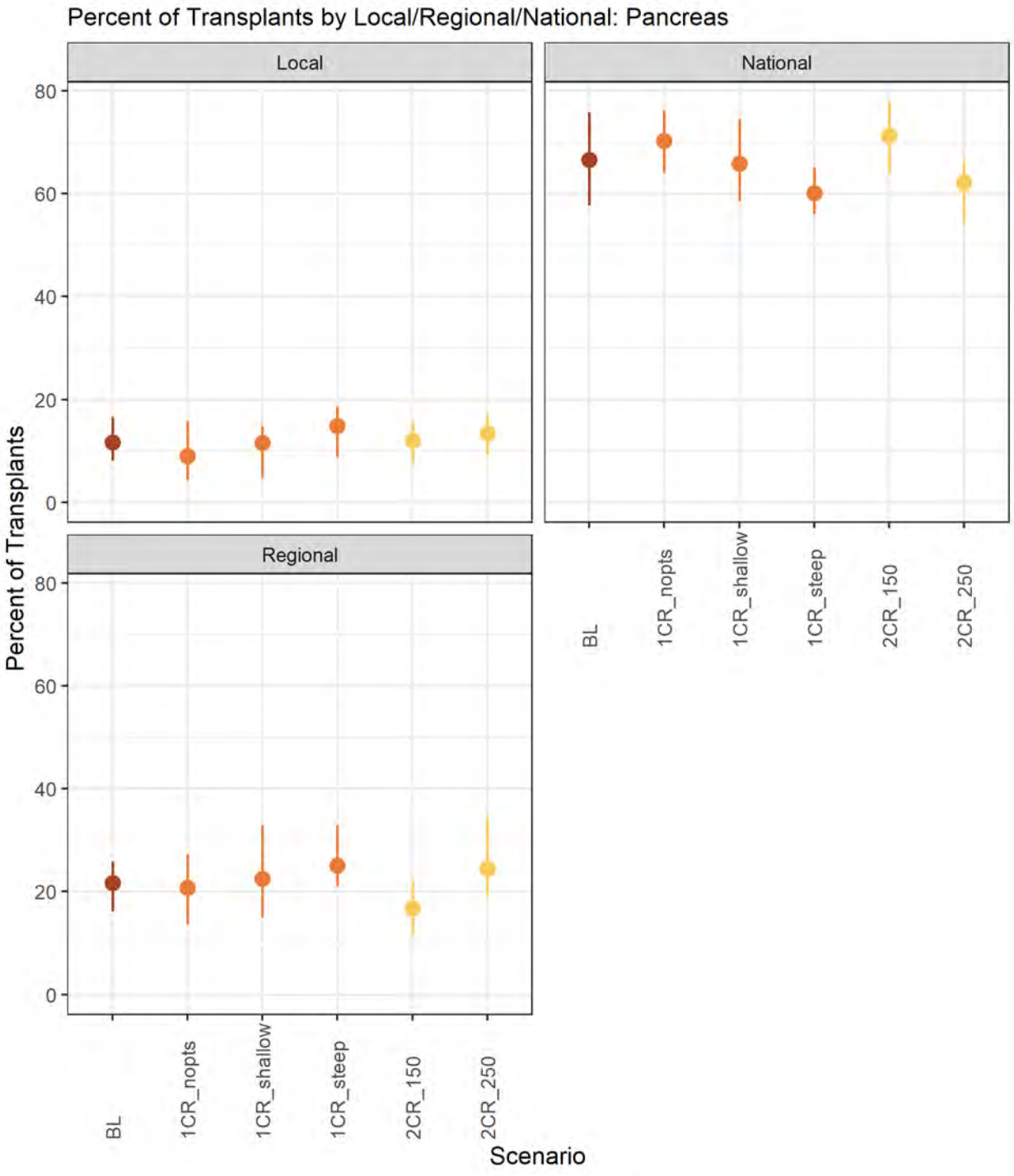
Transplant Percentages: Local/Regional/National



