The New Kidney Allocation System (KAS): The First Six(+) Months

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OPTN Board of Directors meeting
Dec 2, 2015

Analyses performed by UNOS Research Department:
Darren Stewart, MS; John Beck; Anna Kucheryavaya, MS

Background

- KAS implemented Dec 4, 2014
- Key goals:
  - Make better use of available kidneys
  - Increase transplant opportunities for difficult-to-match patients (increased equity)
  - Increase fairness by awarding waiting time points based on dialysis start date
  - Have minimal impact on most candidates

Background

- Performance tracked monthly through June 2015 (“out of the gate” reports)

(http://optn.transplant.hrsa.gov)

FEATURED REPORTS

KAS Monitoring Report - June 2015
(PDF - 569 KB)

KAS Monitoring Report - May 2015
(PDF - 754 KB)

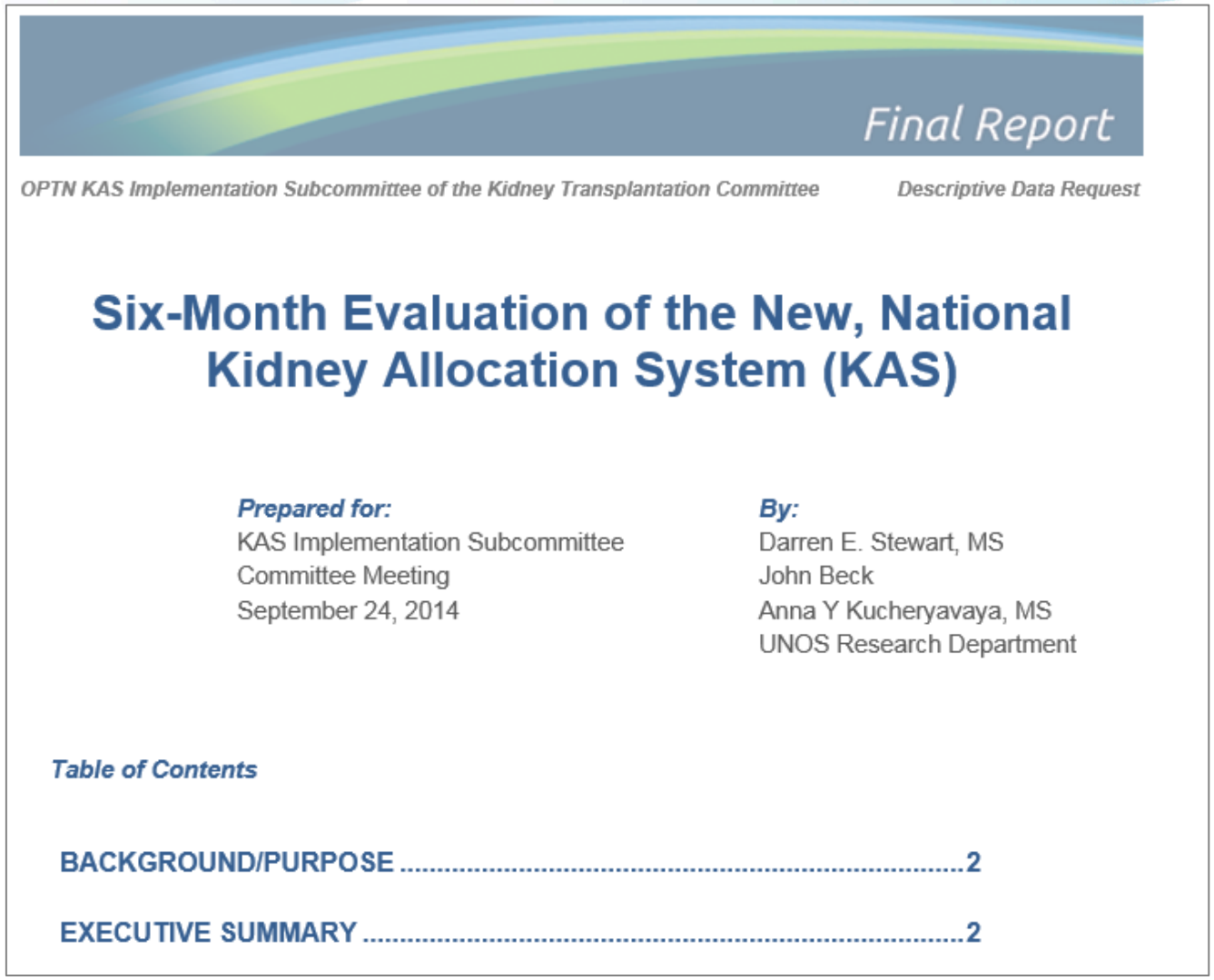
KAS Monitoring Report - April 2015
(PDF - 748 KB)

KAS Monitoring Report - March 2015
(PDF - 2.5 MB)

KAS Monitoring Report - February 2015
(PDF - 422 KB)

KAS "Out of the Gate" Monitoring Report - January 2015
(PDF - 392 KB)

Background



Final Report

OPTN KAS Implementation Subcommittee of the Kidney Transplantation Committee *Descriptive Data Request*

Six-Month Evaluation of the New, National Kidney Allocation System (KAS)

Prepared for:
KAS Implementation Subcommittee
Committee Meeting
September 24, 2014

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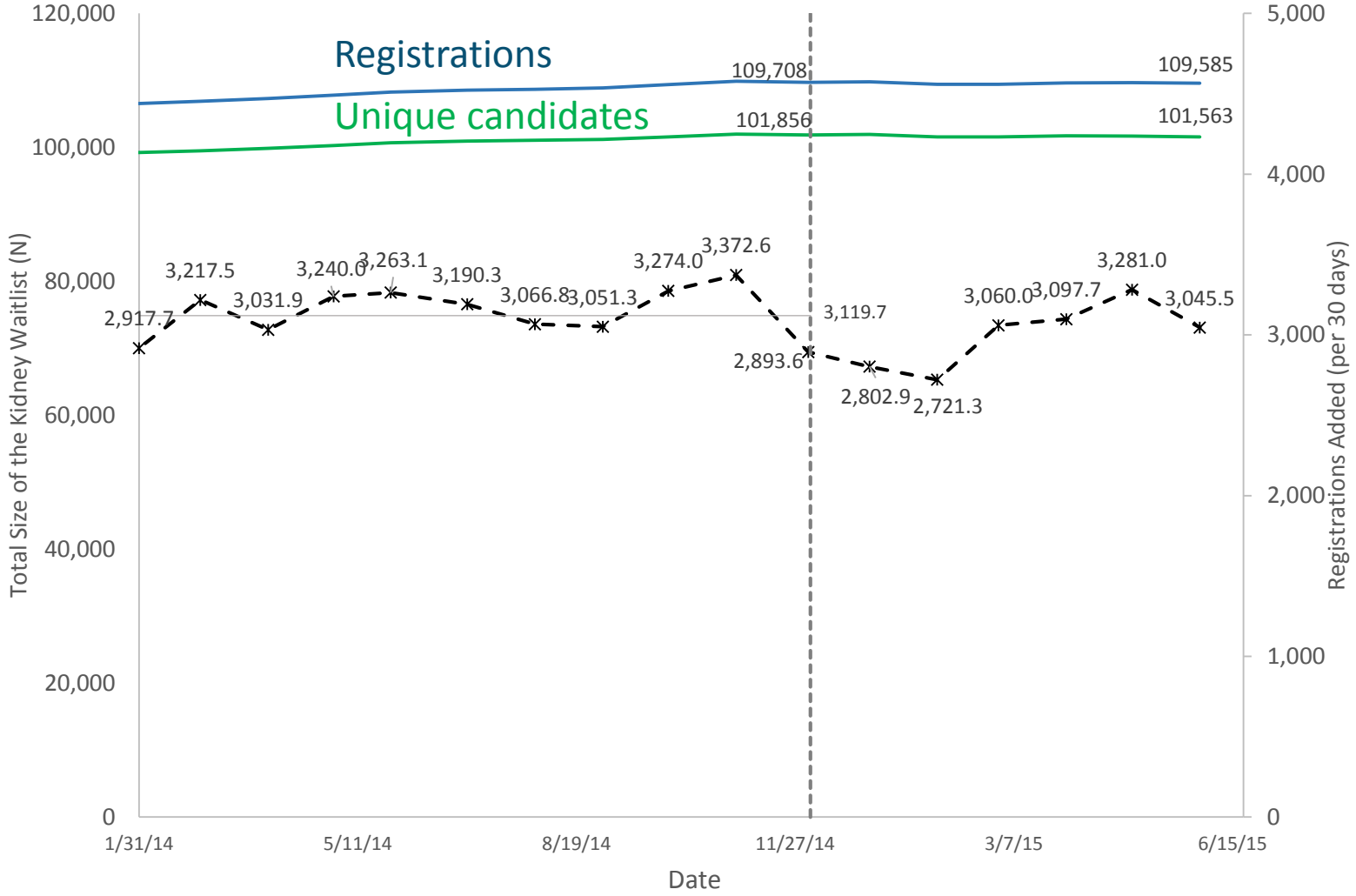
Pre-KAS period: June 1, 2013 – December 3, 2014 (18 months)

Post-KAS period: December 4, 2014 – May 31, 2015 (6 months)

Kidney waiting list trends

Trends in the kidney waiting list



- The size of the kidney waiting list has plateaued after KAS.
- New registrations decreased by 4.2%.

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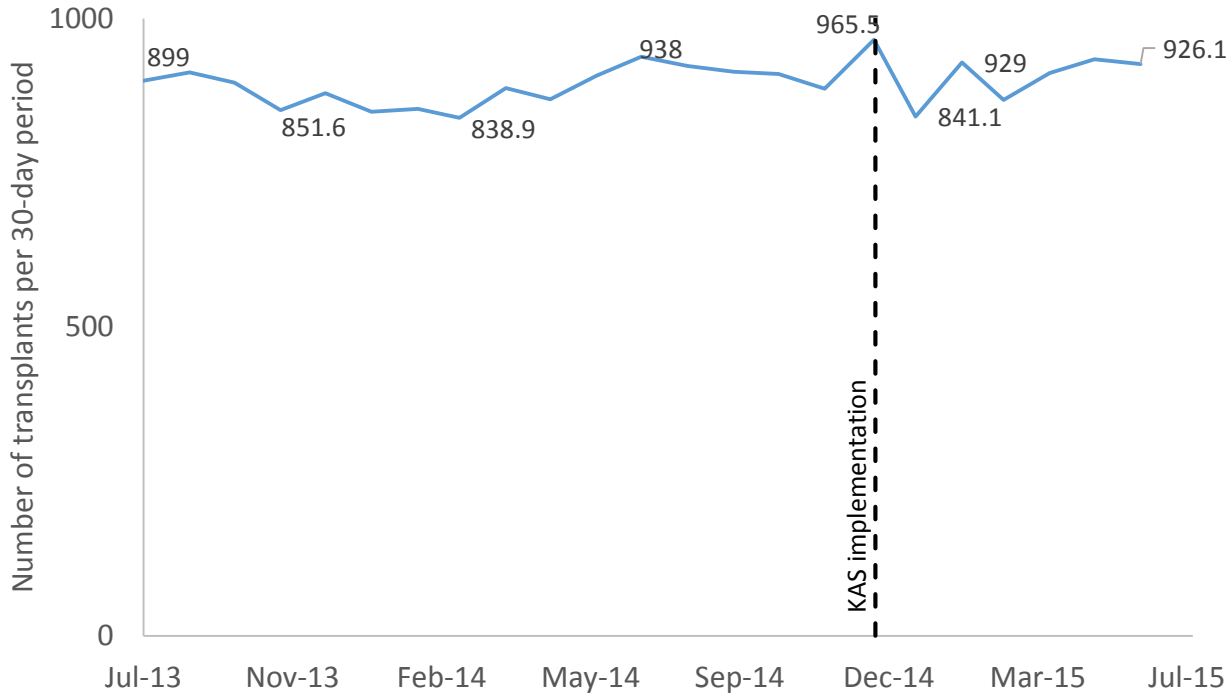
Table I.1a
Table I.3a

Deceased donor kidney transplants

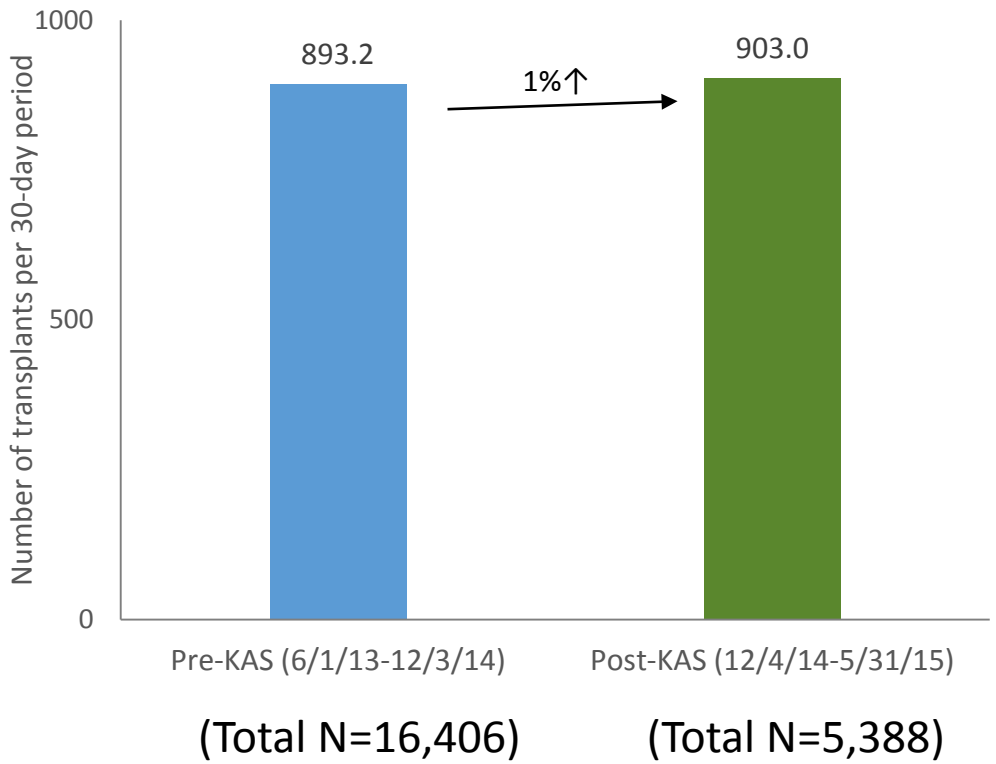
Solitary deceased donor transplants under KAS

Pre vs. post-KAS trends

Over time (per 30 days)



On average



(Total N=16,406) (Total N=5,388)

- Transplant volume has increased slightly (about 1%) post-KAS.

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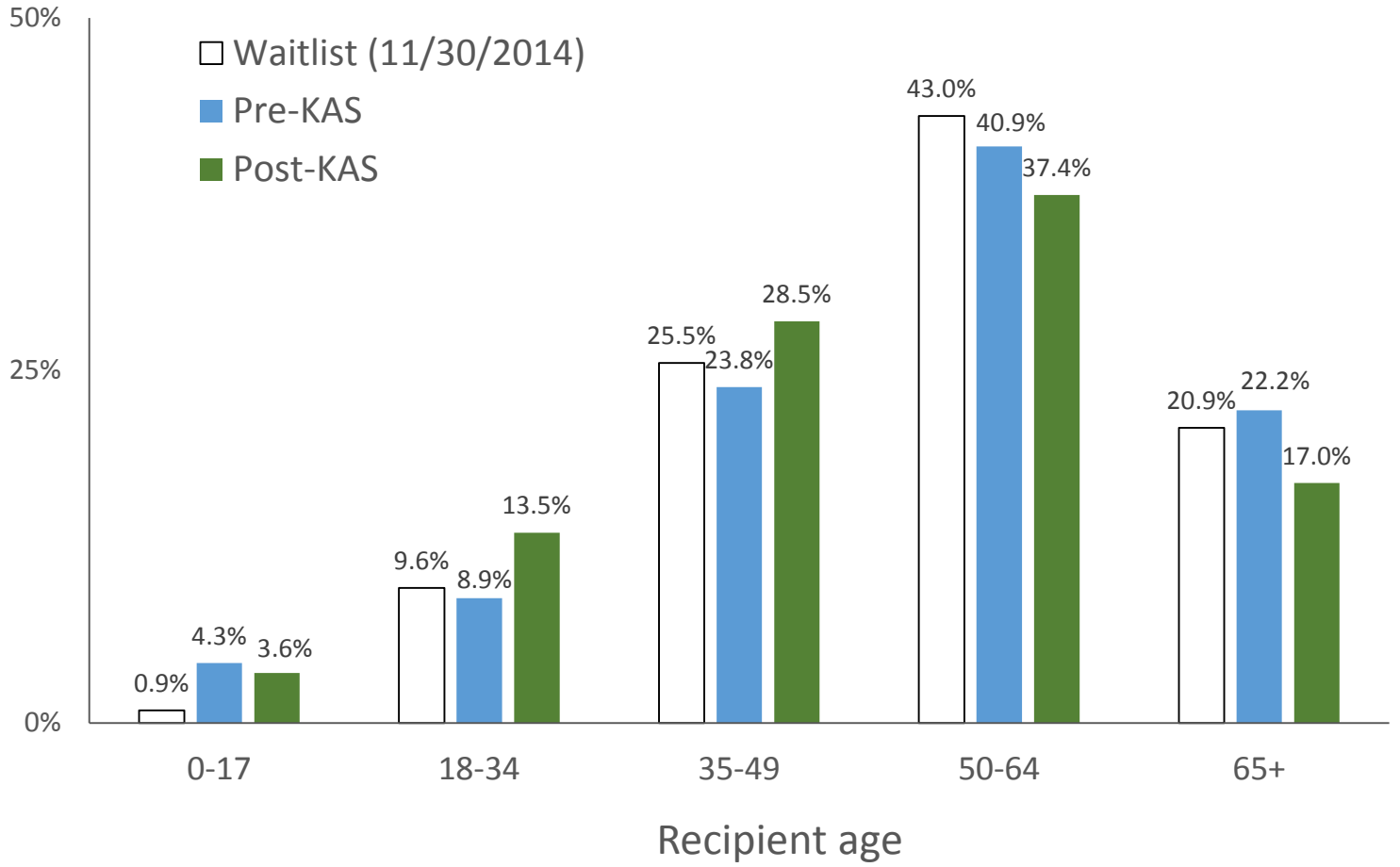
Table II.1a

Who's getting transplanted under KAS?

Percentage of Deceased Donor Kidney Transplants by Recipient Age



- More young adults (18-49) are receiving kidney transplants.
- Still, over half of transplants are going to age 50+ recipients under KAS.

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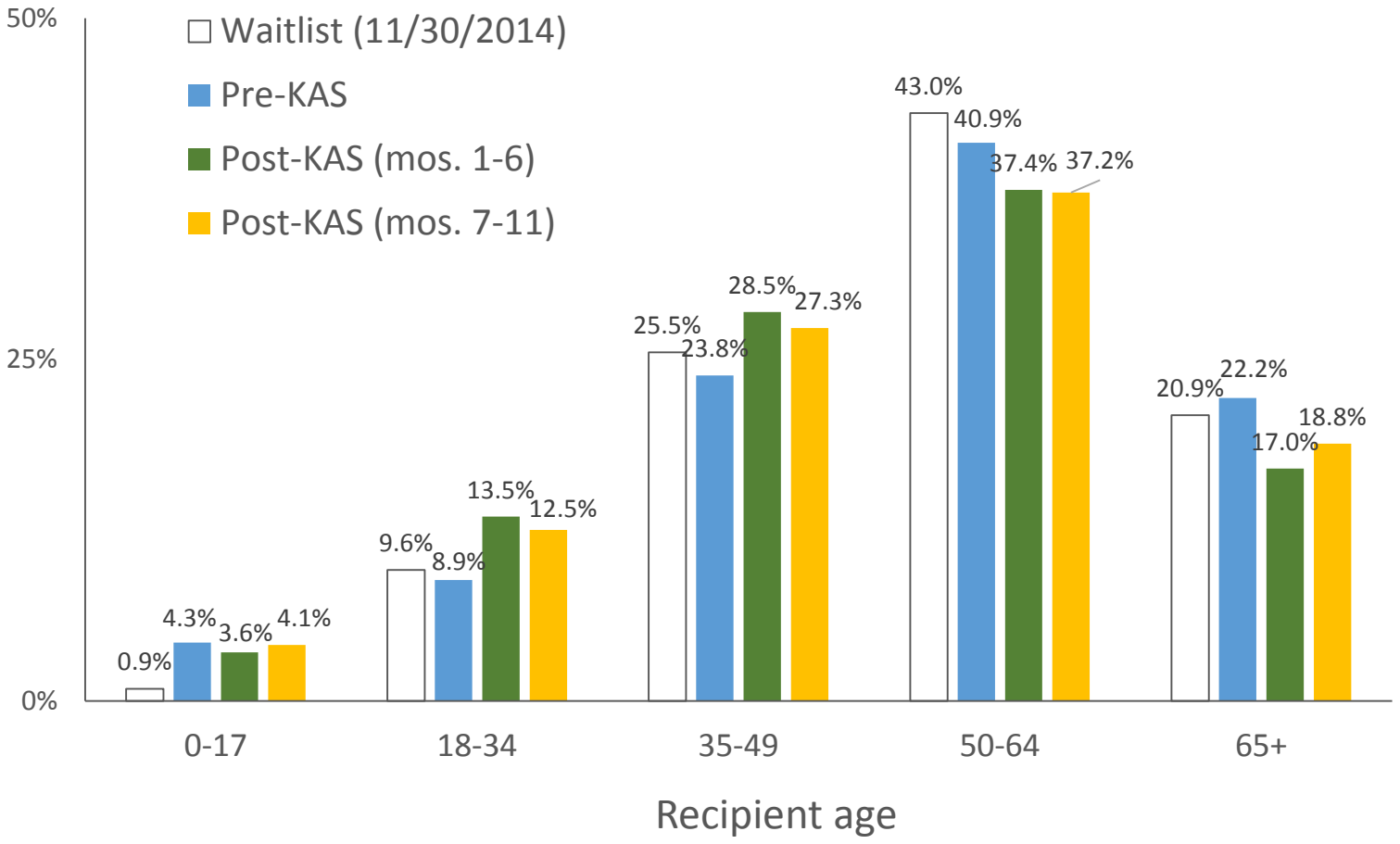
Eras - Pre: 18 months (June 1, 2013 – Dec 3, 2014) Post: 6 months (Dec 4, 2014 – May 31, 2015)

Table 1.2a
Table II.1b

Who's getting transplanted under KAS?

Percentage of Deceased Donor Kidney Transplants by Recipient Age

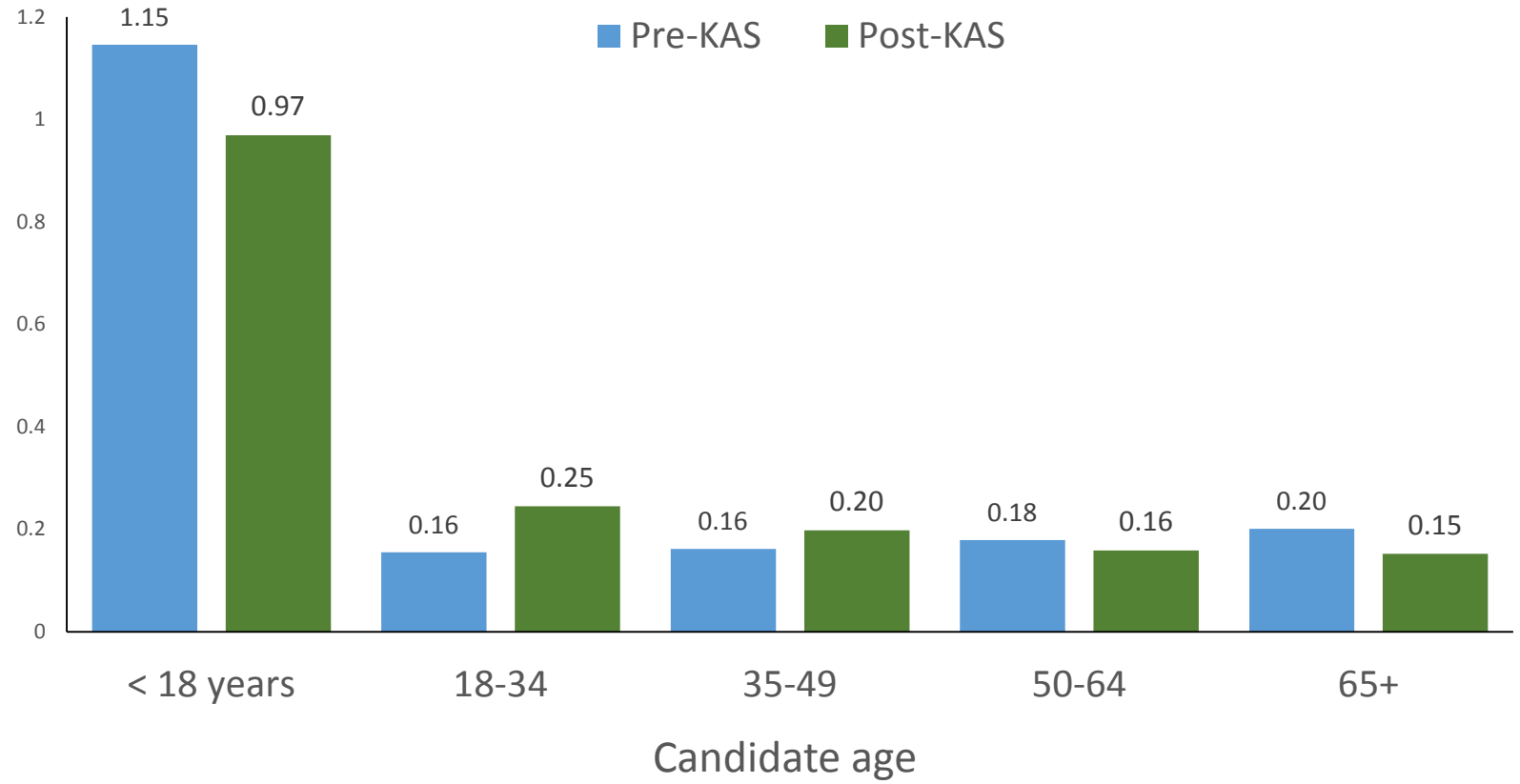


- Pediatric volume has returned to near pre-KAS levels in recent months.

