Changes to kidney allocation: Gains and Losses

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Conflict of Interest Disclosure

- I have no relevant financial relationships to disclose.

Numbers in the thousands

As of January 8, 2016 there are 100,791 people waiting for a kidney transplant.[1]

In 2015 there were 11,480 deceased donor kidney transplants[2] performed, went to patients needing a kidney alone transplant.

Each year more than 5000 die waiting for kidney transplant[3].

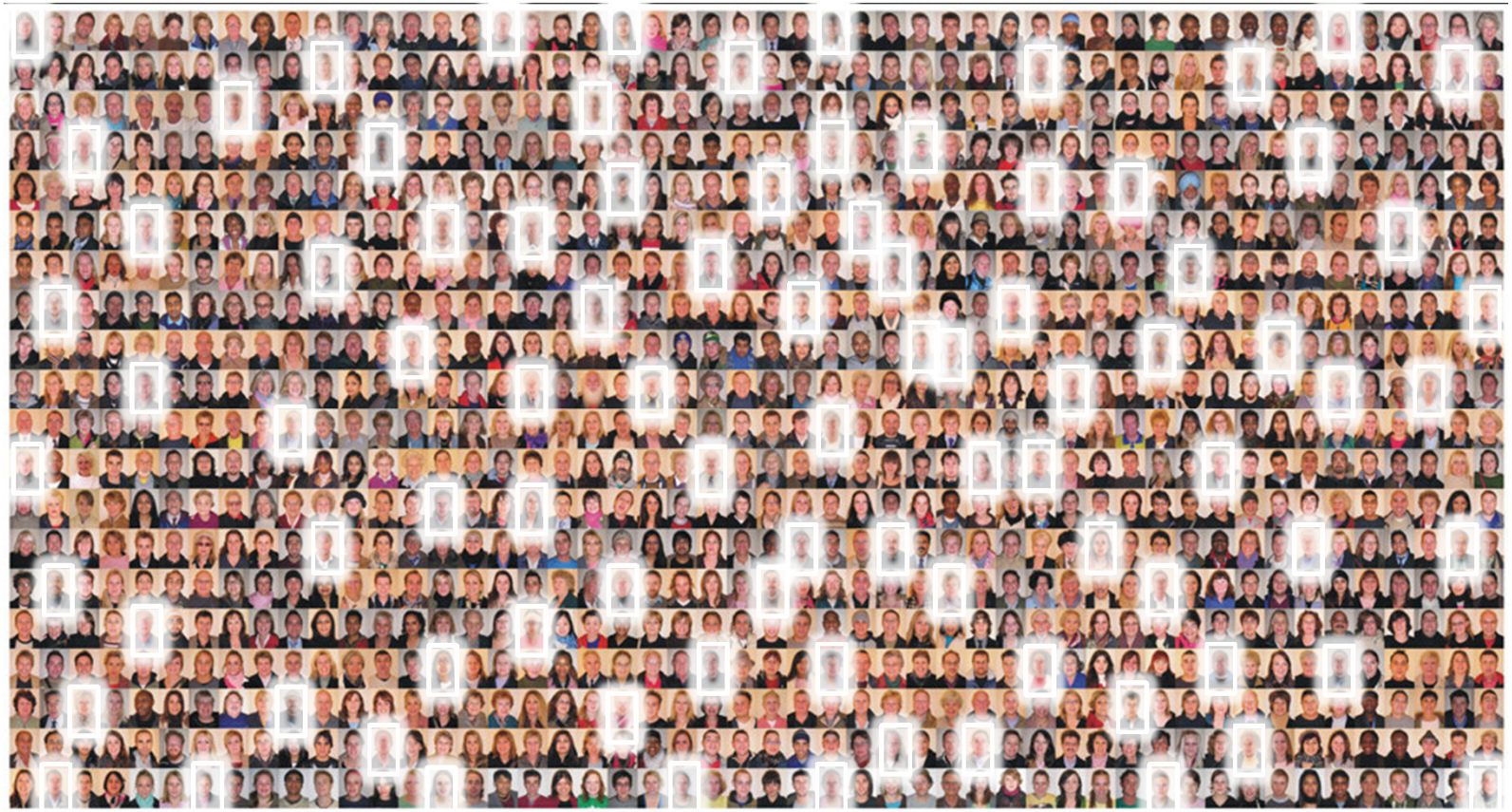
Each day 14.

One person every 2 hours.

[1] https://www.unos.org/data/transplant-trends/#waitlists_by_organ
[2] OPTN/UNOS Research Department.
[3]http://srtr.transplant.hrsa.gov/annual_reports/2012/pdf/01_kidney_13.pdf

One thousand people

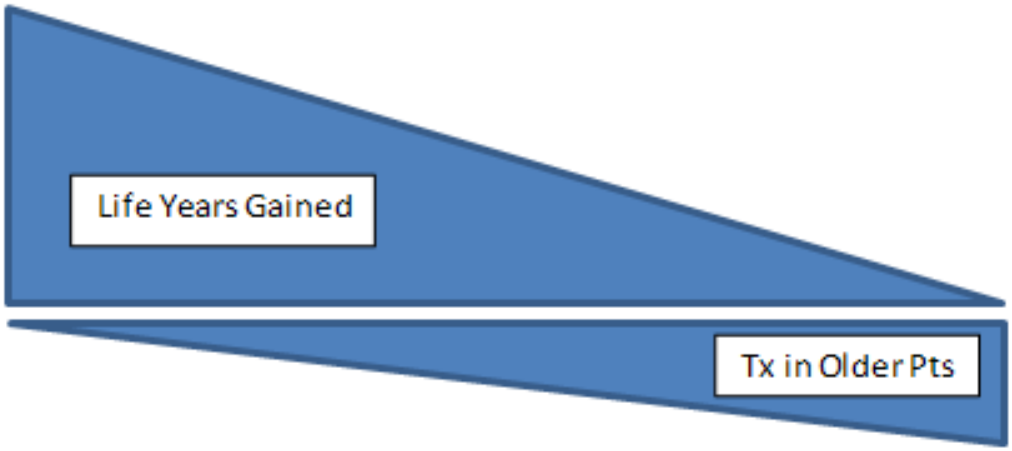
You choose who receives a kidney transplant

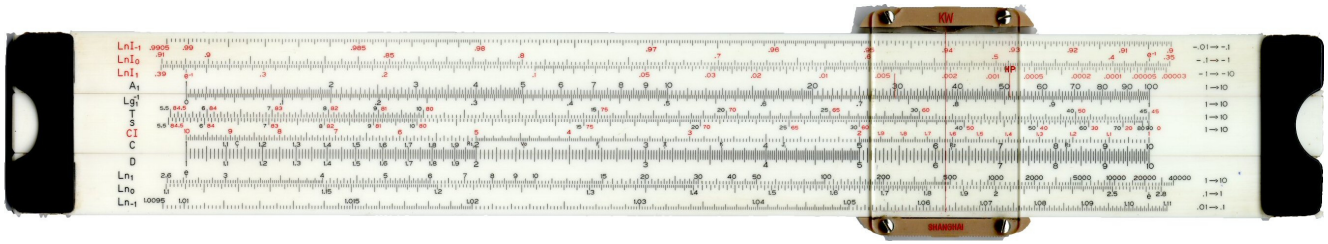


Reality

Harsh reality

Determining a balance: Equity and Utility





KAS at one year

Results presented are from:

Stewart DE, Kuckeryavaya AY, Klassen DK, Turgeon NA, Formica RN, Aeder MI. One Year after KAS Implementation: Marked Changes in the Characteristics of Deceased Donor Kidney Transplants. Am J Transplant 2016 – *in press*.

