

# The New Kidney Allocation System (KAS): The First 18 Months

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# Topics

1. Background
2. Transplant volume
3. Regional distribution of transplants
4. Pediatric transplants
5. “Bolus” effects
  - CPRA 99-100 recipients
  - Recipients with 10+ years on dialysis
6. Kidney utilization
7. Recipient outcomes
8. KDPI mapping table error (April 20 – May 19, 2016)

# 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

# Analysis periods

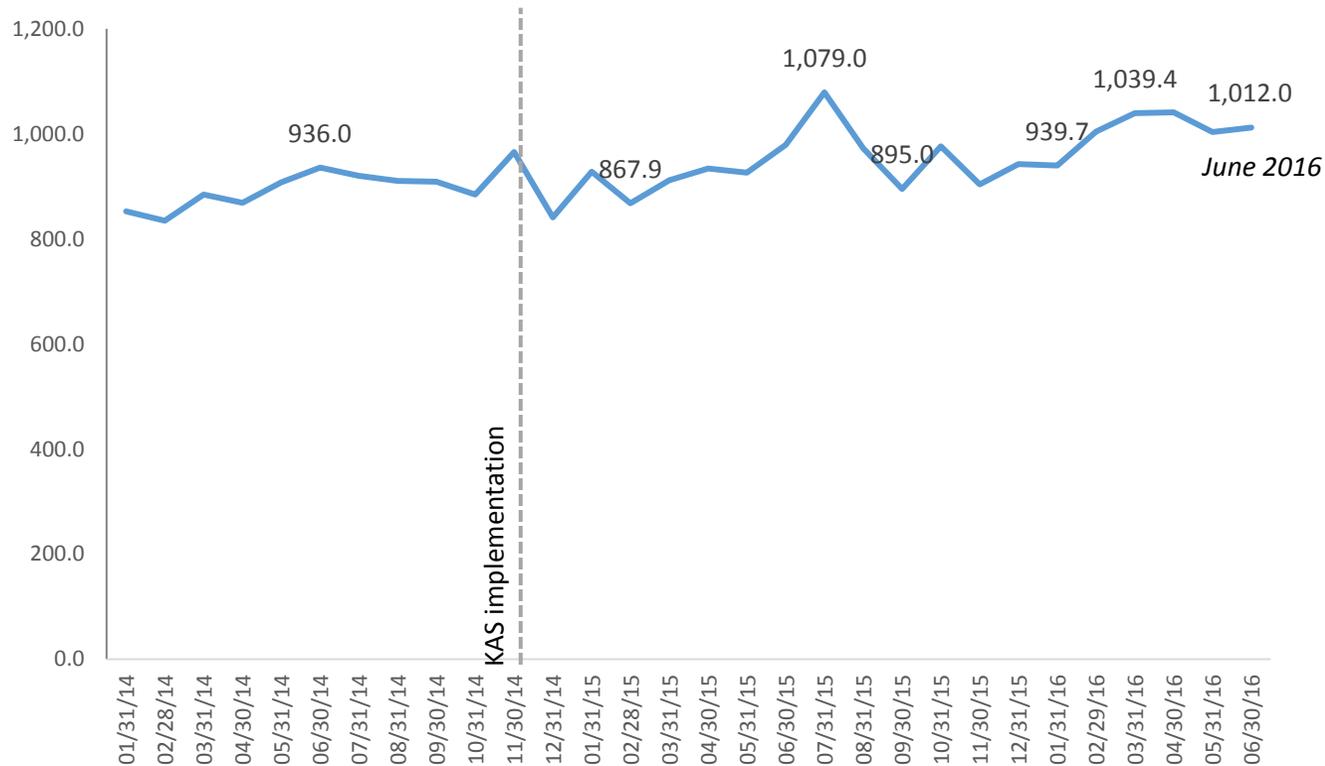
- Pre-KAS: Dec 4, 2013 – Dec 3, 2014 (12 months)
- Post-KAS: Dec 4, 2014 – May 31, 2016 (~18 months)

*Some slides include a longer post-KAS evaluation (e.g., 19 or 20 months, as indicated)*