Eras - Pre: 18 months (June 1, 2013 – Dec 3, 2014) Post: 6 months (Dec 4, 2014 – May 31, 2015) Post: 7-11 (Jun 1, 2015 – Oct 31, 2015)

Table 1.2a
Table II.1b

Transplant rates (per active patient-year) by candidate age



- Pediatric transplant rate 5 times higher than for adults.
- Transplant rate increase for 18-34 and 35-49, decreased for older patients.

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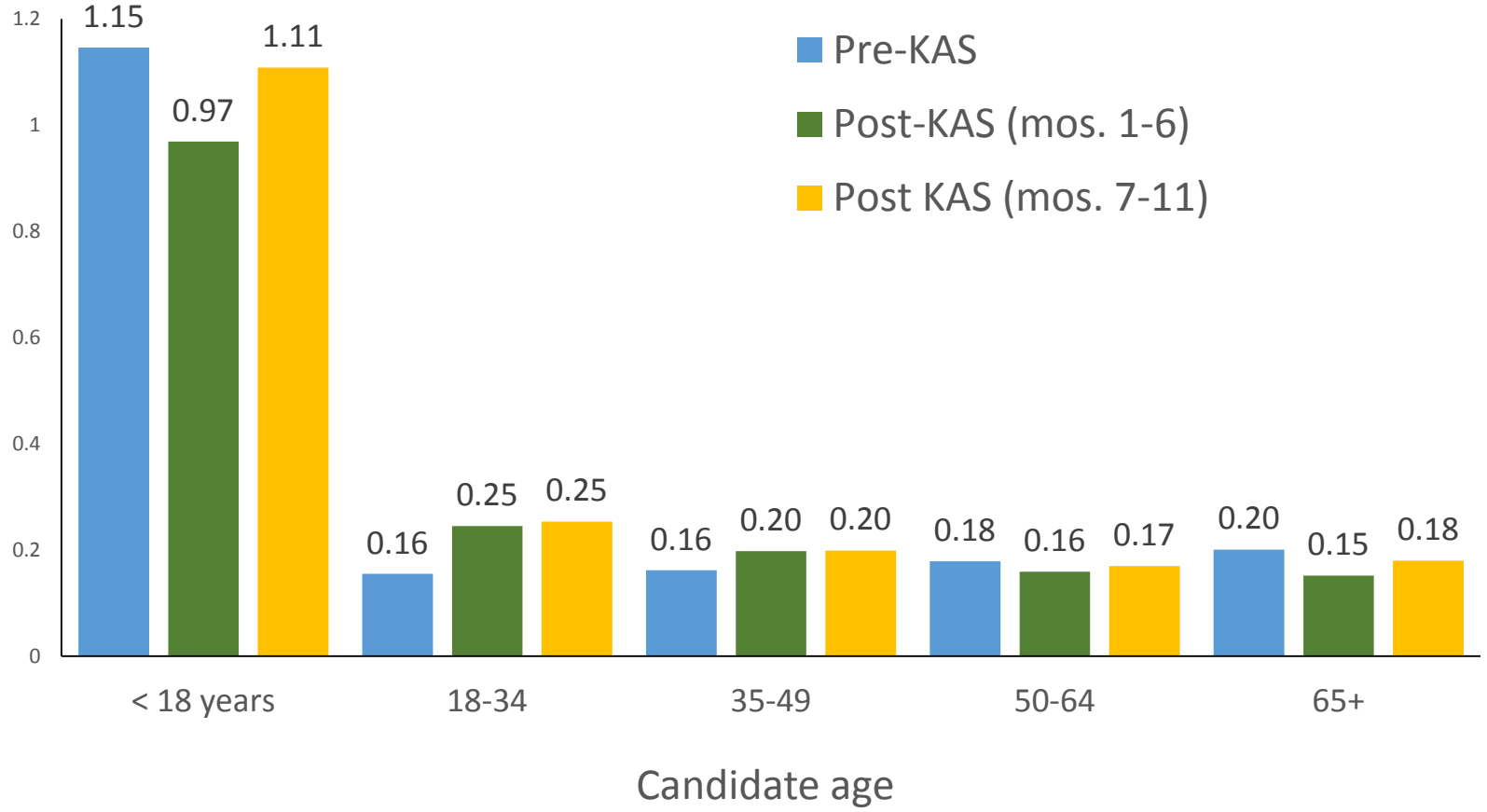
Table II.12

Transplant rates (per active patient-year) by candidate age



- Pediatric transplant rate in past 5 months nearly identical to pre-KAS.
- Transplant rate for age 65+ has rebounded as well.

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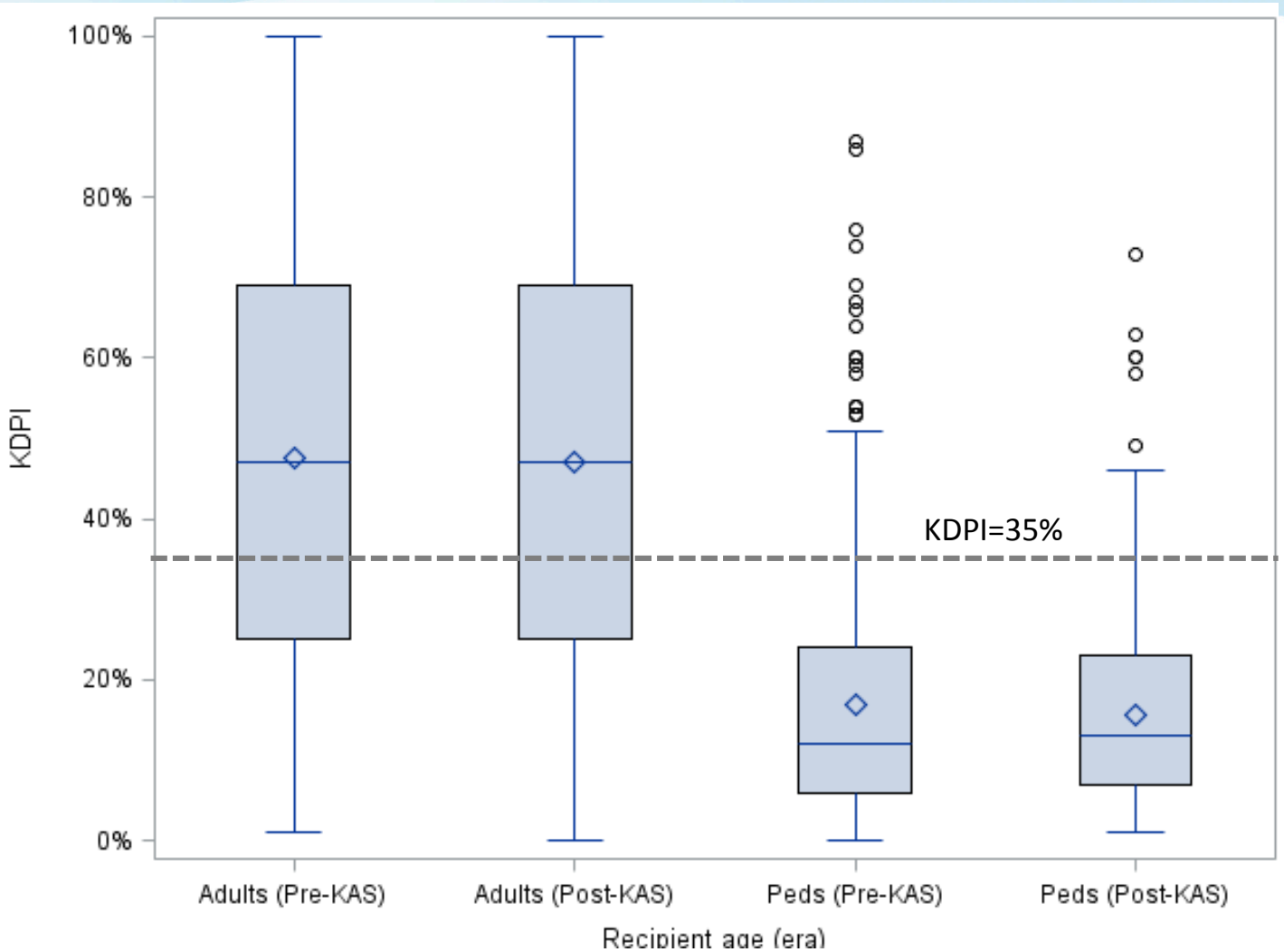
Table II.12

Donor KDPI distribution for pediatric & adult recipients



- Pediatric transplants Pre-KAS: 86% had KDPI<35%; post-KAS: 95%
- Post-KAS: Adult median KDPI: 47%; Pediatric: 13%

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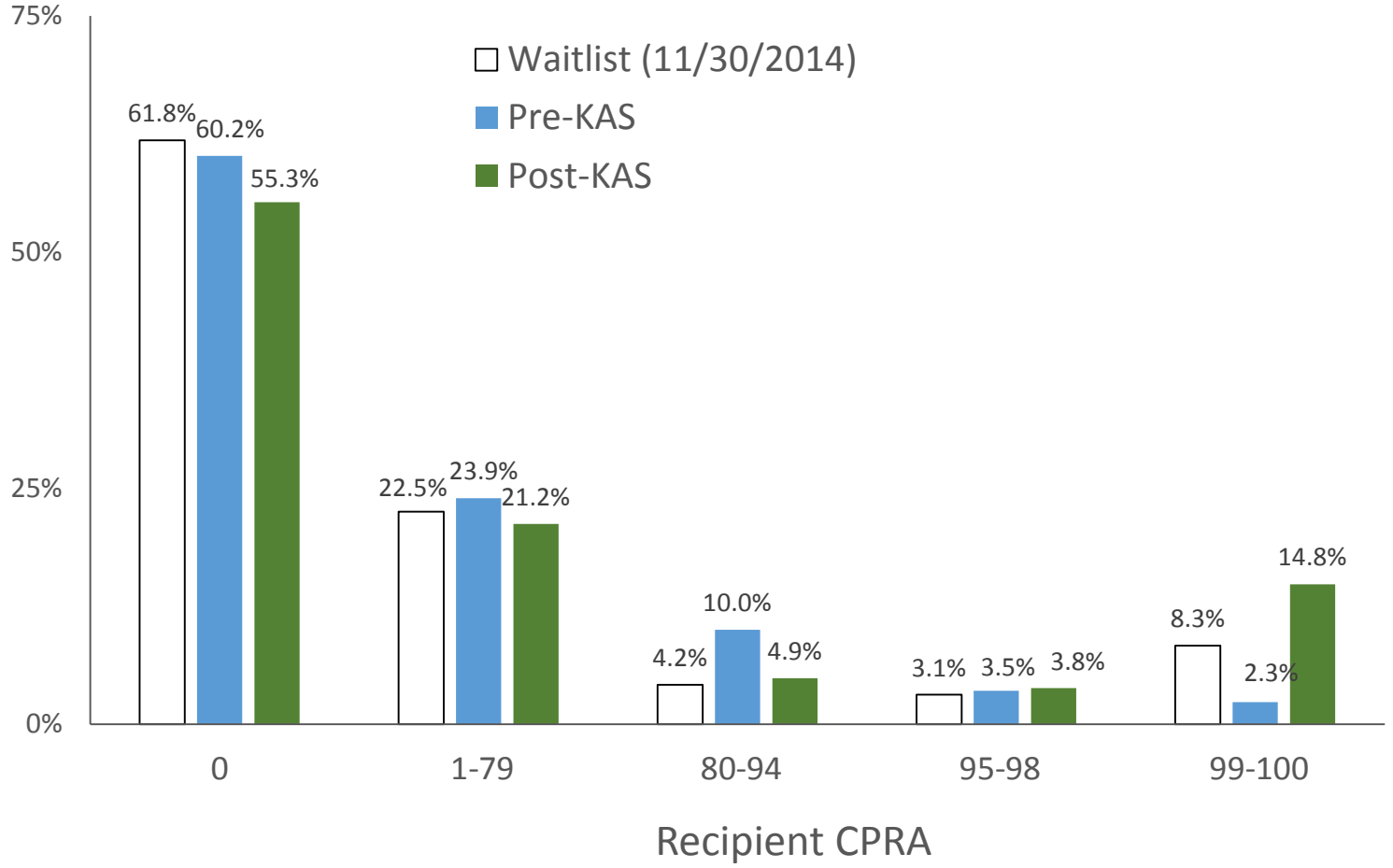
Who's getting transplanted under KAS?

Percentage of Deceased Donor Kidney Transplants by Recipient CPRA



- Transplants have increased sharply for CPRA 99-100% patients.
- Transplants have declined for CPRA=0% and 80-94% patients.

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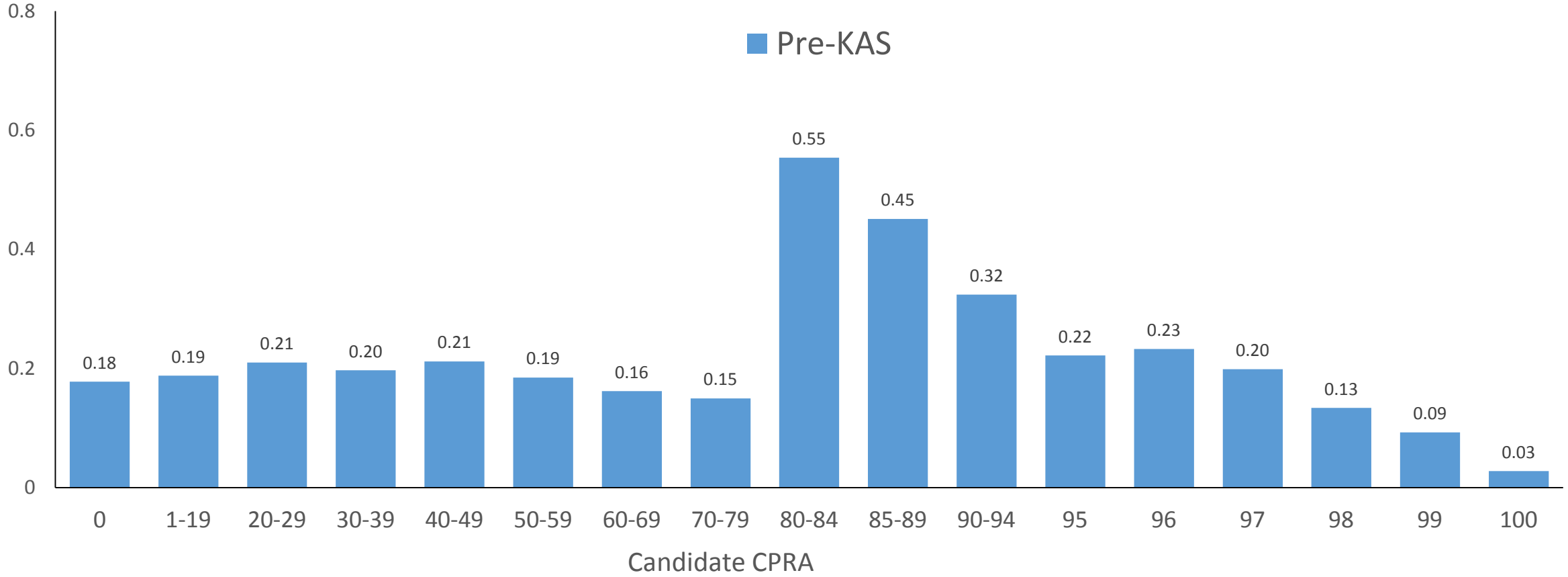
Table 1.2a
Table II.1b

Transplant rates (per active patient-year) by candidate CPRA



- Pre-KAS, transplant rates were extremely variable across the CPRA spectrum.

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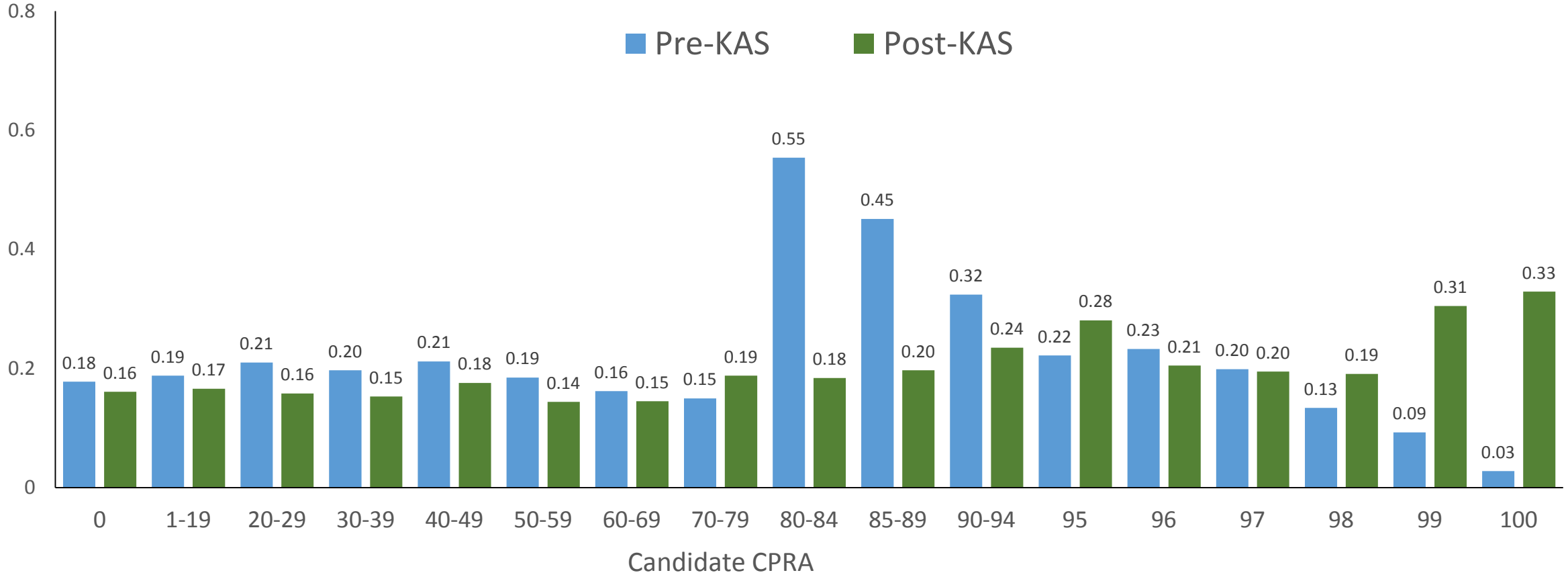
Table II.12

Transplant rates (per active patient-year) by candidate CPRA



- Post-KAS, marked ↓ for CPRA 80-94 and ↑ for CPRA 99-100
- Transplant rate pattern smoother: increase in equitable access

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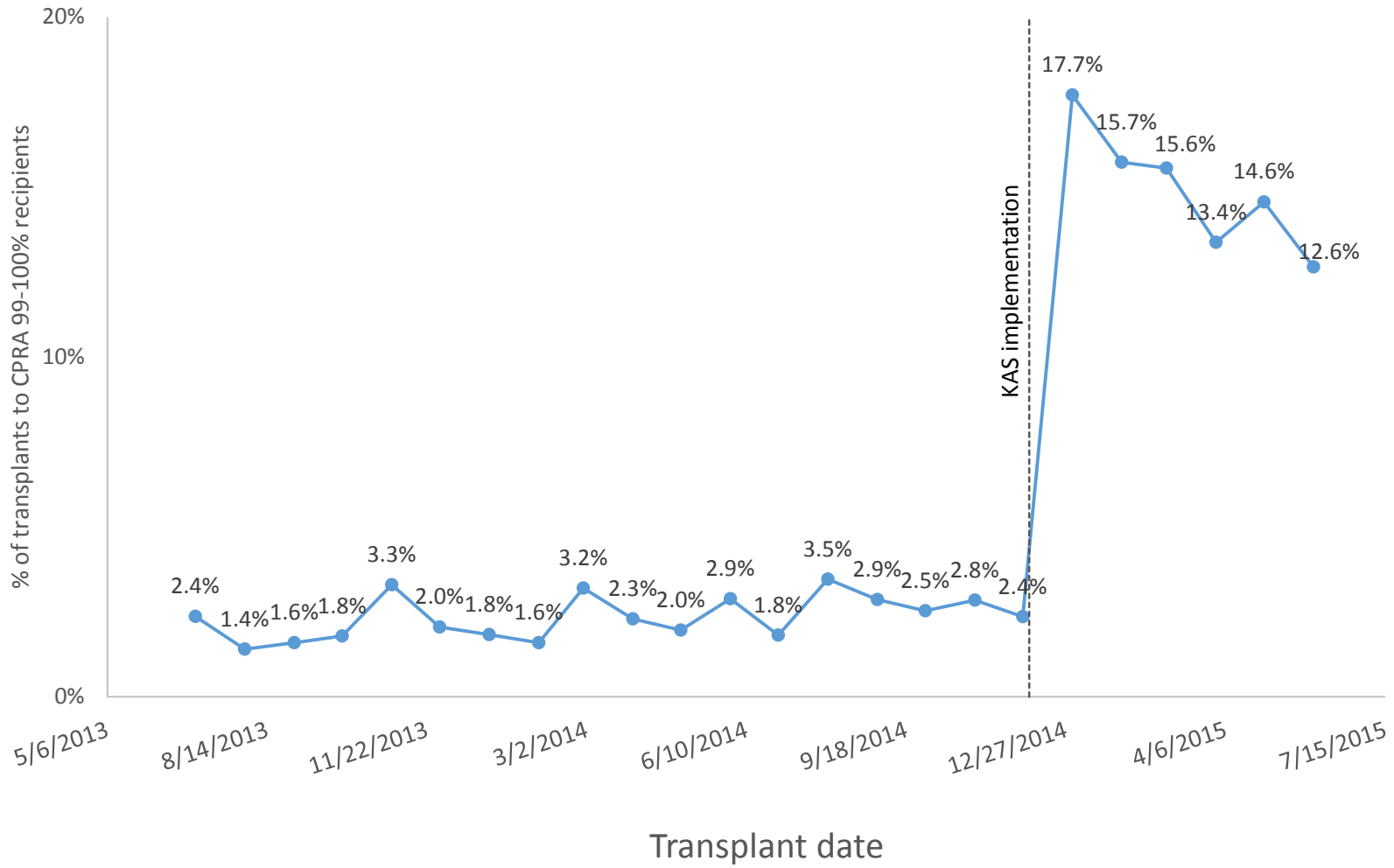
Table II.12

CPRA 99-100% recipient “bolus effect”



- Transplants to CPRA 99-100% patients rose sharply after KAS but have been tapering over time, likely due to a bolus effect.

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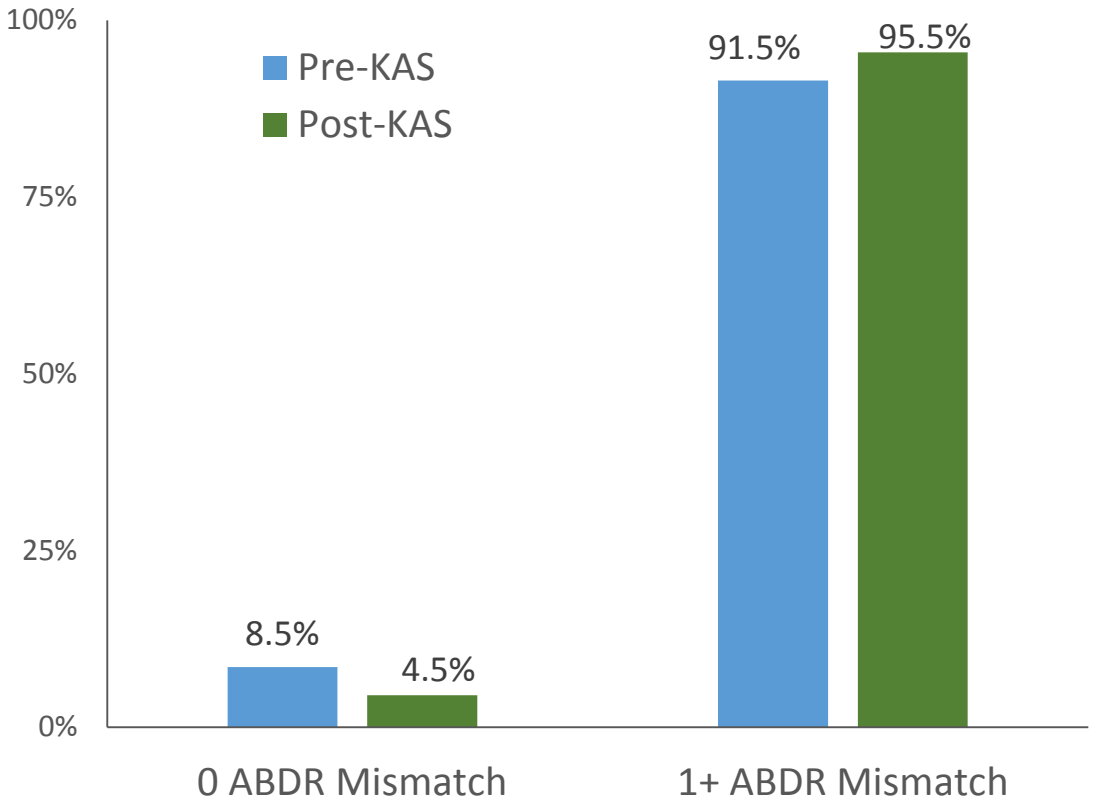
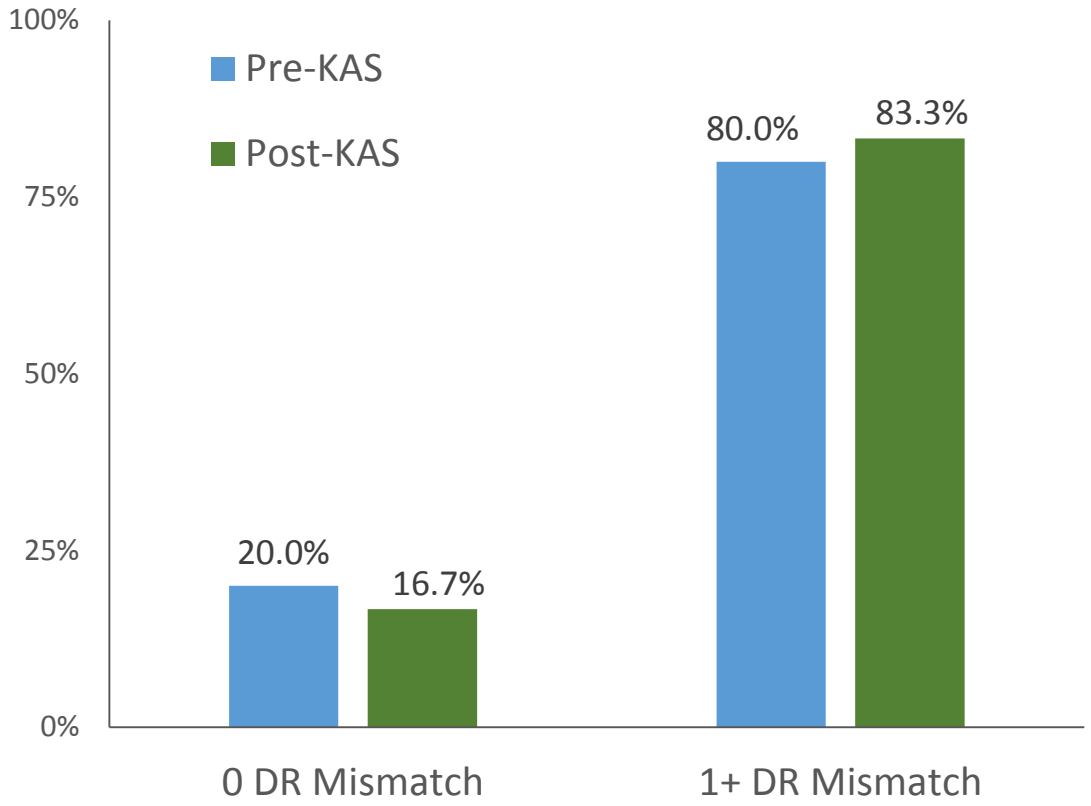
Table A.1d

Transplants by HLA mismatch level





- Fewer 0-ABDR and 0-DR mismatch transplants occurred in the post-KAS period.