For the purposes of this presentation:

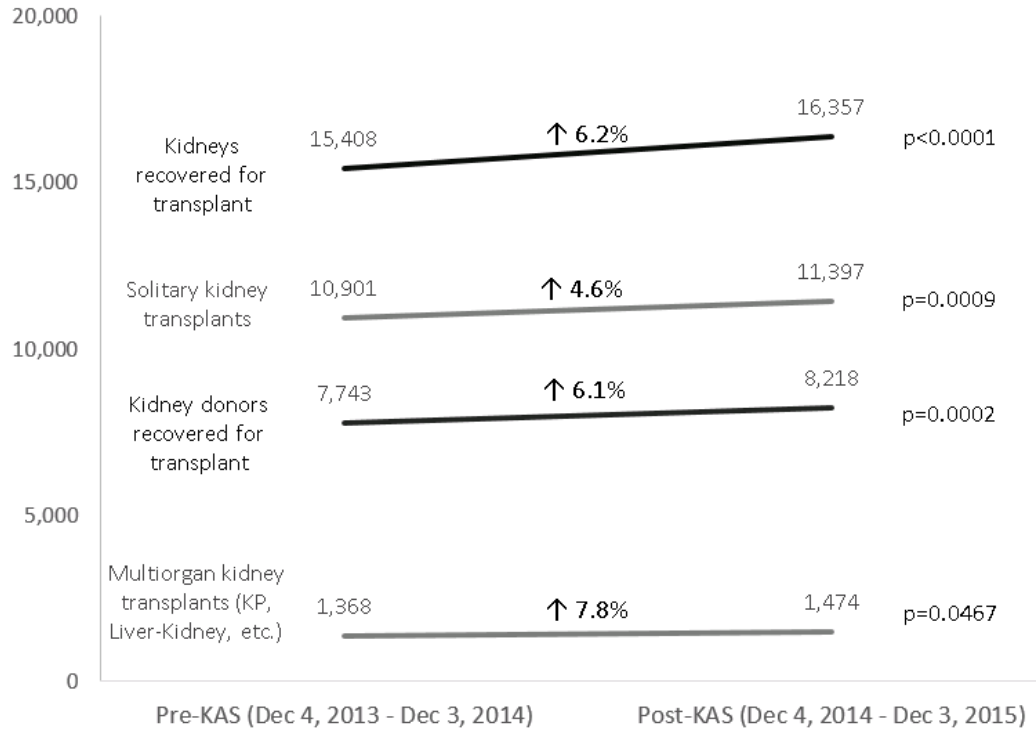
p-value < 0.0005: unambiguous statistical significance **(strong evidence of a change)**

0.0005 ≤ p-value < 0.05: questionable statistical significance **(borderline evidence of a change)**

0.05 ≤ p-value: **statistically insignificant**

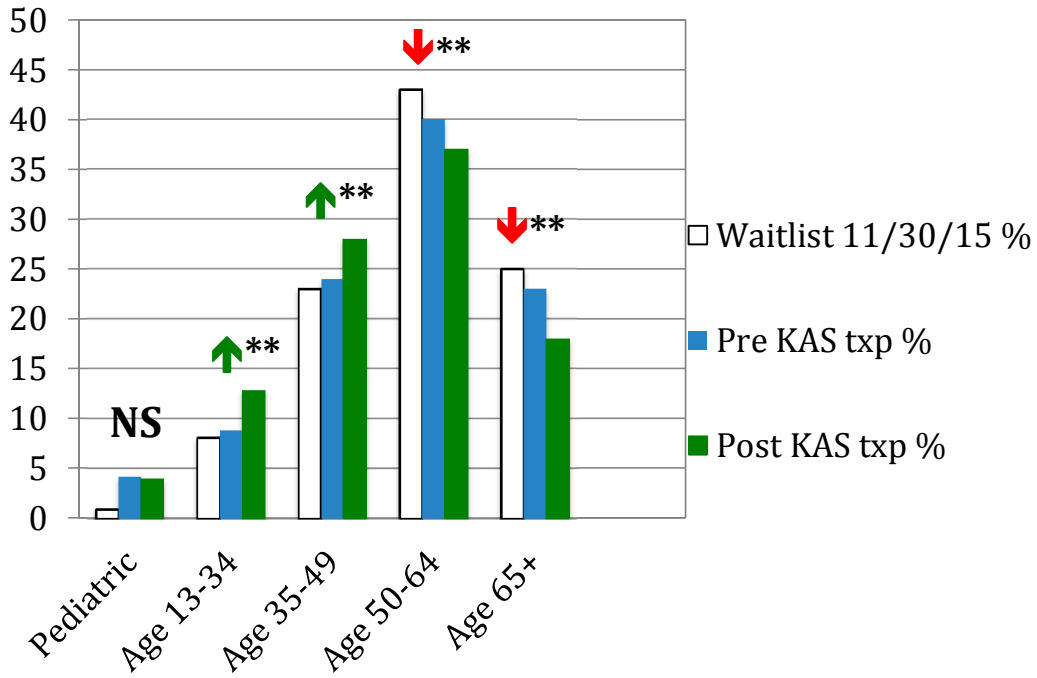
These P values are the result of Bonferroni's correction which divides 0.05 by 100. This creates a conservative estimate and accounts for the fact there are numerous (~100) hypothesis tests and some were designed apriori and some post hoc.

Number of Deceased Donor Kidney Transplants, Kidney Donors, and Kidneys Recovered for Transplantation, Pre vs. Post-KAS



Median KDRI pre-KAS 1.223 and post-KAS 1.221 *P = 0.57*

Transplants by age of recipient



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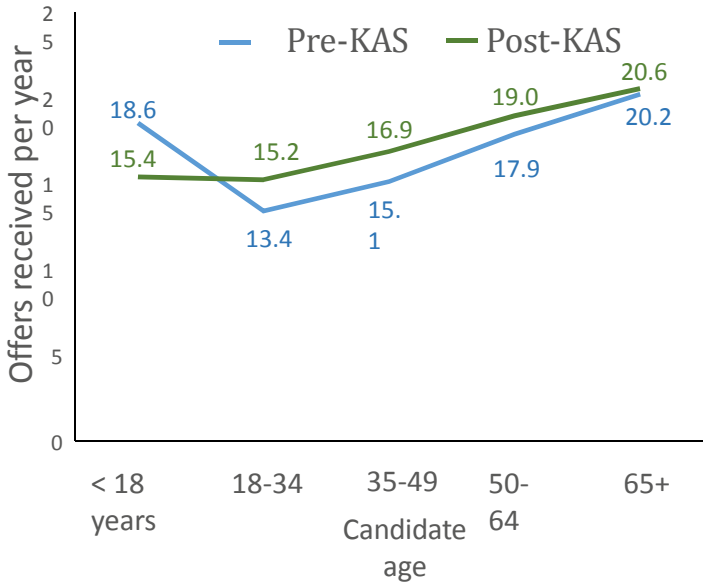
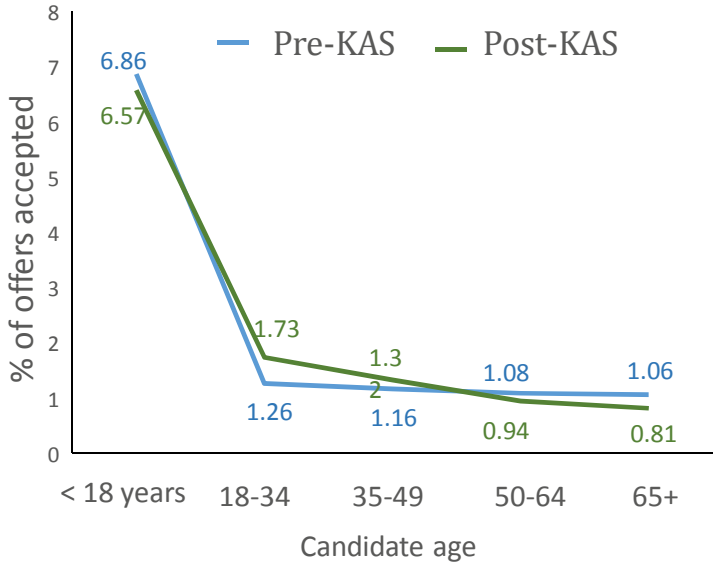
Pediatrics more in depth