Percent of Transplants by Local/Regional/National: Kidney

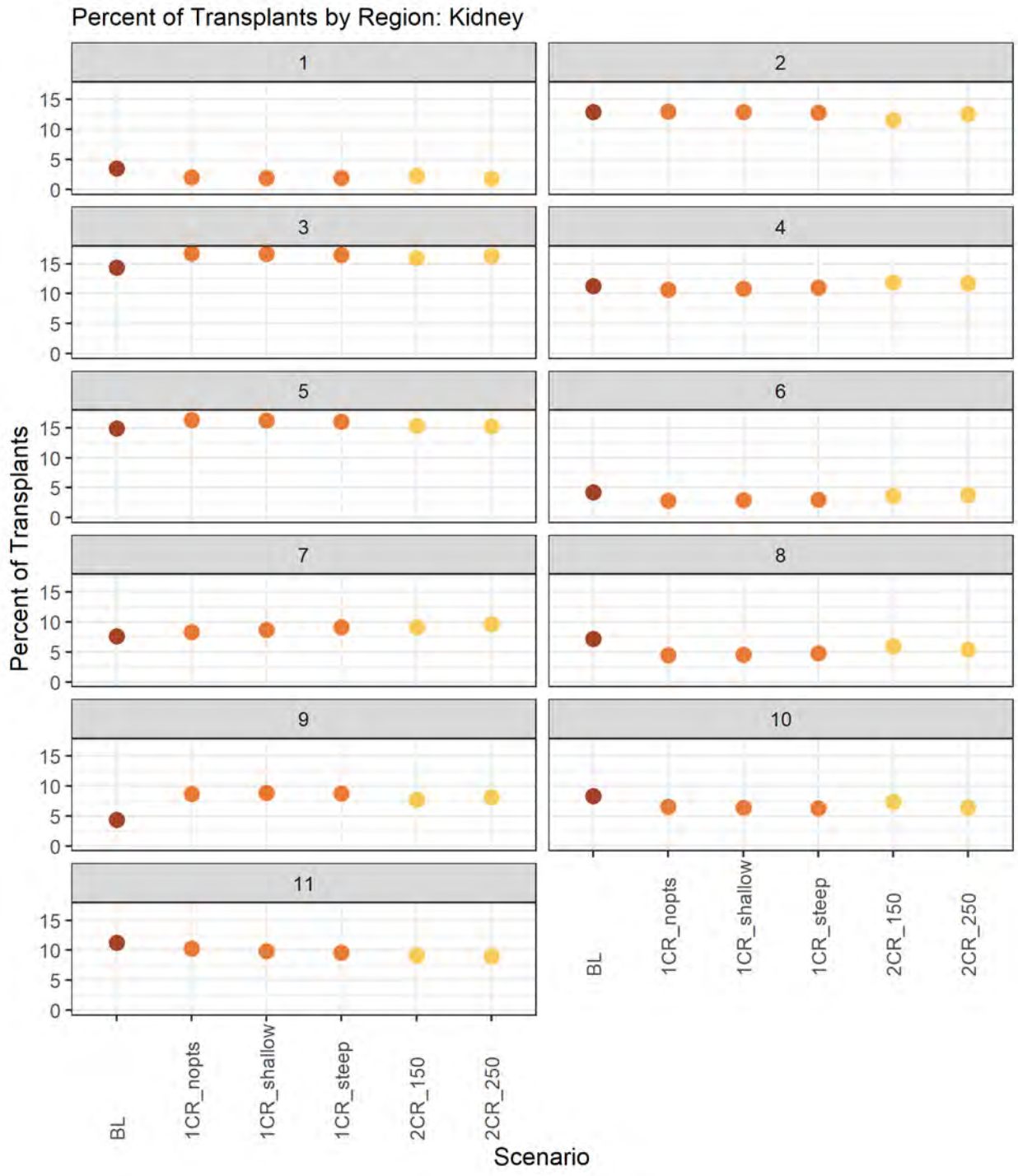


Percent of Transplants by Local/Regional/National: Kidney-Pancreas

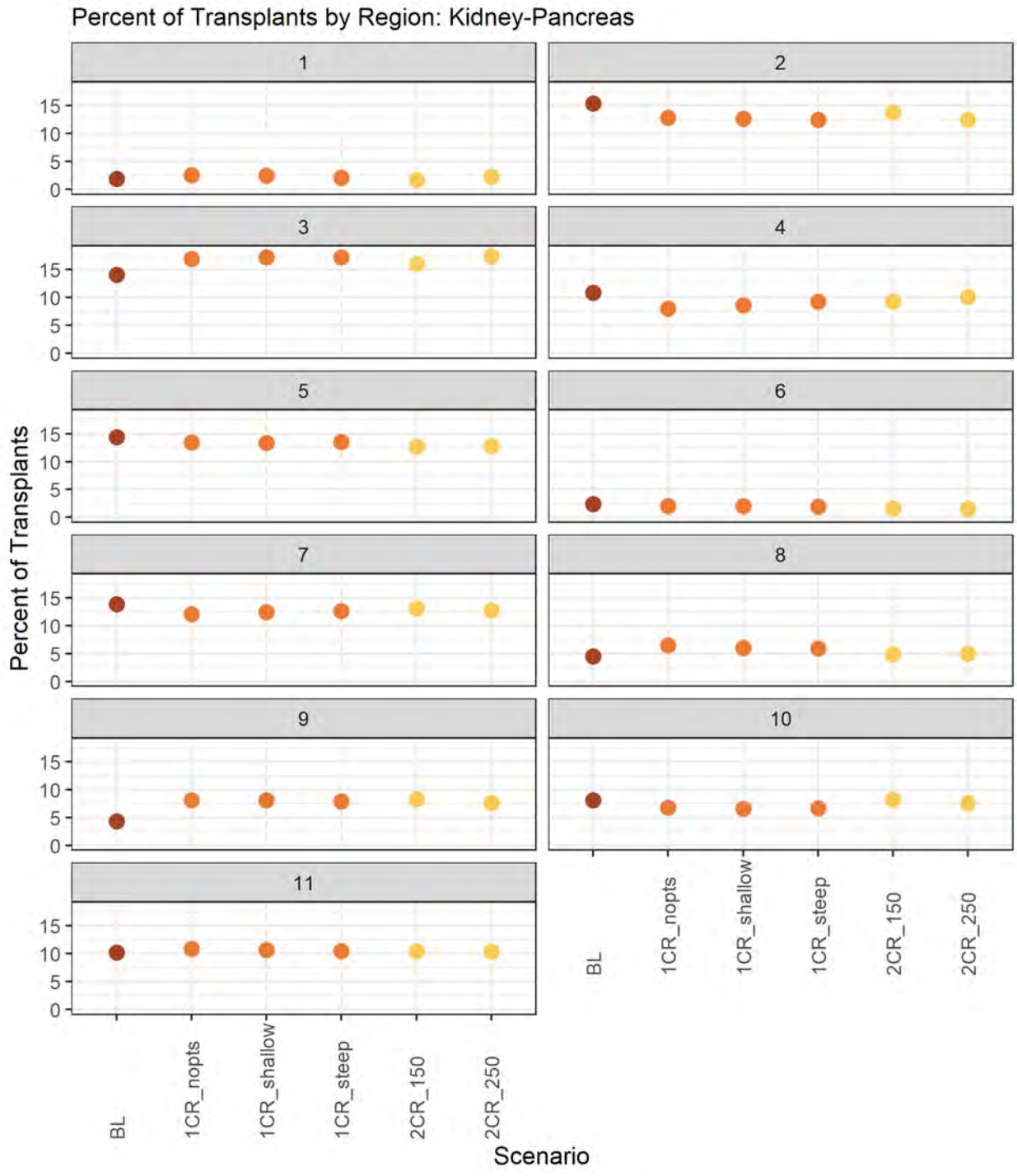


Percent of Transplants by Local/Regional/National: Pancreas

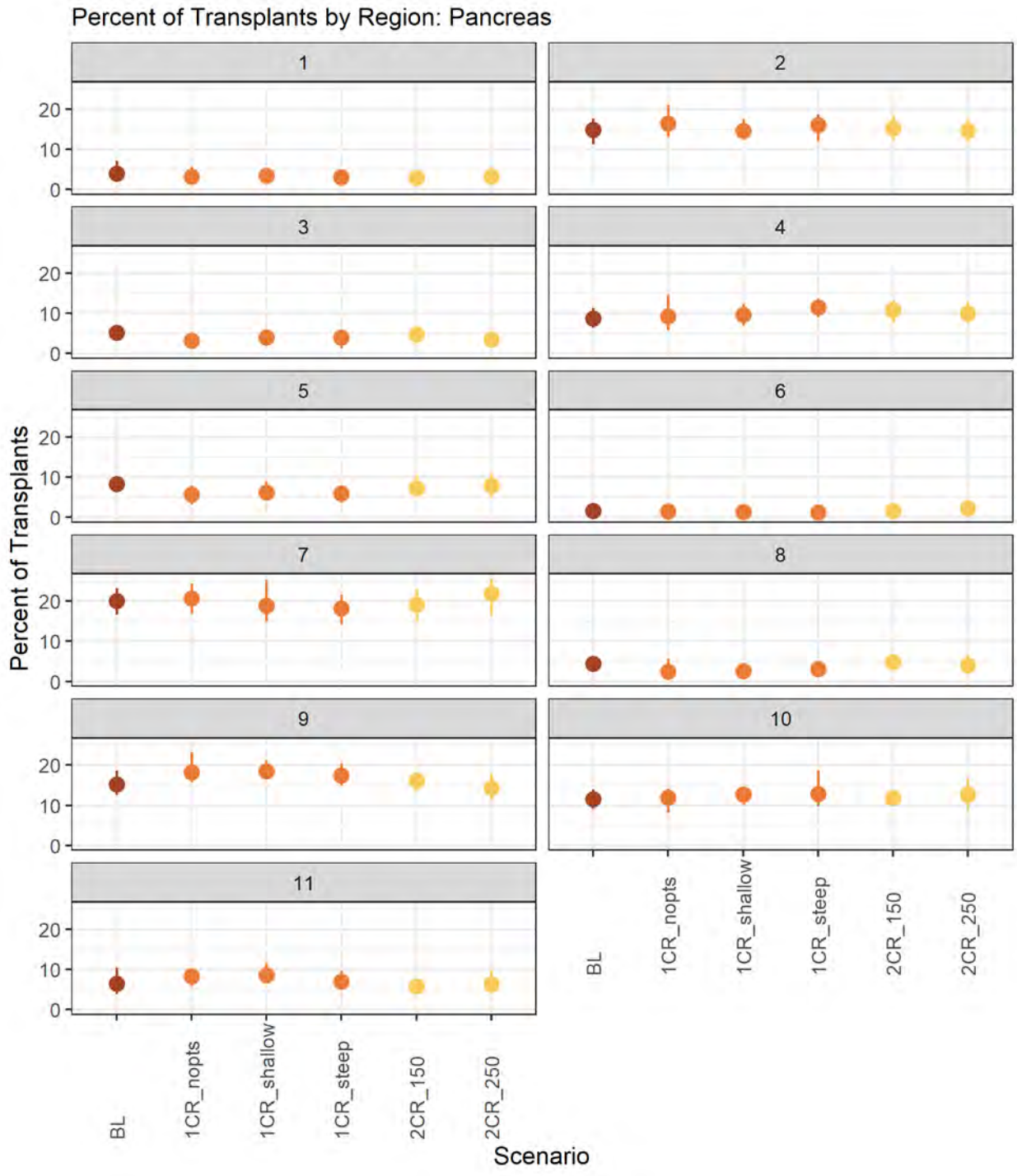
Transplant Percentages: Region



Percent of Transplants by Region: Kidney

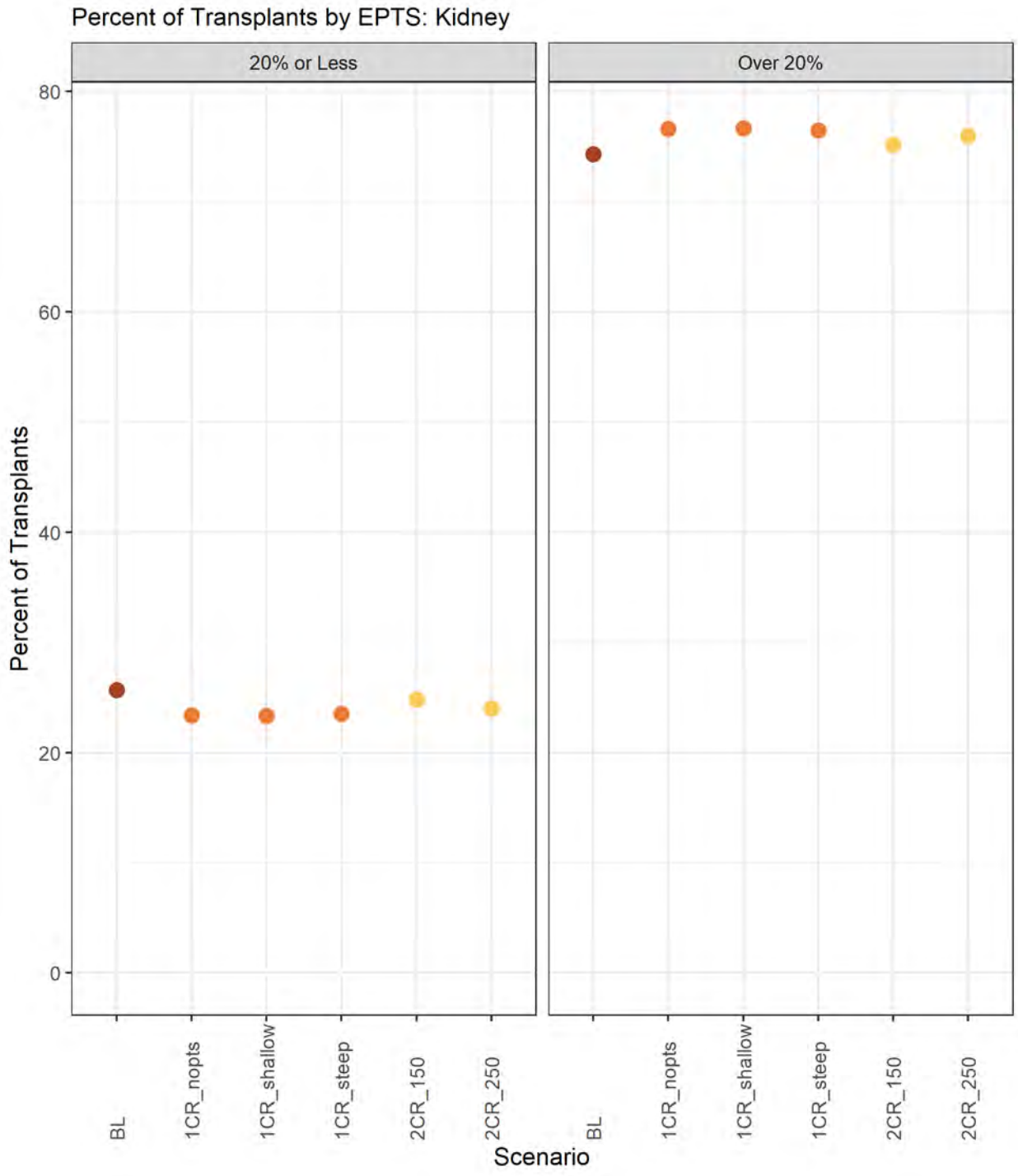


Percent of Transplants by Region: Kidney-Pancreas



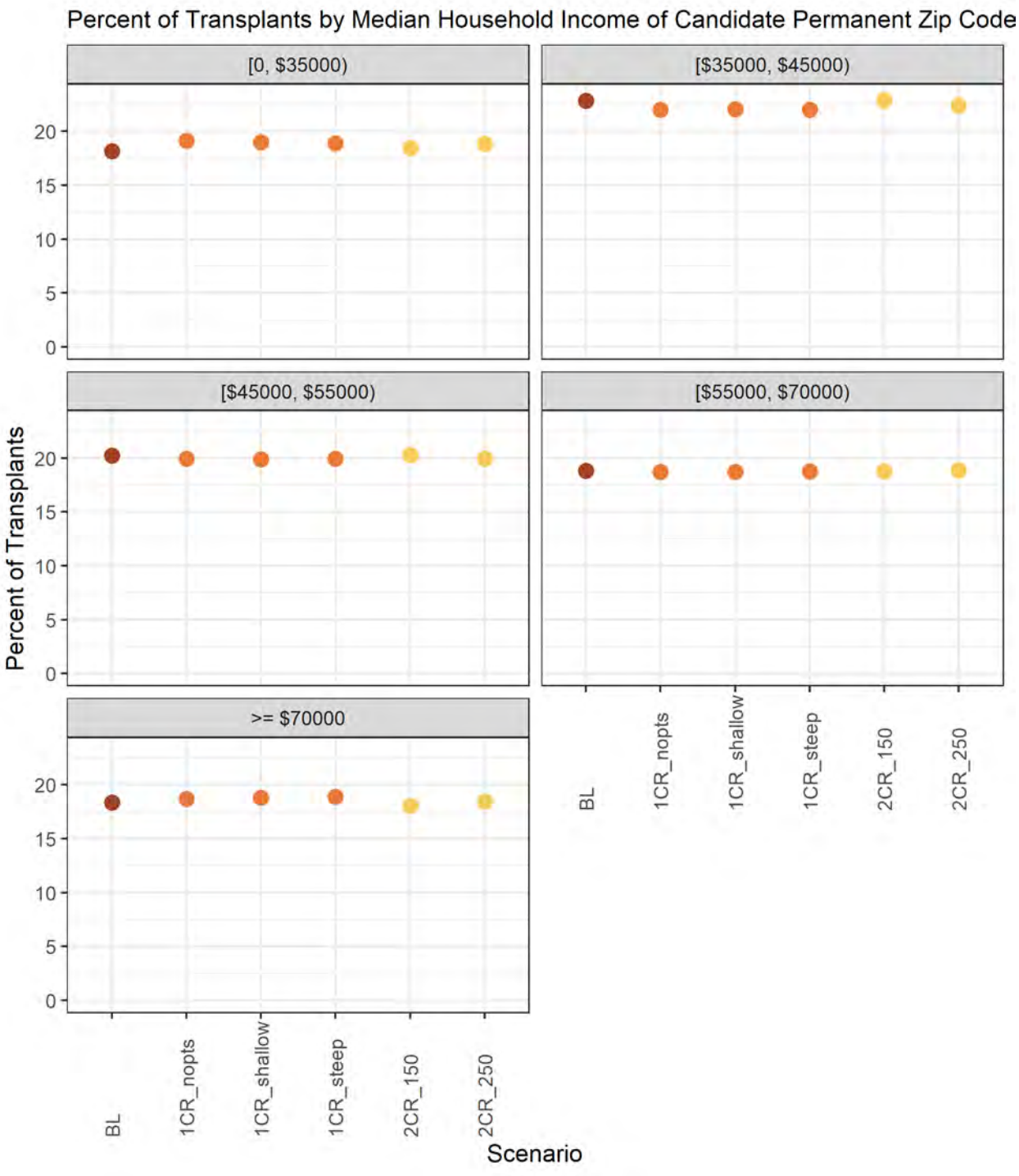
Percent of Transplants by Region: Pancreas

Transplant Percentages: EPTS

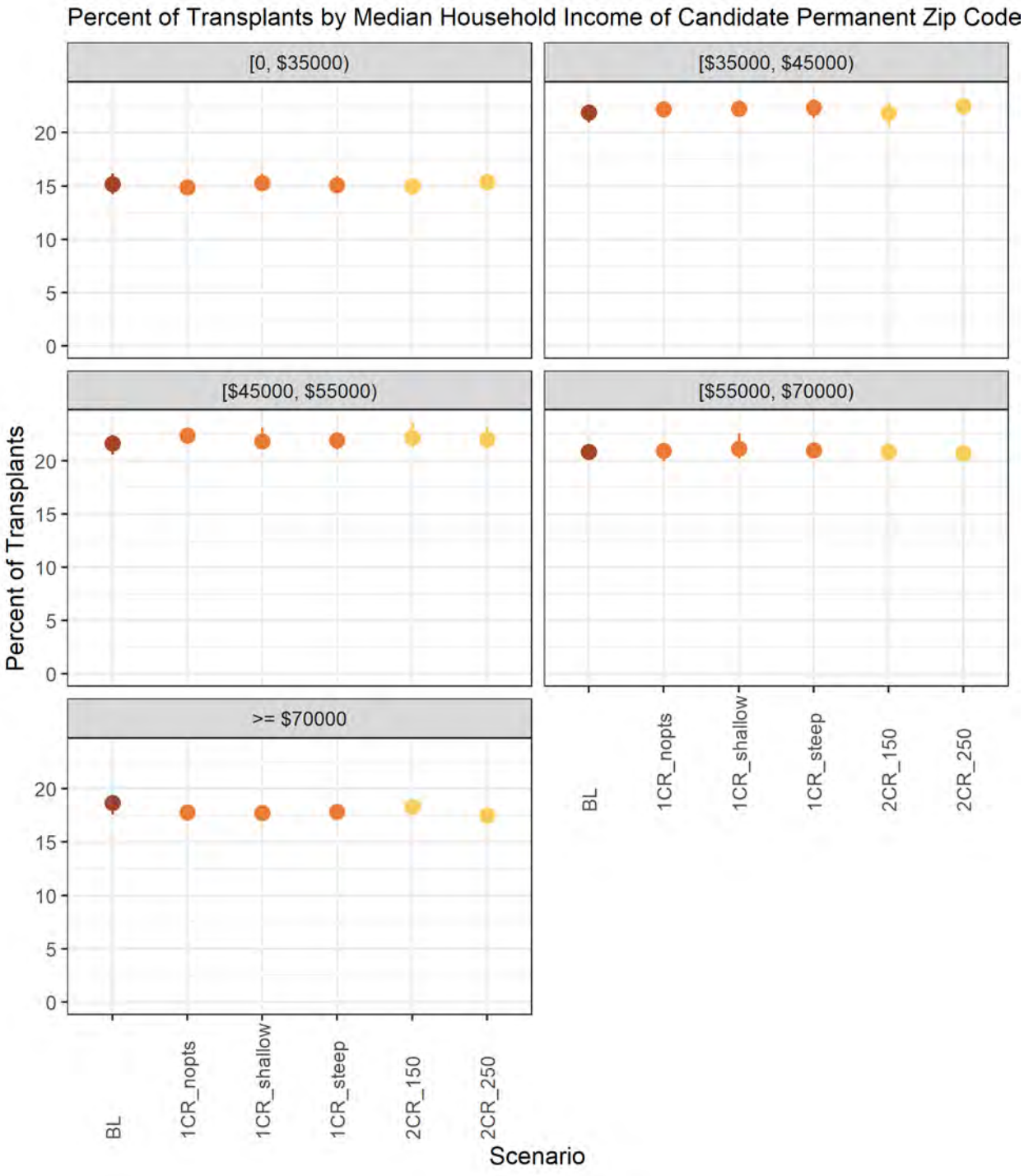


Percent of Transplants by EPTS: Kidney

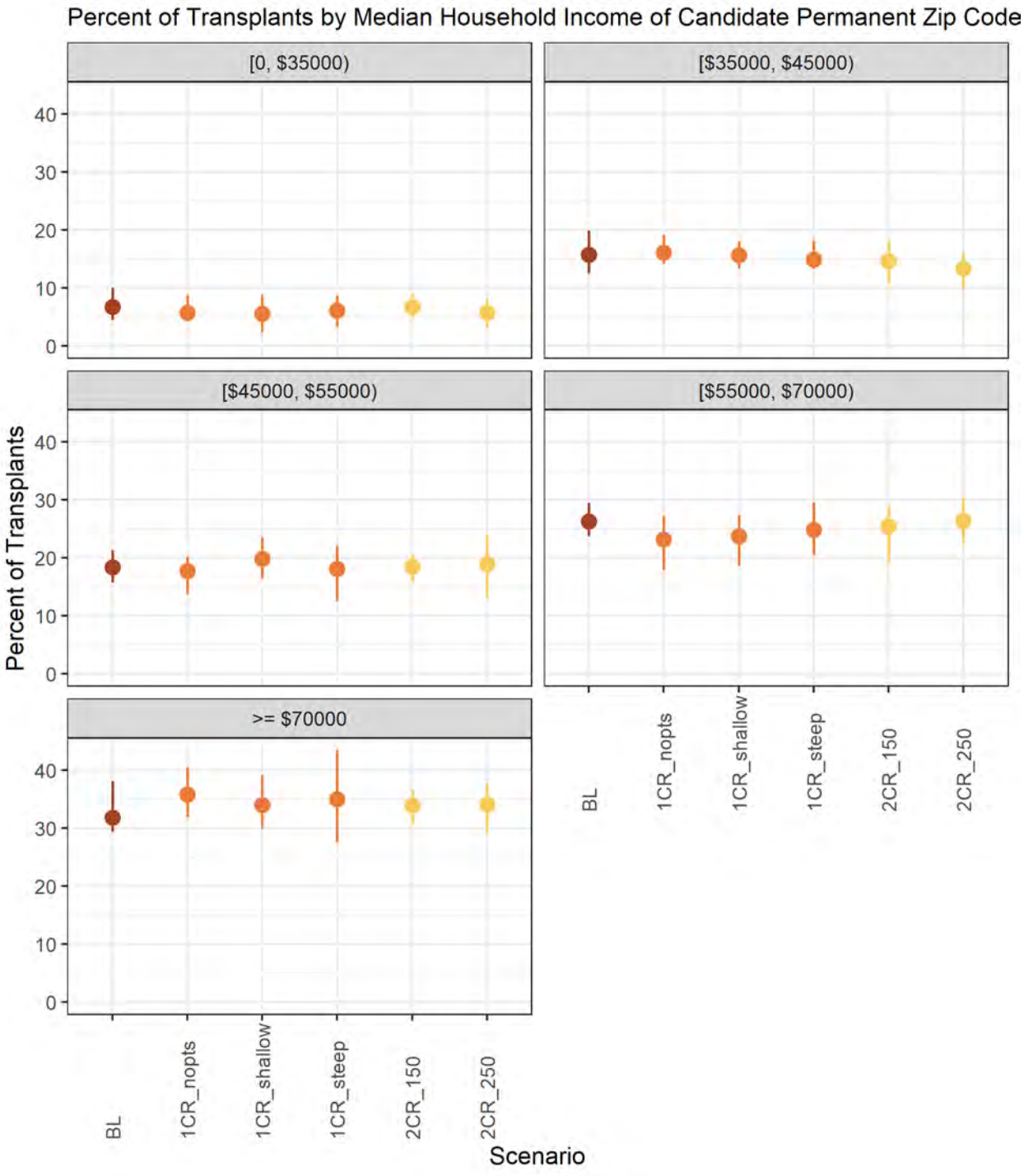
Transplant Percentages: Median Household Income of Candidate Permanent Zip Code