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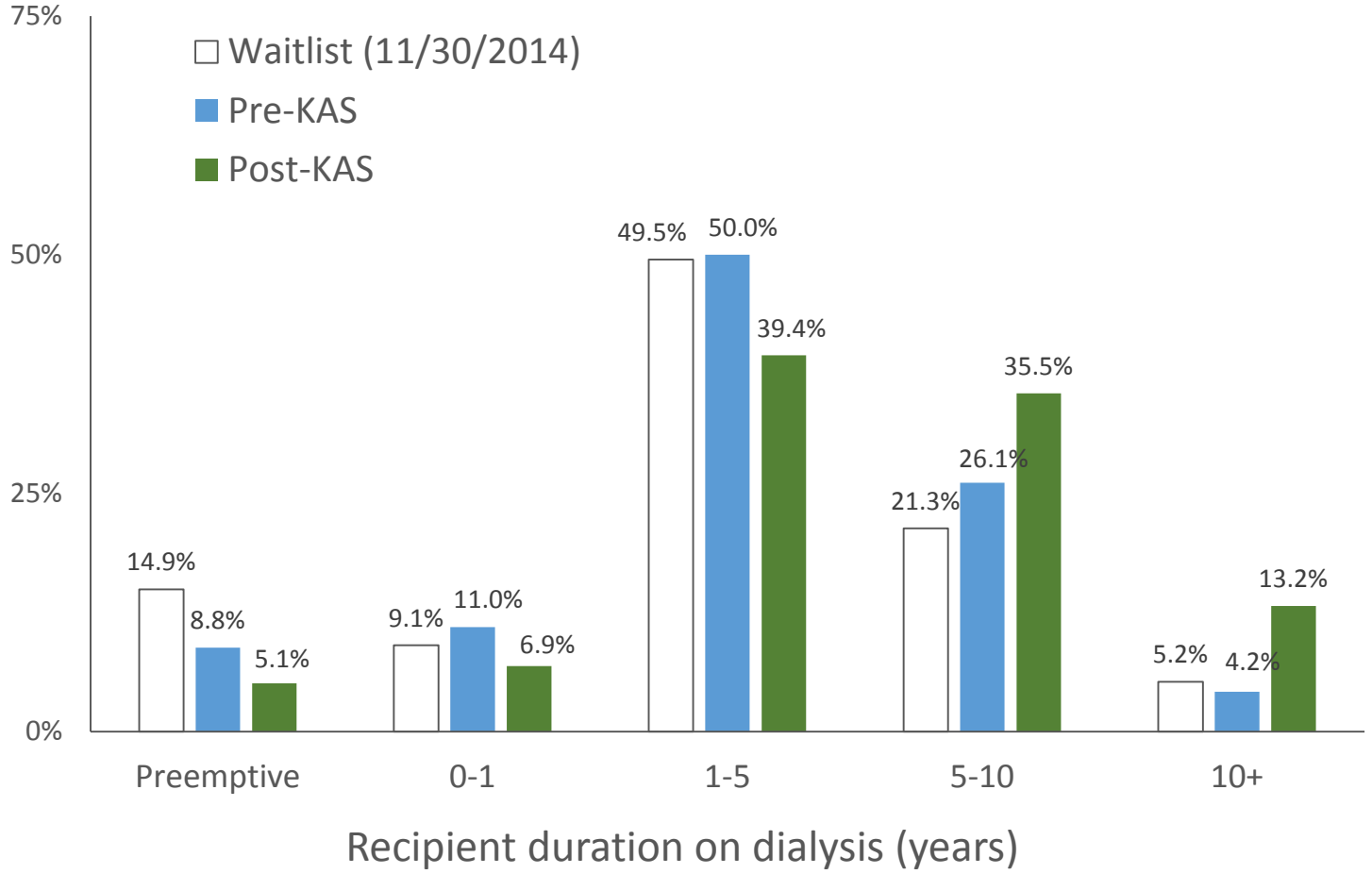
Table II.1b

Who's getting transplanted under KAS?

Percentage of Deceased Donor Kidney Transplants by Recipient Duration on Dialysis



- More transplants are going to long dialysis duration recipients.
- Fewer preemptive (before dialysis) transplants.

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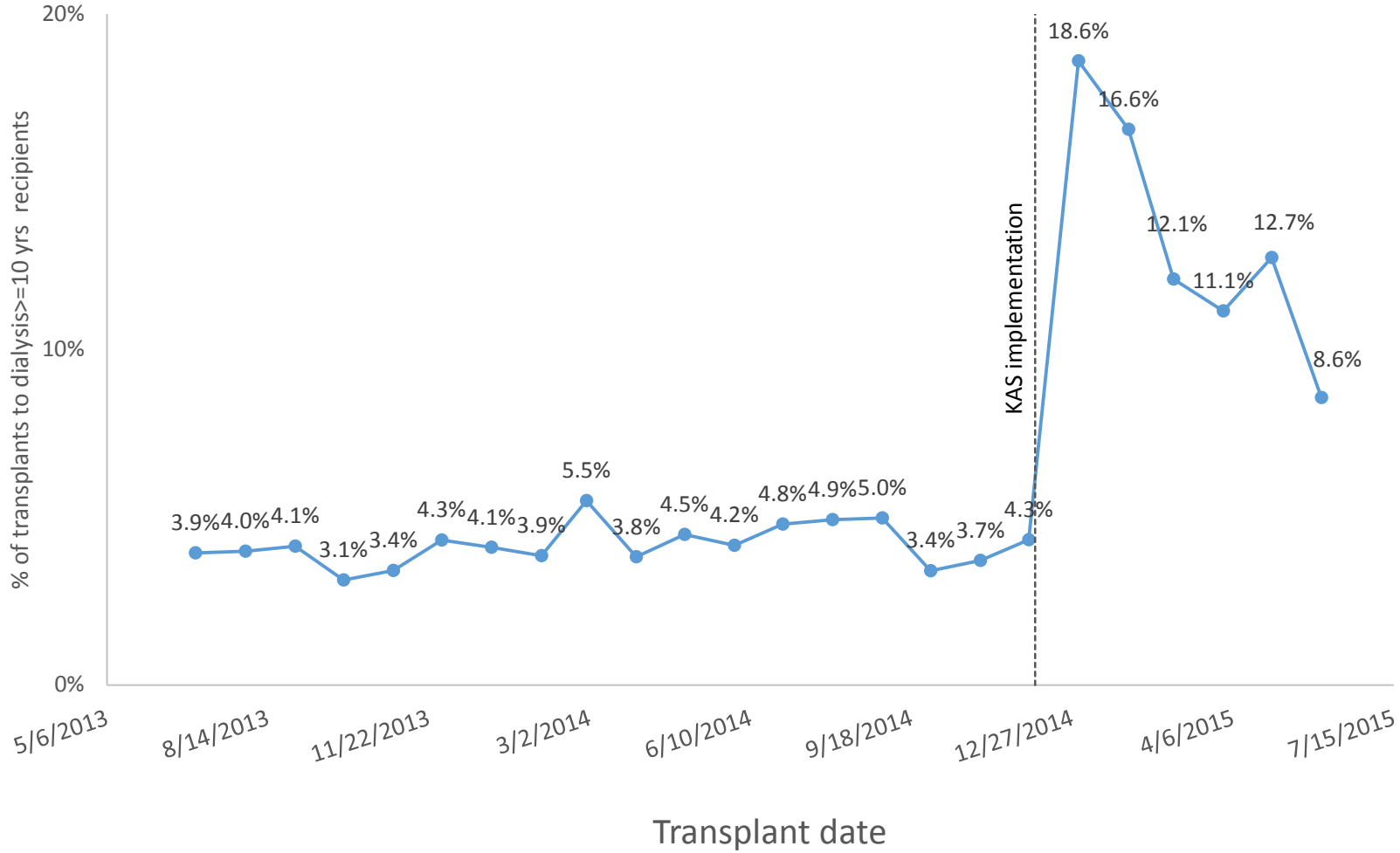
Table 1.2a
Table II.1b

High dialysis time recipient “bolus effect”

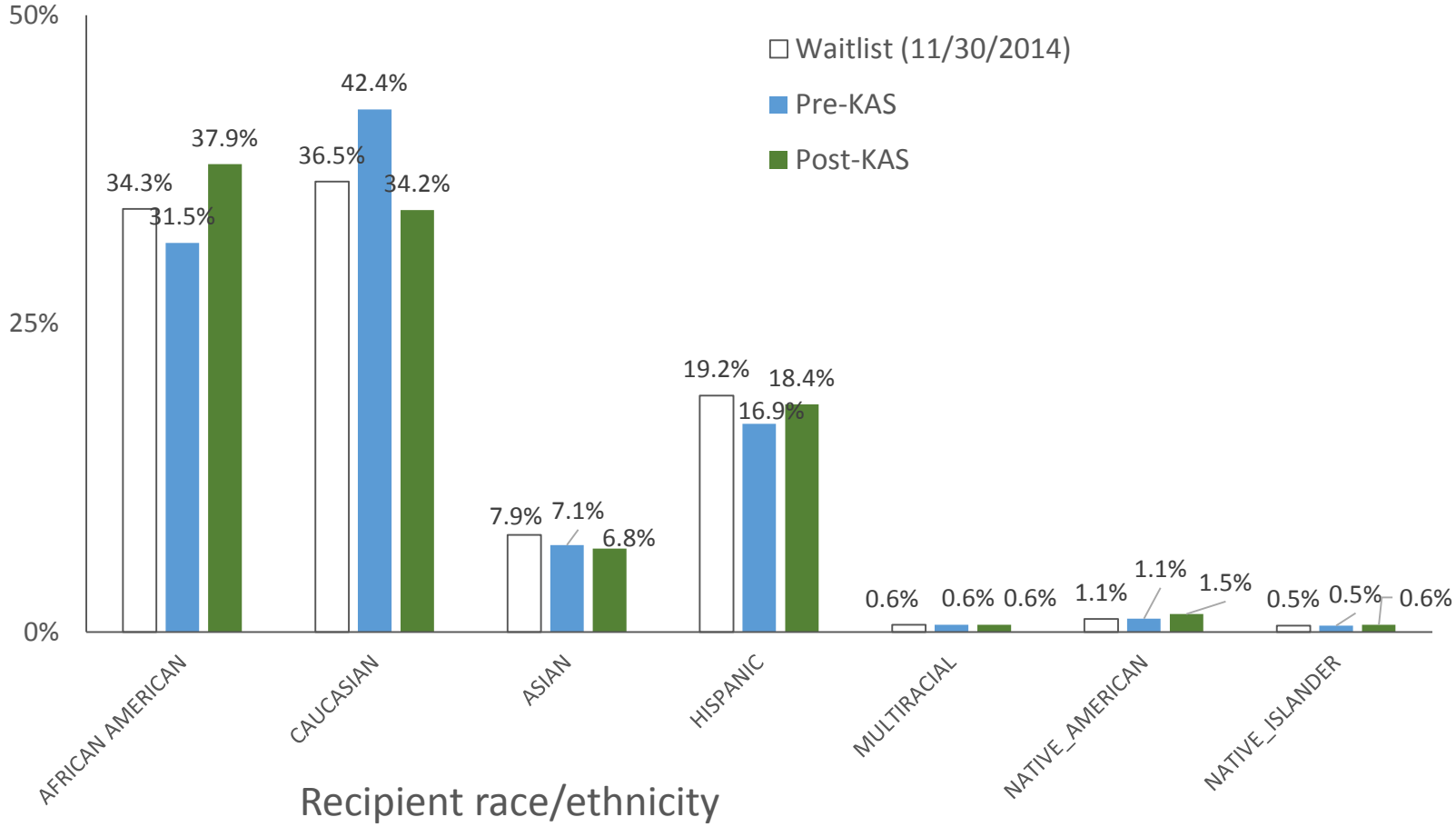


- Transplants to recipient with 10+ years of dialysis rose sharply after KAS but have been tapering over time, likely due to a bolus effect.

Table A.1d

Who's getting transplanted under KAS?

Percentage of Deceased Donor Kidney Transplants by Recipient Race/ethnicity

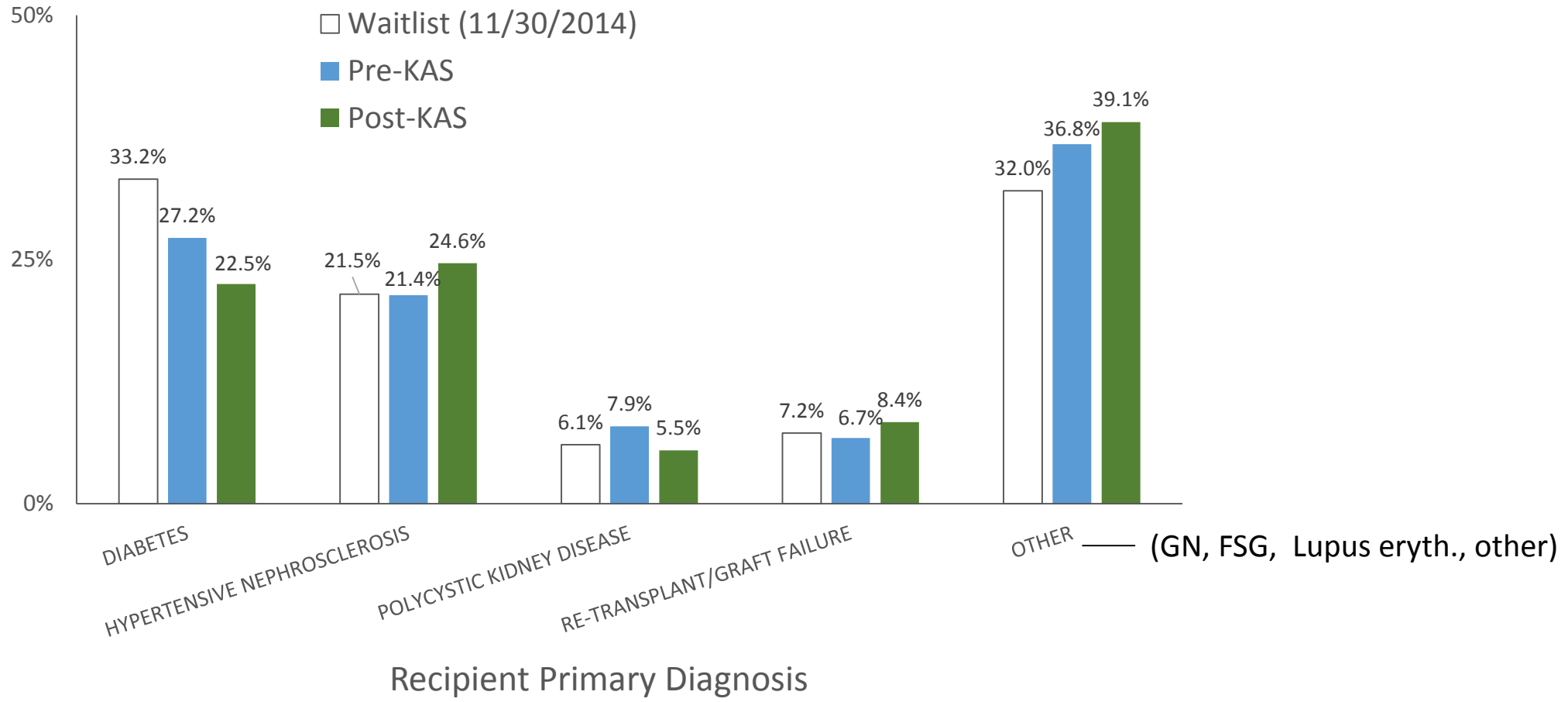


- More African Americans are receiving kidney transplants under KAS.
- Transplants have also increased for Hispanics, but declined for Whites.

Table 1.2a
Table II.1b

Who's getting transplanted under KAS?

Percentage of Deceased Donor Kidney Transplants by Recipient Primary Diagnosis



- Transplants increased for recipients with hypertensive nephrosclerosis as well as patients needing a retransplant.
- Transplants have decreased for diabetics and polycystic kidney disease patients.

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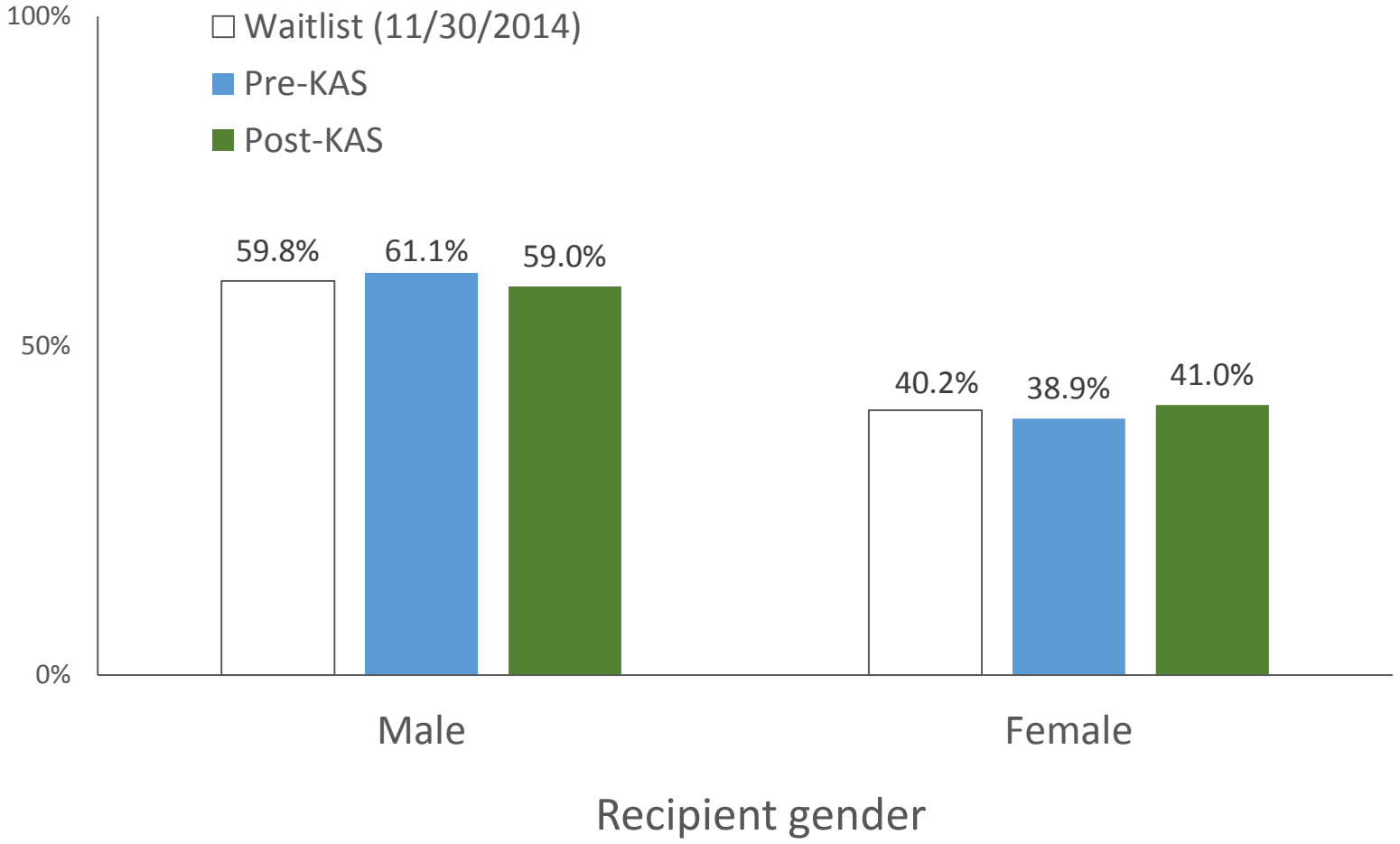
Table 1.2a
Table II.1b

Who's getting transplanted under KAS?

Percentage of Deceased Donor Kidney Transplants by Recipient Gender



- Transplants to female recipients have increased slightly under KAS.
- Highly sensitized patients tend to more often be female.

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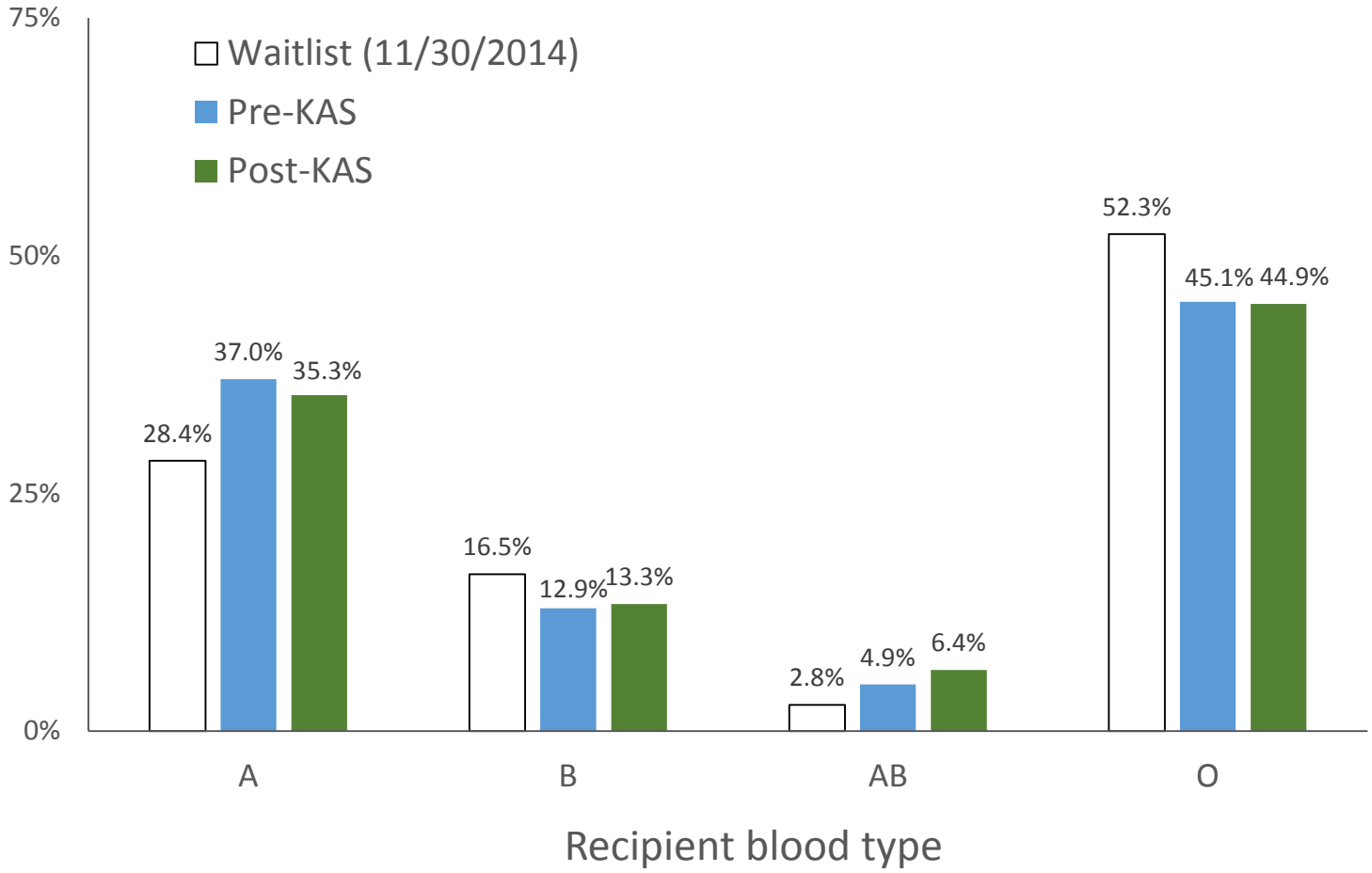
Table 1.2a
Table II.1b

Who's getting transplanted under KAS?