Pediatric transplants pre-KAS 4.2%, post KAS 3.9% *P = 0.17*

Offers received



Acceptance rates



Pediatric recipients received a KDPI<35% kidney: pre-KAS 86%, post-KAS 95.3%

Post-KAS Fifty-one (44%) programs performed **fewer**, 44 (38%) performed **more**, 20 (17%) were **unchanged**.

Longevity Matching Part 1

Pre-KAS 12/3/13 – 12/3/14			
	KDPI		
	0-20	21-85	86-100
AGE	%	%	%
0-39	7.1	11.2	0.2
40-49	4.2	13.8	0.6
50-64	7.1	28.9	3.9
65+	3.2	15.9	3.9

Post-KAS 12/4/14 – 12/3/15			
	KDPI		
	0-20	21-85	86-100
AGE	%	%	%
0-39	12.8↑	11.5	0.2
40-49	5.2↑	14.3	0.6
50-64	3.2↓	30.3	3.8
65+	1.1↓	13.7	3.4↓

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NS

Longevity Matching Part 2

Donor-recipient match characteristic			
Age difference	Pre-KAS txp %	Post-KAS txp %	Δ%
0-10 years	33.3	35.9	↑7.66
10-20 years	27.7	29.8	↑7.41
20-30 years	17.9	18.0	↑0.9
30+ years	21.1	16.3	↓22.6

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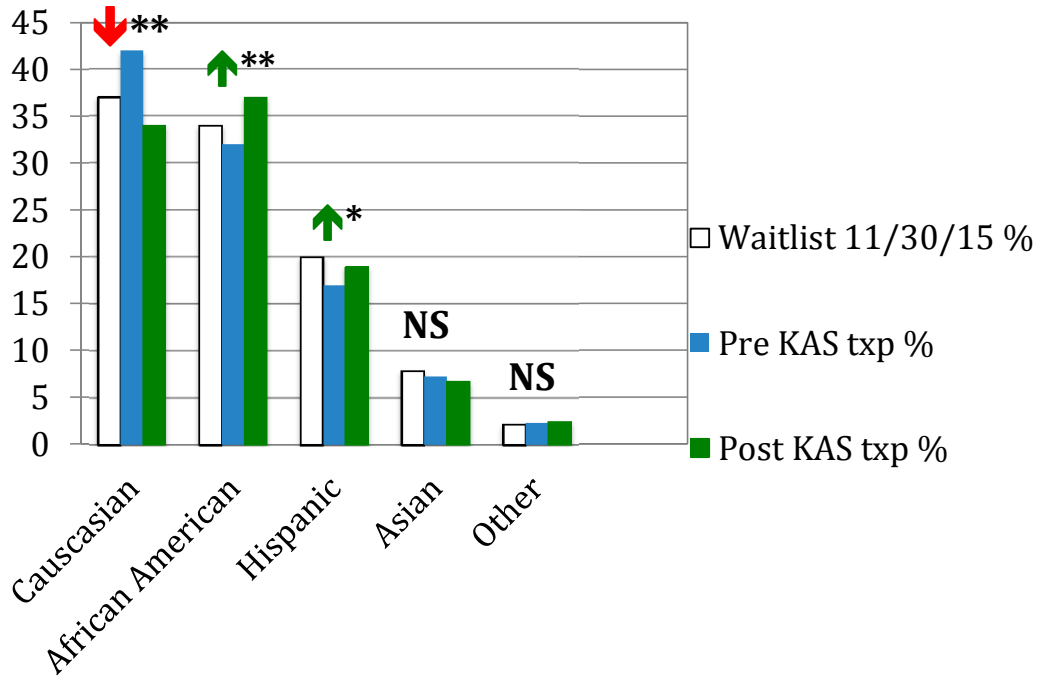
NS