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

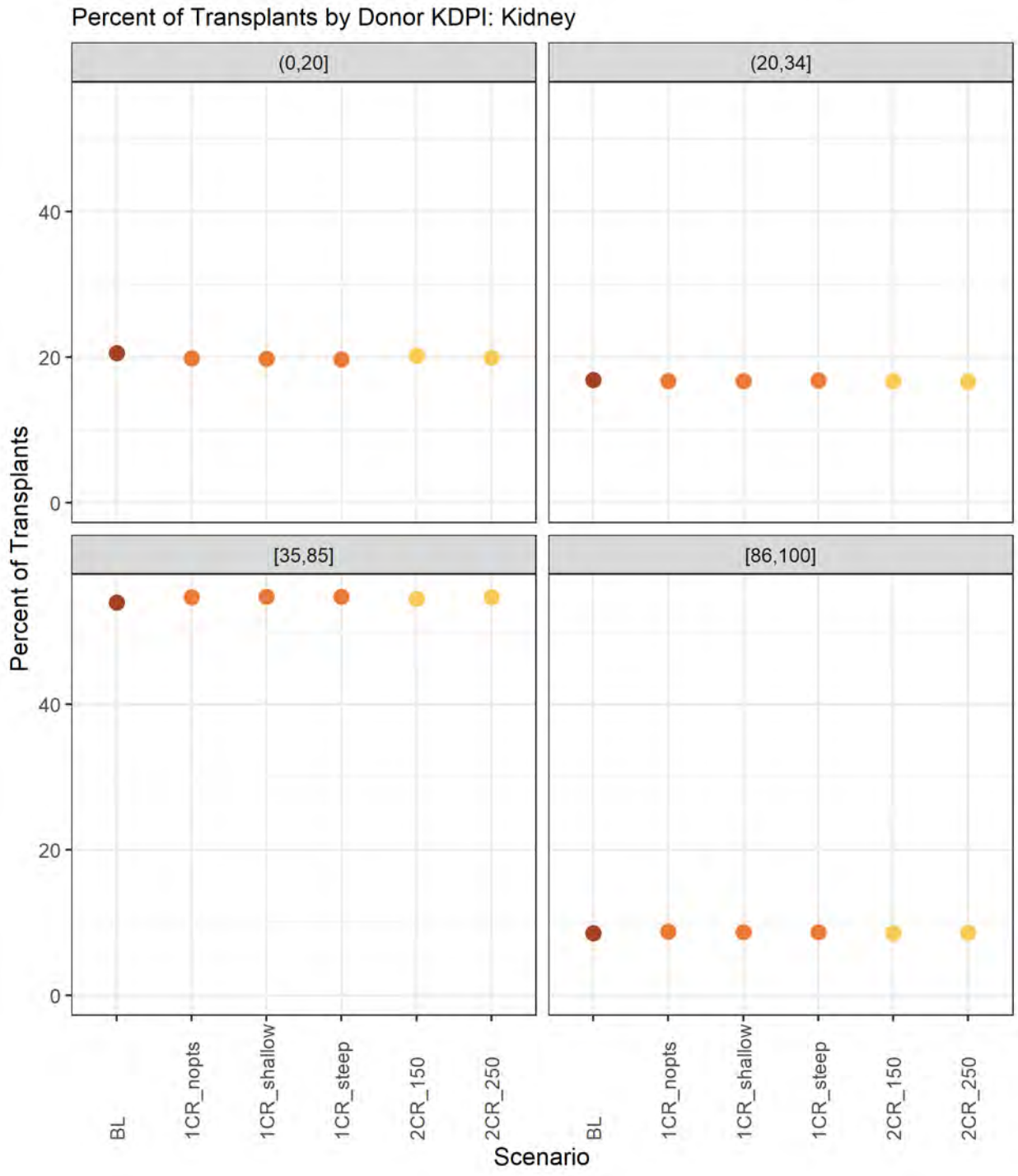


Percent of Transplants by Median Household Income of Candidate Permanent Zip Code: Kidney-Pancreas



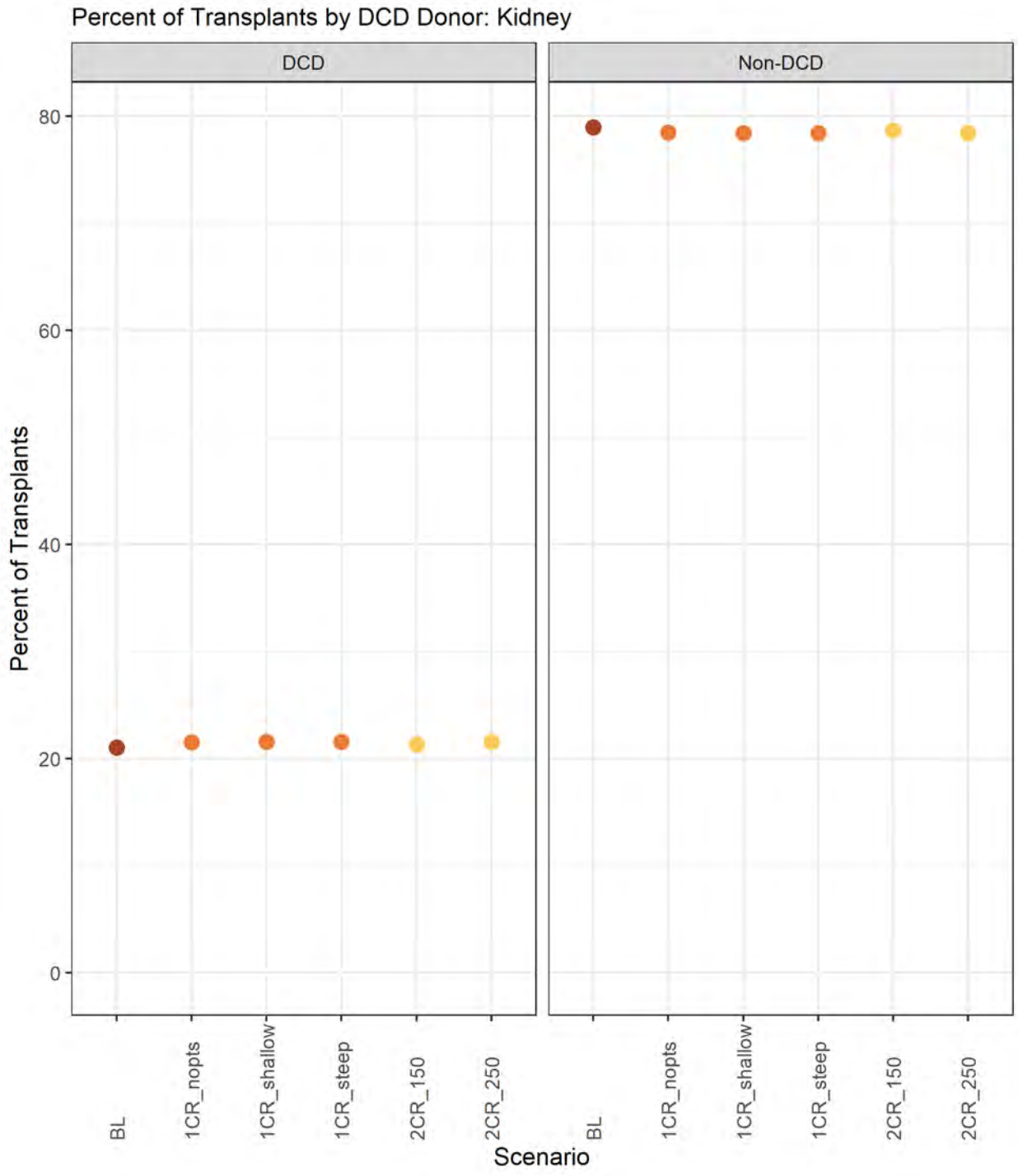
Percent of Transplants by Median Household Income of Candidate Permanent Zip Code: Pancreas

Transplant Percentages: Donor KDPI



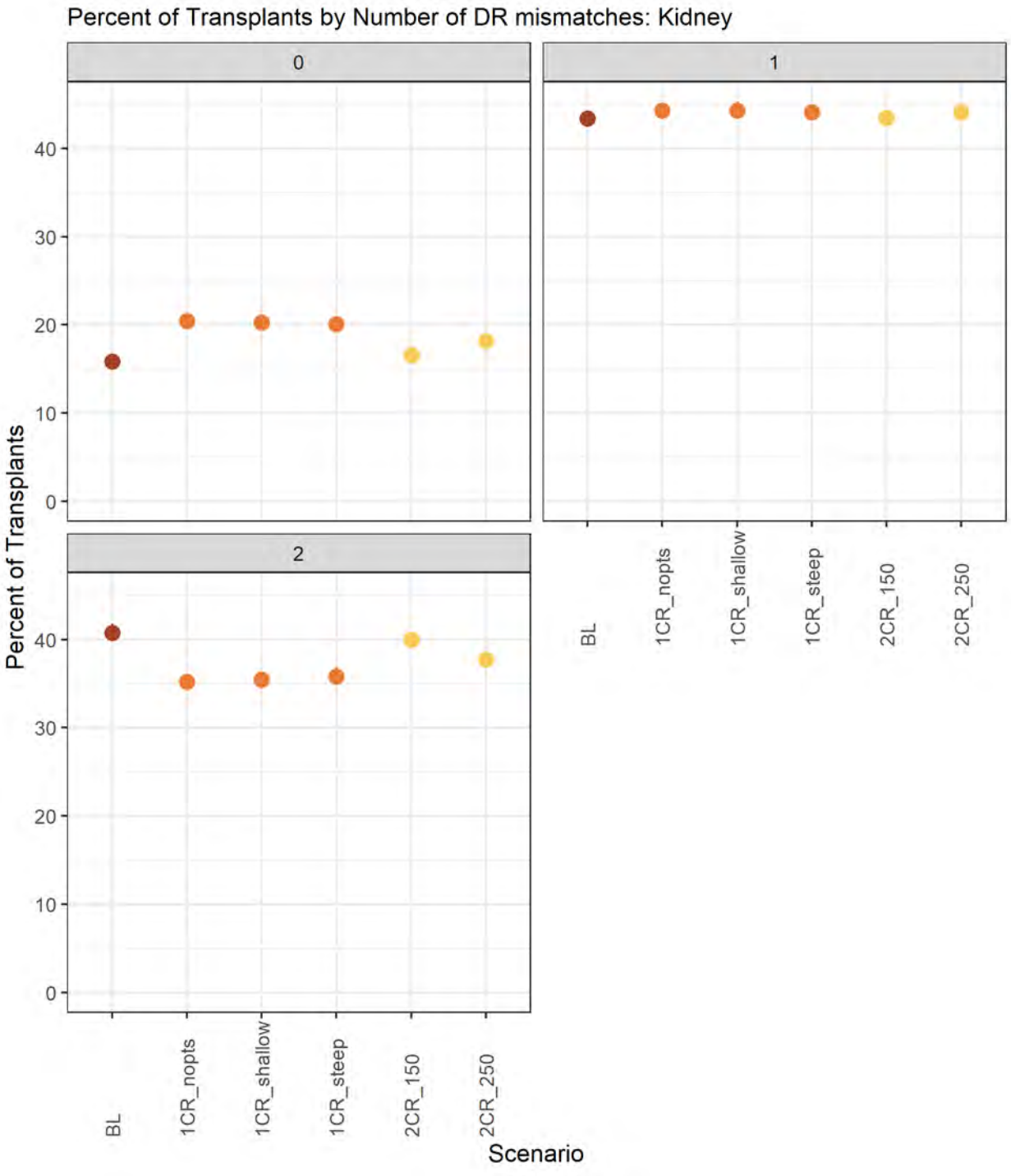
Percent of Transplants by Donor KDPI: Kidney