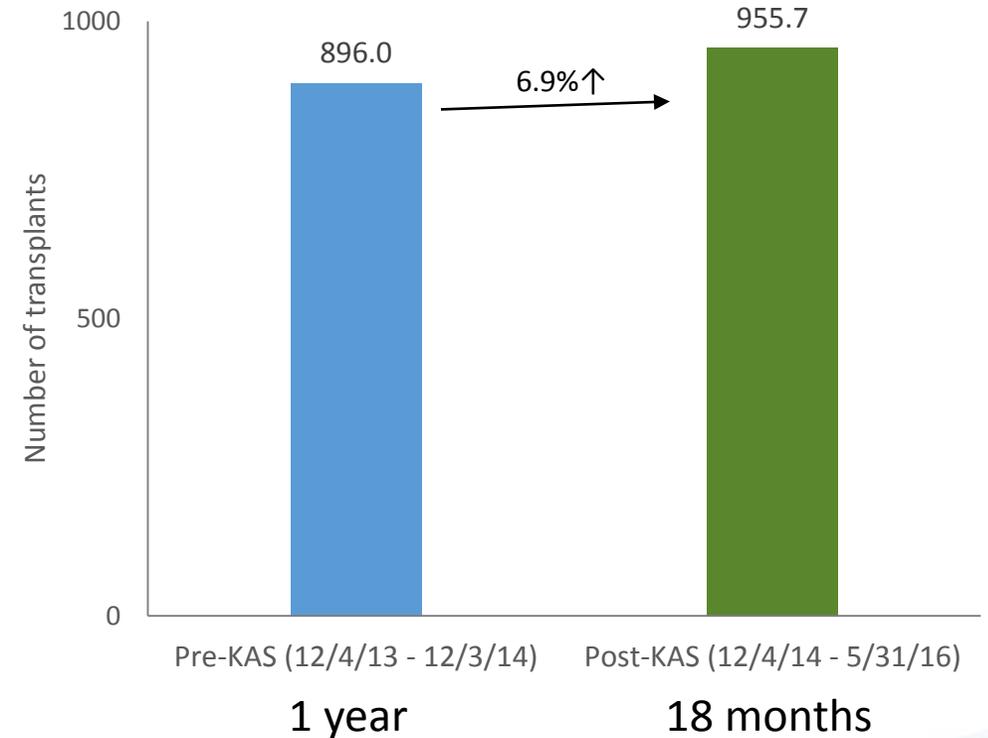
# Solitary deceased donor kidney transplants under KAS

Pre vs. post-KAS trends

Over time (per 30 days)