Transplants by race of recipient



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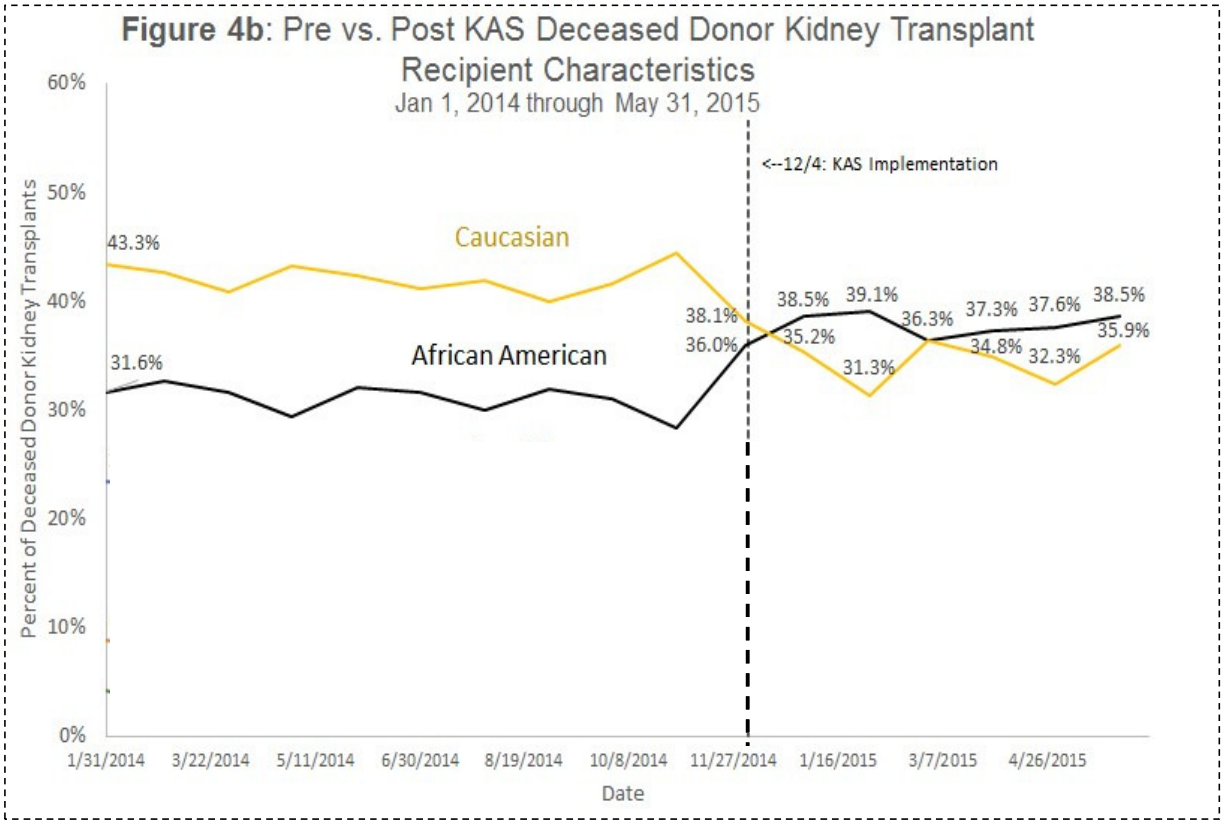
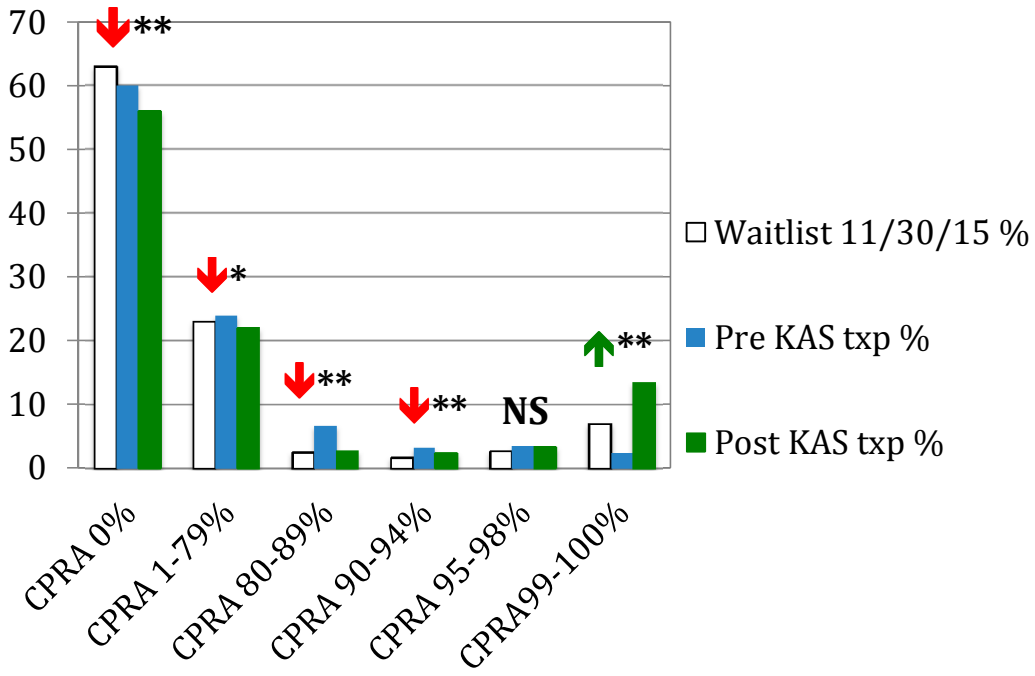
An observation with out an immediate answer



Transplants by degree of sensitization



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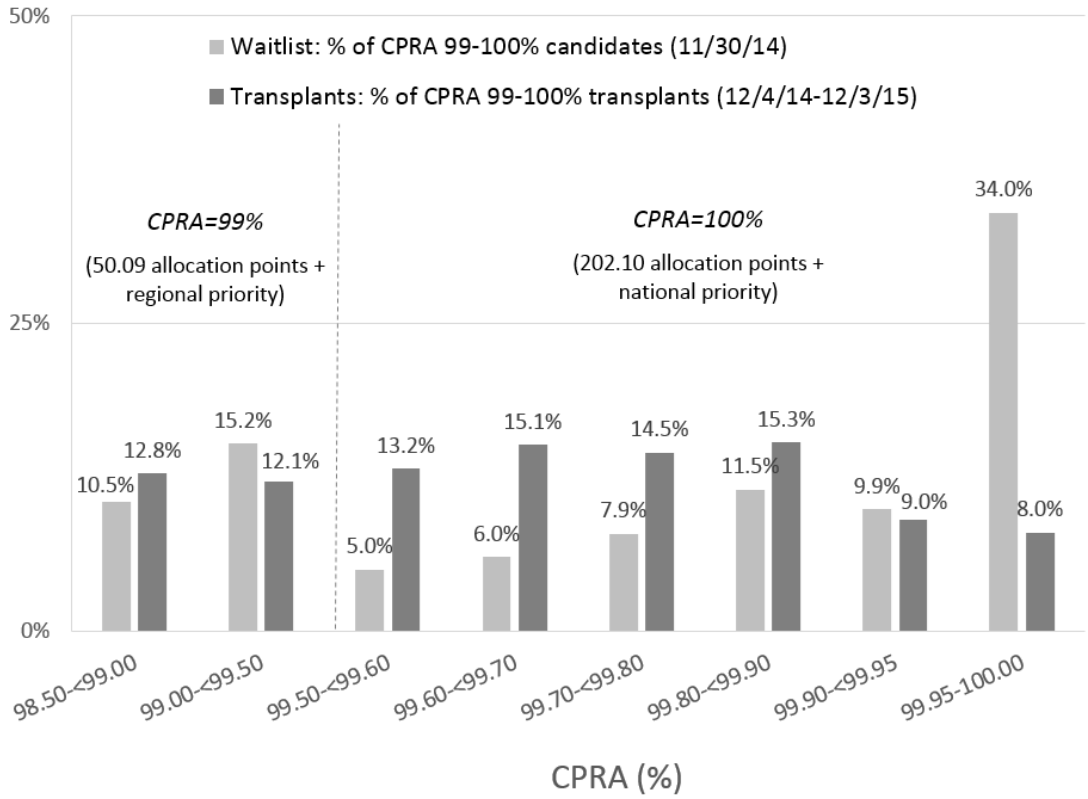
Comparison of CPRA 99-100% Patients: Waiting List vs. Transplant Recipient Prevalence, by Fine CPRA Intervals

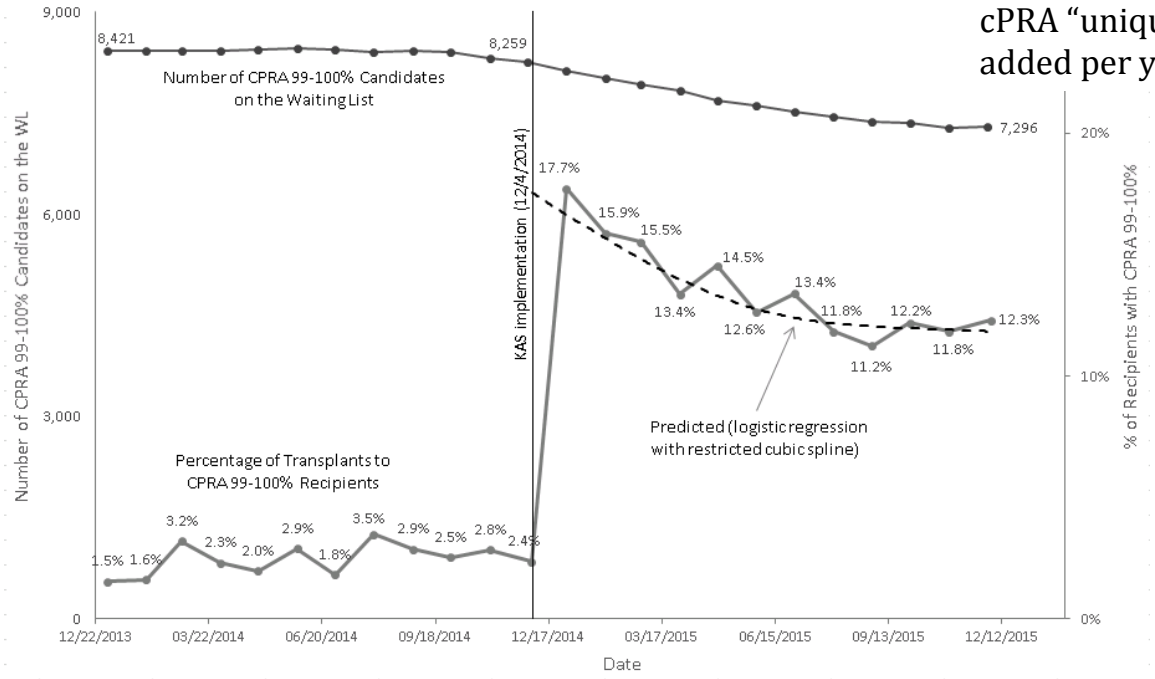


CPRA values are rounded to the nearest integer (e.g., 98.50% is considered to be 99% in KAS