Percentage of Deceased Donor Kidney Transplants by Recipient Blood Type



- The distribution of transplants has changed little by recipient ABO.
- Slight increases for blood type B and AB patients.

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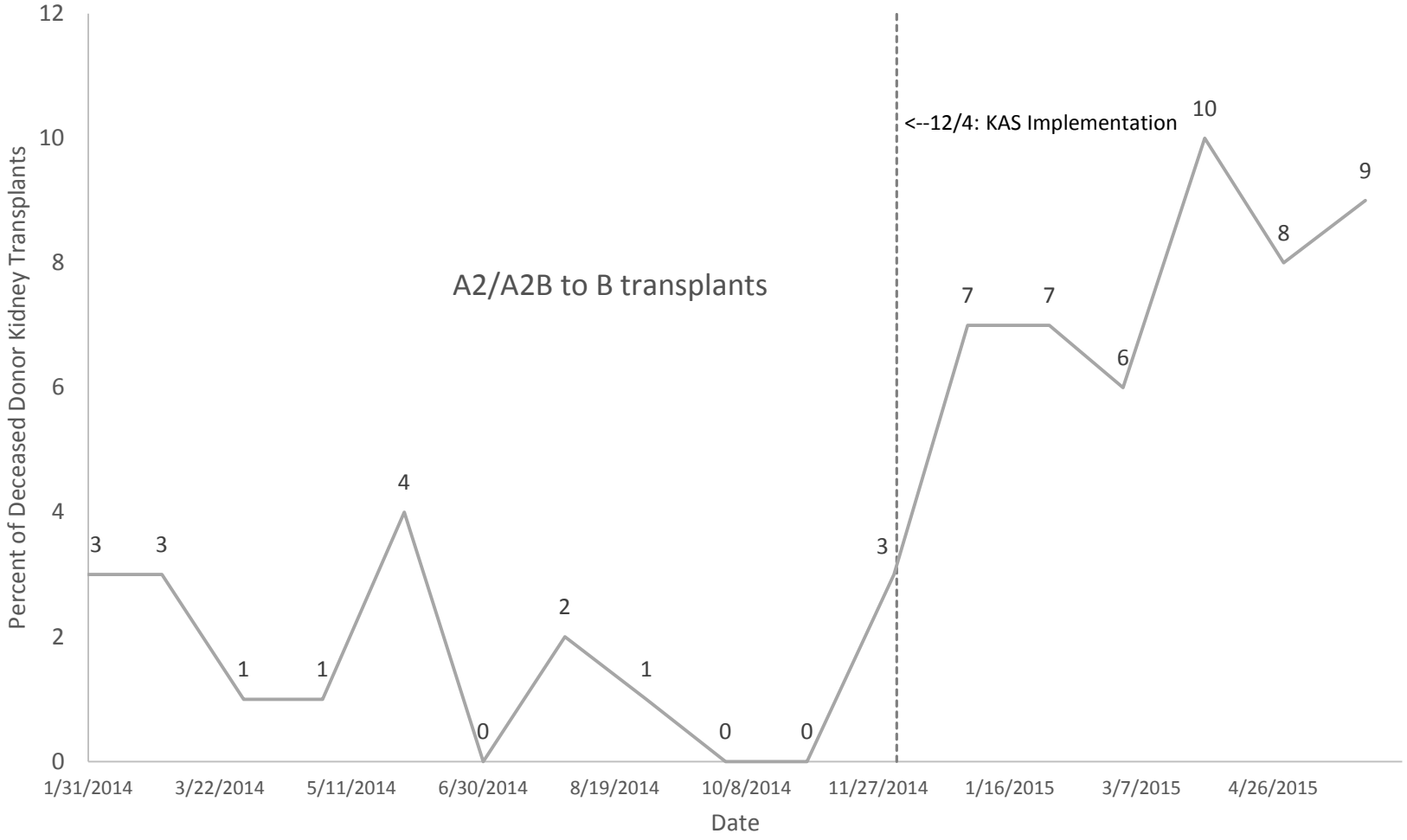
Table 1.2a
Table II.1b

A2/A2B subtype to blood type B recipients

Trends

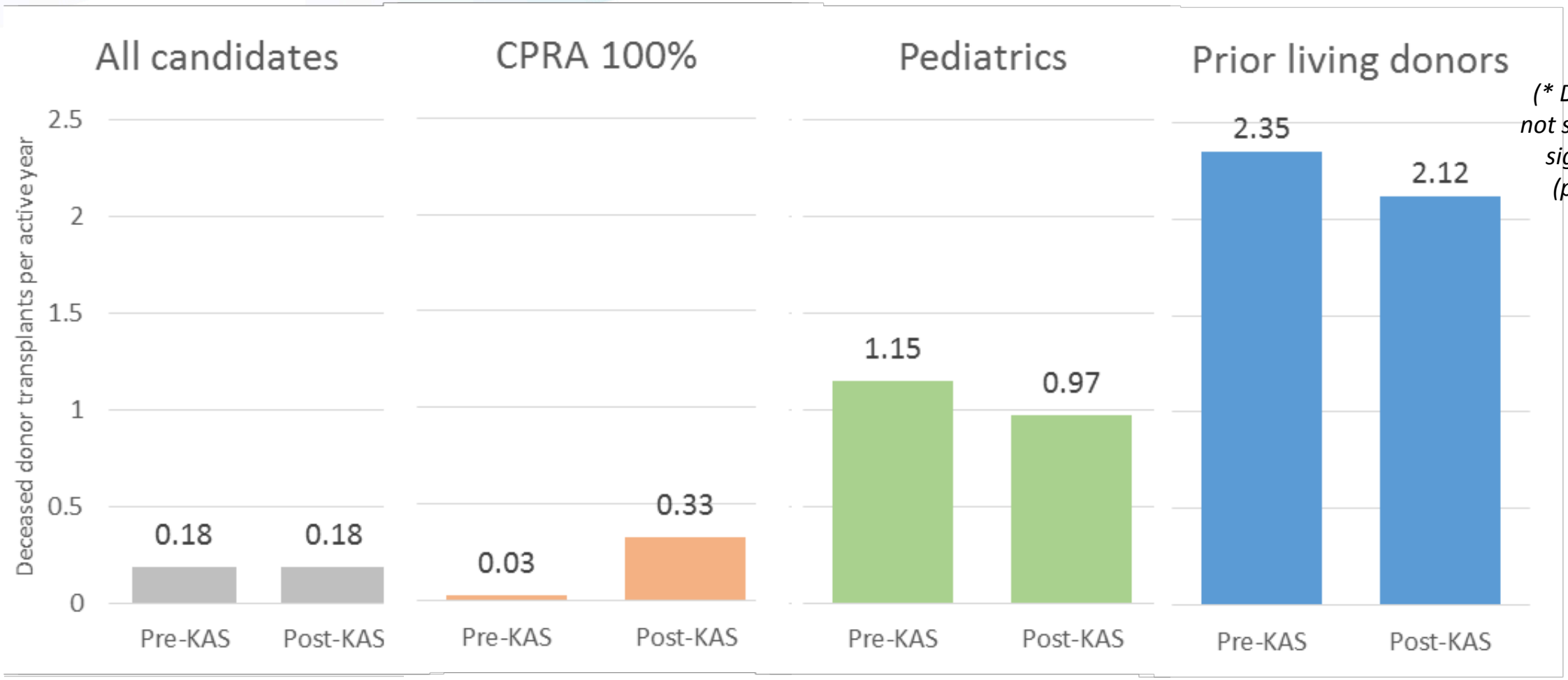


- Sharp rise in A2/A2B transplants, though counts still small.

Table II.9

Prior living donors' access to transplants

Deceased donor transplant rates per active patient-year on the WL



(Difference not statistically significant (p>0.05))*

- Transplant rates for prior living donors are similar pre vs. post KAS and much greater than for other kidney candidate populations.

Eras - Pre: 18 months (June 1, 2013 – Dec 3, 2014) Post: 6 months (Dec 4, 2014 – May 31, 2015)

Table II.12

Longevity-matching under KAS

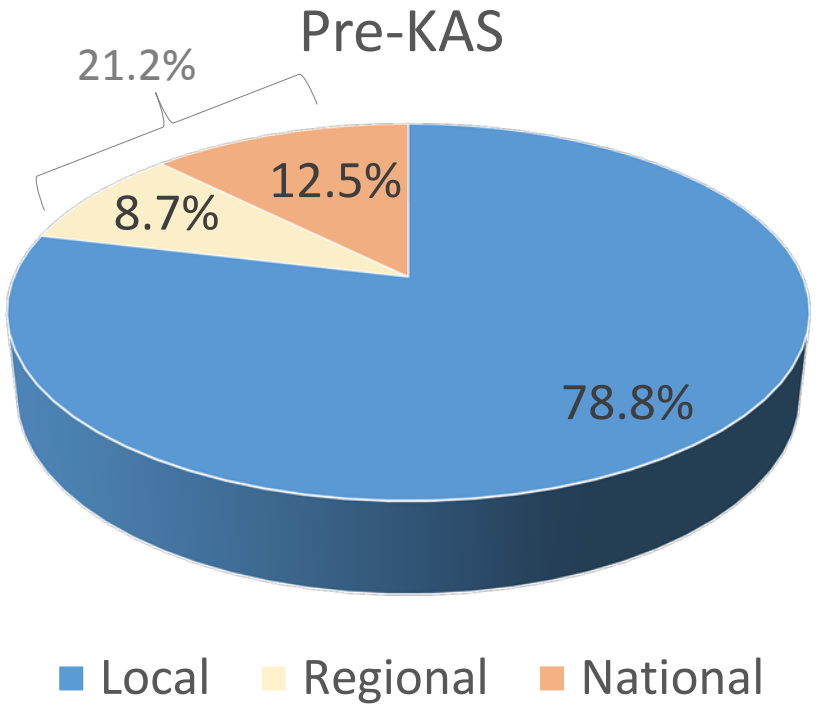
Percentage of Deceased Donor Kidney Transplants by KDPI and Recipient Age

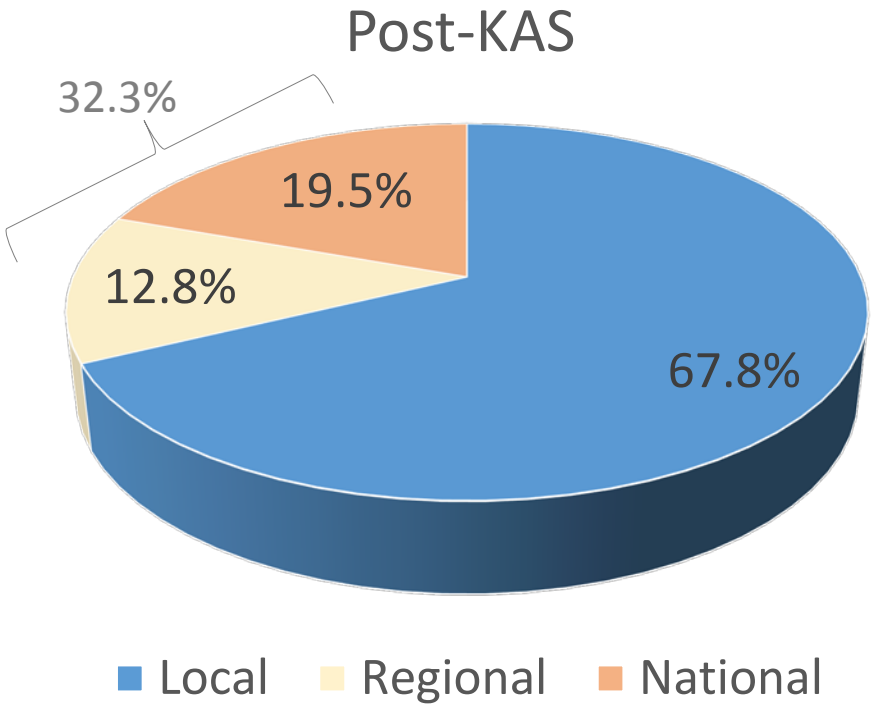
PRE-KAS (6/1/2013-12/3/2014)					
	KDPI				All
	KDPI 0-20	KDPI 21-34	KDPI 35-85	KDPI 86-100	
AGE	%	%	%	%	%
0-17	2.9	0.8	0.6	0.0	4.3
18-34	2.5	1.9	4.4	0.1	8.9
35-49	5.5	4.5	13.2	0.6	23.8
50-64	7.1	6.5	23.6	3.7	40.9
65 Plus	2.9	2.6	13.1	3.6	22.2
All	20.9	16.2	54.8	8.1	100.0

POST-KAS (12/4/2014-5/31/2015)					
	KDPI				All
	KDPI 0-20	KDPI 21-34	KDPI 35-85	KDPI 86-100	
AGE	%	%	%	%	%
0-17	2.5	0.9	0.2	0.0	3.6
18-34	↑ 6.7	2.4	4.3	0.1	13.5
35-49	7.3	4.7	15.9	0.6	28.5
50-64	↓ 2.8	6.0	25.4	3.3	37.4
65 Plus	↓ 1.0	2.2	10.9	3.0	17.0
All	20.3	16.2	56.5	7.0	100.0

- Transplants with KDPI 0-20% and recipient age 18-34:
  - Pre-KAS: 2.5% of transplants / Post-KAS: 6.7% of transplants
- Transplants with KDPI 0-20% and recipient age 50+:
  - Pre-KAS: 10% of transplants / Post-KAS: 4% of transplants

Geographic distribution of kidney transplants





- More kidneys are being distributed outside recovery OPO's DSA.

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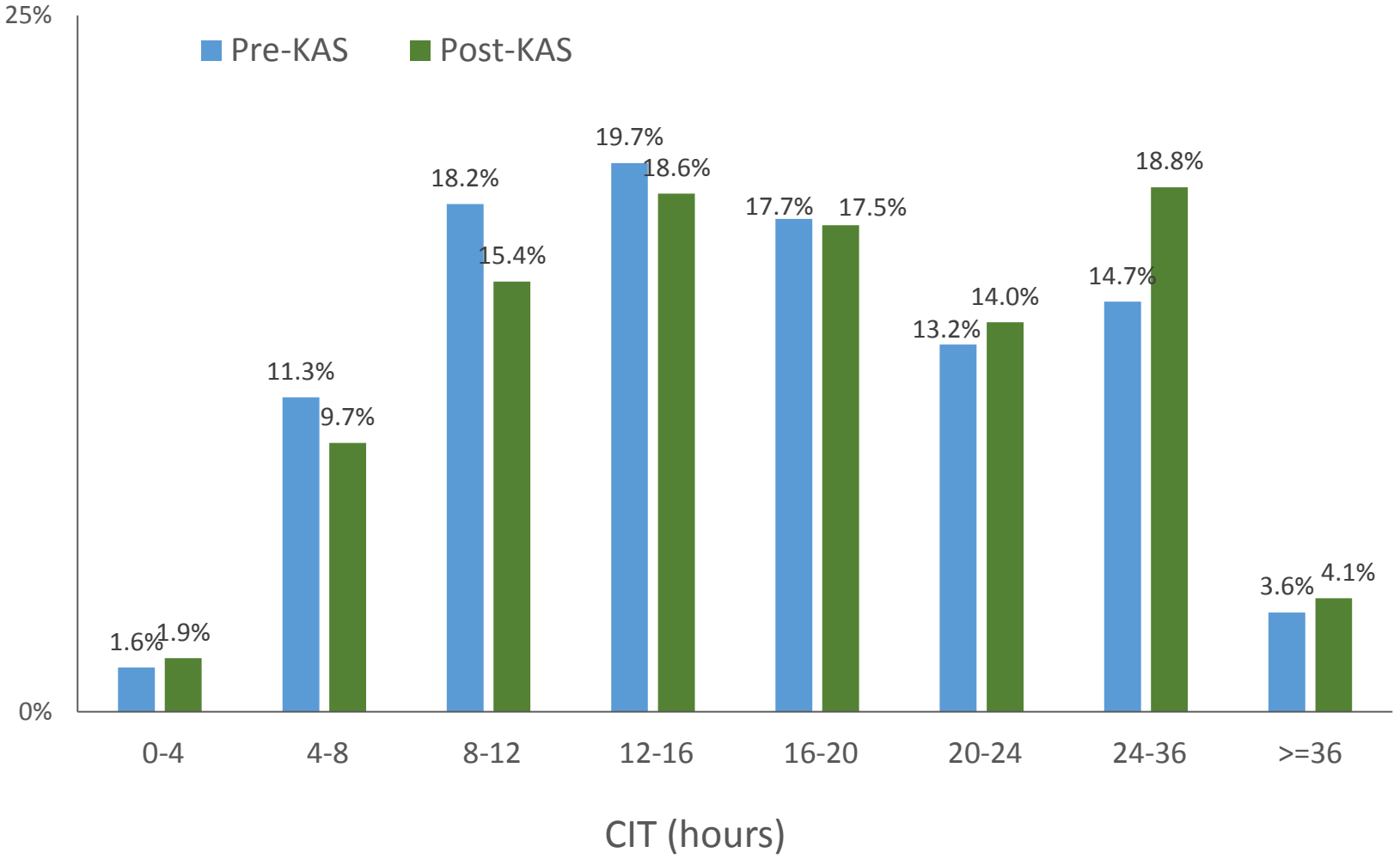
Table II.1b

Cold ischemic times for transplanted kidneys



- Average CIT increased 6% from 17.0 to 18.1 hours
- CIT> 24 hours - Pre-KAS: 18.3%, Post-KAS: 22.9%

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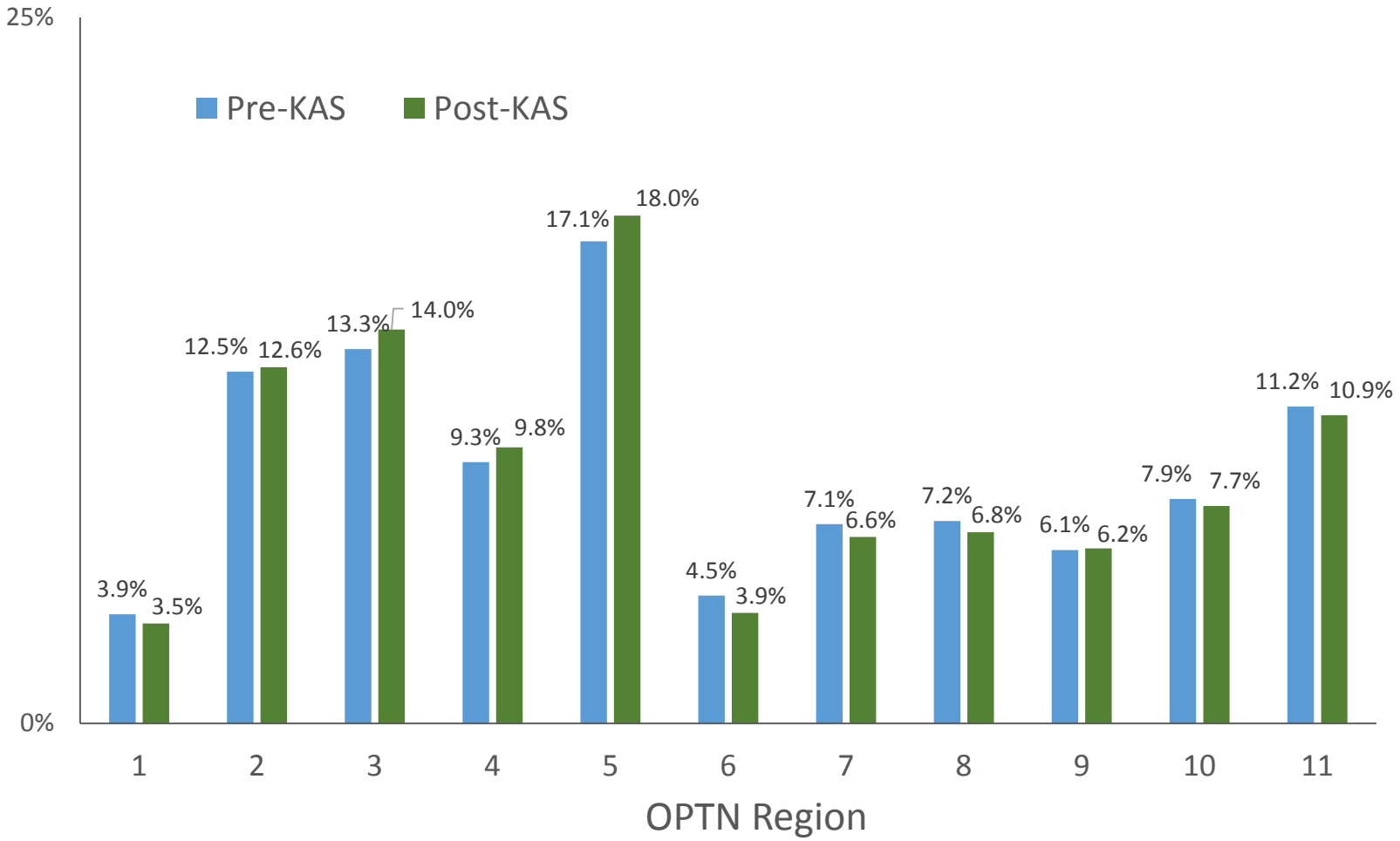
Table II.1d
(known CIT only)

Geographic distribution of kidney transplants



- No significant changes by OPTN region.

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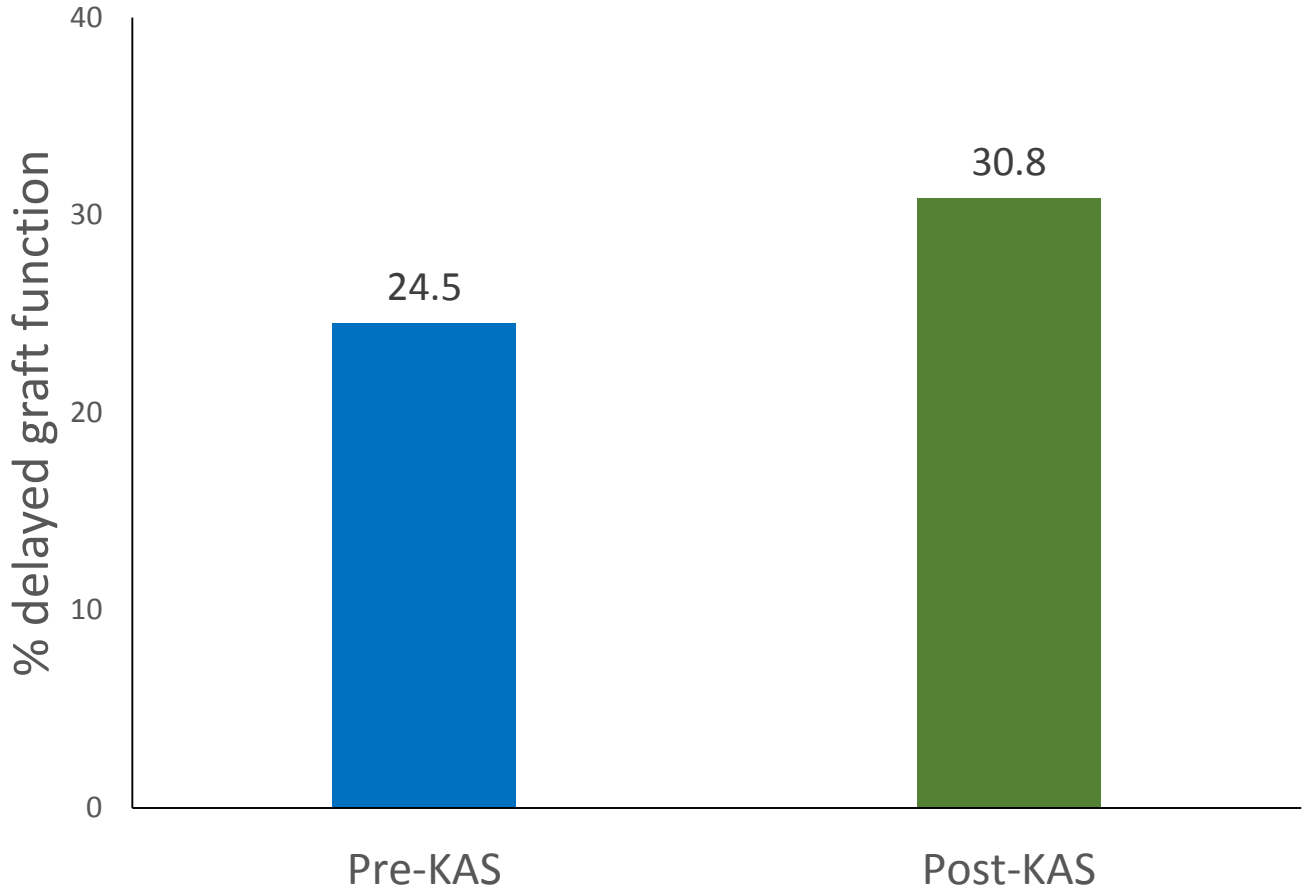
Table II.6

Delayed graft function (DGF) rates



- The percentage of recipients requiring dialysis within the first week after transplant increased from 24.5% pre-KAS to 30.8% after KAS.