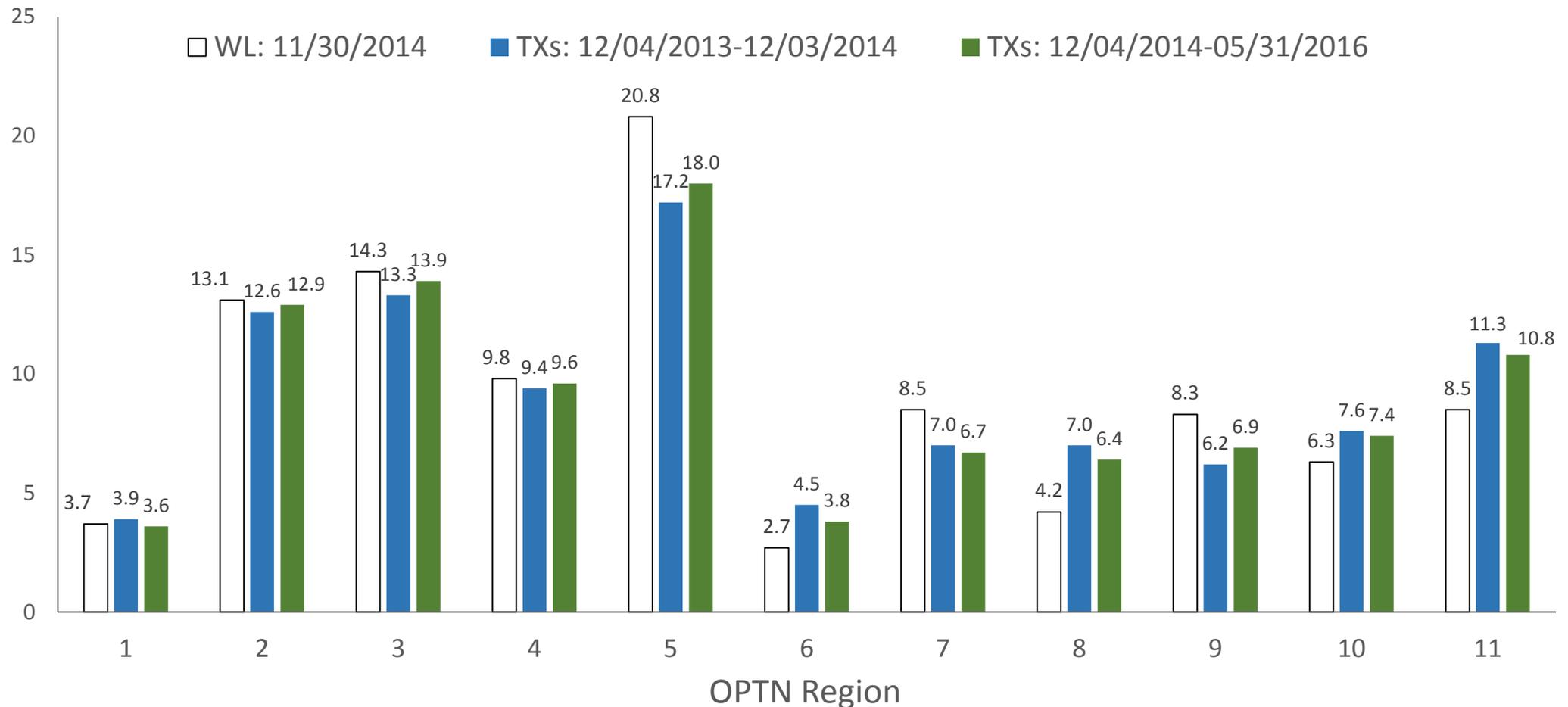


Overall (per 30 days)



- Transplant volume increased 6.9%, from 896.0 to 955.7 per month.

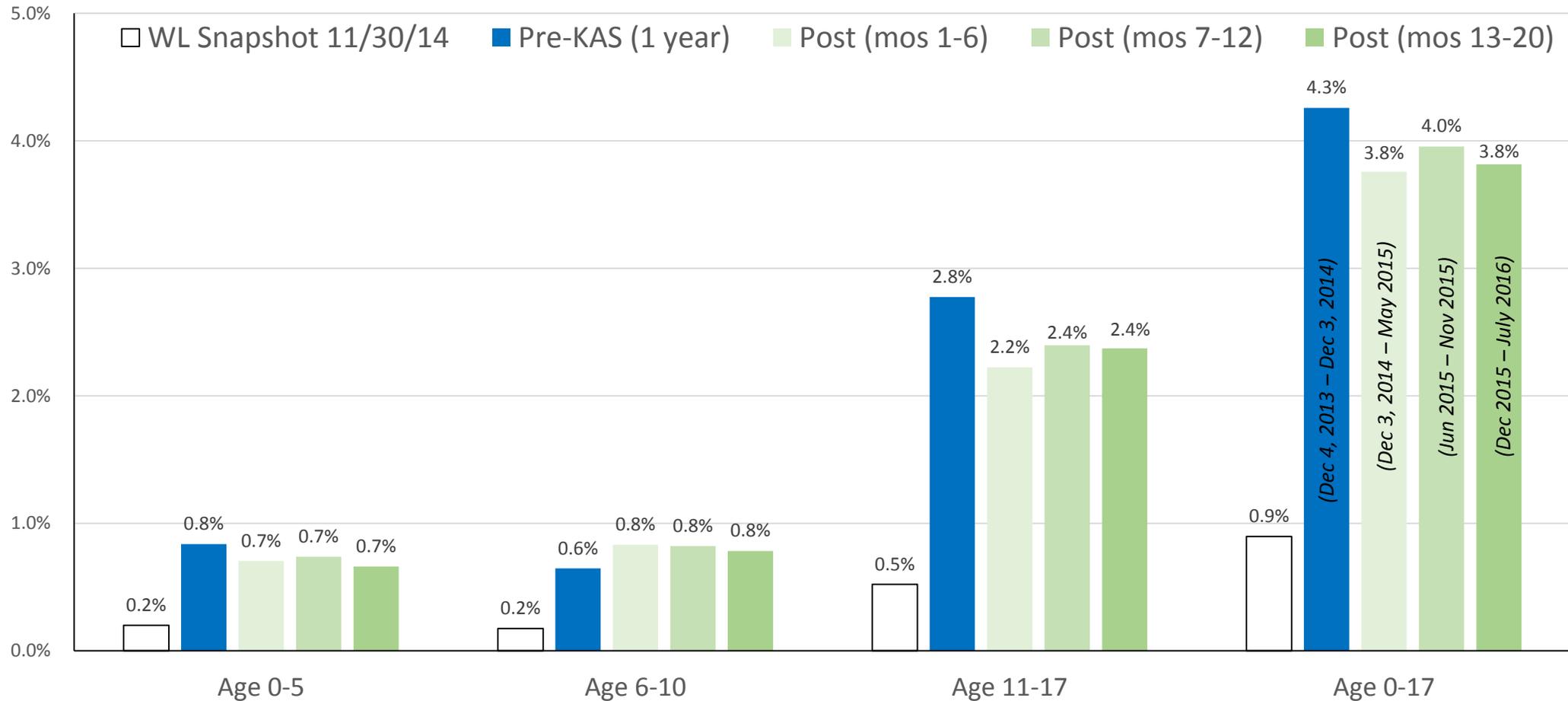
# Regional distribution of kidney transplants