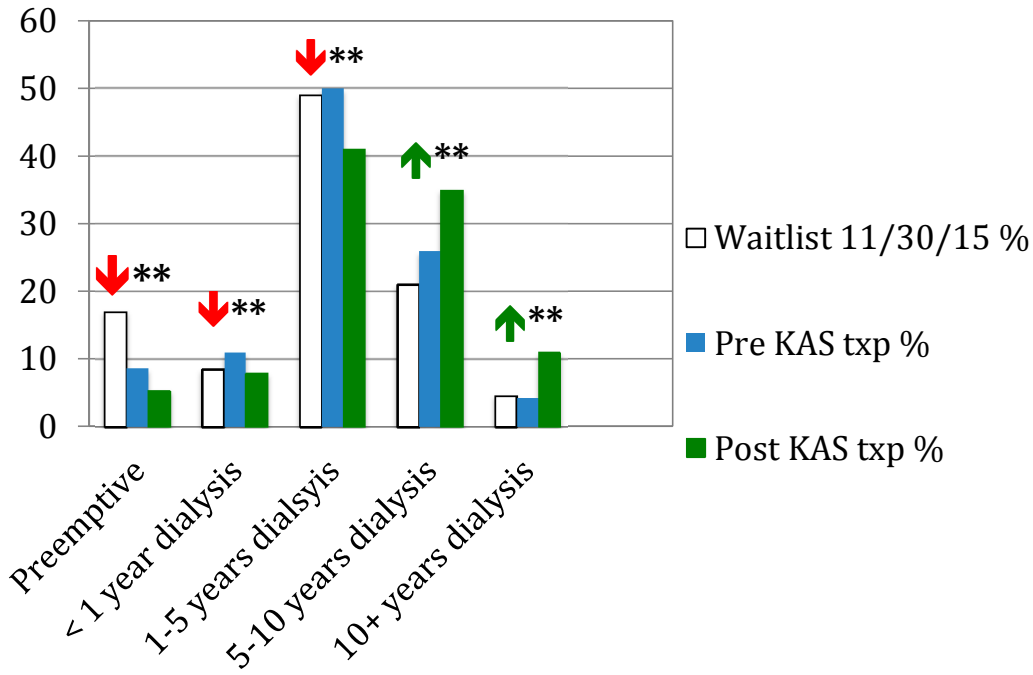
High CPRA "bolus effect"

Changes over time for CPRA 99-100% patients: Observed and predicted % of transplant recipients, and number of candidates remaining on the waiting list.

Number of 99 & 100 % cPRA "unique candidates" added per year ~ 837



Transplants by dialysis exposure



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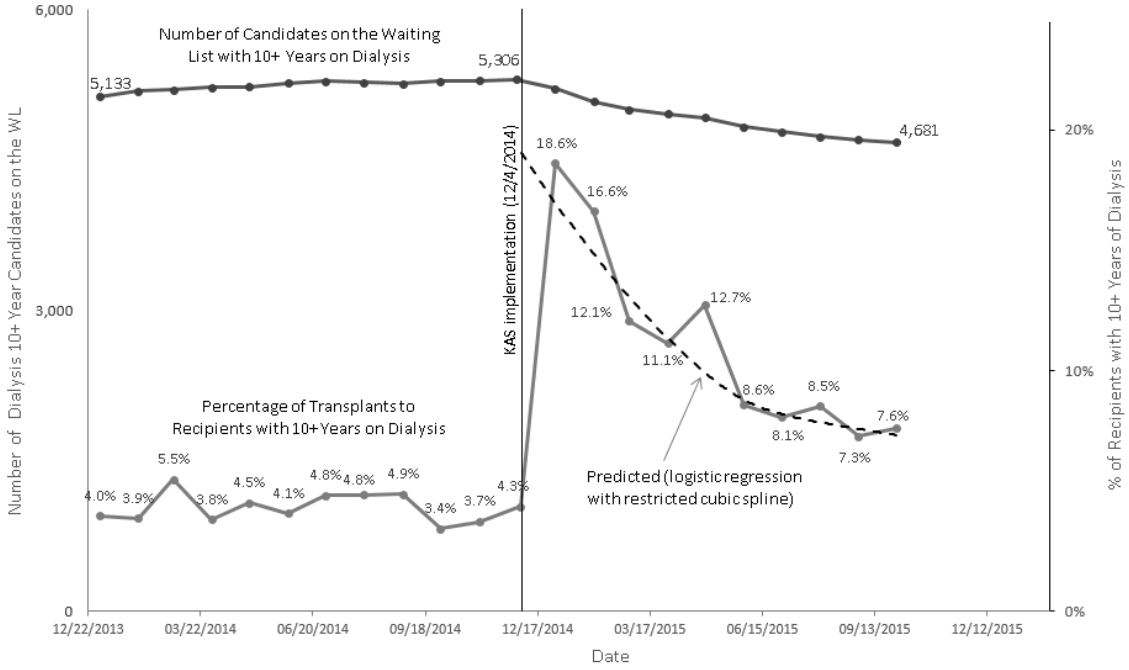
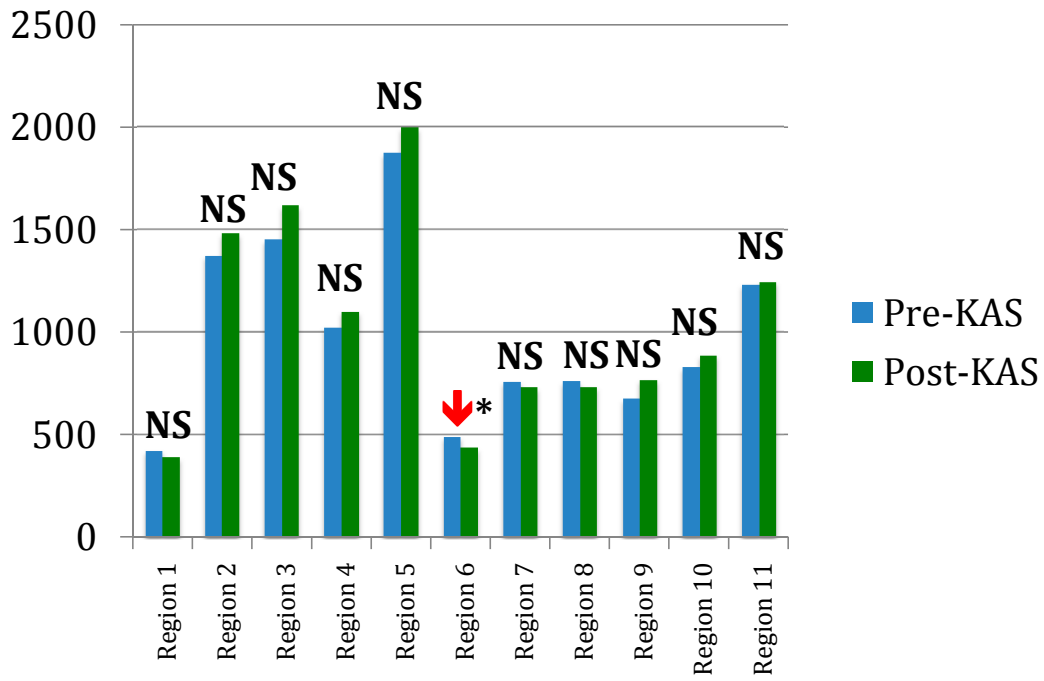
Long dialysis time "bolus effect"