Transplant Percentages: DCD Donor



Percent of Transplants by DCD Donor: Kidney

Transplant Percentages: Number of DR mismatches

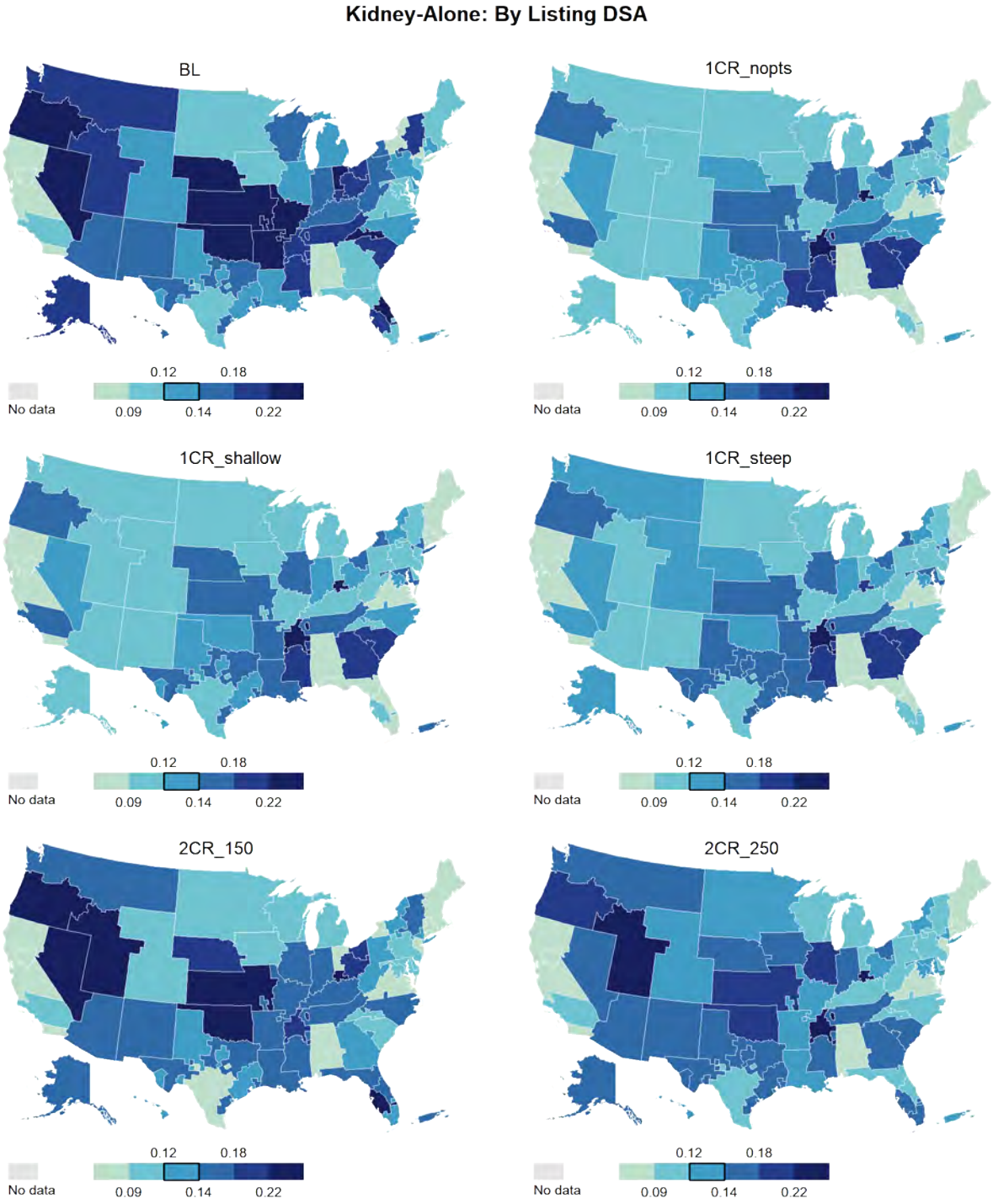


Percent of Transplants by Number of DR mismatches: Kidney

Choropleth Maps of Metrics by DSA

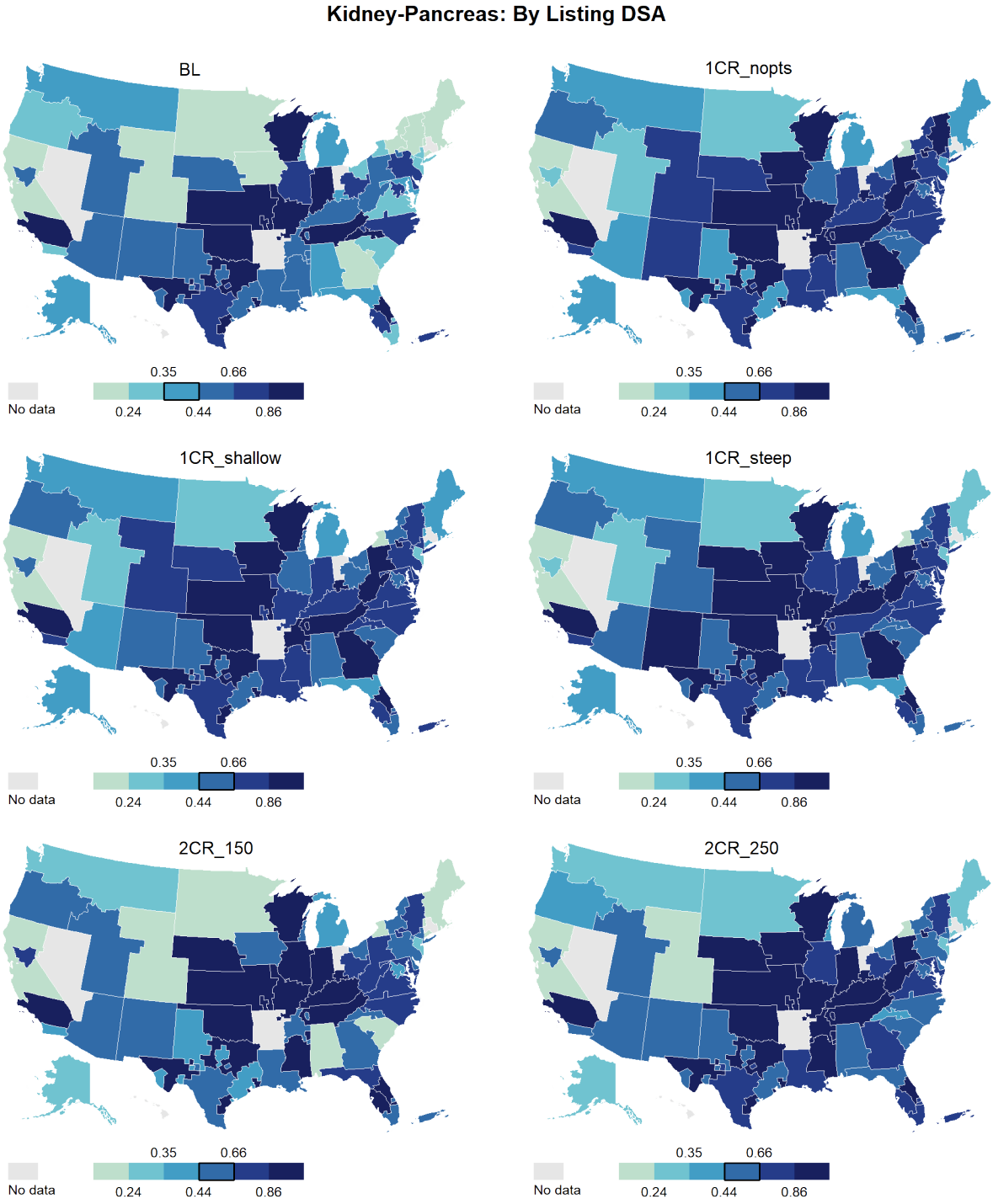
DSAs with either no transplant program or without the given outcome during the simulation (e.g. transplant or waitlist death) are both shown as having “No Data.”