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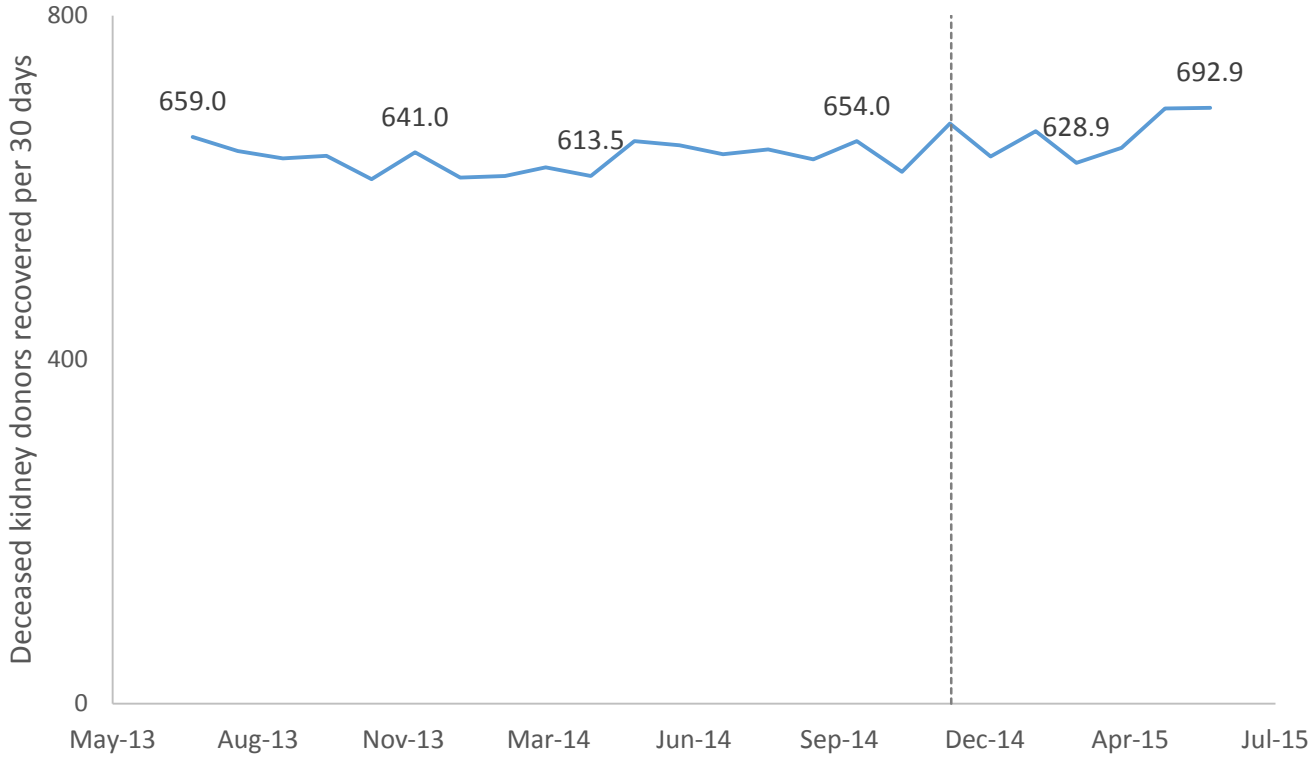
Table II.16

Deceased donor kidney recovery and utilization

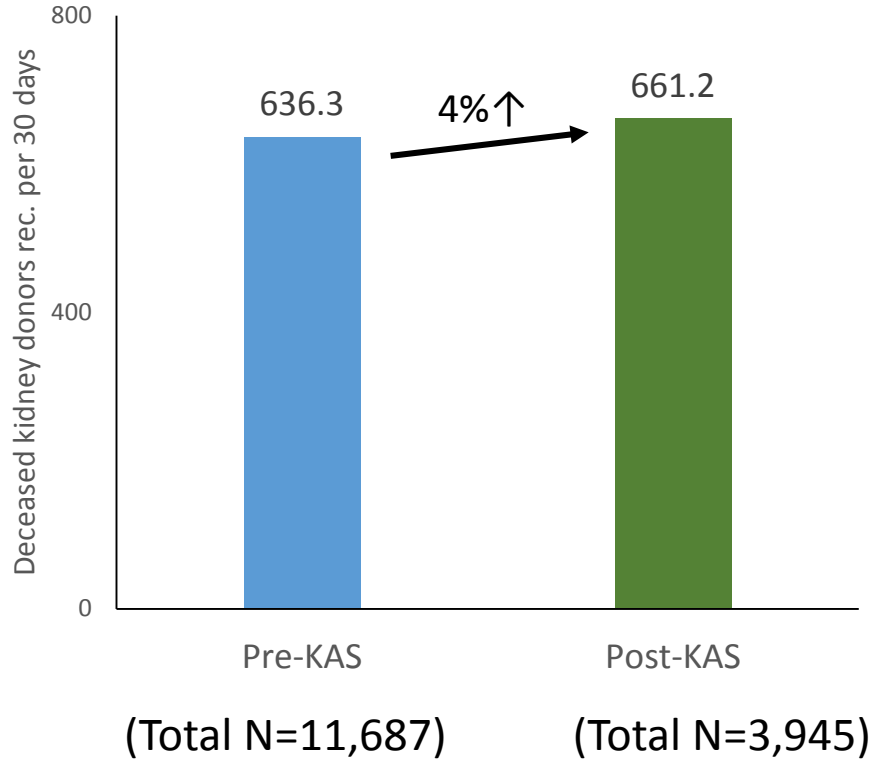
Deceased kidney donors recovered under KAS

Pre vs. post-KAS trends

Over time (per 30 days)



On average



(Total N=11,687) (Total N=3,945)

- Recovered kidney donor volume has increased 4% post-KAS.

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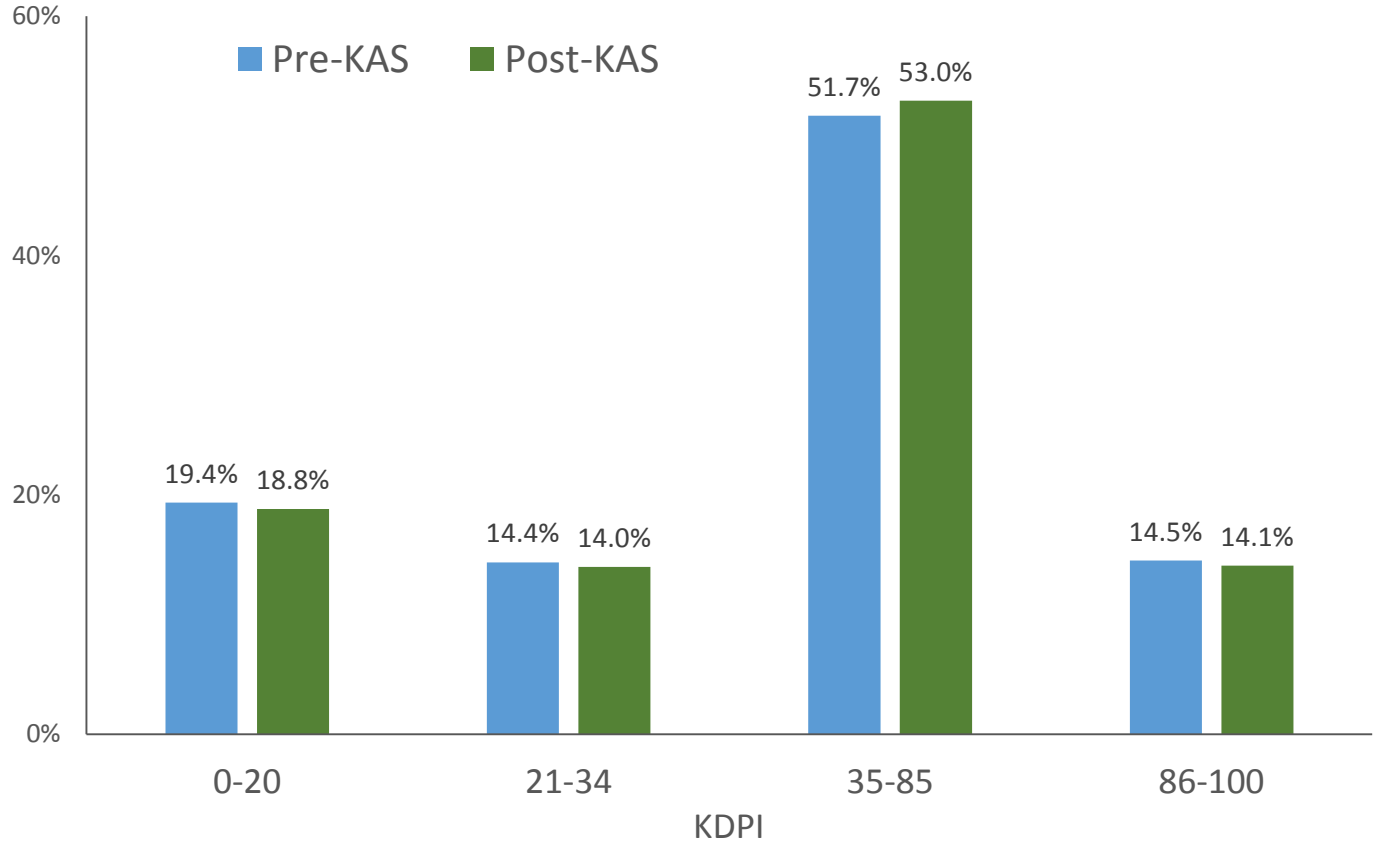
Table II.1a

Kidney recovery & utilization under KAS

Percentage of Recovered Deceased Kidney Donors by KDPI



- Total kidney donors recovered per month increased 4% (636 to 661).
- However, the distribution by KDPI has remained very similar.

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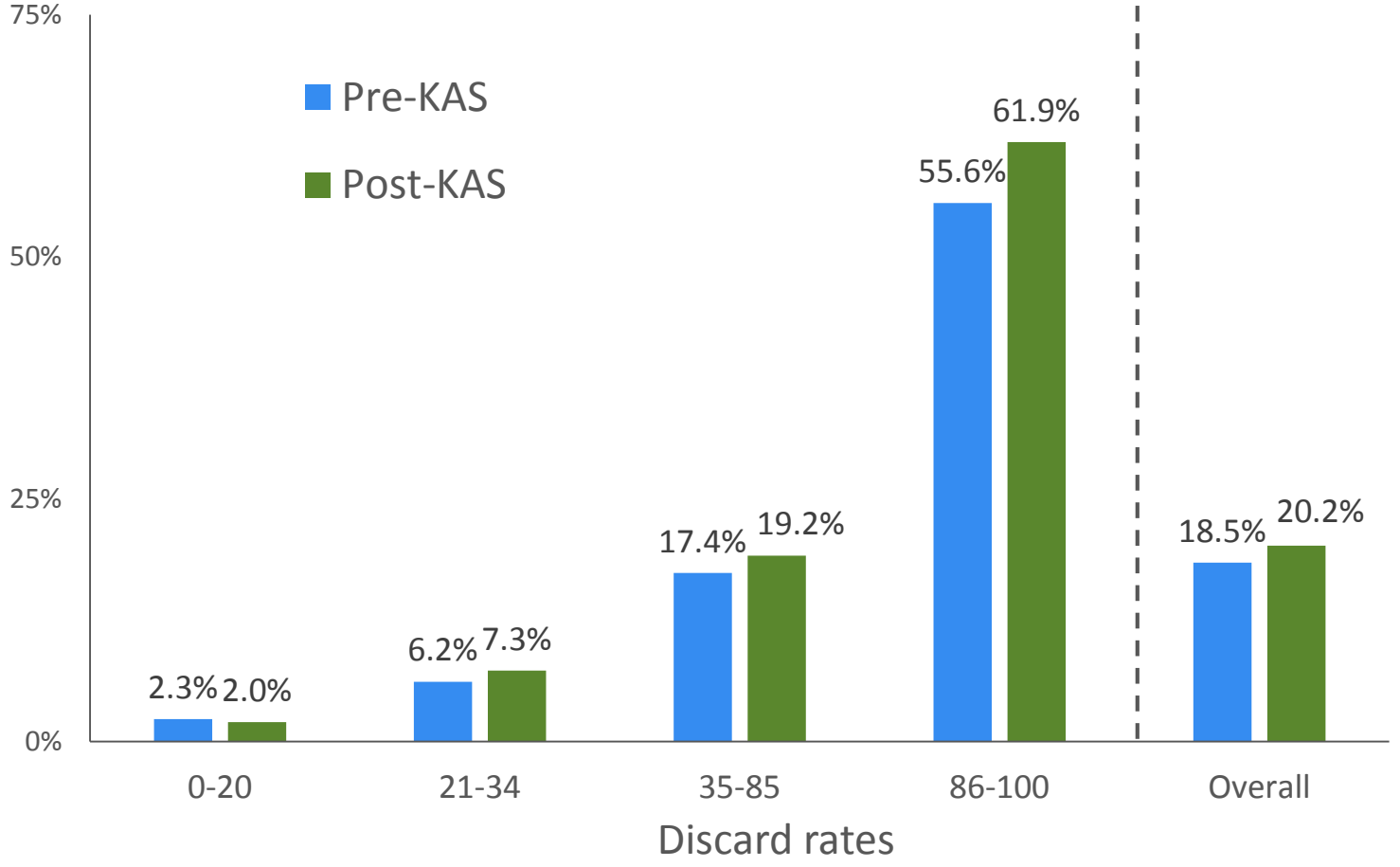
Table III.1b

Kidney recovery & utilization under KAS

Kidney Discard Rate by KDPI



- Kidney discard rates increased by 1.7% points (about 10%).
- Increase largest for, but not limited to, KDPI>85% kidneys.

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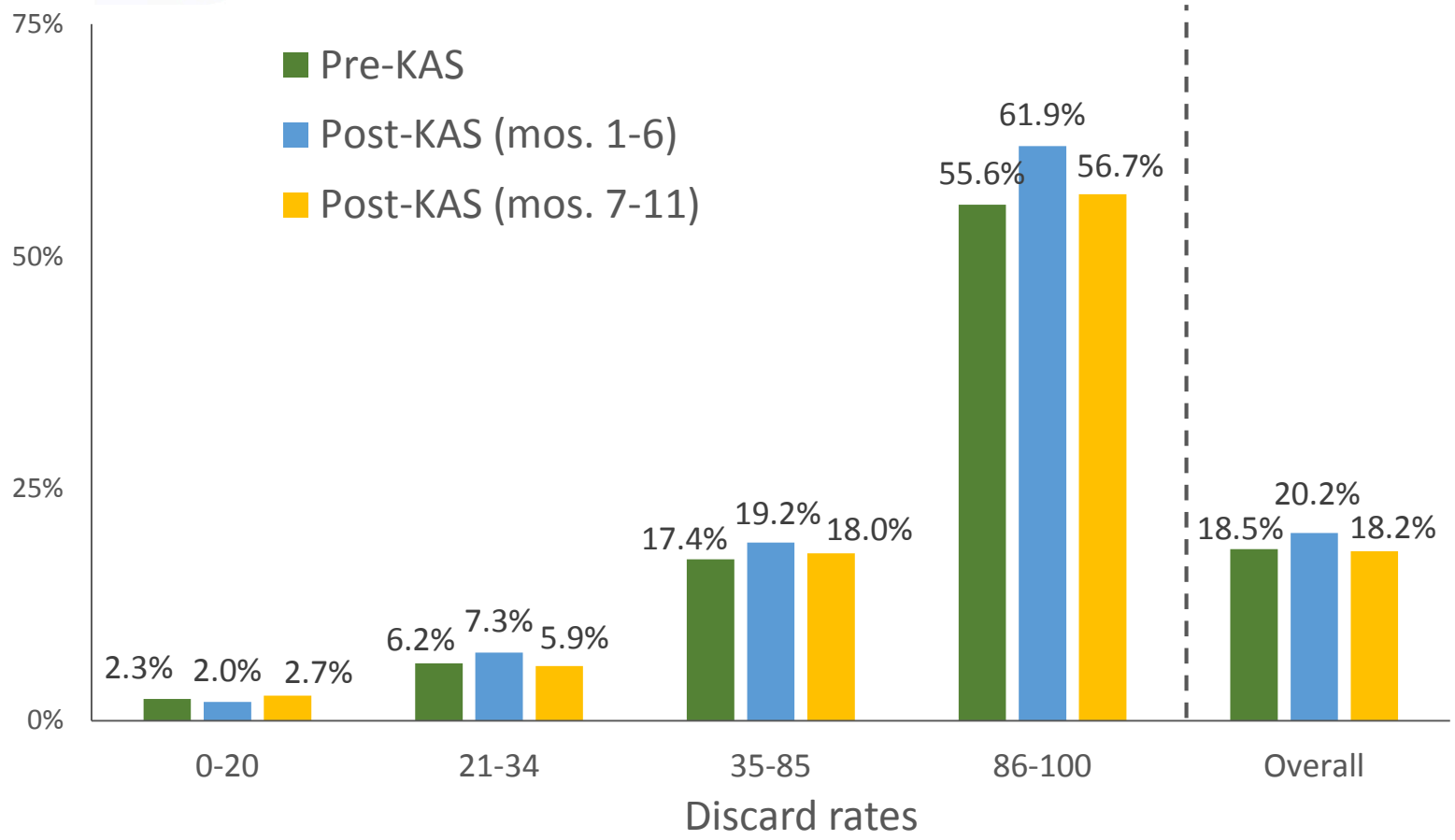
Table III.3

Kidney recovery & utilization under KAS

Kidney Discard Rate by KDPI -- *including months 7-11 (Jun – Oct '15)*



- Discard rates have returned to pre-KAS levels in recent months.

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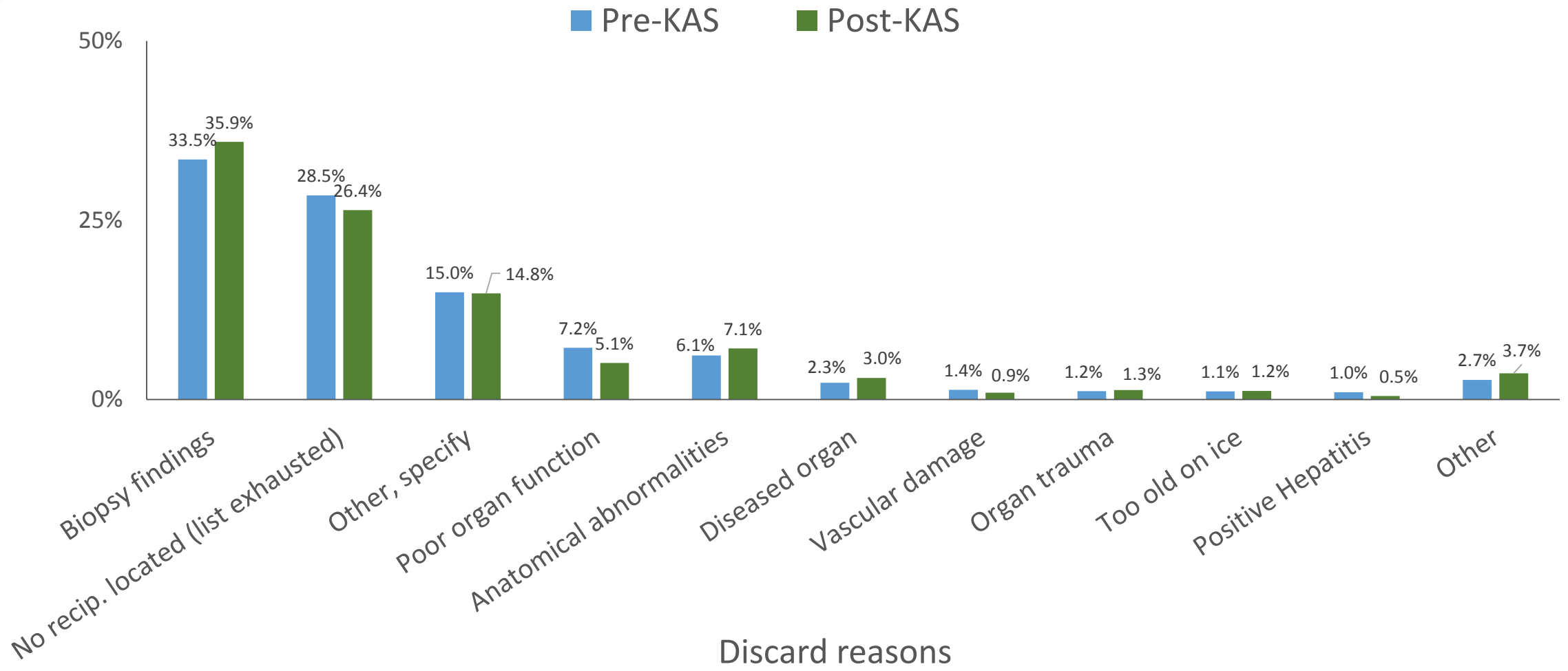
Kidney recovery & utilization under KAS

Kidney Discard Reasons



- Reasons for discard similar pre vs post-KAS.

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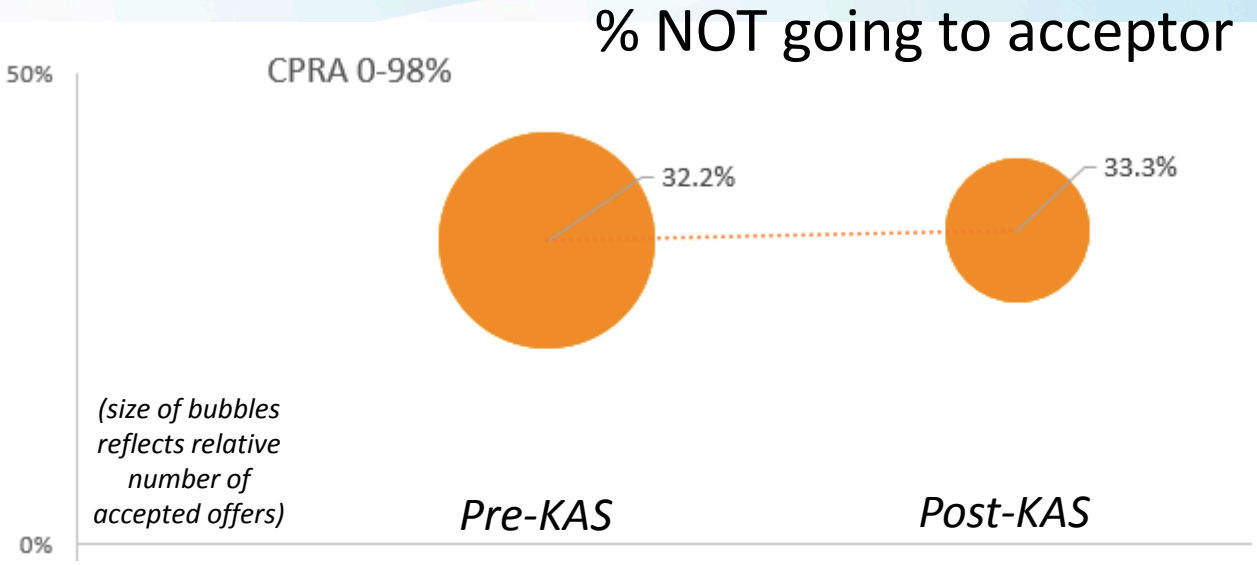
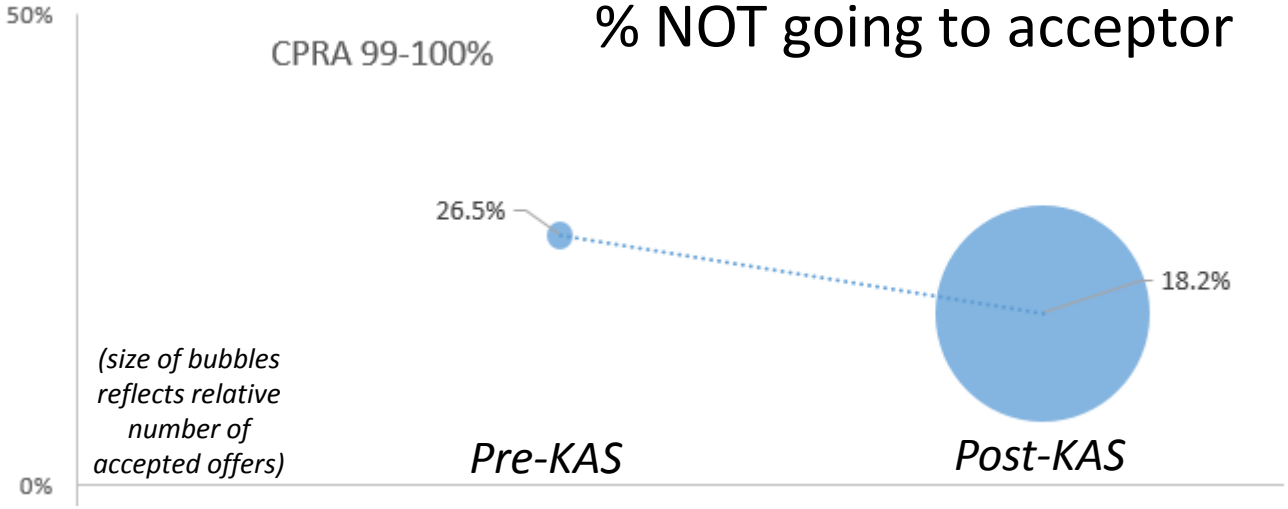
Table III.4

Disposition of offers accepted non-locally*





- ✓ Less non-local acceptances are for CPRA 0-98 patients under KAS (size of bubble)
- ✓ Of these acceptances, about 1/3 have not gone to acceptor, pre and post-KAS

- ✓ Dramatic increase in number of non-local acceptances for CPRA 99-100% patients
- ✓ DECREASE in % of kidneys not transplanted to these acceptors

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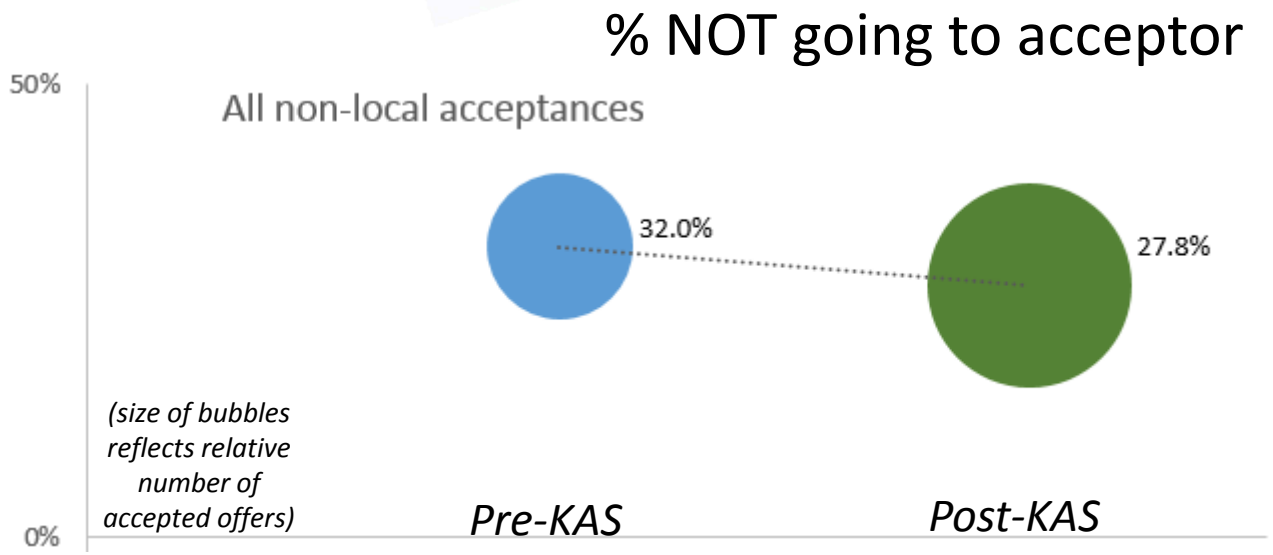
Table III.6