Changes over time* for patients with dialysis duration of 10+ Years: Observed and predicted % of transplant recipients, and number of candidates remaining on the waiting list



**Limited to 12/4/2014-9/30/2015 post-KAS period due to additional data lags required for determining candidate and recipient dialysis duration*

Regional distribution of kidneys



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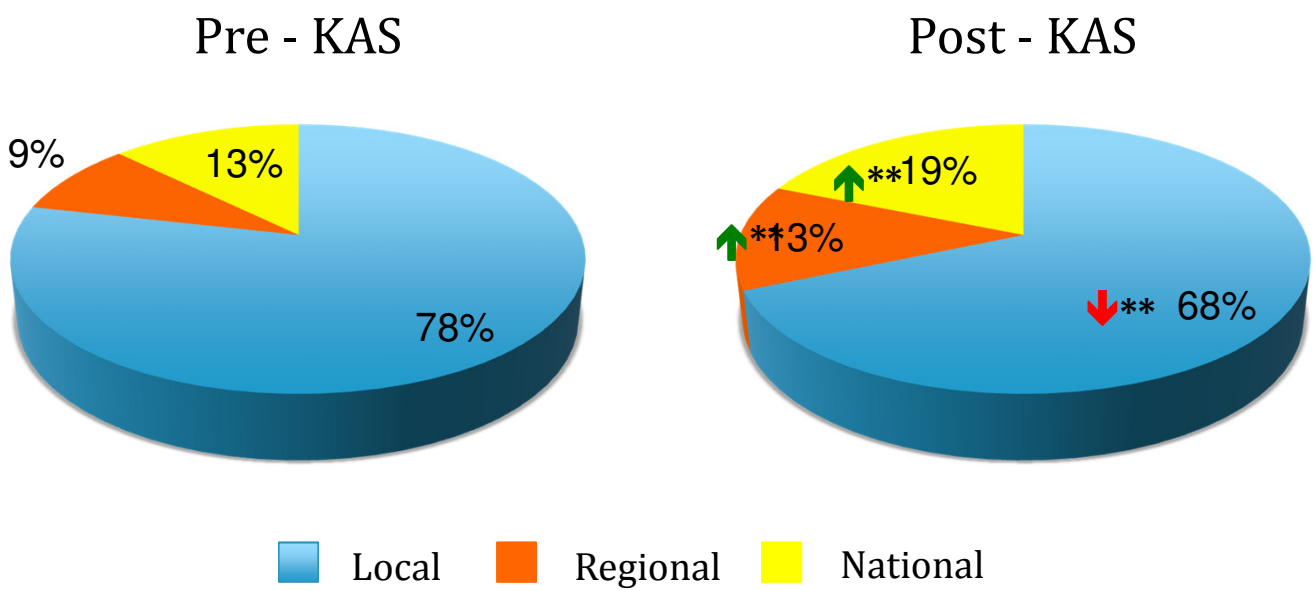
Geographic distribution of kidney transplants



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Local transplants from KDPI 0-20% kidneys; pre-KAS 23.0%, post-KAS 22.0% *P = NS*

Changes in distance traveled and cold ischemic times for kidney transplants
Pre - KAS vs. Post - KAS

	Pre - KAS		Post -KAS		Pre- KAS		Post-KAS		
	Distance Traveled (miles)		Distance Traveled (miles)		CIT (hours)		CIT (hours)		
Transplant Characteristic	Mean	Median	Mean	Median	Mean	%>24 hours	Mean	%>24 hours	Δ% >24hr
CPRA 0%	175	39	191	51	17	19%	18	21%	↑2%
CPRA 1-98%	209	56	209	60	17	16%	17	19%	↑3%
CPRA 99=100%	440	145	704	517	18	21%	21	30%	↑9%
KDPI 0-20%	186	48	275	70	15	13%	17	18%	↑5%
KDPI 21-34%	197	37	281	84	16	17%	17	20%	↑3%
KDPI 35-85%	193	46	261	70	18	20%	18	22%	↑2%
KDPI 86-100%	220	56	260	108	19	26%	21	30%	↑4%

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Delayed Graft Function

Cold ischemic time					
	% Pre-KAS		% Post-KAS		
CIT	txp	DGF	txp	DGF	Δ %
0-12 hr	31	17	27	22	↑5
12-24 hr	50	26	51	30	↑4
24-36 hr	15	31	18	37	↑6
36+ hr	3.5	34	4.1	38	↑4

Dialysis Exposure					
	% Pre-KAS		% Post-KAS		
Dialysis	txp	DGF	txp	DGF	Δ%
None	8.7	3.7	5.5	5.2	↑1.5
0-1 yr	11	18	7.8	19	↑1
1-5 yr	50	23	41	28	↑5
5-10 yr	26	34	35	36	↑2
10+ yr	4.3	38	11	36	↓2

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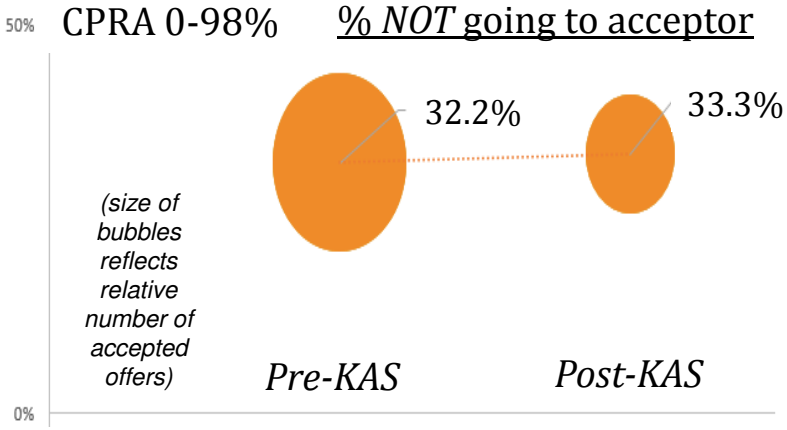
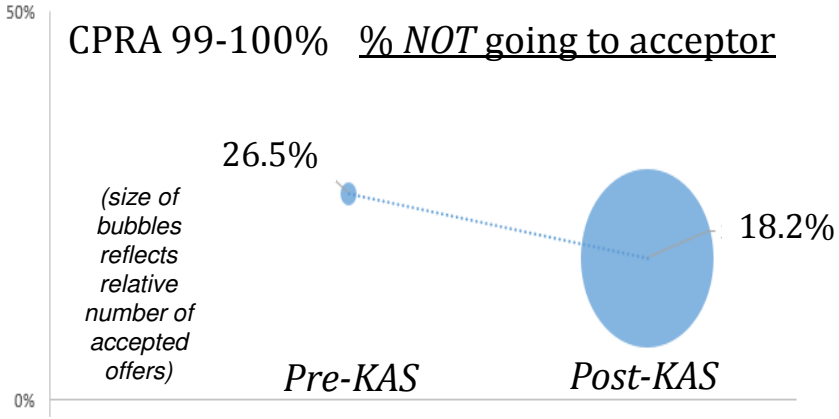
NS