Maps of Transplant Rate by DSA



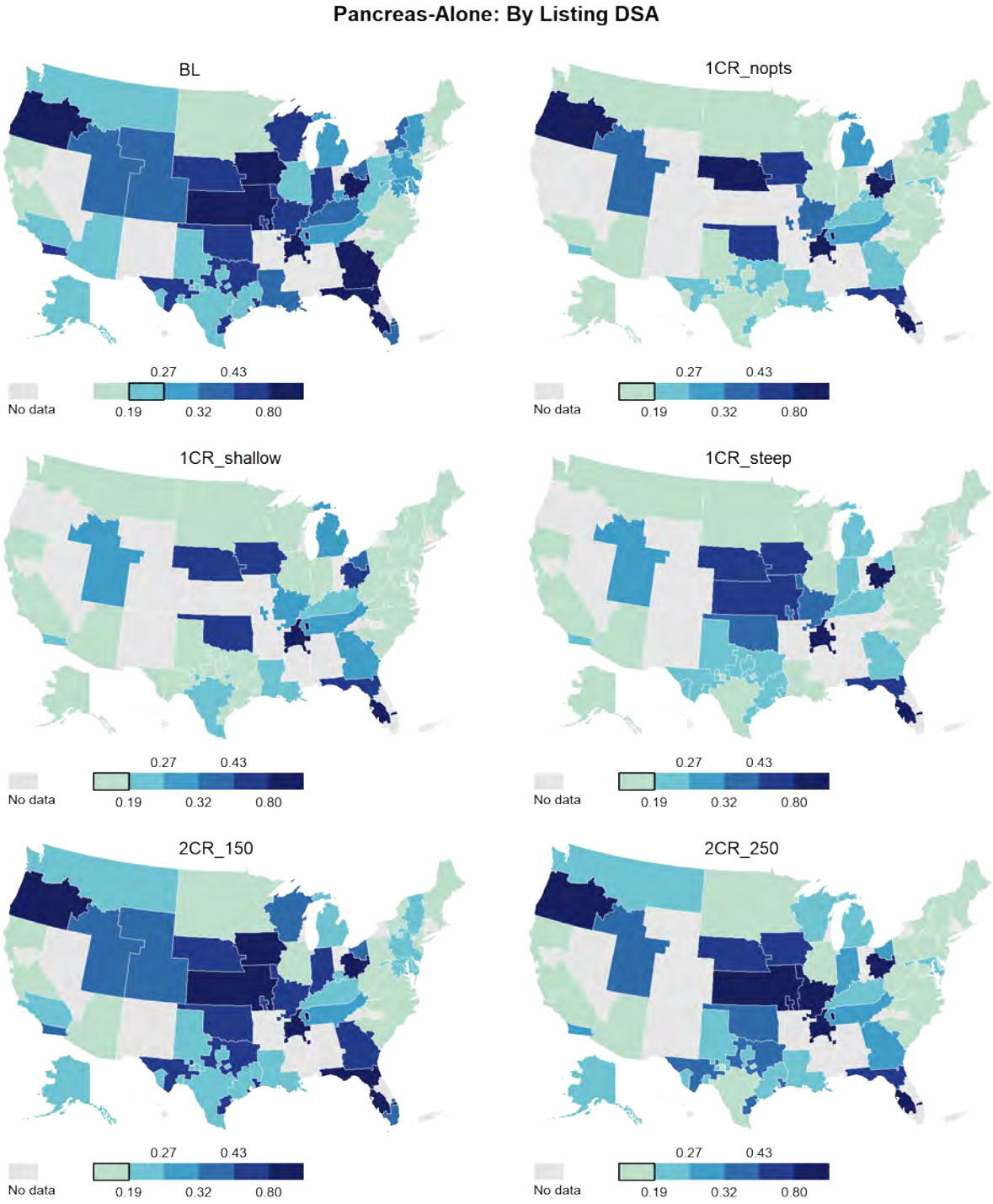
Kidney-Alone: By Listing DSA

Maps of Transplant Rate by DSA



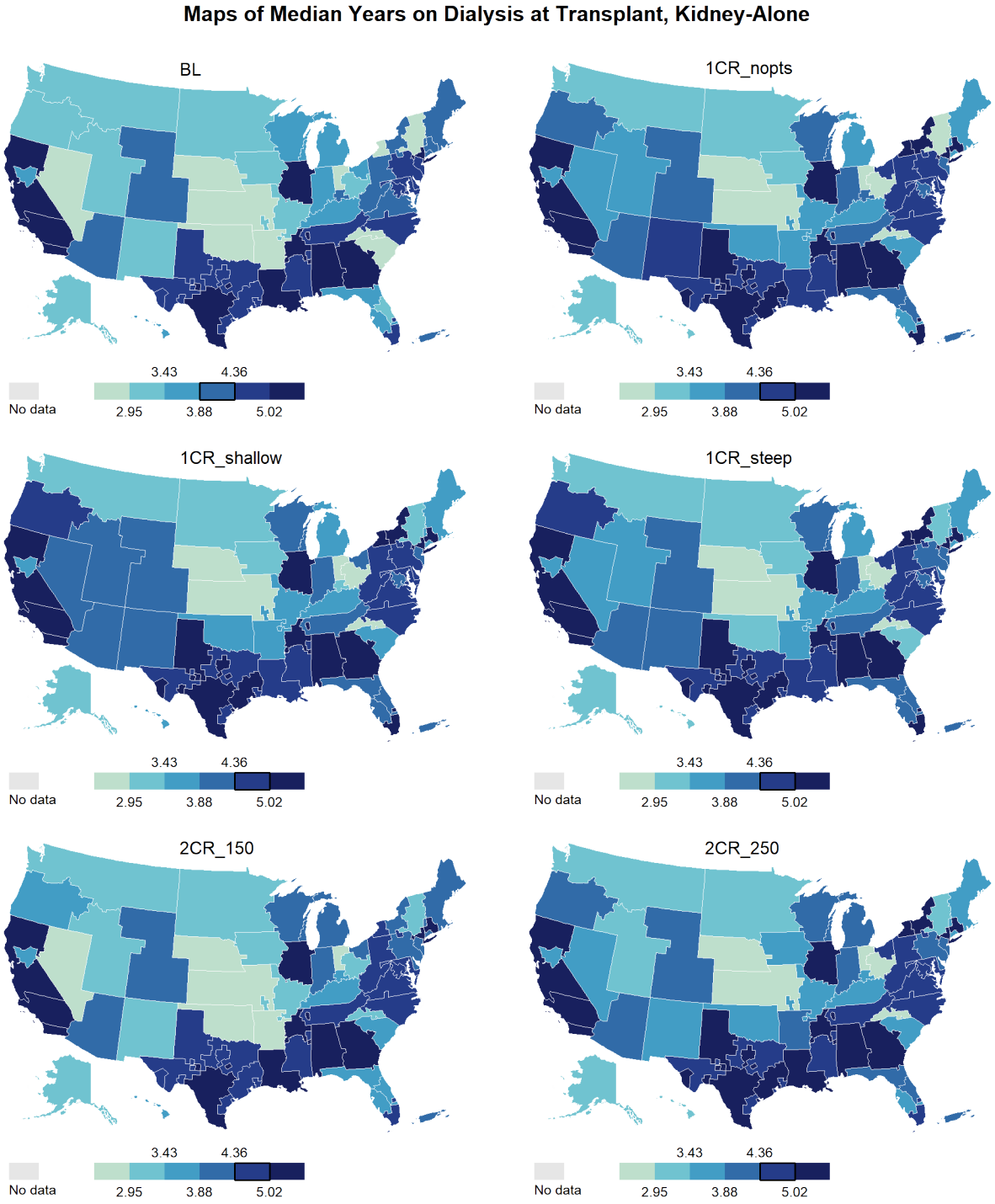
Kidney-Pancreas: By Listing DSA

Maps of Transplant Rate by DSA



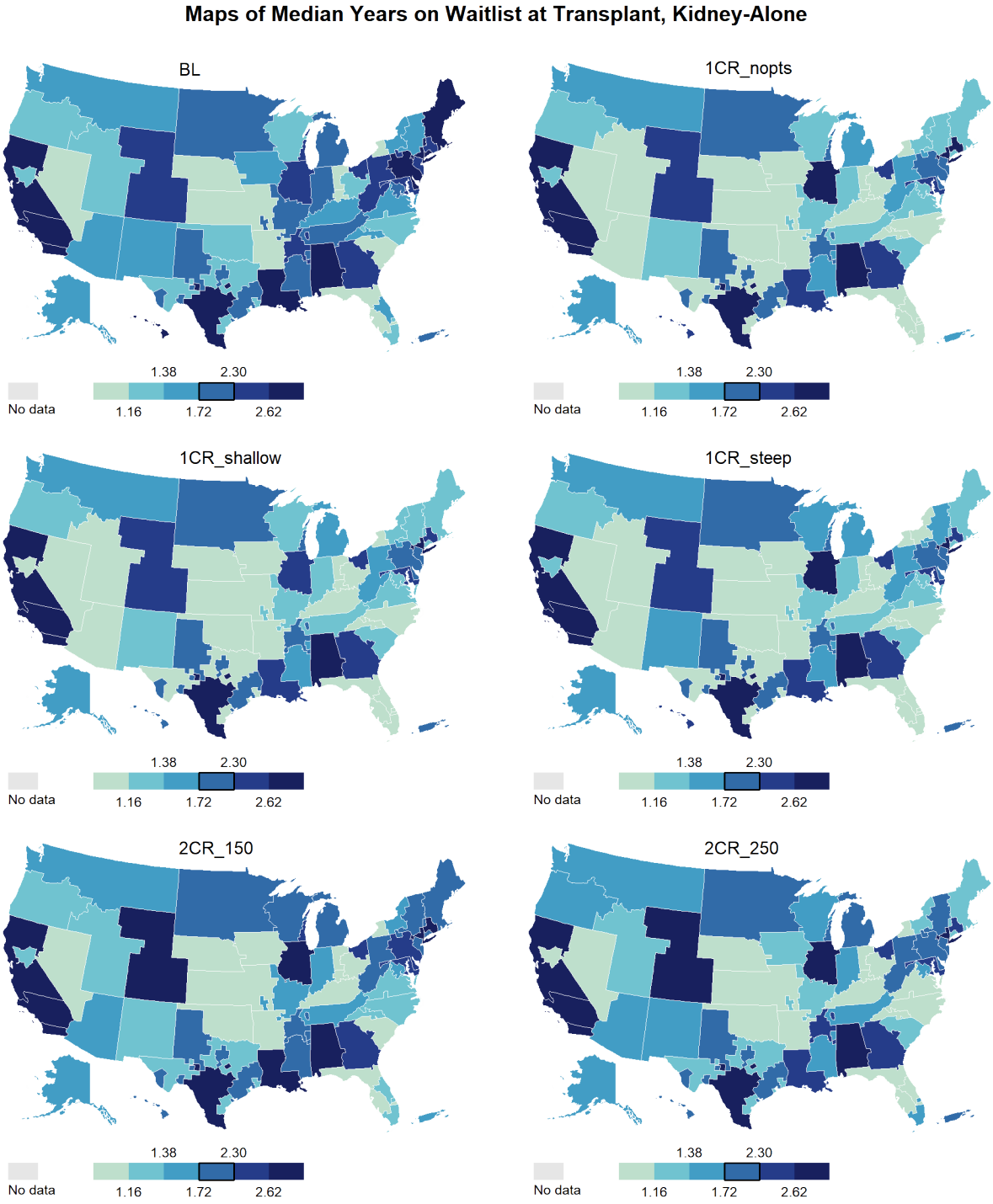
Pancreas-Alone: By Listing DSA

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



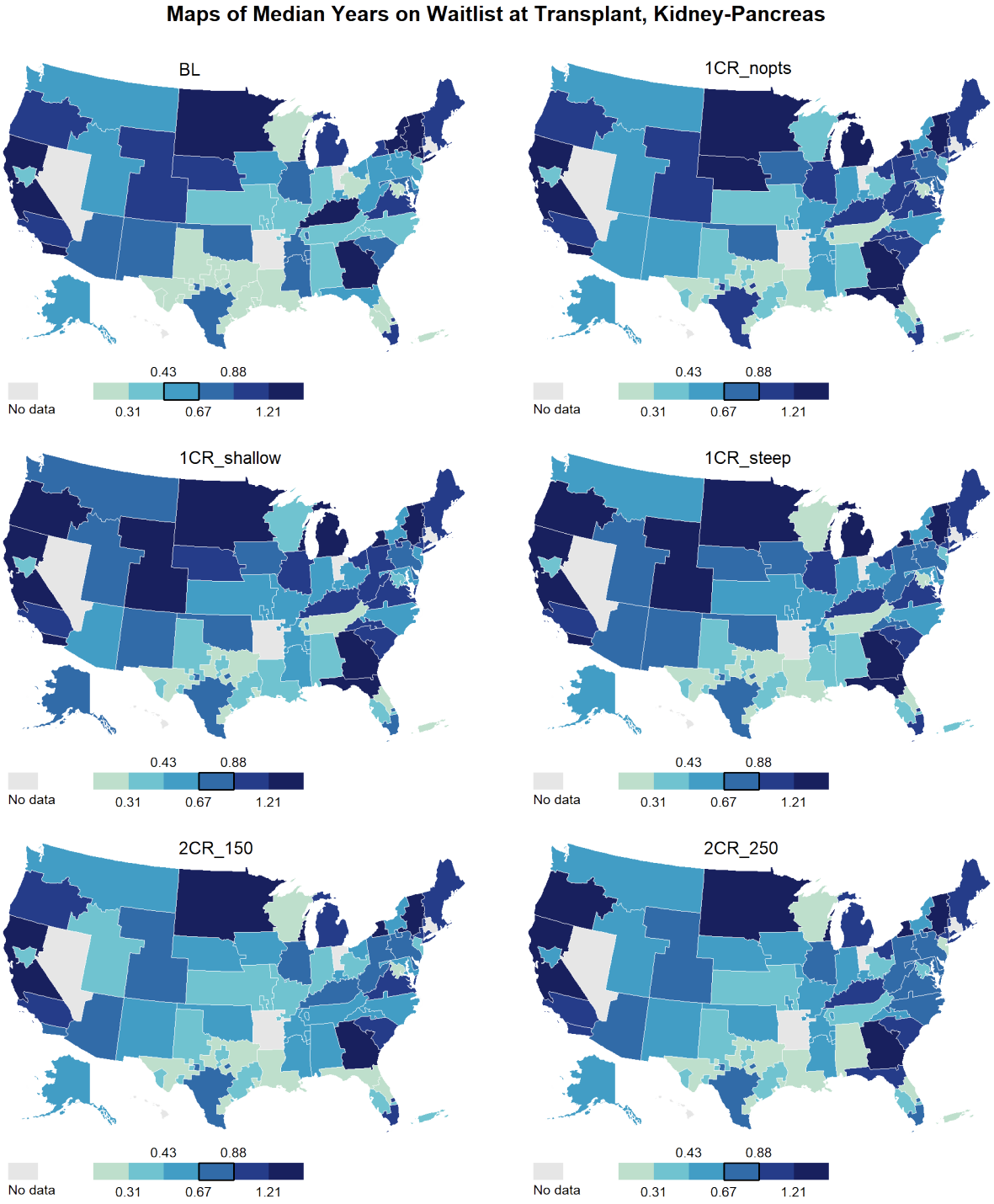
Maps of Median Years on Dialysis at Transplant, Kidney-Alone

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



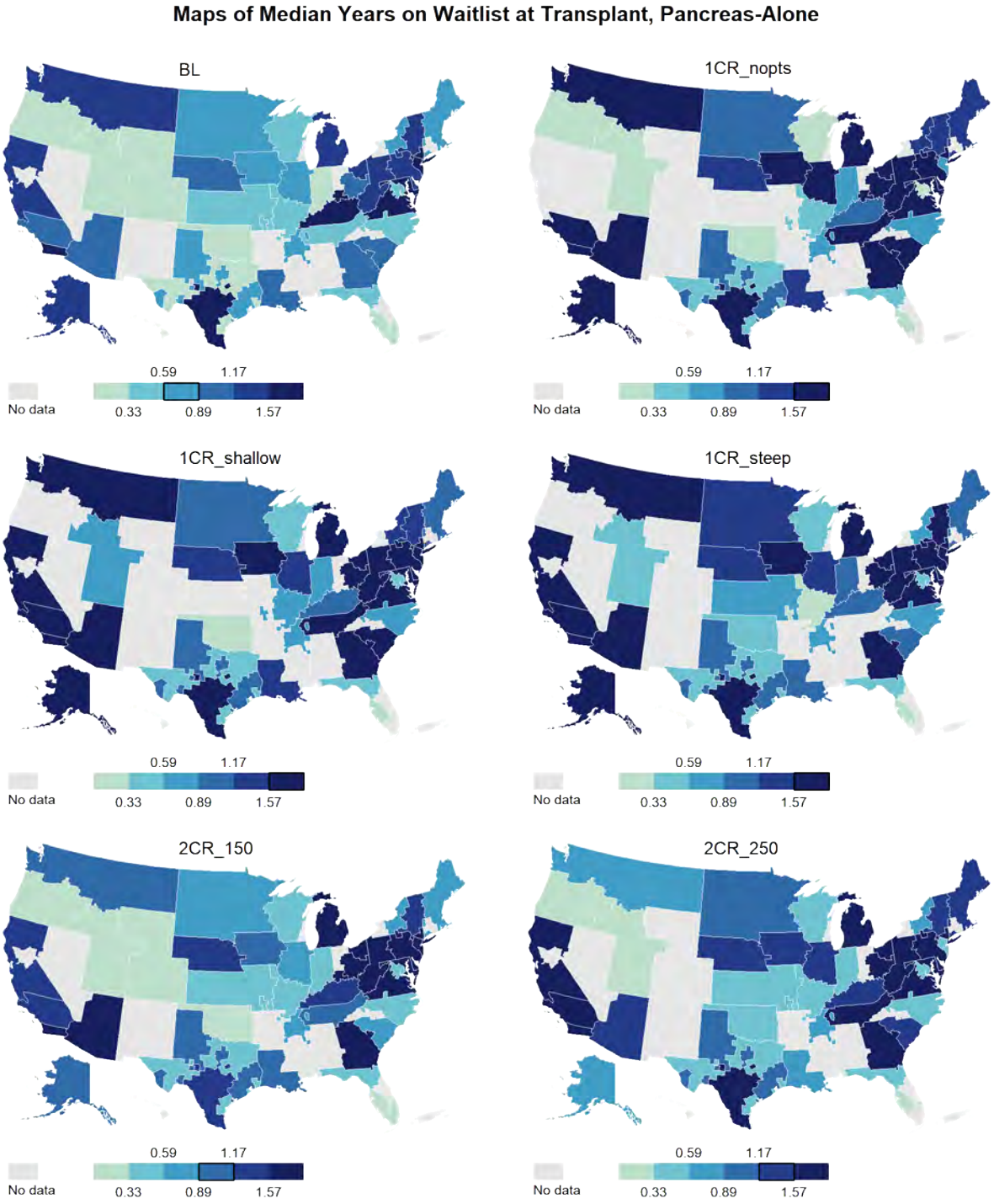
Maps of Median Years on Waitlist at Transplant, Kidney-Alone

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



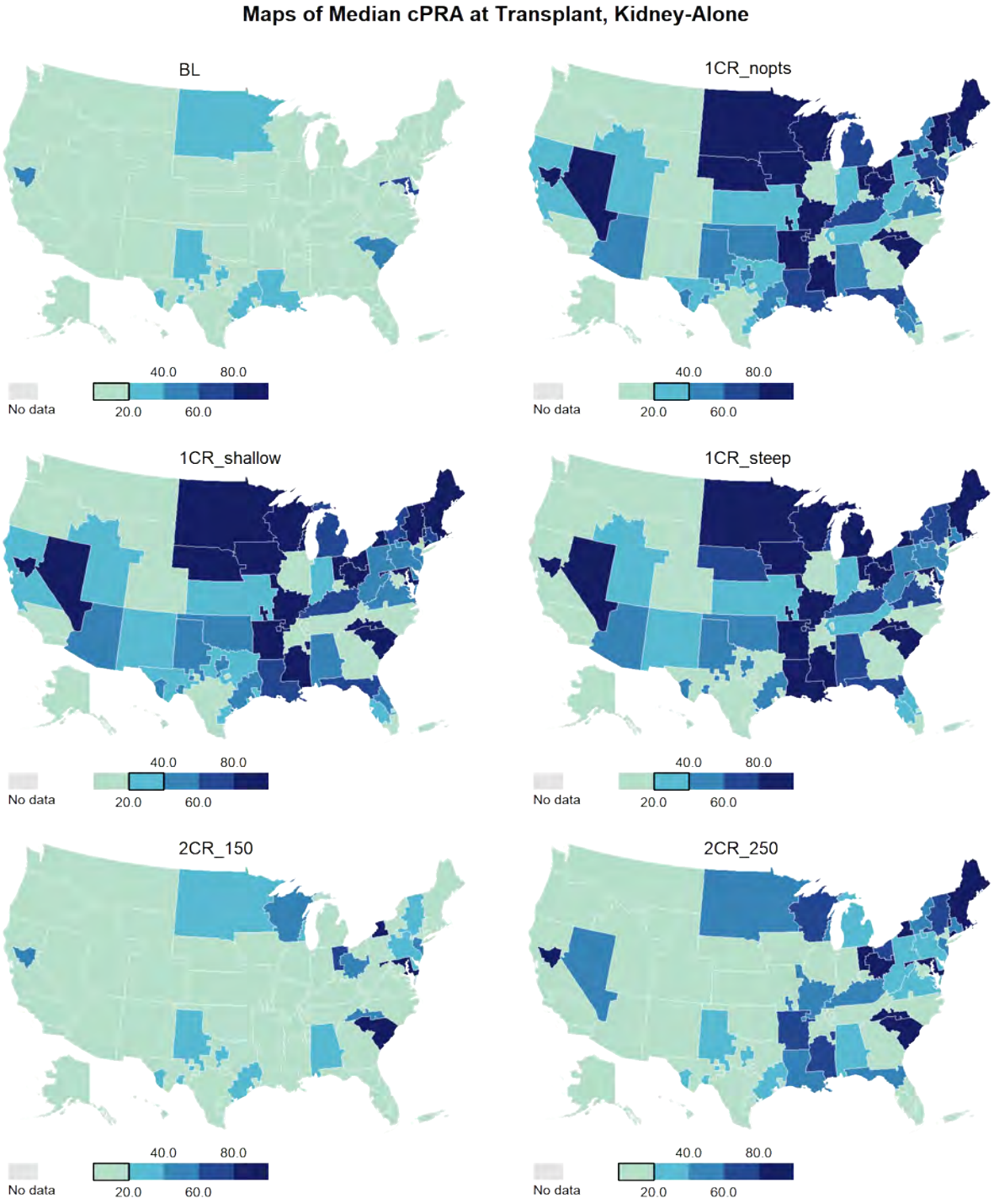
Maps of Median Years on Waitlist at Transplant, Kidney-Pancreas

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



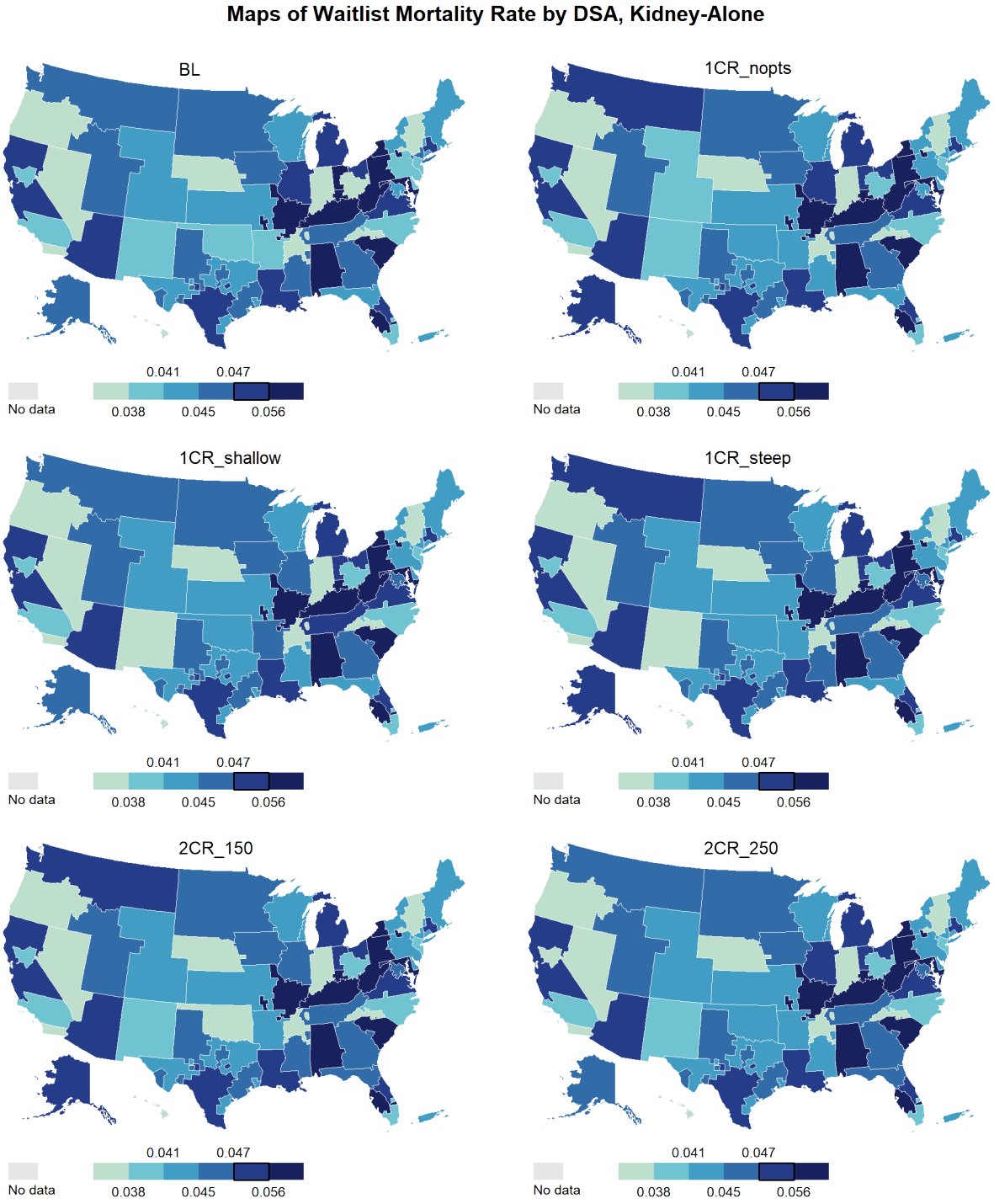
Maps of Median Years on Waitlist at Transplant, Pancreas-Alone