Disposition of offers accepted non-locally*

All non-local acceptances



- ✓ Overall, increase in number of non-local acceptances
- ✓ Decrease in % of kidneys not transplanted to these acceptors

<u>Net effects:</u>

- ➢ Slight overall increase in # acceptances not going to acceptor (~95 to 113 per month)
- ➢ Distribution of these cases has shifted by CPRA

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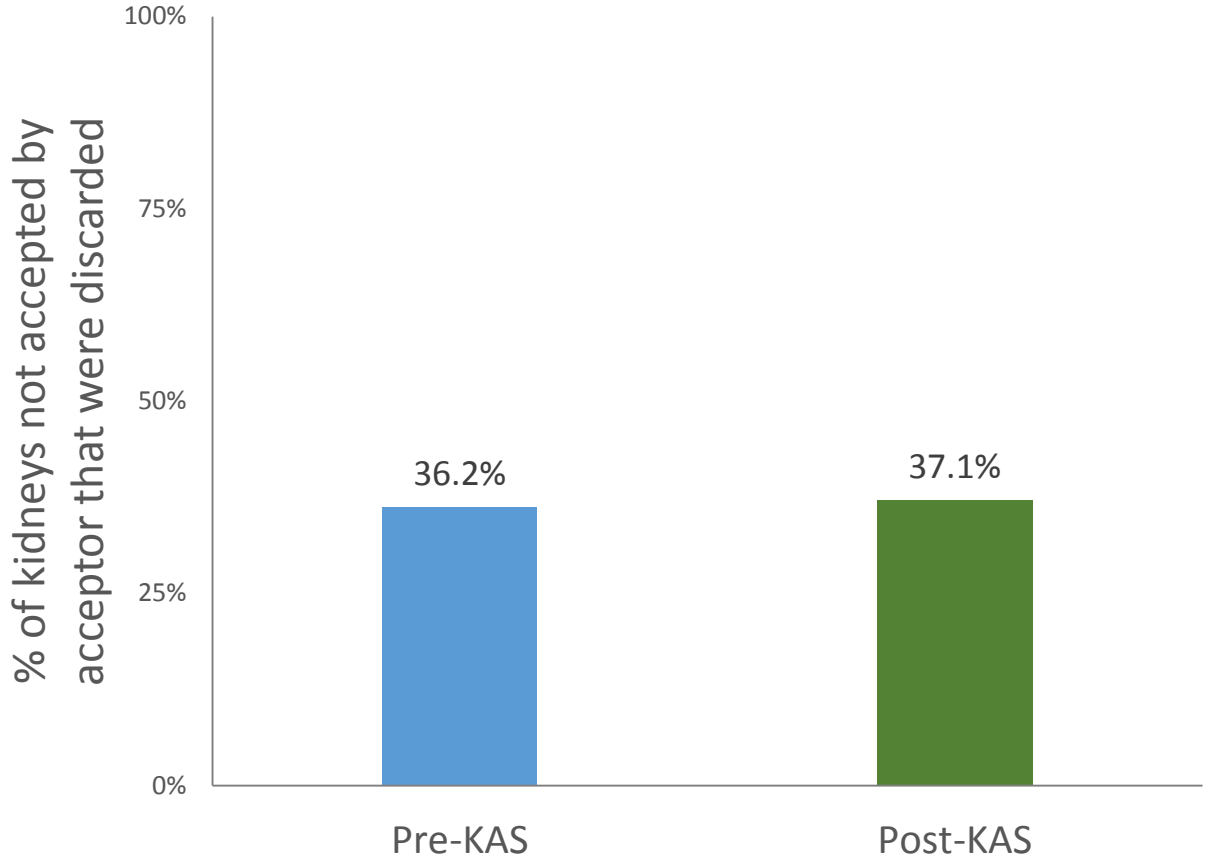
Table III.6

Non-local accepted Offers Not Transplanted to the Acceptor

Percent Discarded



- Just over a third of kidneys accepted but not transplanted to the accepting patient were discarded, pre and post-KAS.
- The remaining kidneys were transplanted into another recipient.

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Table III.6

Summary: First Six+ Months of KAS

- Overall – KAS is meeting key goals
  - Increase in the number of transplants among very highly sensitized patients
  - Increase in access to transplant for African Americans candidates
  - Decrease in longevity mismatches
- “Bolus effects”: the percent of transplants to CPRA 99-100% and dialysis>10 years recipients are both tapering post-KAS
- Increase in A2/A2B→B transplants, but still room for growth
- Transplant volume up 1%

Summary: First Six+ Months of KAS (cont'd)

- Several trends deserve further attention:
  - Fewer 0MM transplants
  - Slight drop in pediatric transplants, but appears to have bounced back
  - Increase in discard rates, particularly KDPI>85% kidneys. But rates seem to have stabilized in more recent data.
  - Logistical challenges in allocation
  - Increased CIT and DGF
- Other metrics (e.g., graft survival rates) require additional lag time and will be available in future reports

Feedback from the Community

- Transplants for blood types A_2 and A_2B for blood type B candidates
- Living donor prioritization
- Access for pediatrics
- Access for older recipients
- Outcomes from transplanting more patients with increased dialysis time and other risk factors
- Discard rates
- Logistical challenges of increased sharing
- Highly sensitized candidates undergoing desensitization

What's being addressed?

- KAS Clarifications & Clean Up Proposal
- Increasing the # of centers willing to accept kidneys from donors with medically eligible blood types A_2 and A_2B for blood type B candidates
- Living Donor Prioritization

What does the Kidney Committee need to monitor?

- Access for pediatrics
- Access for older recipients
- Outcomes from transplanting more patients with increased dialysis time and other risk factors
- Discard rates

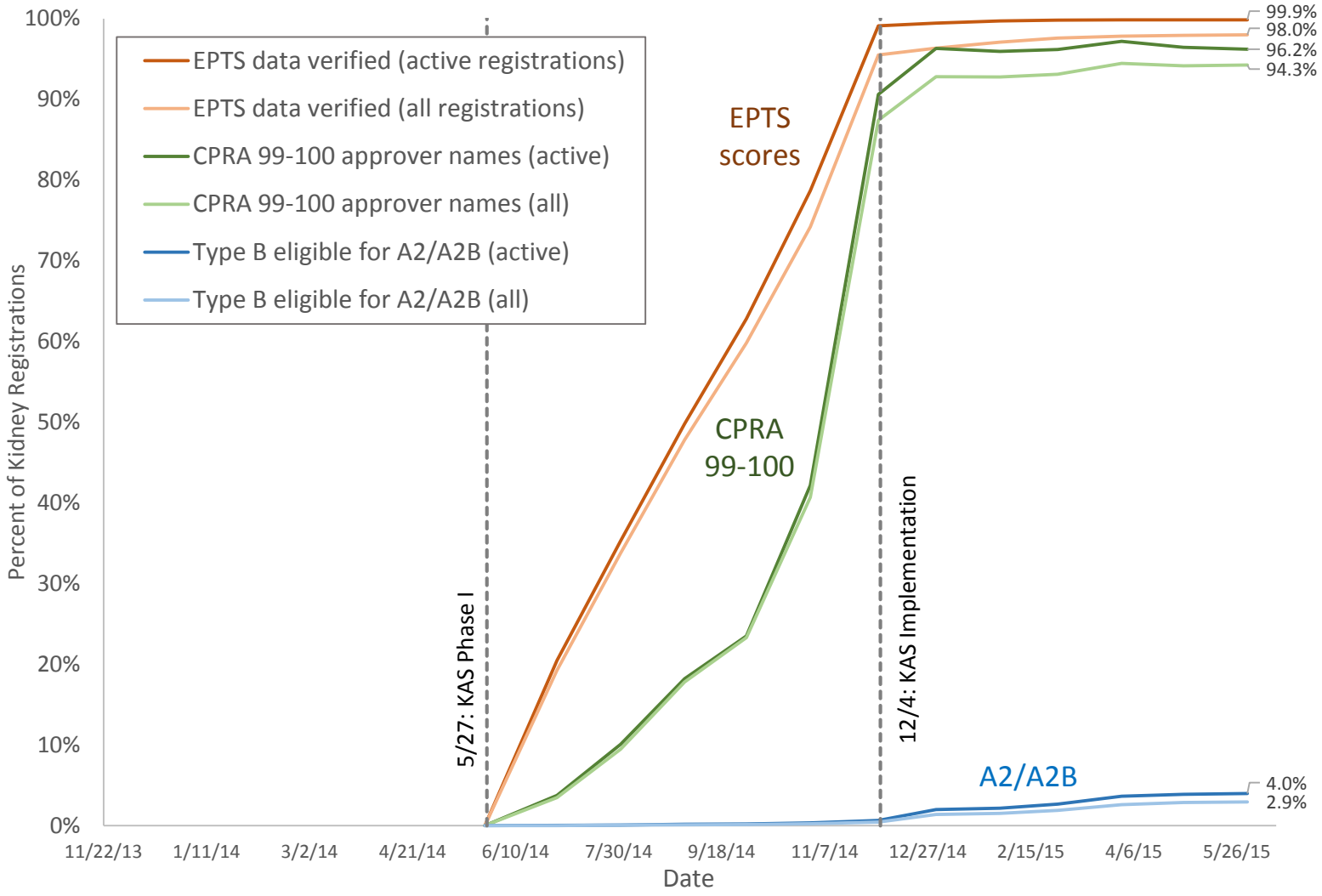
What does the Kidney Committee need to work on?

- Logistical challenges of increased sharing
- Highly sensitized candidates undergoing desensitization

Questions?

Extras

Trends in KAS readiness



- Prior to KAS implementation, centers had entered data to calculate EPTS scores for nearly all patients and had entered signatures verifying unacceptable antigens for over 90% of CPRA 99-100% patients.

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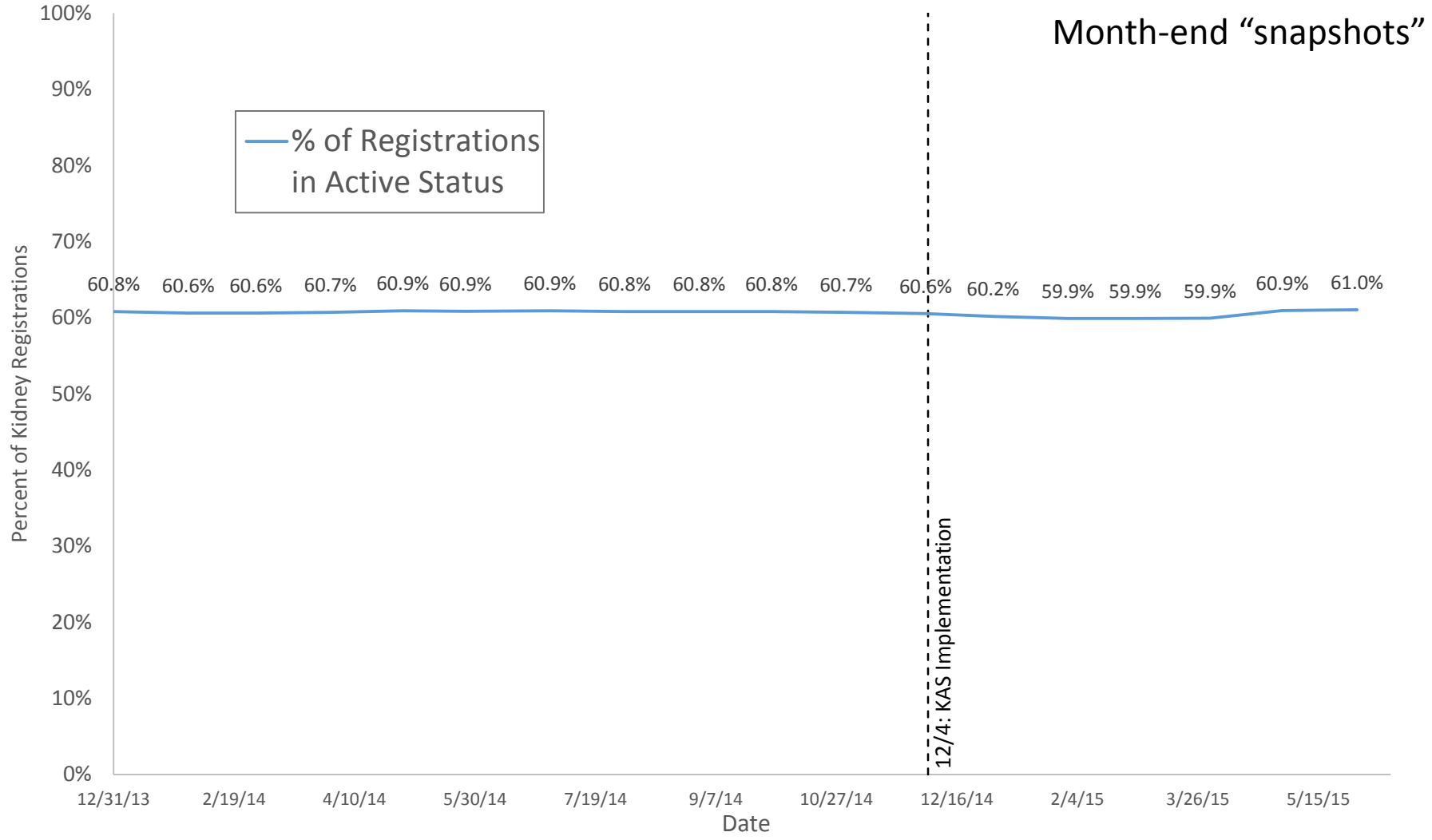
Table I.1a

Trends in the kidney waiting list



- The % of registrations on the kidney waiting list in active status has remained relatively constant at about 60%.

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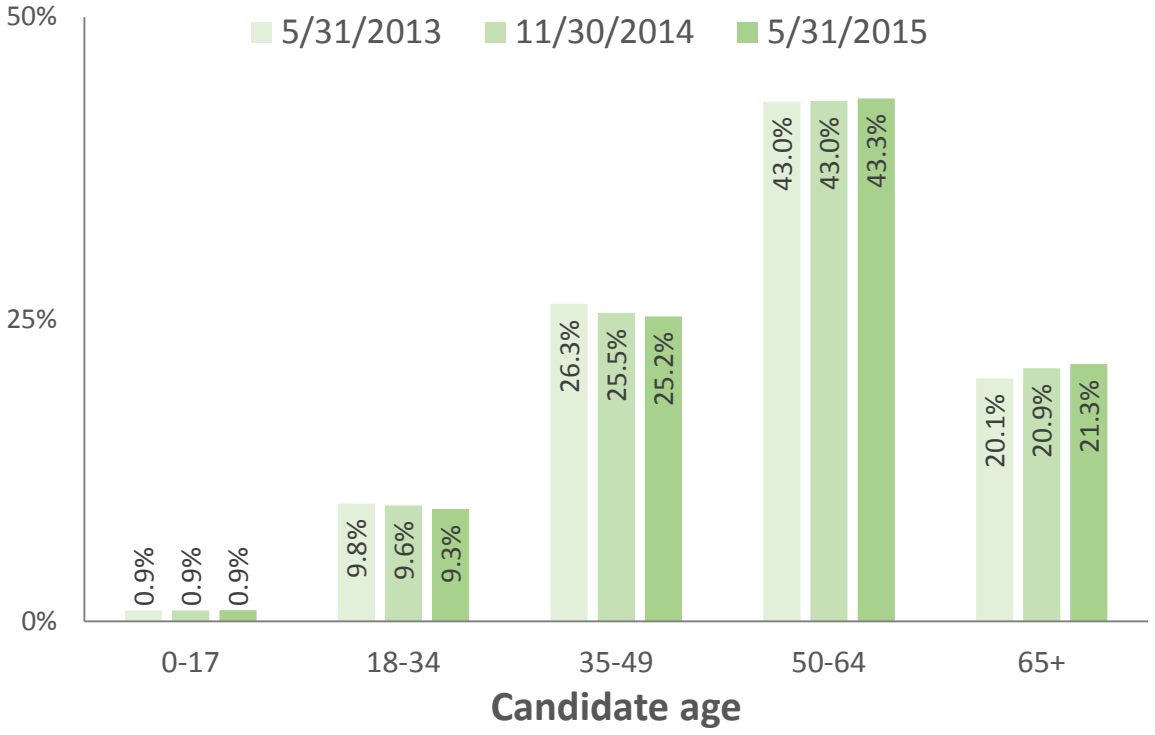
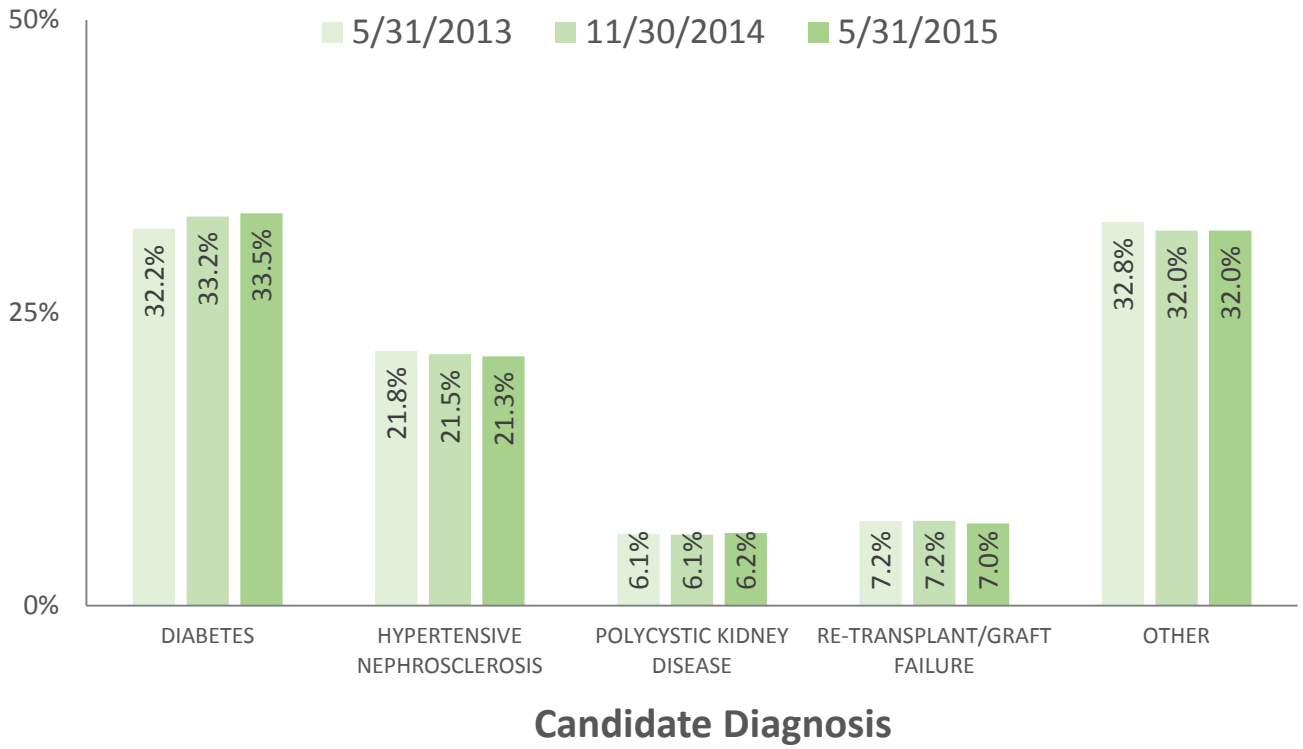
Table I.1a

Trends in the kidney waiting list

Comparing 3 month-end "snapshots" by candidate age and diagnosis



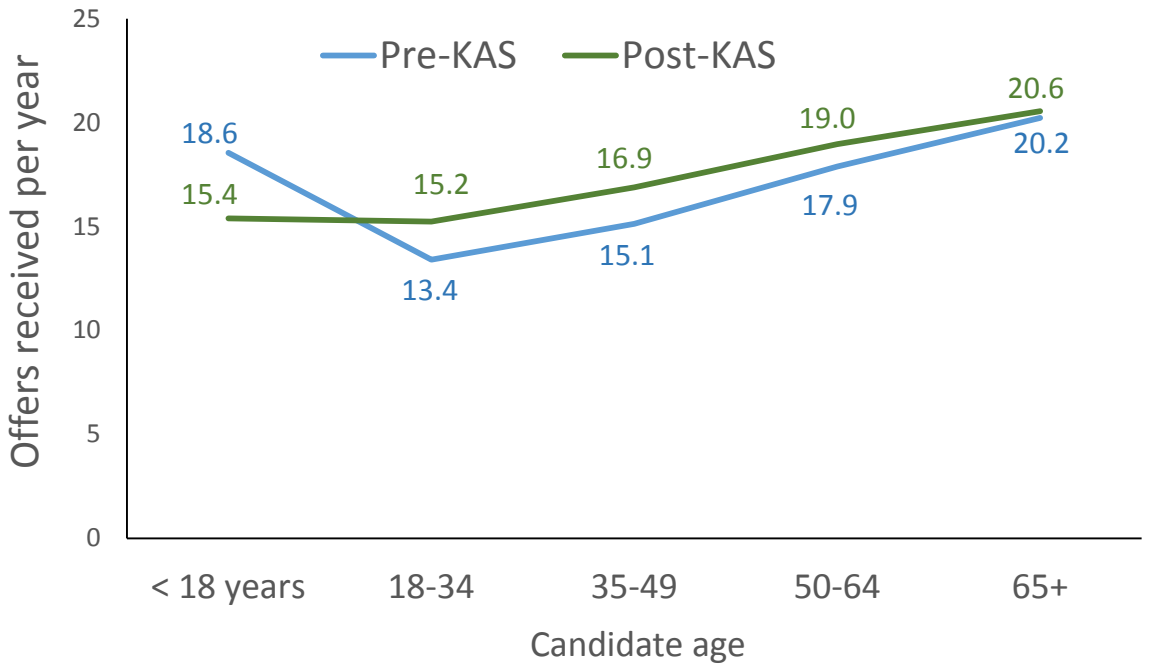


- The distribution of registrations on the waiting list by candidate age, race/ethnicity, diagnosis, and other factors has changed little.

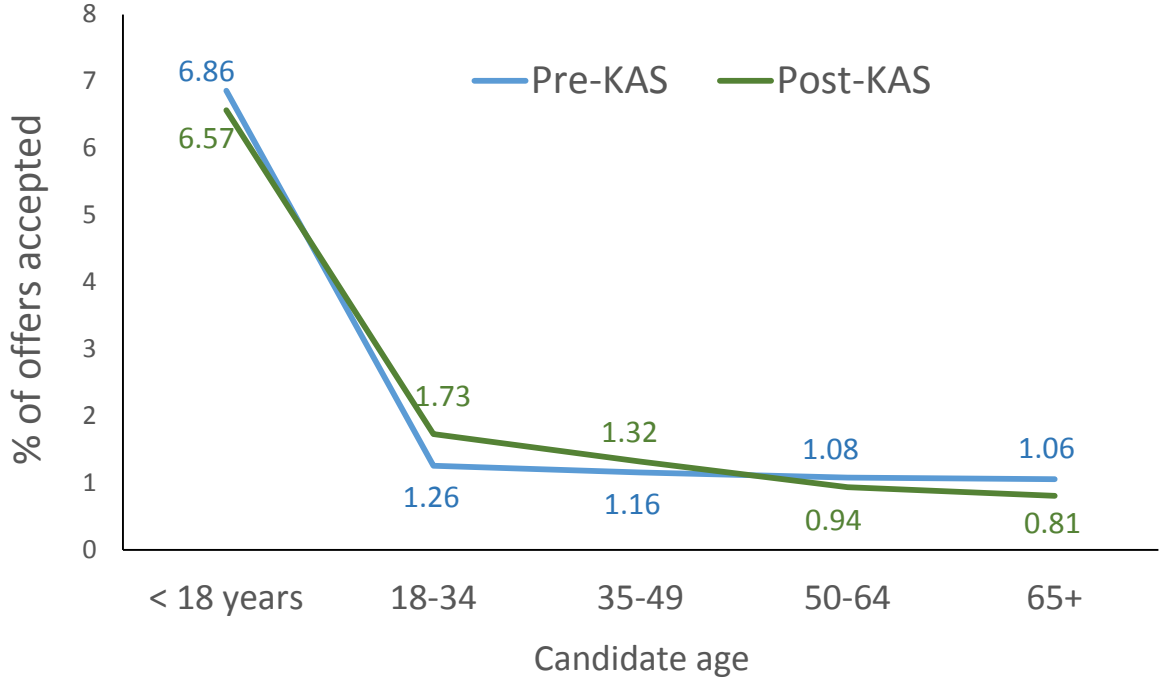
Table I.2a

Rates of receiving and accepting offers by candidate age

Offers received



Acceptance rates



- Offer rates dropped post-KAS for pediatrics, but acceptance rates remained relatively high. Donor quality increased for pediatric offers (avg KDPI↓).
- Offer acceptance rates dropped for older patients and increased for younger adults, most likely due to organ quality (KDPI) differences.