Disposition of offers accepted non-locally



Less non-local acceptances are for CPRA 0-98 patients under KAS (size of bubble)

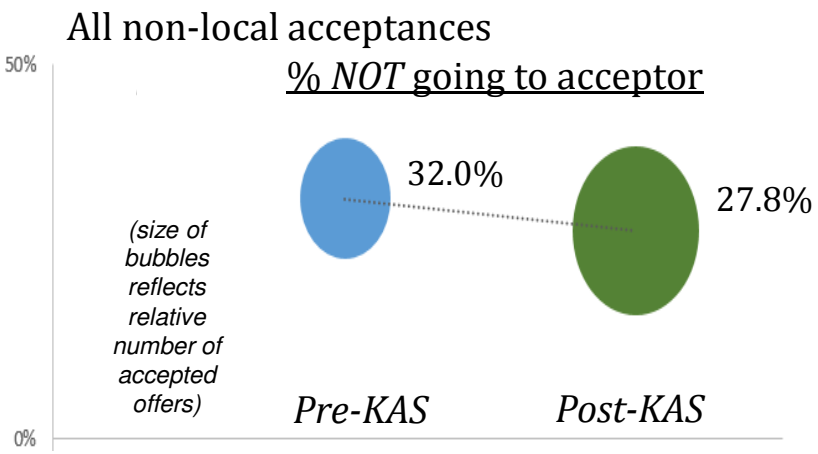
Of these acceptances, about 1/3 have not gone to acceptor, pre and post-KAS



Dramatic increase in number of non-local acceptances for CPRA 99-100% patients

DECREASE in % of kidneys not transplanted to these acceptors

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

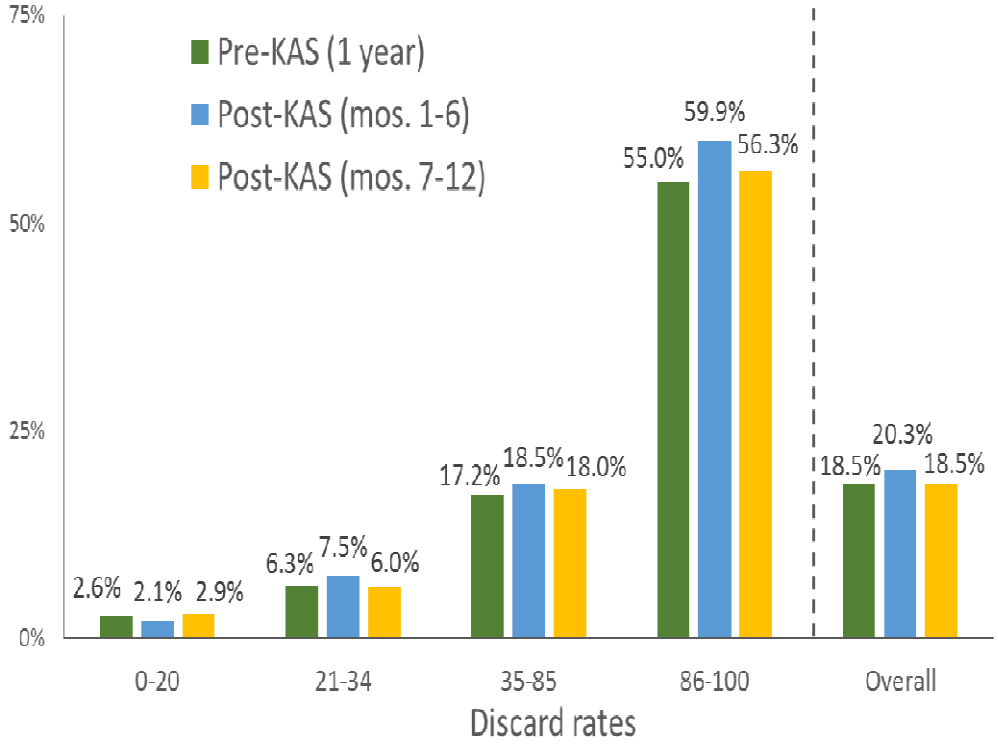
Net effects:

Slight overall increase in # acceptances not going to acceptor (~95 to 113 per month)

Distribution of these cases has shifted by CPRA

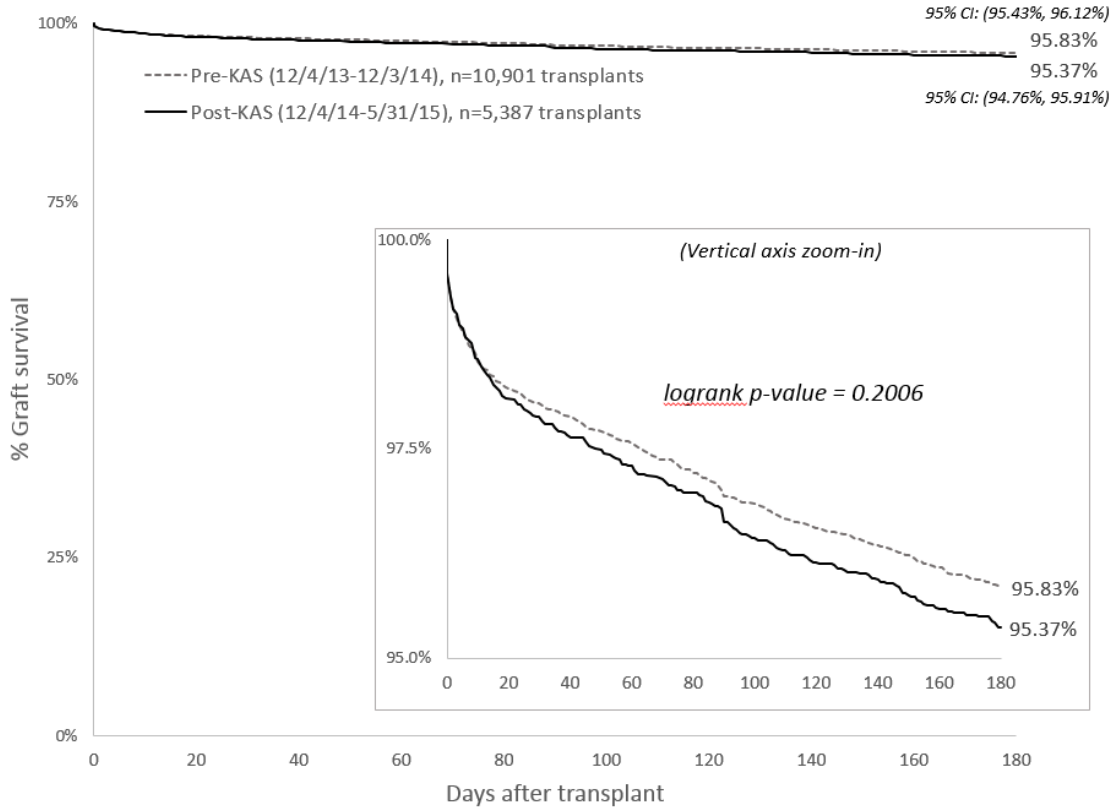
Kidney recovery & utilization under KAS

Kidney Discard Rate by KDPI



Discard rates initially rose but subsequently stabilized. Further tracking and study underway.