Maps of Median cPRA at Transplant, Kidney-Alone



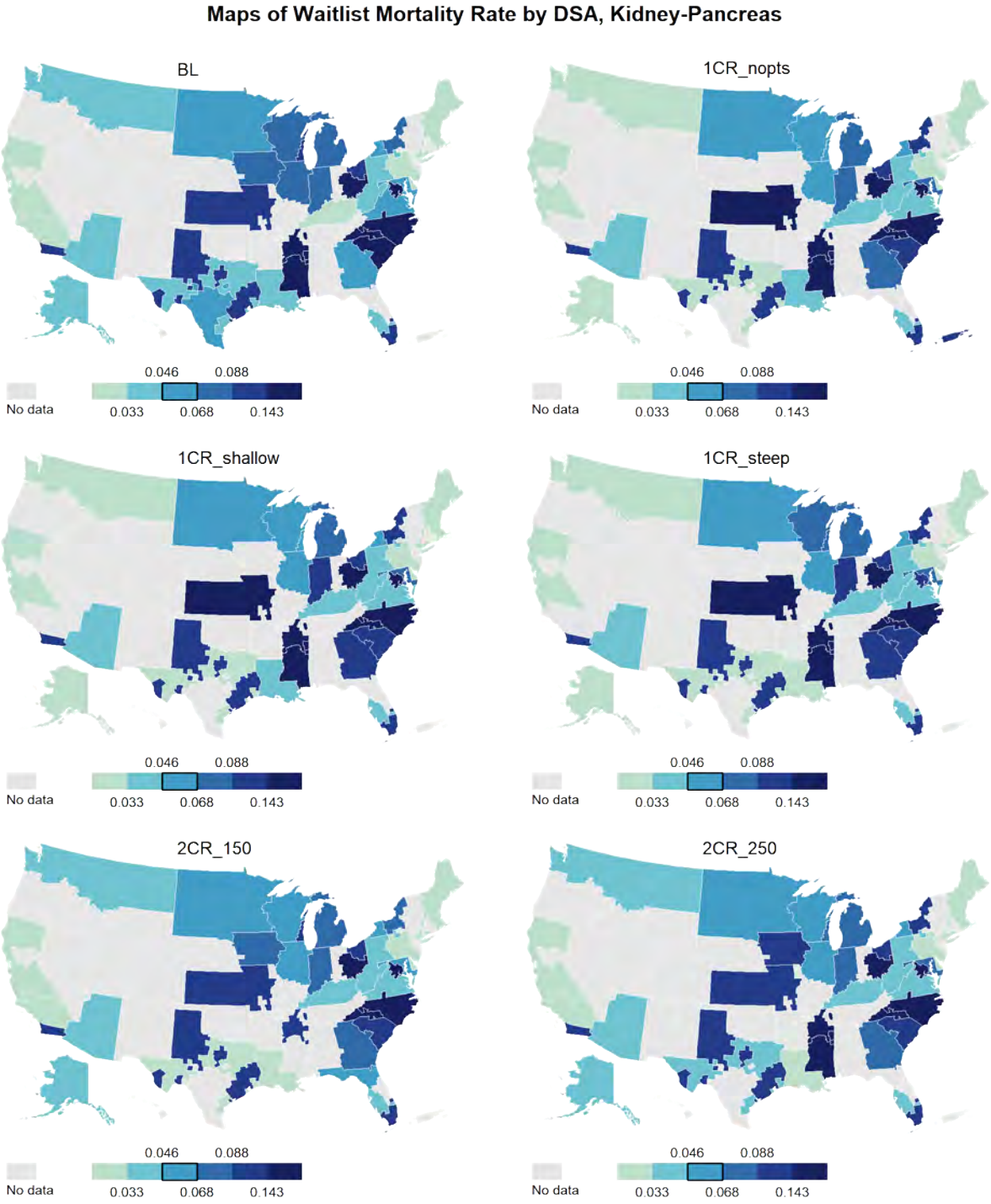
Maps of Median cPRA at Transplant, Kidney-Alone

Maps of Waitlist Mortality Rate by DSA, Kidney-Alone



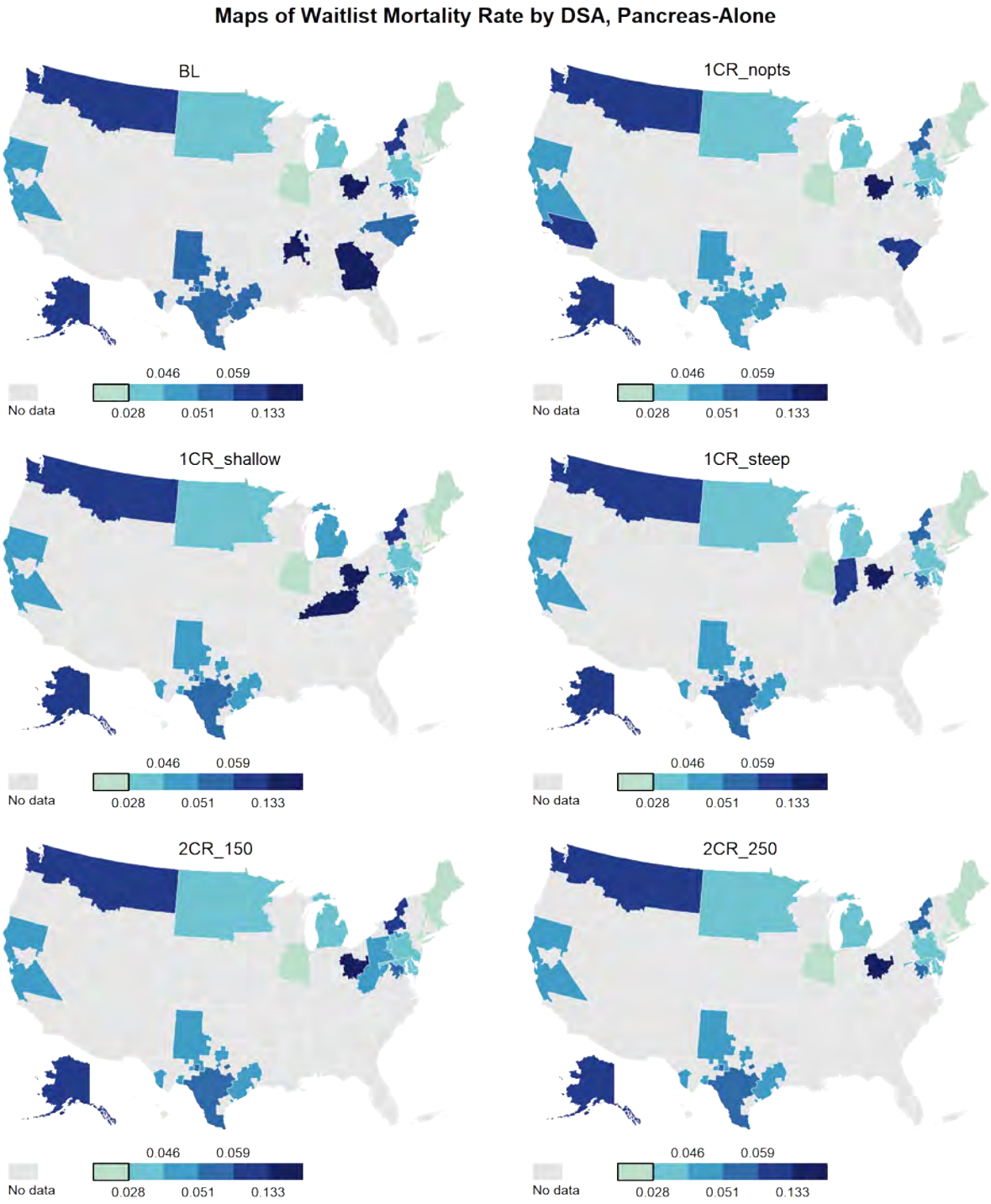
Maps of Waitlist Mortality Rate by DSA, Kidney-Alone

Maps of Waitlist Mortality Rate by DSA, Kidney-Pancreas



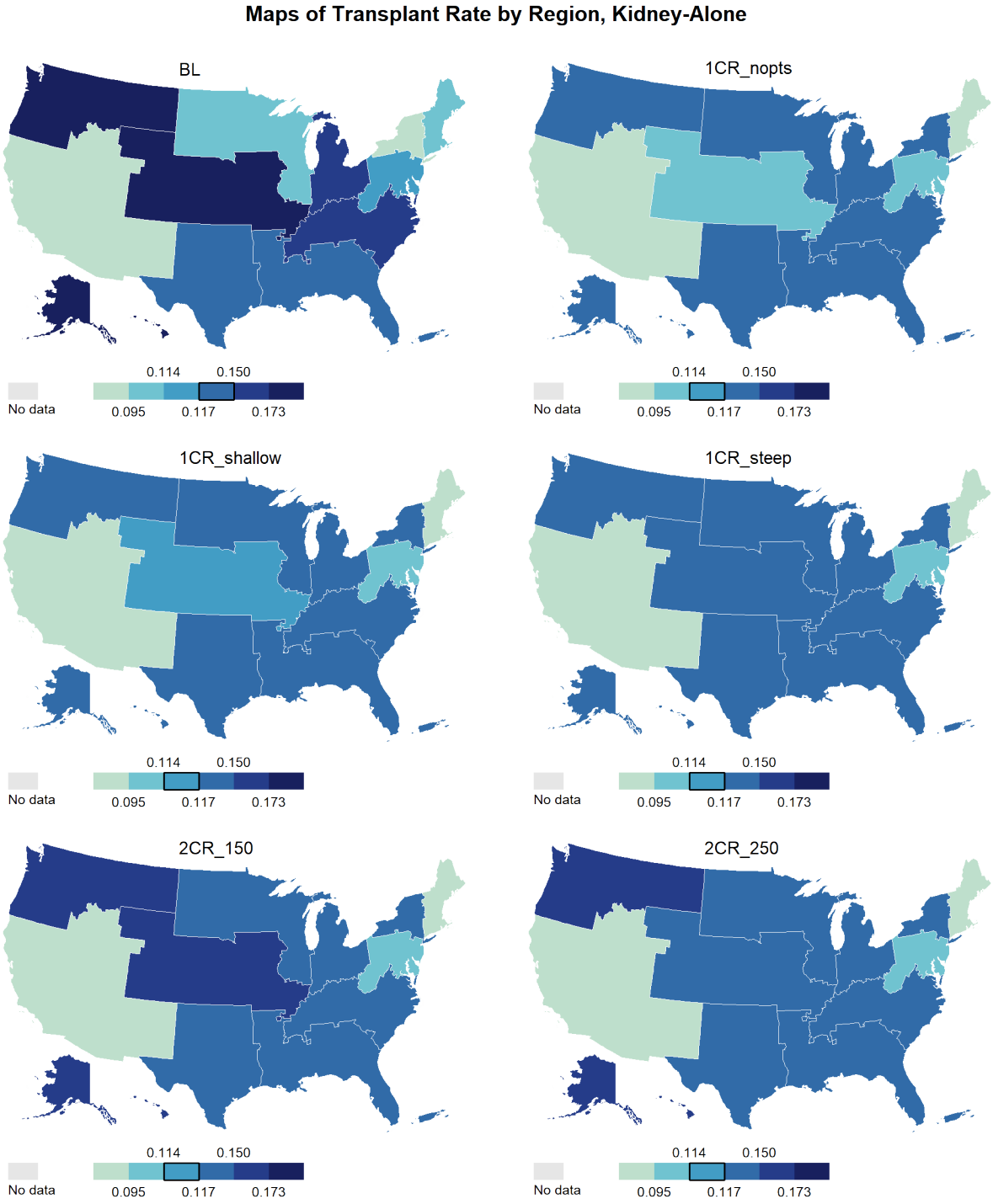
Maps of Waitlist Mortality Rate by DSA, Kidney-Pancreas

Maps of Waitlist Mortality Rate by DSA, Pancreas-Alone



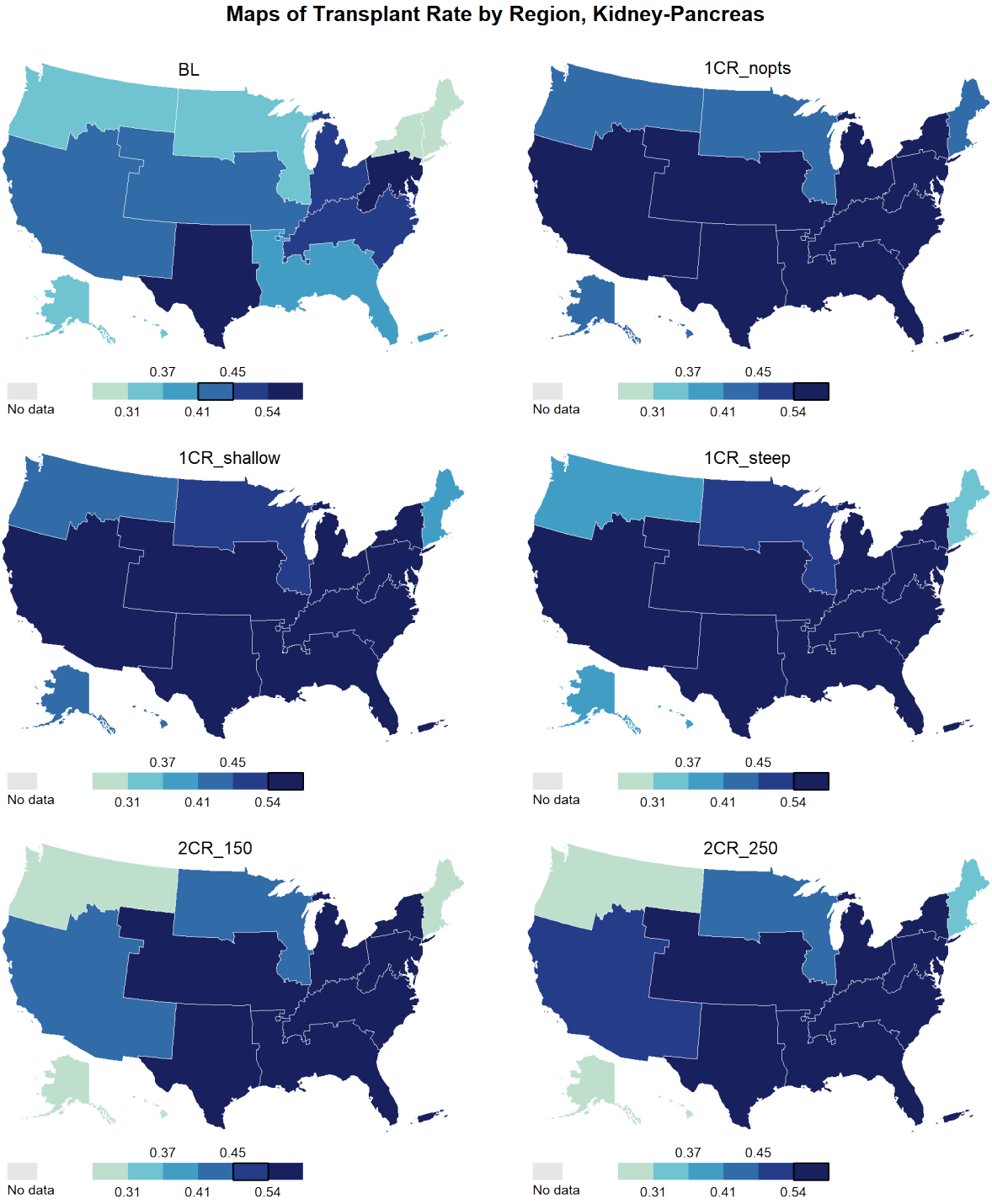
Maps of Waitlist Mortality Rate by DSA, Pancreas-Alone