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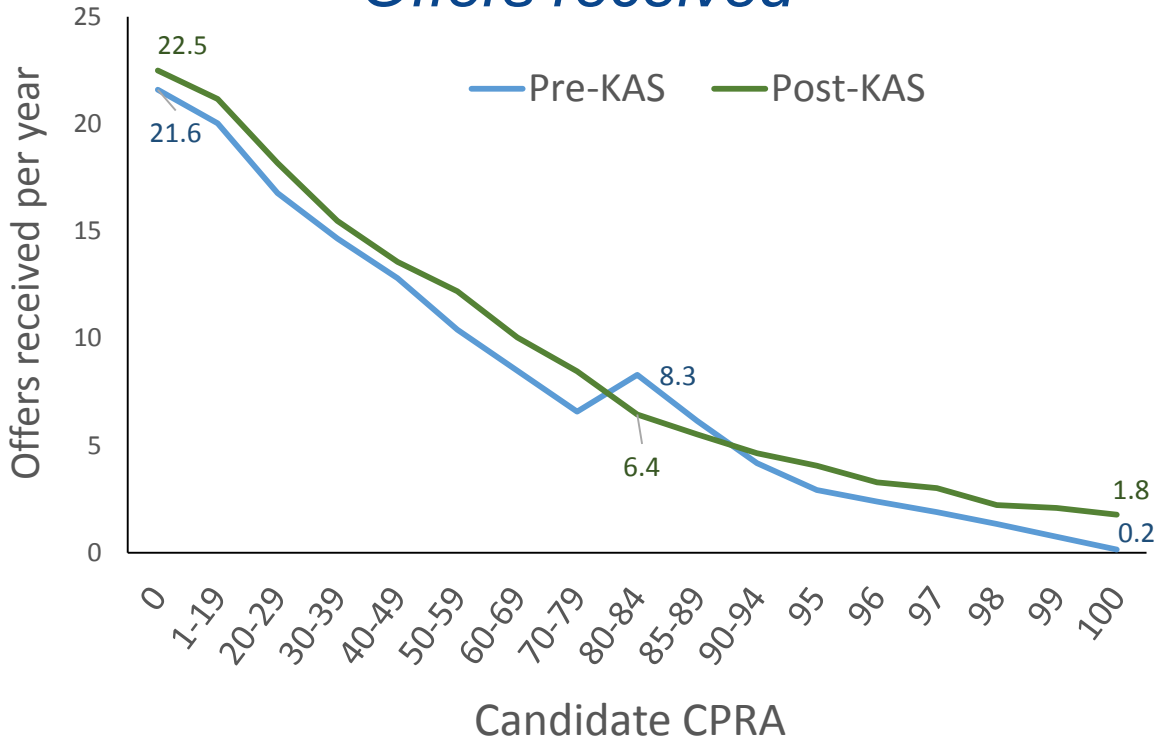
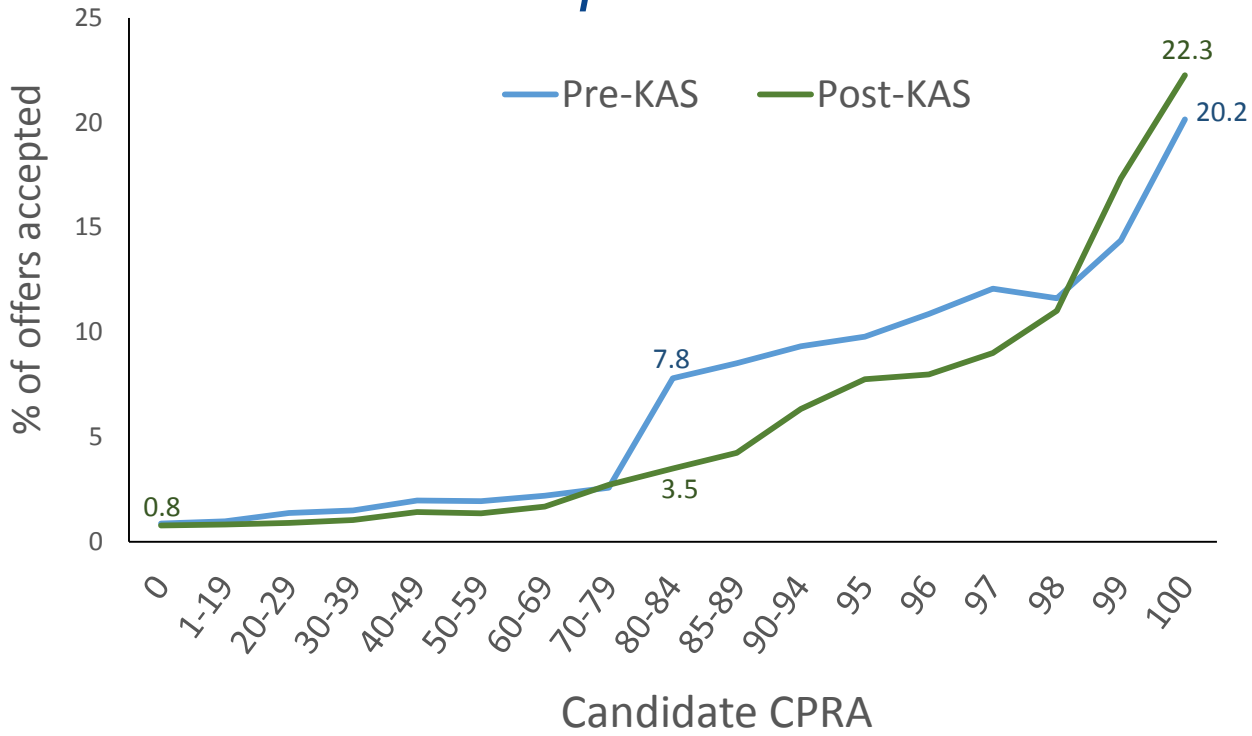
Table II.13
Table III.5

Offer & accept. rates by candidate CPRA

Offers received



Acceptance rates



- Offer rate curve smoother post-KAS, and higher for CPRA>95% patients.
- Offer acceptance rates increase as CPRA increases, both pre/post-KAS

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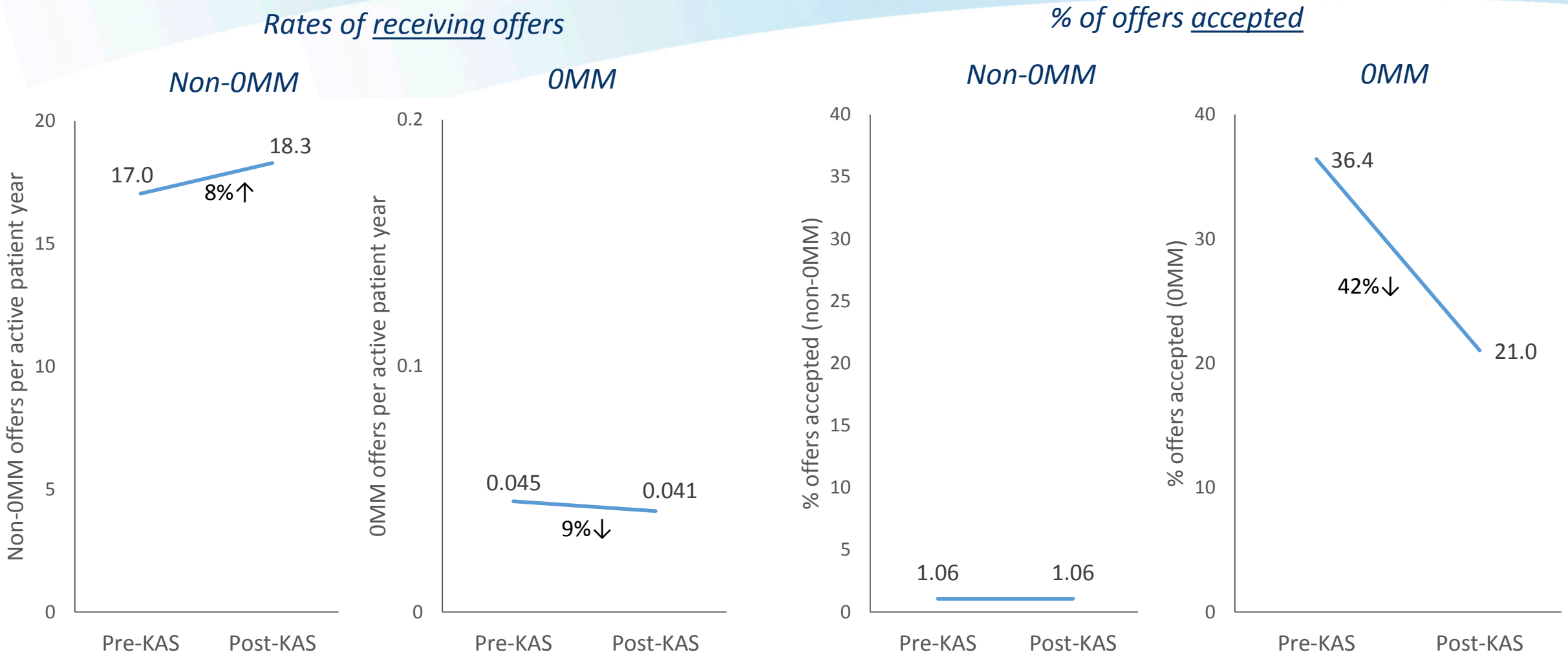
Table II.13
Table III.5

Offer rates and acc. rates by HLA mismatch level



- 0MM offers decreased 9% post-KAS.
- Acceptance rates for 0MM offers dropped by 42%.

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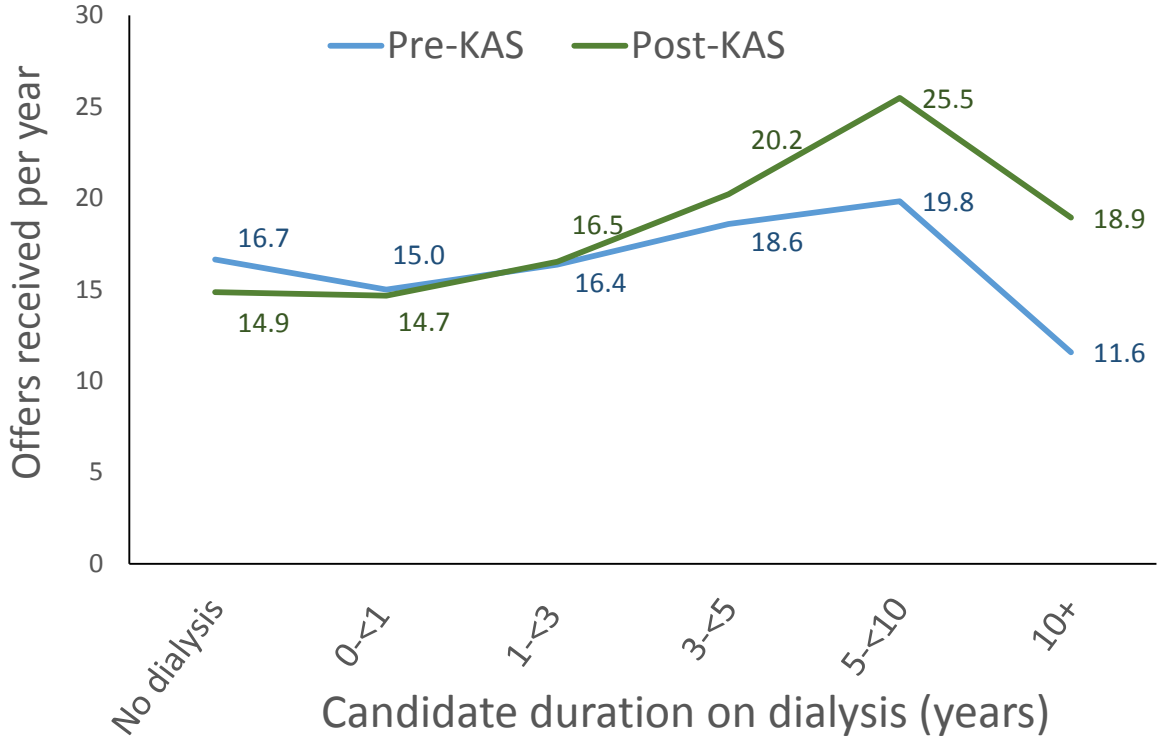
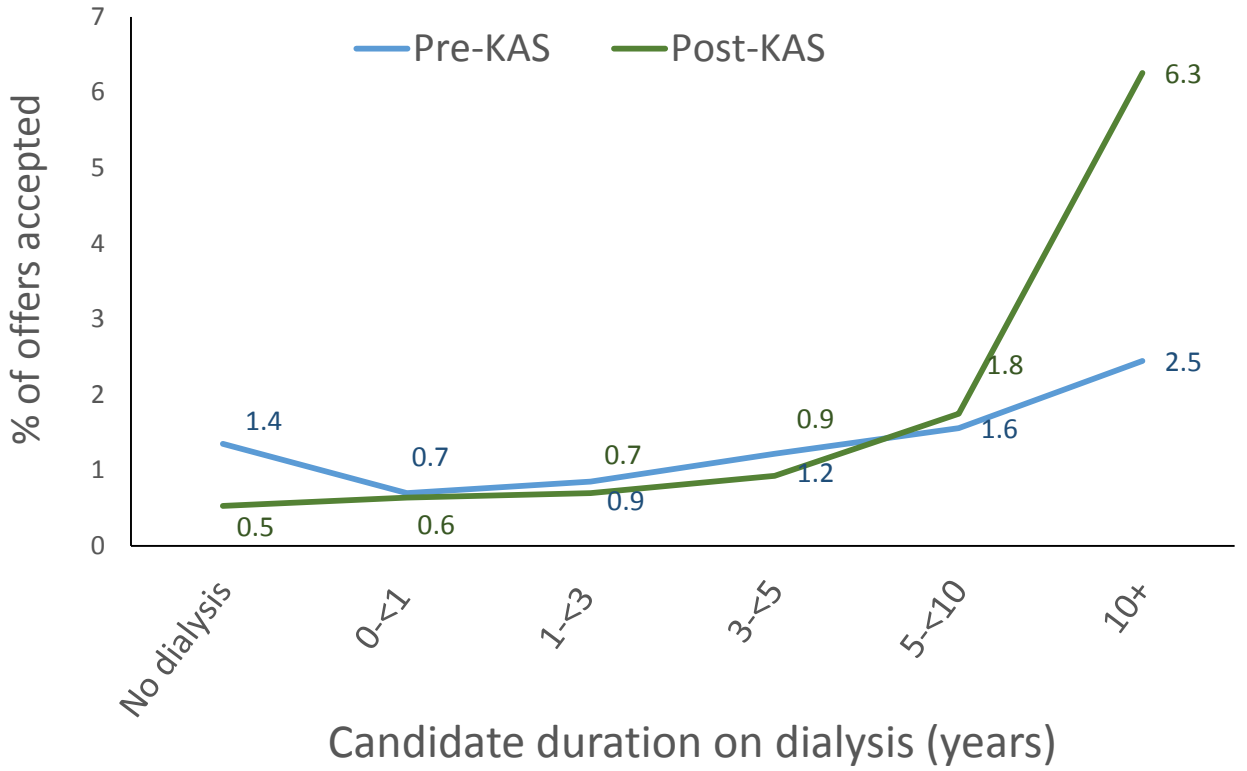
Table II.13
Table III.5

Offer & accept. rates by candidate time on dialysis

Offers received



Acceptance rates



- Offer rates increased post-KAS for high dialysis time patients.
- Offer acceptance rates rose sharply for candidates with 10+ years on dialysis and dropped sharply for preemptive patients.

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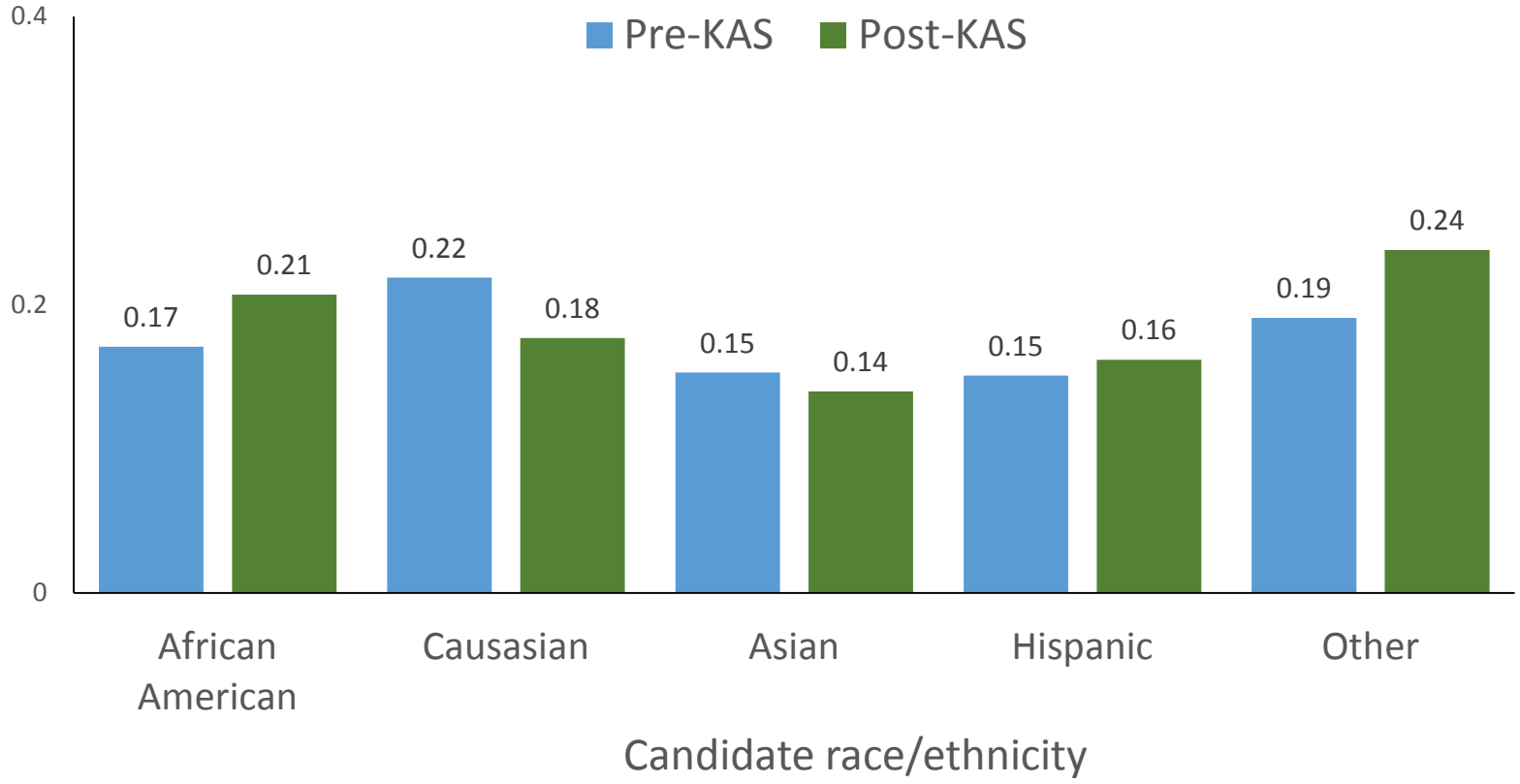
Table II.13
Table III.5

Transplant rates (per active patient-year) by candidate race/ethnicity



- Statistically significant increase in transplant rates for African American (AA) candidates, decrease for Caucasian candidates.
- Offer rates up 17% and acceptance rates up 6% for AA candidates.

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Table II.12

A2/A2B subtype to blood type B recipients

Pre vs post-KAS summary

Metric	Pre-KAS	Post-KAS
A2/A2B transplants	34	47
A2/A2B transplants (normalized per year)	22.5	95.8
% of transplants	0.2%	0.9%

- A2/A2B→B transplants have increased 4-fold.

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Table II.9

Single vs. Dual vs. En bloc kidney transplants

Pre vs post-KAS summary

	Pre-KAS		Post-KAS	
	N	%	N	%
Single	15948	97.2%	5239	97.2%
Dual	144	0.9%	38	0.7%
En bloc	314	1.9%	111	2.1%

- Dual kidney transplants have decreased slightly post-KAS.

Table II.10

Multi-organ kidney transplants

Pre vs post-KAS summary

Multi-organ kidney transplant type	Pre-KAS		Post-KAS	
	N	%	N	%
All	2086	11.3%	694	11.4%
Heart-Kidney	159	1.0%	54	1.0%
Kidney-Pancreas (KP)	1100	6.3%	346	6.0%
Liver-Kidney (SLK)	803	4.7%	288	5.1%
Other	24	0.1%	6	0.1%

- The proportion of transplanted deceased donor kidneys used in multi-organ transplants has changed little.

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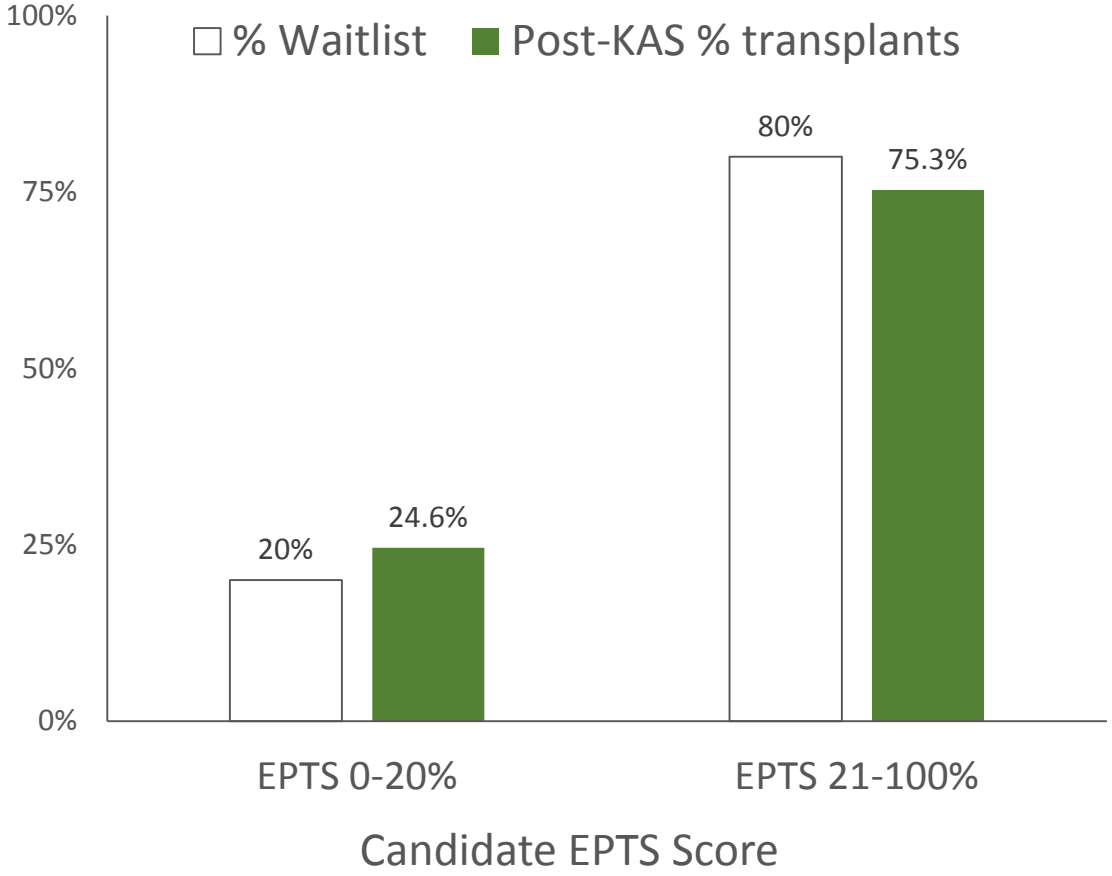
Table II.11

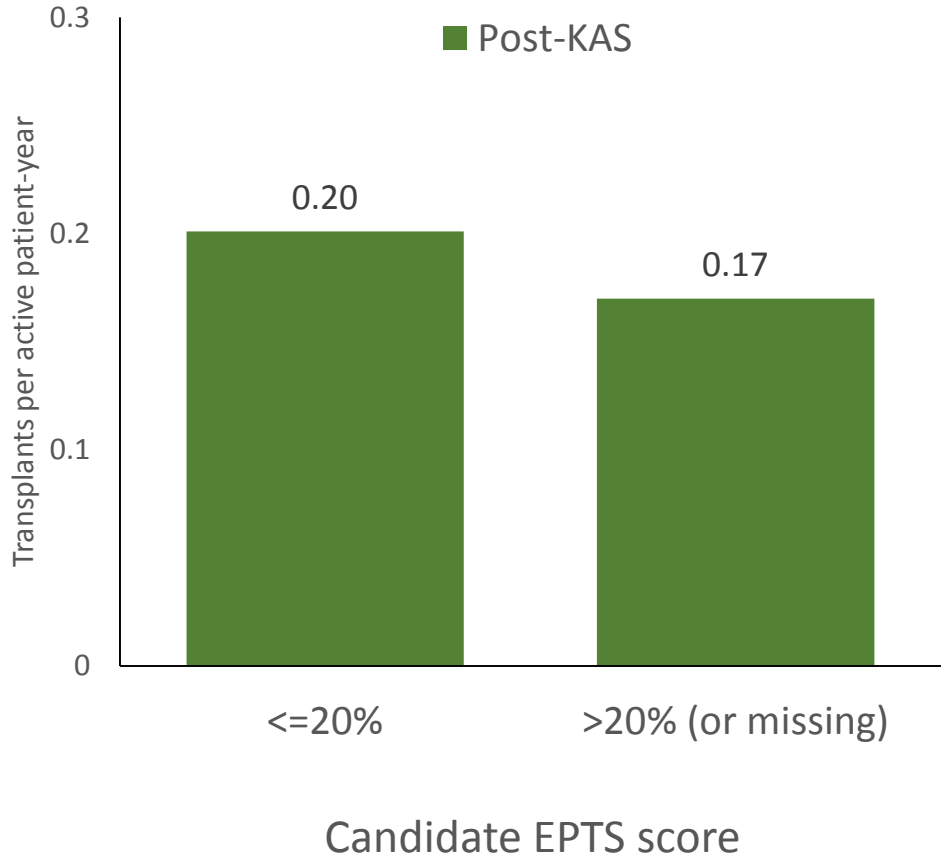
Longevity-matching under KAS

- Of KDPI 0-20% kidney transplants, 61% are going to EPTS Top 20% recipients under KAS.
- Under KAS, over half (52%) of EPTS Top 20% recipients received a KDPI 0-20% kidney.
- Increased percentage of pediatric recipients receiving KDPI<35% kidneys:
  - Pre-KAS (85%) vs. Post-KAS (94%).
- However, a higher % of KDPI>85% kidneys are going to patients under age 50 (8.4% vs. 10% after KAS)

Table II.3b
Table II.3c

Post-KAS access to transplants by EPTS score





- EPTS 0-20% candidates have moderately higher access to transplants than EPTS 21-100% candidates under KAS, including 18% higher transplant rates.