Pre vs. Post-KAS Comparison of All-Cause Graft Survival Rates up to Six Months Post-Transplant



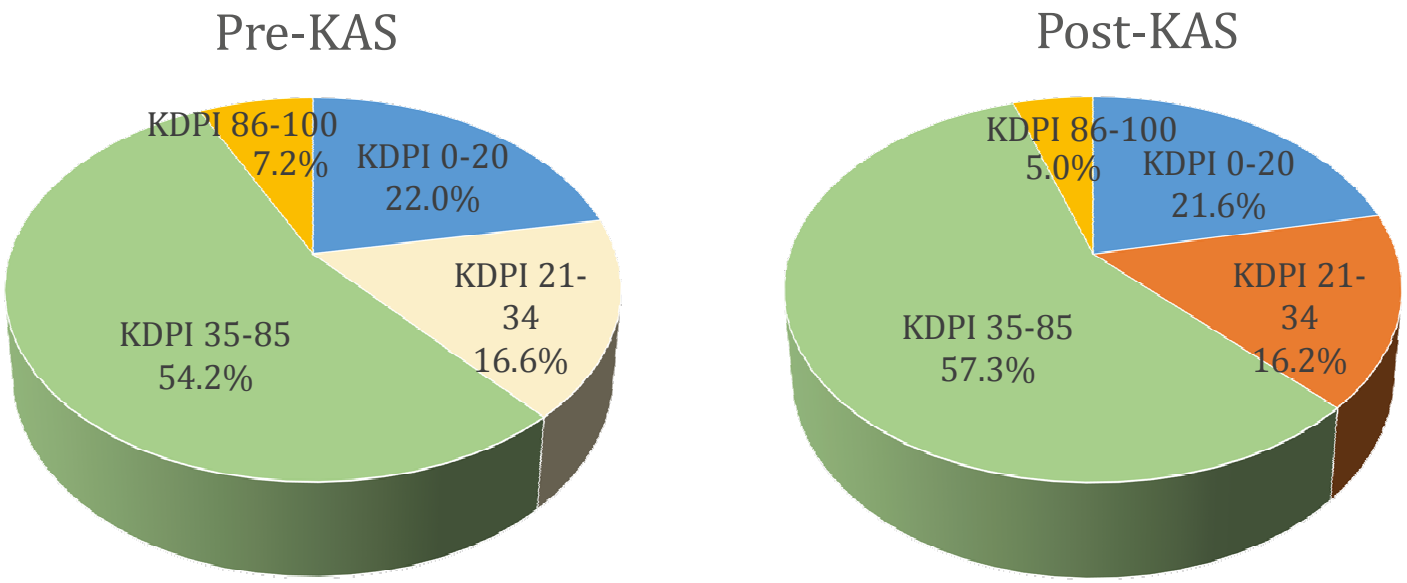
0.46%

Summary: first 12 months of KAS

- Overall – KAS is meeting key goals
  - Increase in the number of transplants among sensitized patients
  - Increase in access for African Americans
  - Fewer longevity mismatches
- However, several effects deserve further attention:
  - Logistical challenges in allocation
  - Increased CIT and DGF

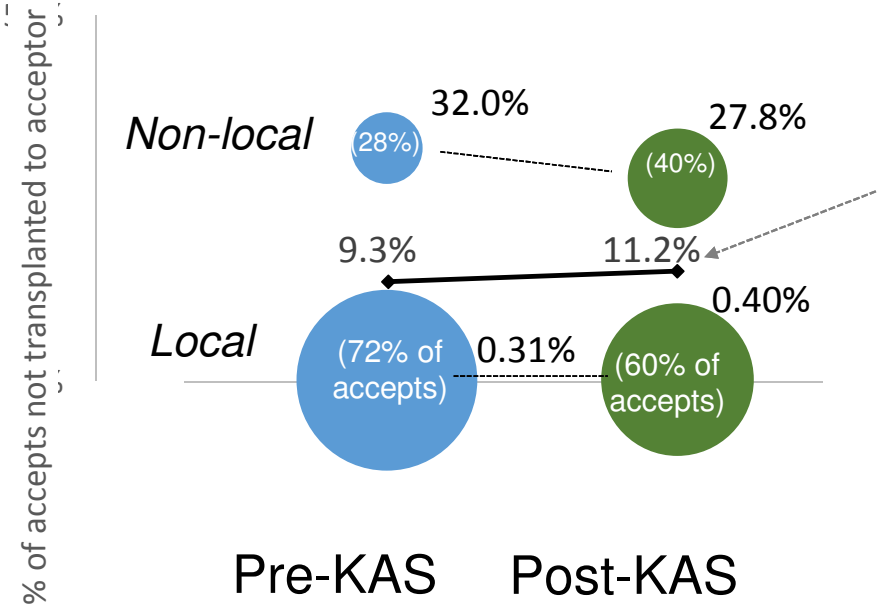
Extra Slides

KDPI distribution of local transplants



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

Accepted offers not transplanted to the acceptor*



(size of bubbles reflects relative number of accepted offers)

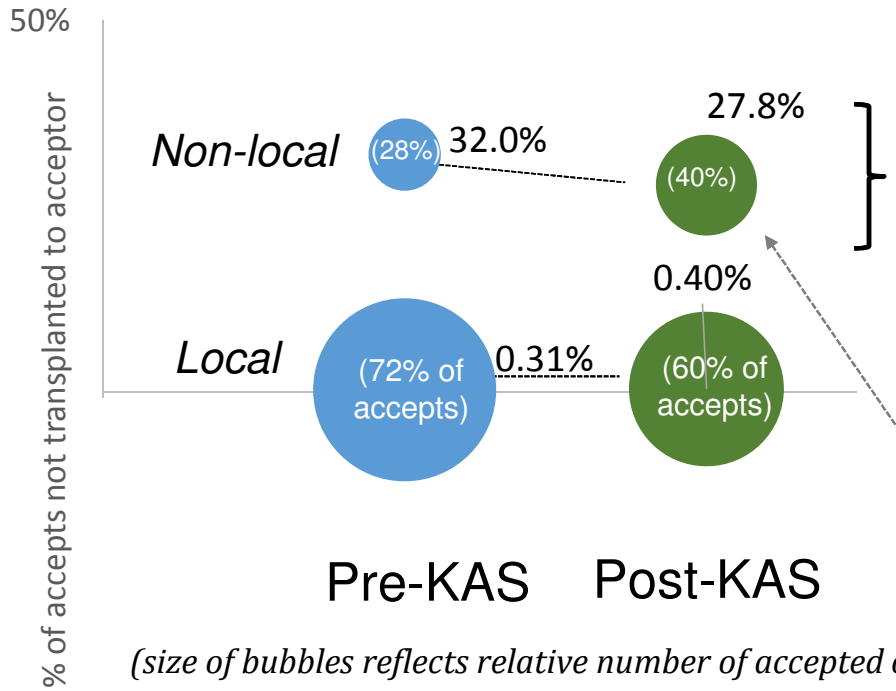
…an ***increase*** in the overall % of accepts not going to the accepting patient.

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%.

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.)

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Pre - KAS vs. Post - KAS

	Pre - KAS				Post - KAS				
	Distance Traveled (miles)		CIT (hours)		Distance Traveled (miles)		CIT (hours)		
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