Maps of Transplant Rate by Region, Kidney-Alone



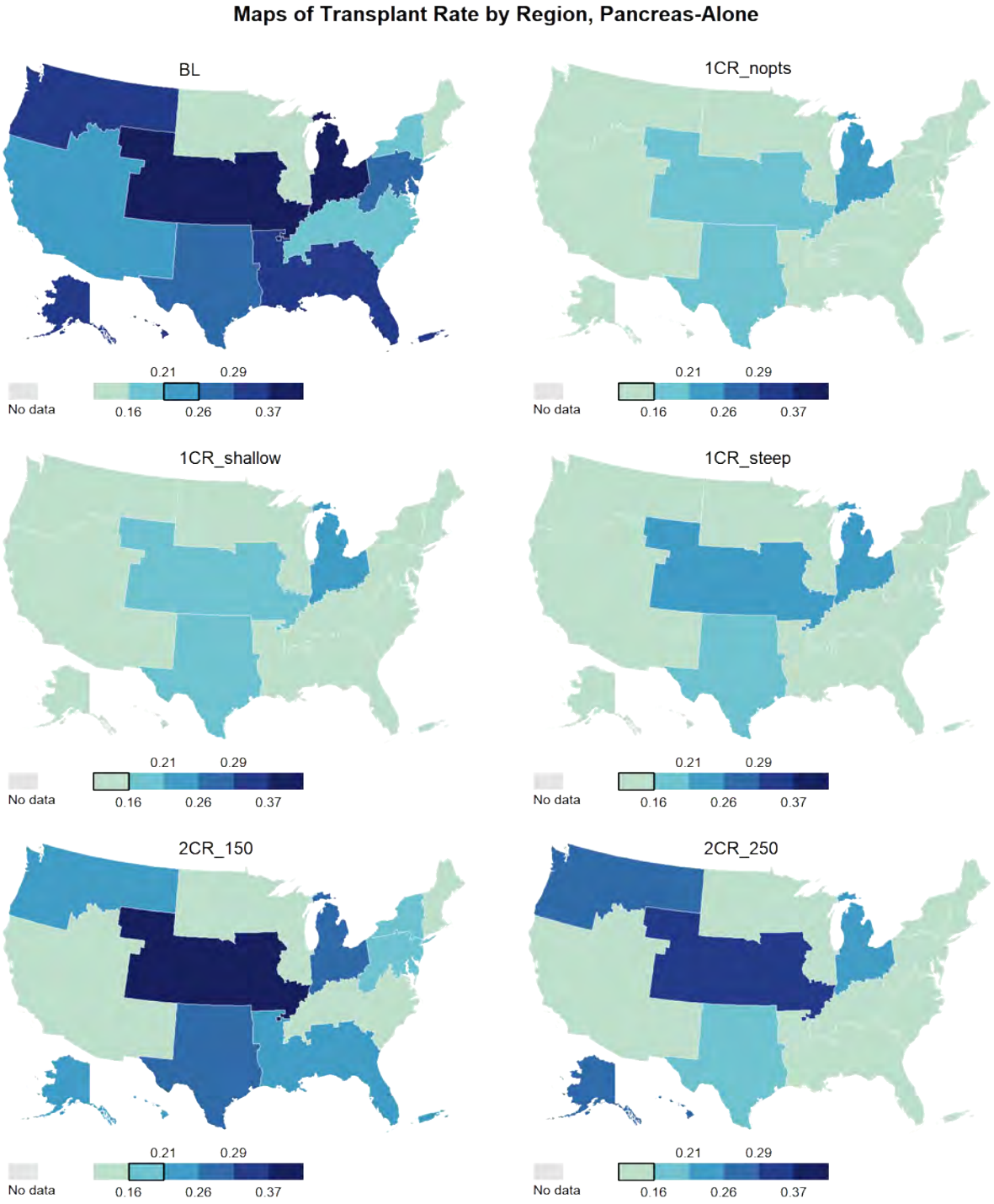
Maps of Transplant Rate by Region, Kidney-Alone

Maps of Transplant Rate by Region, Kidney-Pancreas



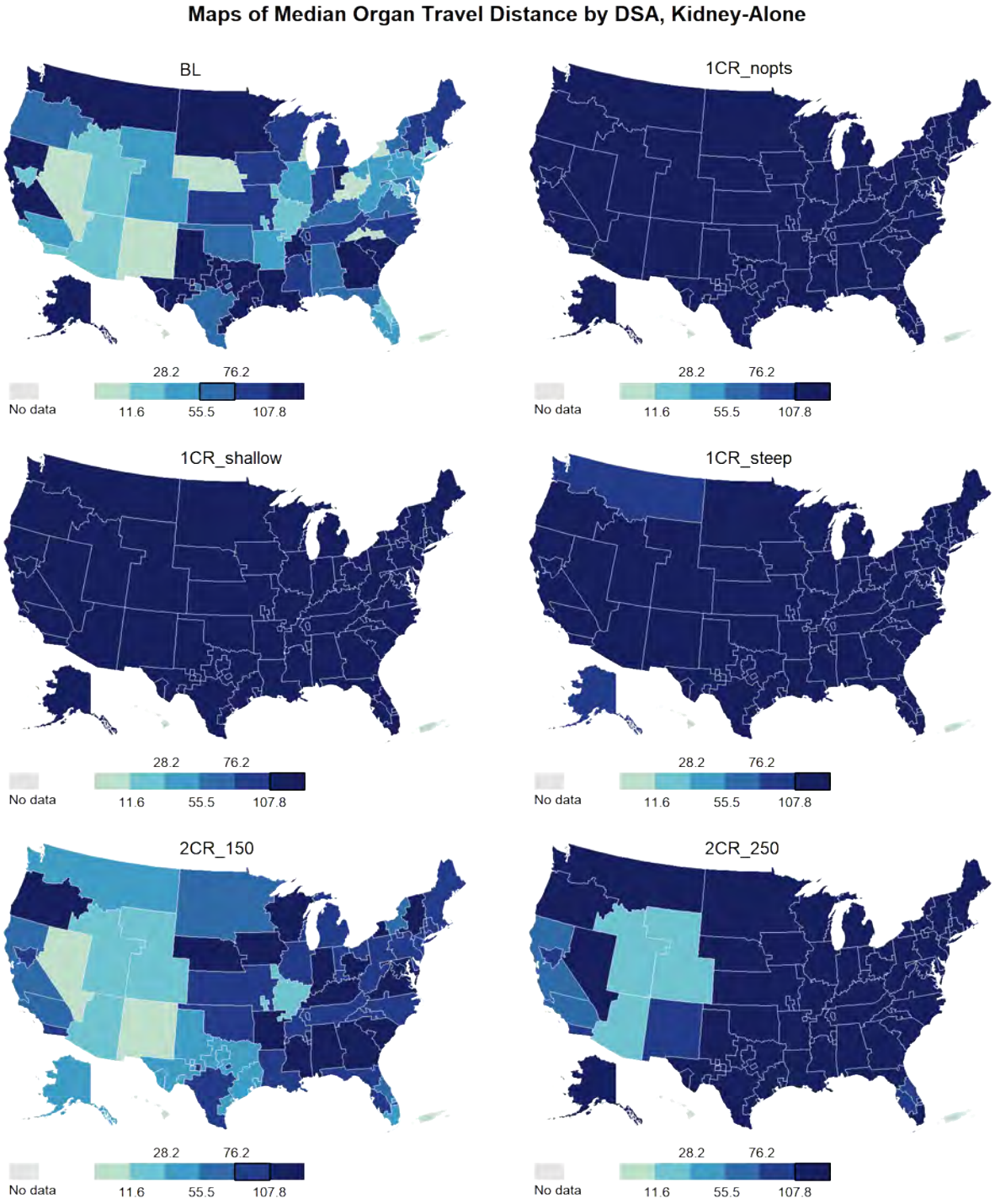
Maps of Transplant Rate by Region, Kidney-Pancreas

Maps of Transplant Rate by Region, Pancreas-Alone



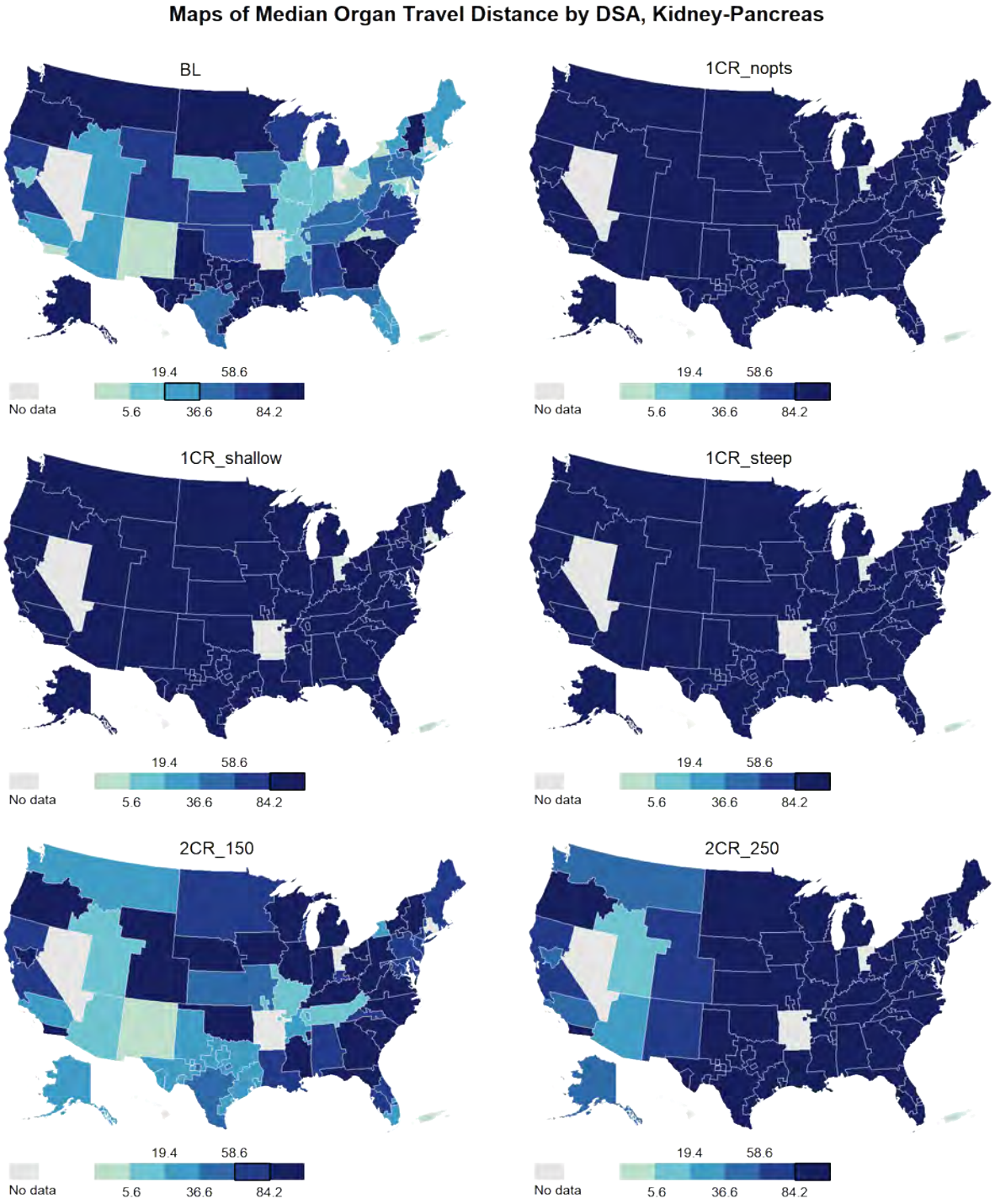
Maps of Transplant Rate by Region, Pancreas-Alone