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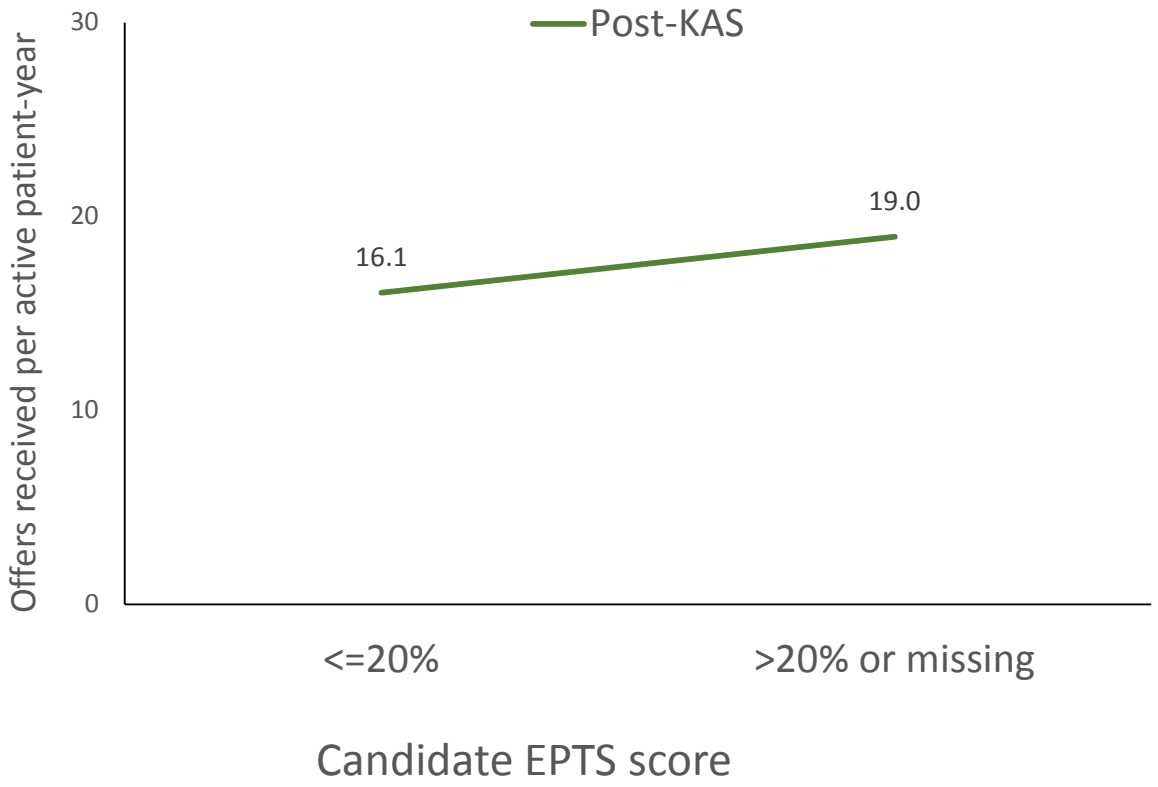
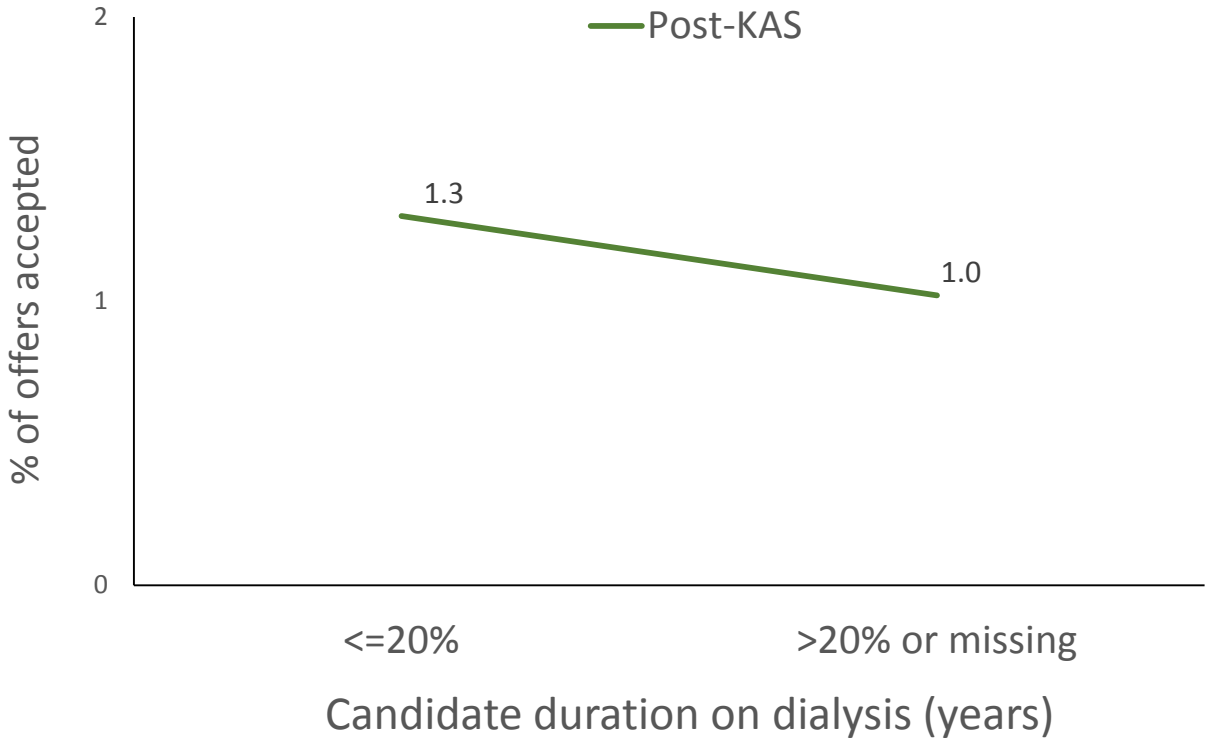
Table 1.2a
Table II.1b
Table II.12

Post-KAS offer and accept. rates by EPTS score

Offers received



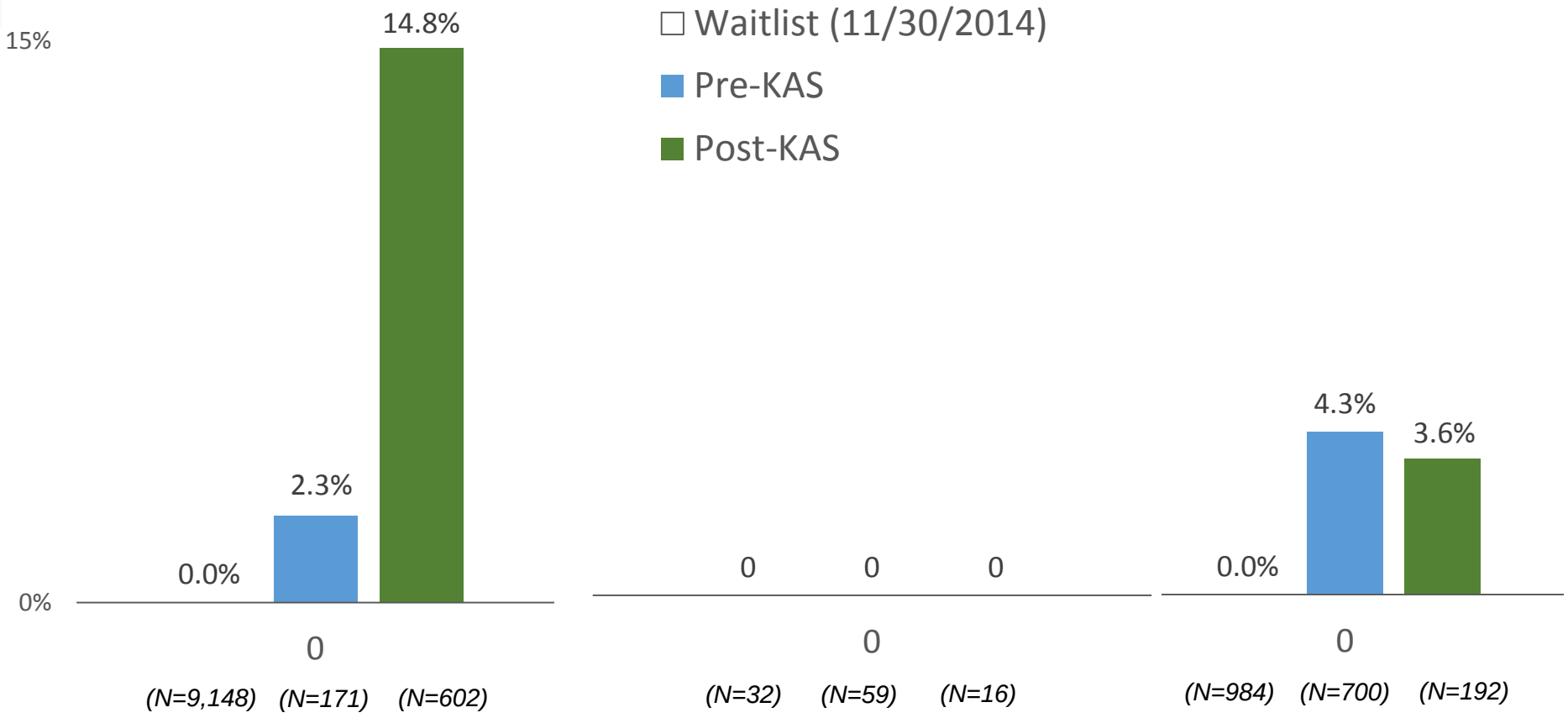
Acceptance rates



- Surprisingly, offer rates were lower for EPTS 0-20% patients.
- However, organ quality was better (lower average KDPI) and acceptance rates for EPTS 0-20% patients were 30% higher than for EPTS 21-100% patients.

Table II.13
Table III.5

Pediatrics, Highly Sensitized, and Prior Living Donors



- Proportion of transplants relative to WL prevalence under KAS:
  - CPRA 99-100: 14.8/8.3 = **1.8** PLDs: 0.30/0.028 = **11** Pediatrics: 3.6/0.9 = **4**

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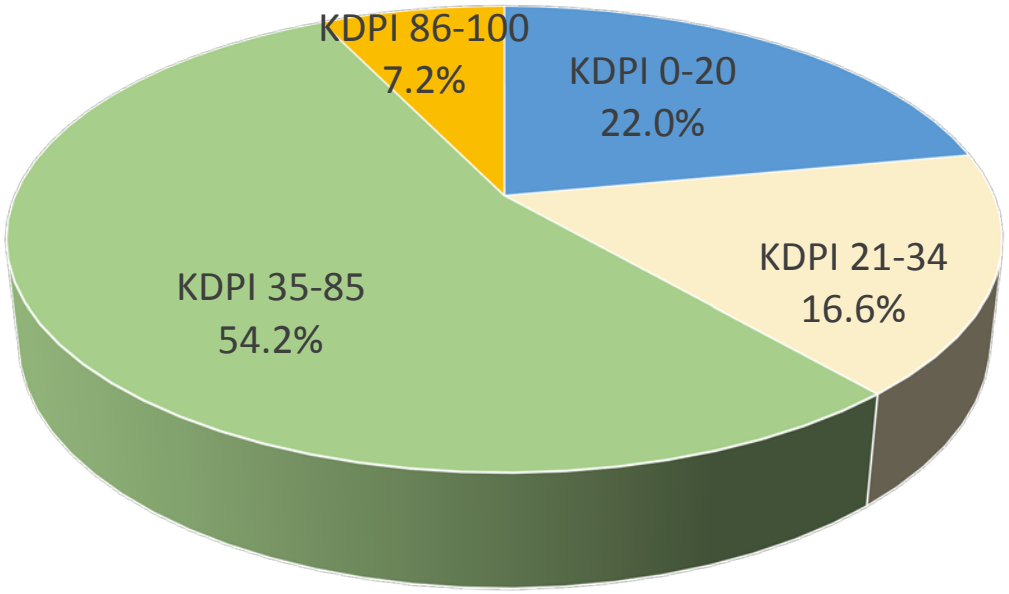
Eras - Pre: 18 months (June 1, 2013 – Dec 3, 2014) Post: 6 months (Dec 4, 2014 – May 31, 2015)

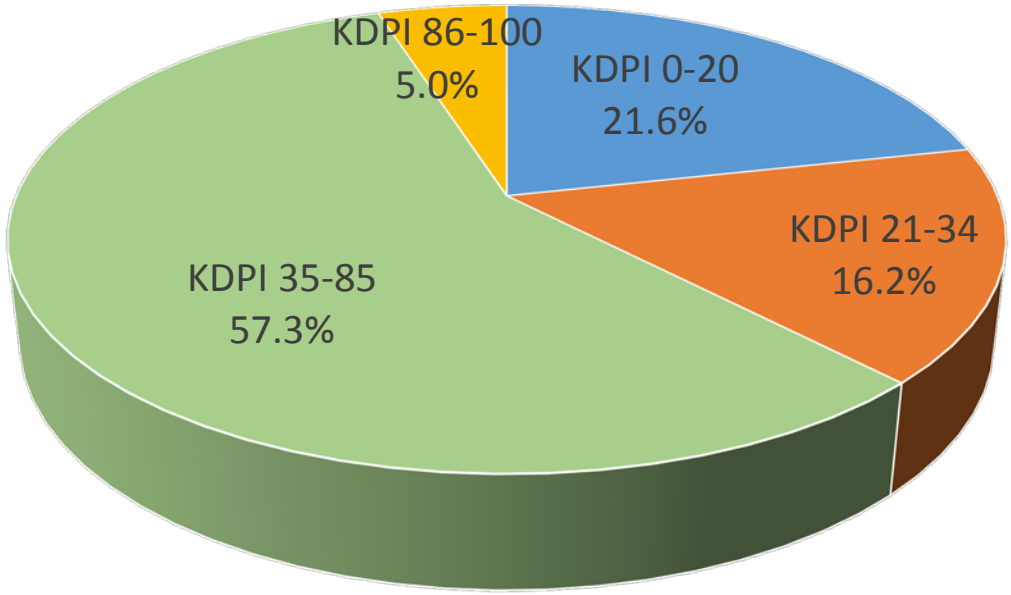
Table 1.2a
Table II.1b

KDPI distribution of local transplants

Pre-KAS



Post-KAS



- Though fewer transplants are occurring locally, approximately the same percentage had KDPI 0-20% kidneys: Pre (22.0%), Post (21.6%)

(inferred from Table II.e)

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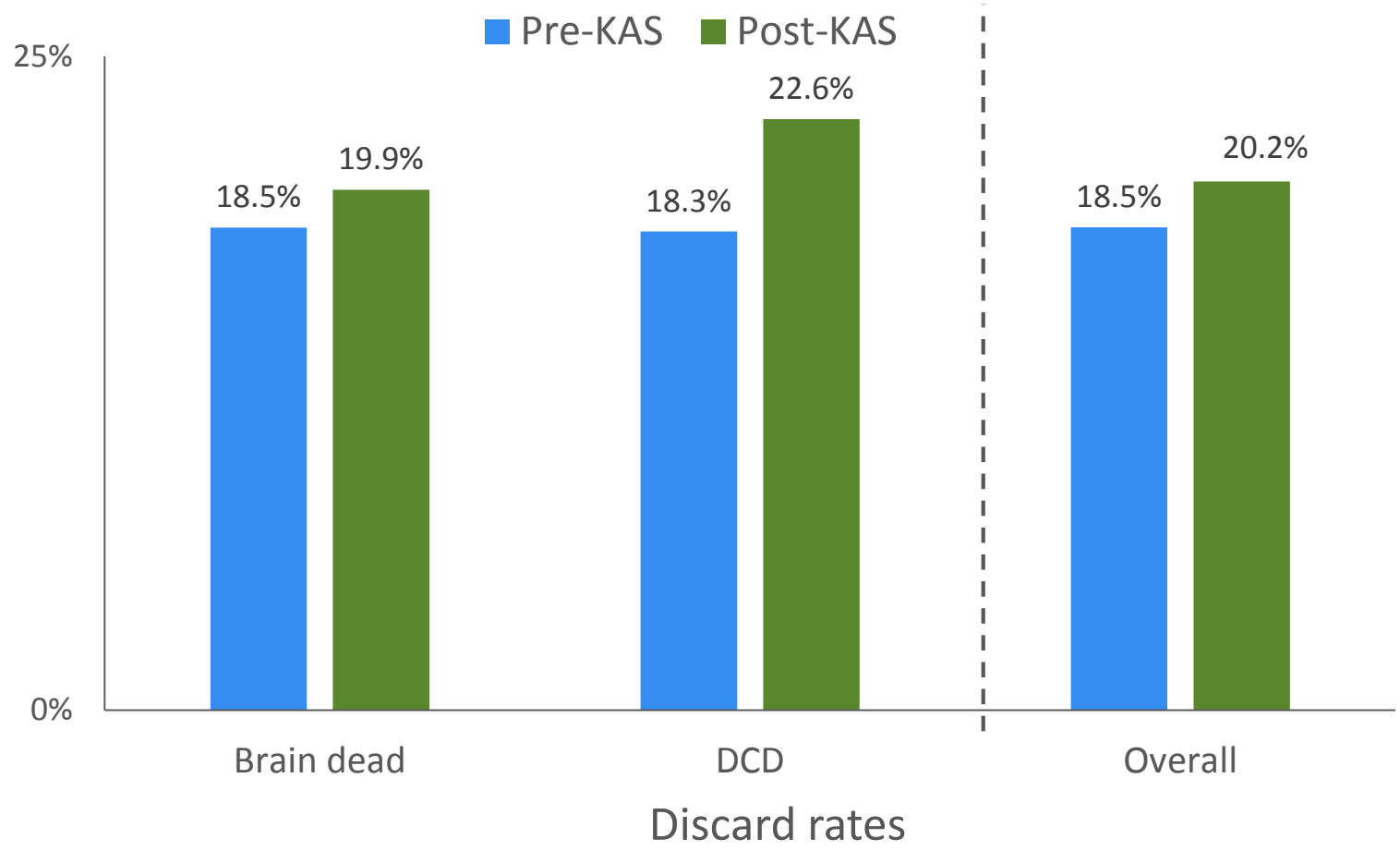
Kidney recovery & utilization under KAS

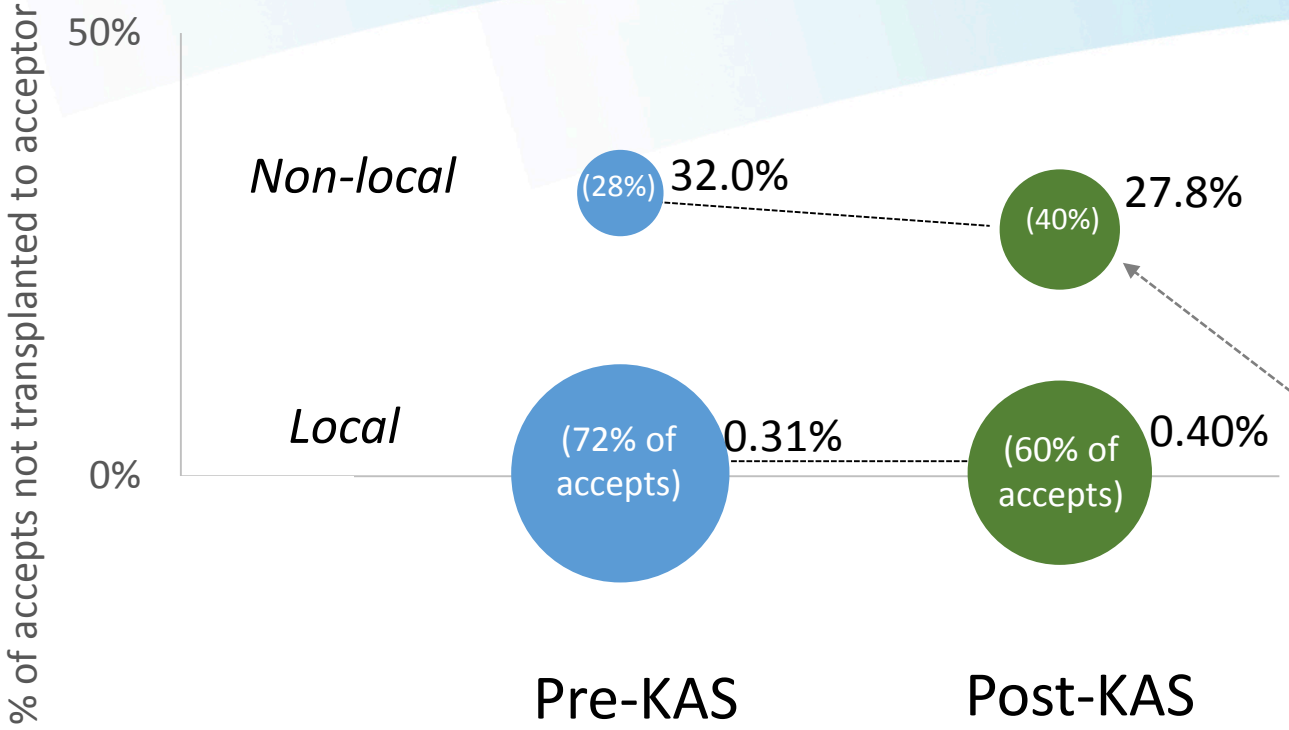
Kidney Discard Rate by DCD vs. BD



- Greater discard rate increase for kidneys from DCD donors.

Table III.3

Accepted Offers Not Transplanted to the Acceptor*



(size of bubbles reflects relative number of accepted offers)

Post-KAS, a ***smaller percentage*** of non-local, accepted offers are not going to the acceptor.

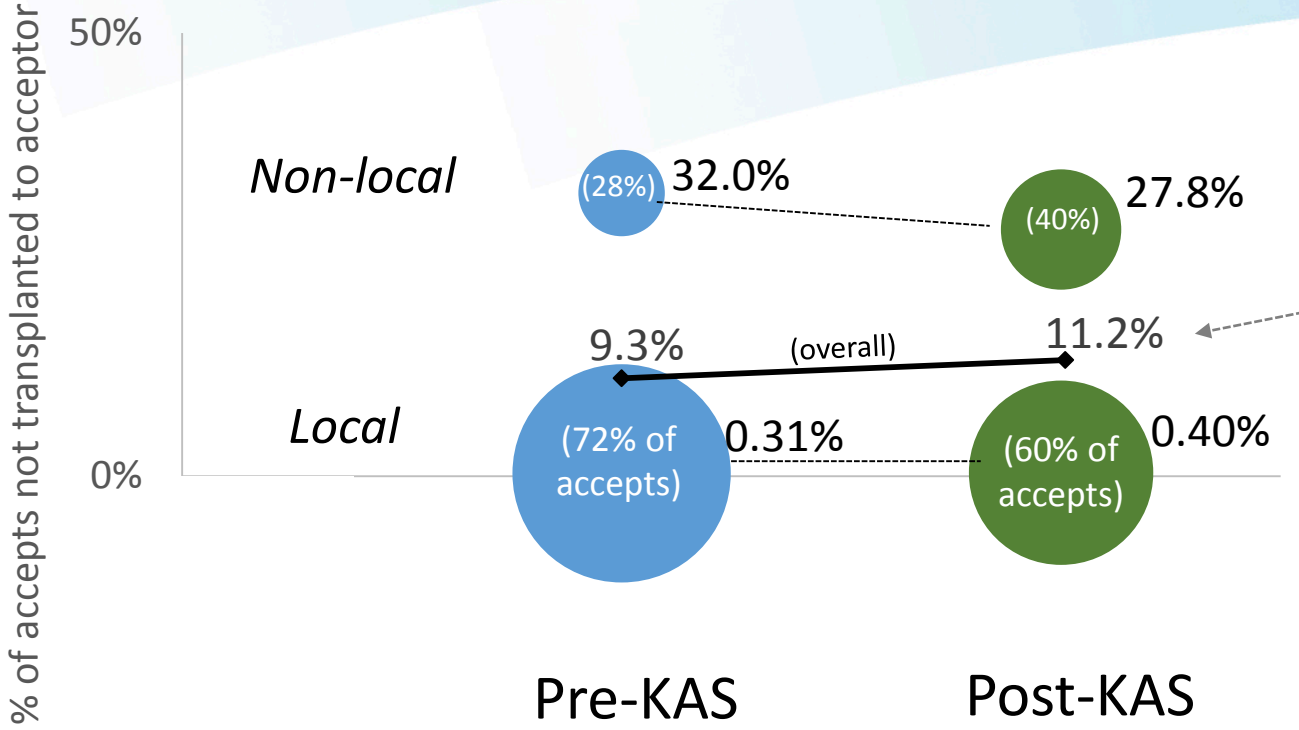
(This is also true for the subset of CPRA 99-100% non-local acceptances: 26.5%→18.2%.)

However, substantially more of the accepted offers are non-local under KAS (28% to 40%), which has lead to... *(next slide)*

(*DonorNet acceptance data may not include all cases and should be interpreted cautiously.)

Table III.6

Accepted Offers Not Transplanted to the Acceptor*



(size of bubbles reflects relative number of accepted offers)

...an ***increase*** in the overall % of accepts not going to the accepting patient.

This is because the overall numbers (9.3% and 11.2%) are weighted averages of local and non-local offers, and 40% of the weight is non-local in the post-KAS era.

(Example of "Simpson's Paradox")

- Bottom line: More kidneys are not going to the acceptor under KAS.
- However, this is because more kidneys are being allocated non-locally, not because of less efficient allocation of shipped kidneys.
- If the non-local rate had not improved but remained at 32%, the overall rate would have been 12.9%.

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(*DonorNet acceptance data may not include all cases and should be interpreted cautiously.)

Table III.6