- Most changes in % of transplants by Region were very small.
- Largest relative changes: Region 9↑; Region 6↓.

# Trends in pediatric transplants

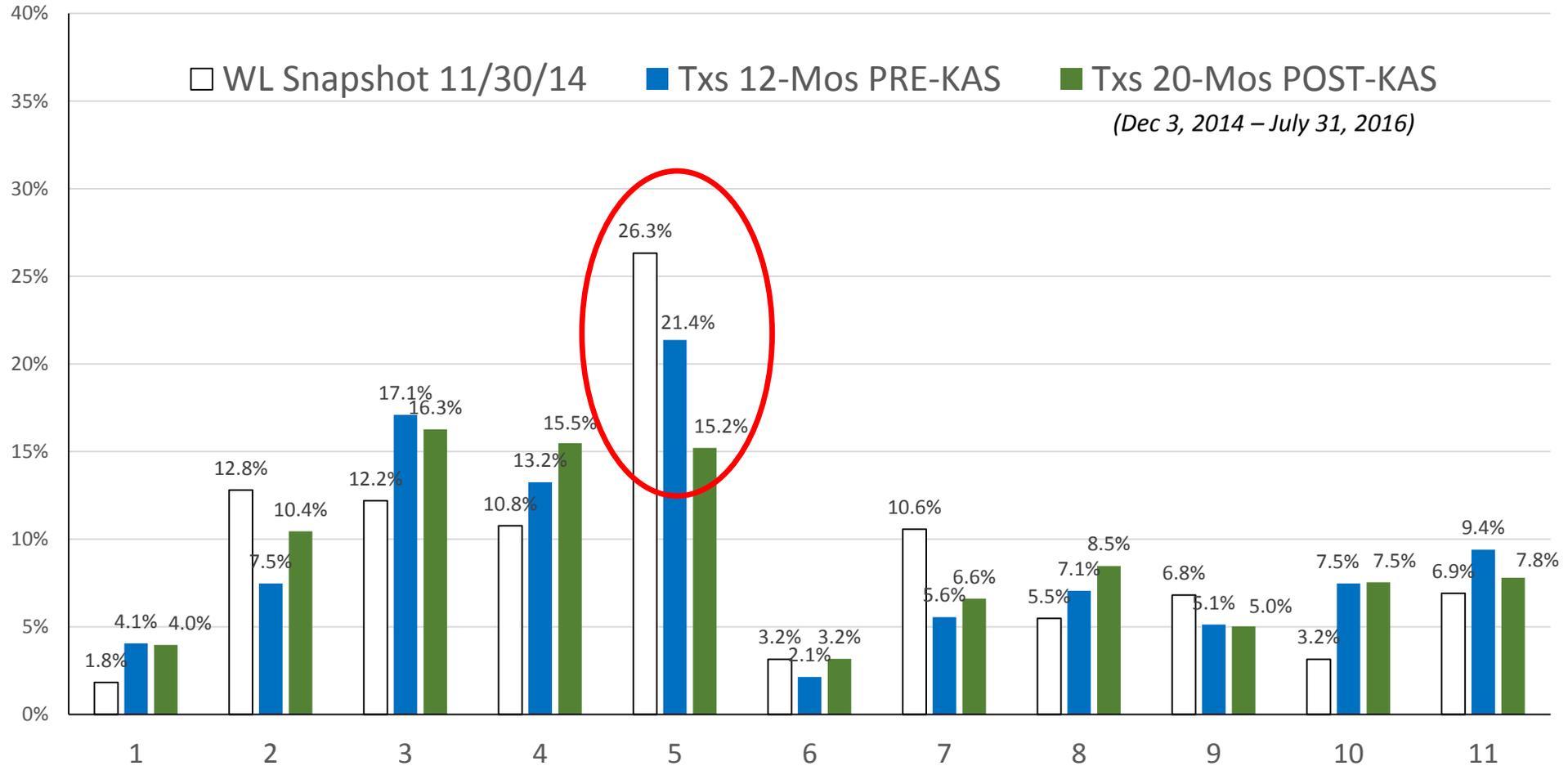
Percent of DD Kidney Transplants to Pediatrics (results through July 31, 2016)



- Pediatrics represent 0.9% of the kidney WL and account for about 4% of transplants.
- Small Post-KAS increase for age 6-10, decreases for age 0-5, 11-17, and overall.