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



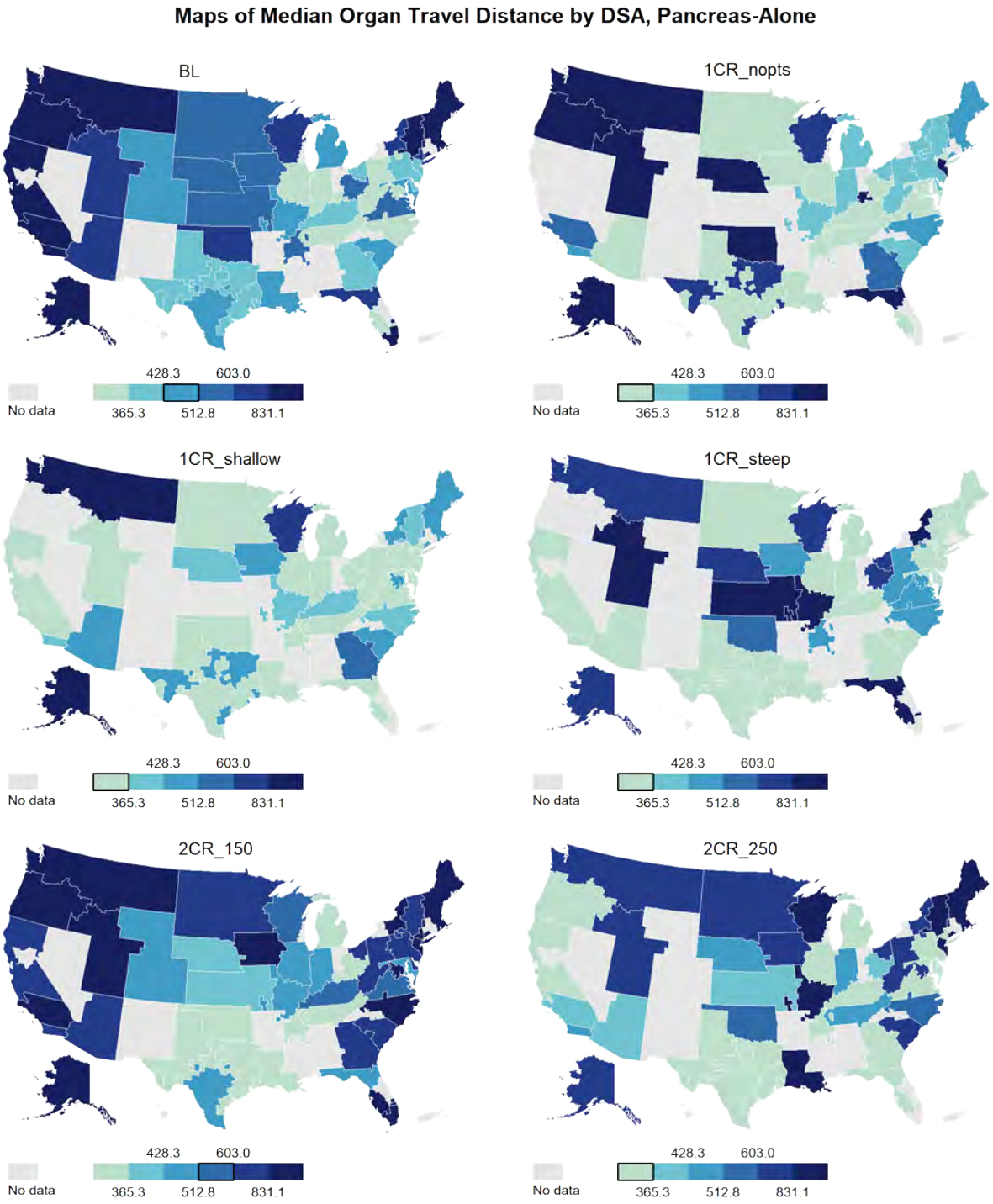
Maps of Median Organ Travel Distance by DSA, Kidney-Alone

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



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

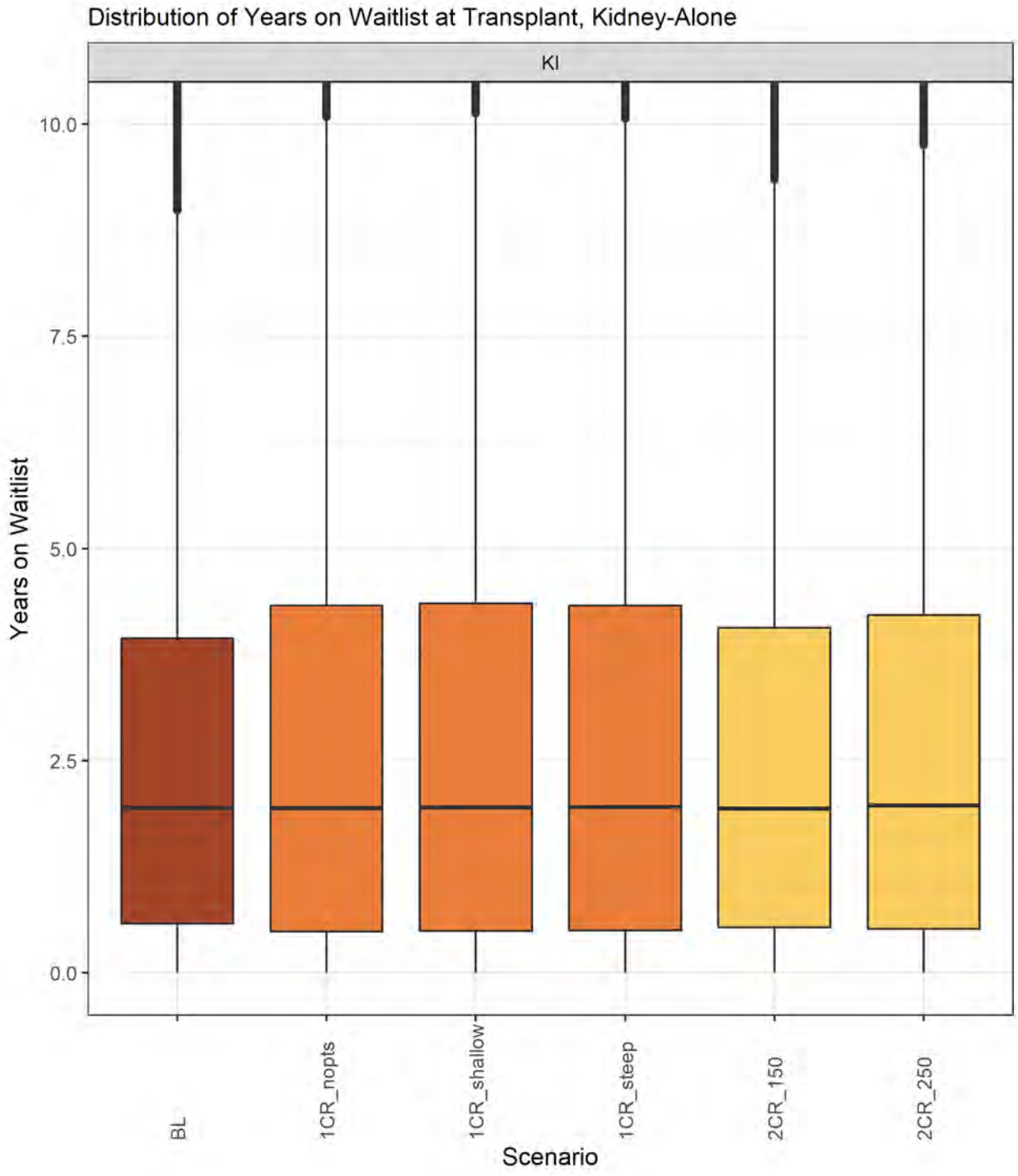
Maps of Median Organ Travel Distance by DSA, Pancreas-Alone



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-Alone

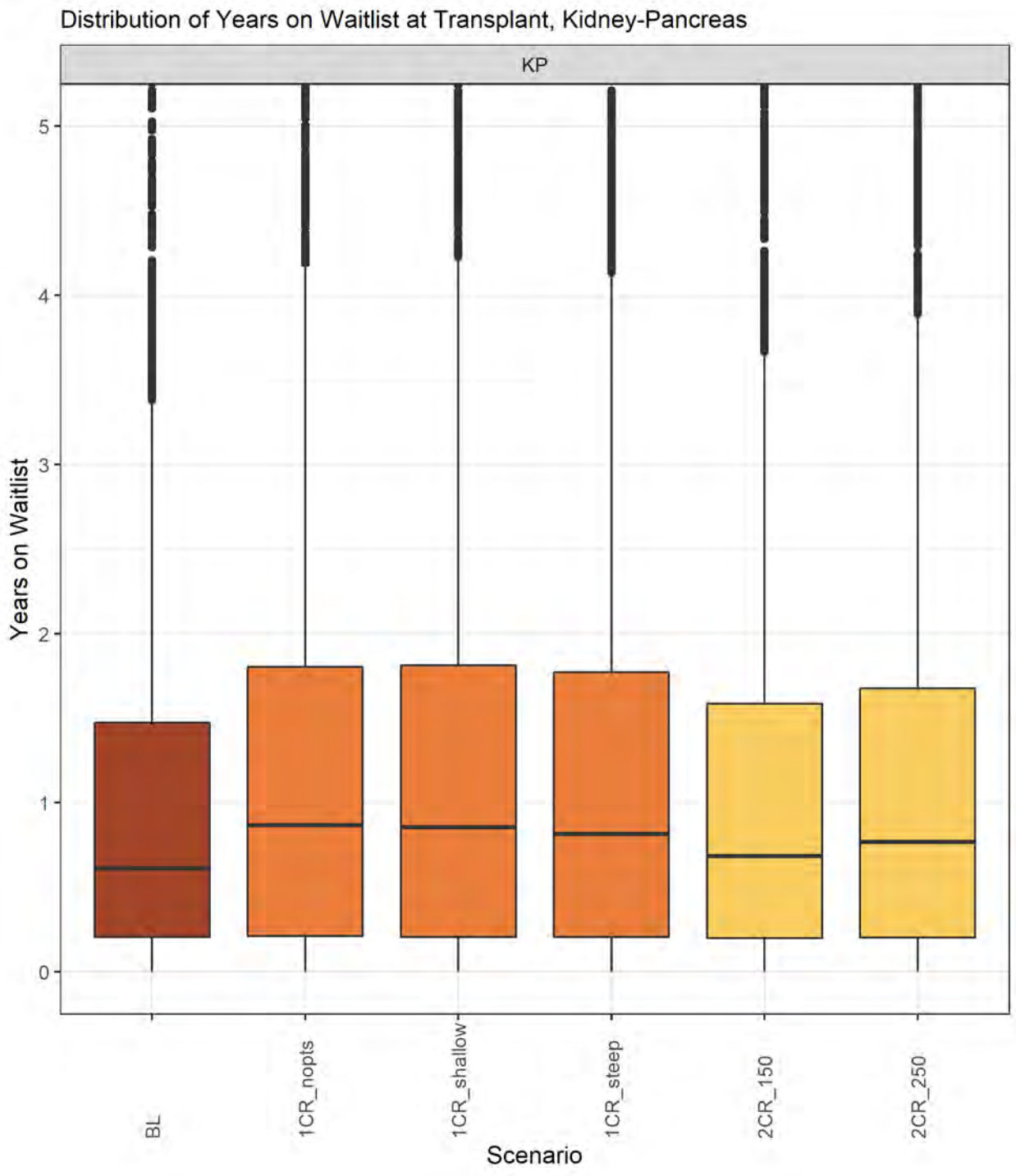


Distribution of Years on Waitlist at Transplant, Kidney-Alone

Time on the Waitlist at Transplant, Kidney-Alone Transplants

Scenario	5th %ile	Q1	Median	Mean	Q3	95th %ile	Std Deviation
BL	0.07	0.58	1.94	2.59	3.94	7.18	2.48
1CR_nopts	0.02	0.49	1.94	2.75	4.33	7.84	2.77
1CR_shallow	0.02	0.49	1.95	2.76	4.35	7.83	2.78
1CR_steep	0.03	0.50	1.95	2.75	4.33	7.82	2.78
2CR_150	0.05	0.54	1.93	2.63	4.07	7.38	2.58
2CR_250	0.04	0.52	1.97	2.70	4.21	7.61	2.67

Distribution of Years on Waitlist at Transplant, Kidney-Pancreas

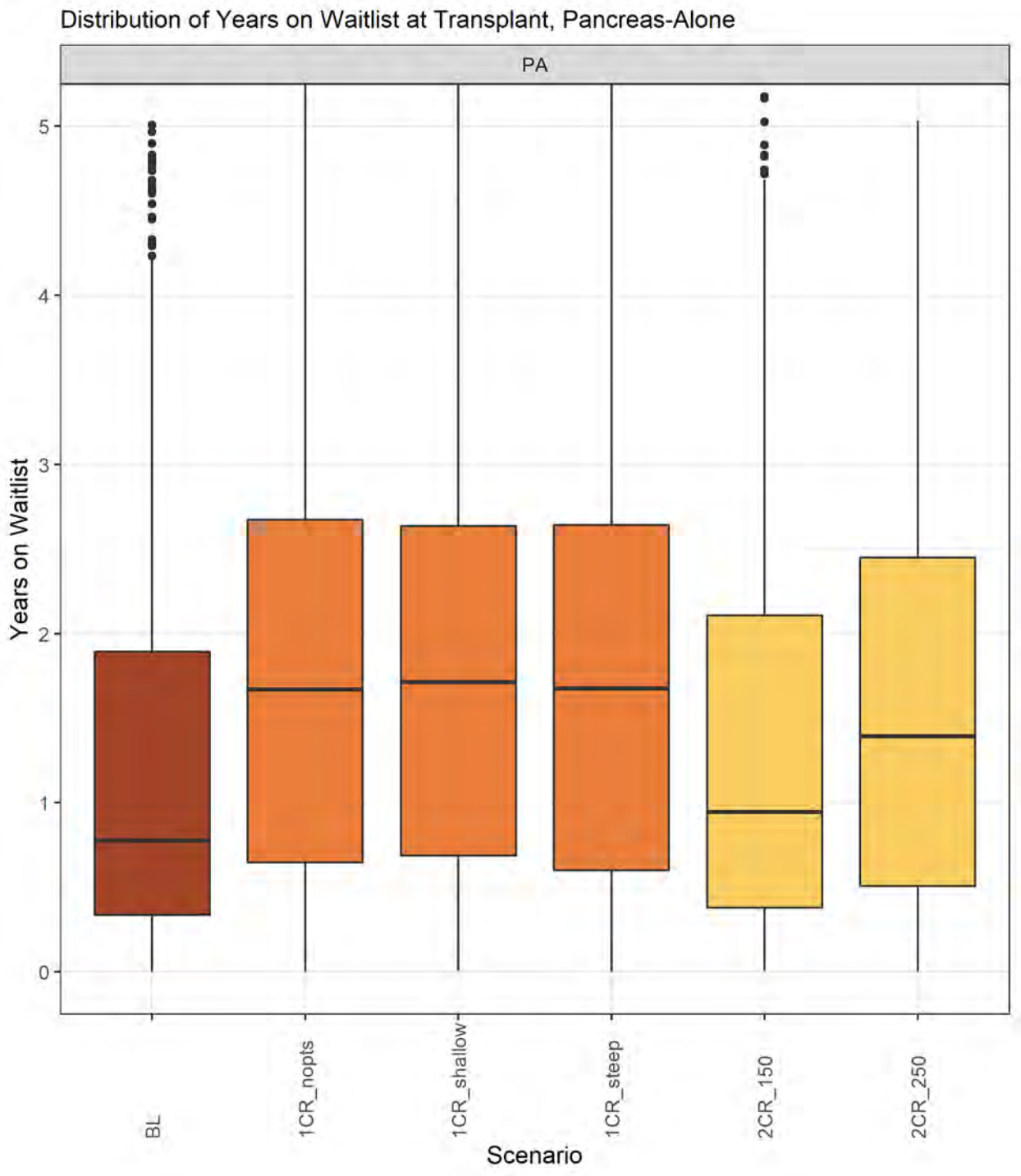


Distribution of Years on Waitlist at Transplant, Kidney-Pancreas

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	0.62	1.08	1.48	3.51	1.29
1CR_nopts	0.01	0.21	0.87	1.25	1.80	3.72	1.39
1CR_shallow	0.01	0.20	0.85	1.25	1.81	3.79	1.41
1CR_steep	0.01	0.21	0.81	1.24	1.77	3.76	1.41
2CR_150	0.03	0.20	0.69	1.13	1.59	3.60	1.33
2CR_250	0.02	0.20	0.77	1.18	1.68	3.70	1.36

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	0.34	0.78	1.27	1.91	3.59	1.34
1CR_nopts	0.10	0.65	1.66	1.89	2.64	4.74	1.55
1CR_shallow	0.13	0.70	1.71	1.92	2.64	4.86	1.55
1CR_steep	0.12	0.60	1.66	1.86	2.60	4.69	1.53
2CR_150	0.08	0.39	0.95	1.40	2.10	3.99	1.37
2CR_250	0.10	0.50	1.38	1.65	2.43	4.35	1.45