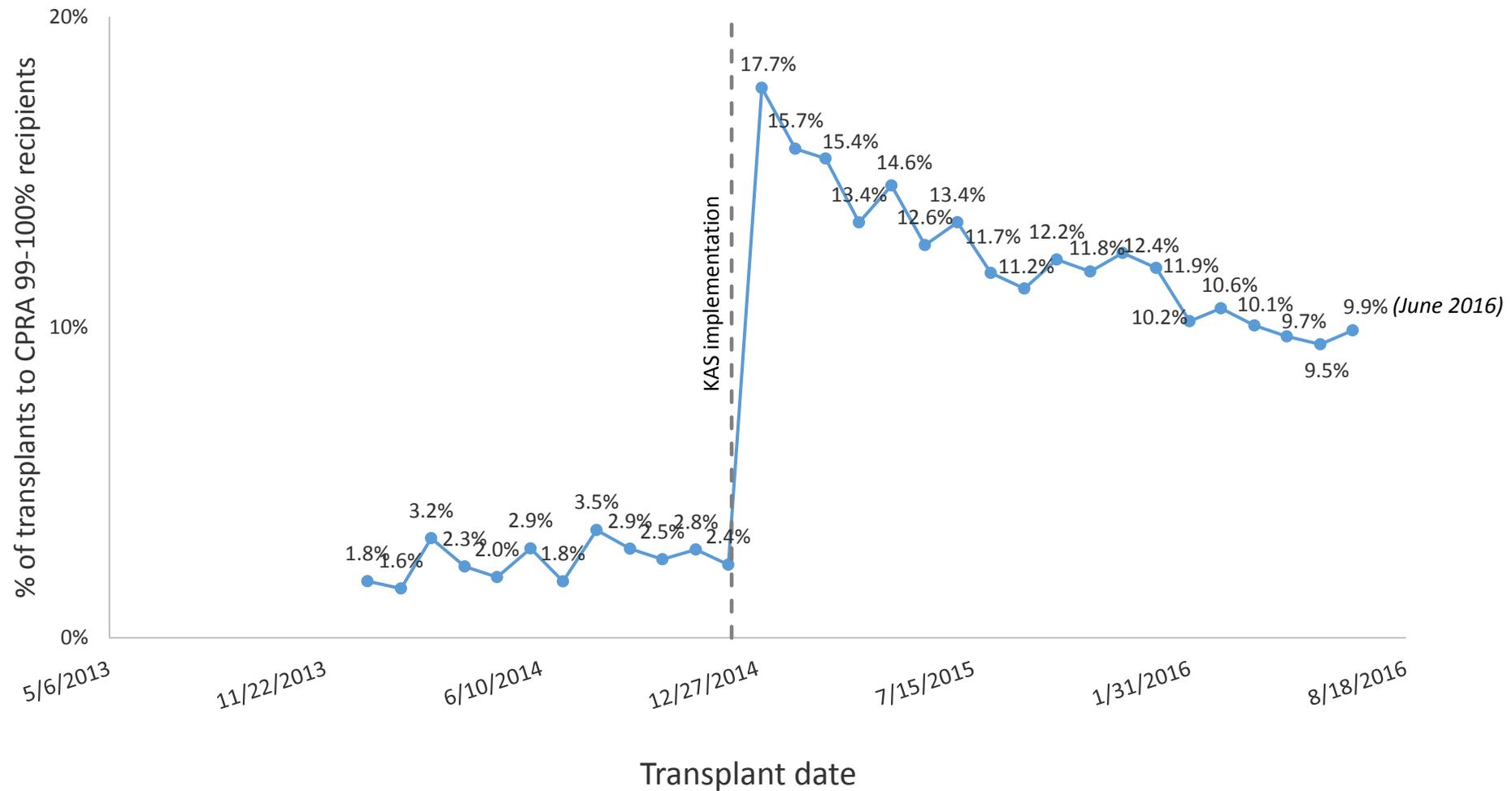
# Geographic distribution of pediatric kidney transplants

Percent of Pediatric DD Kidney Transplants by Region (through July 31, 2016)



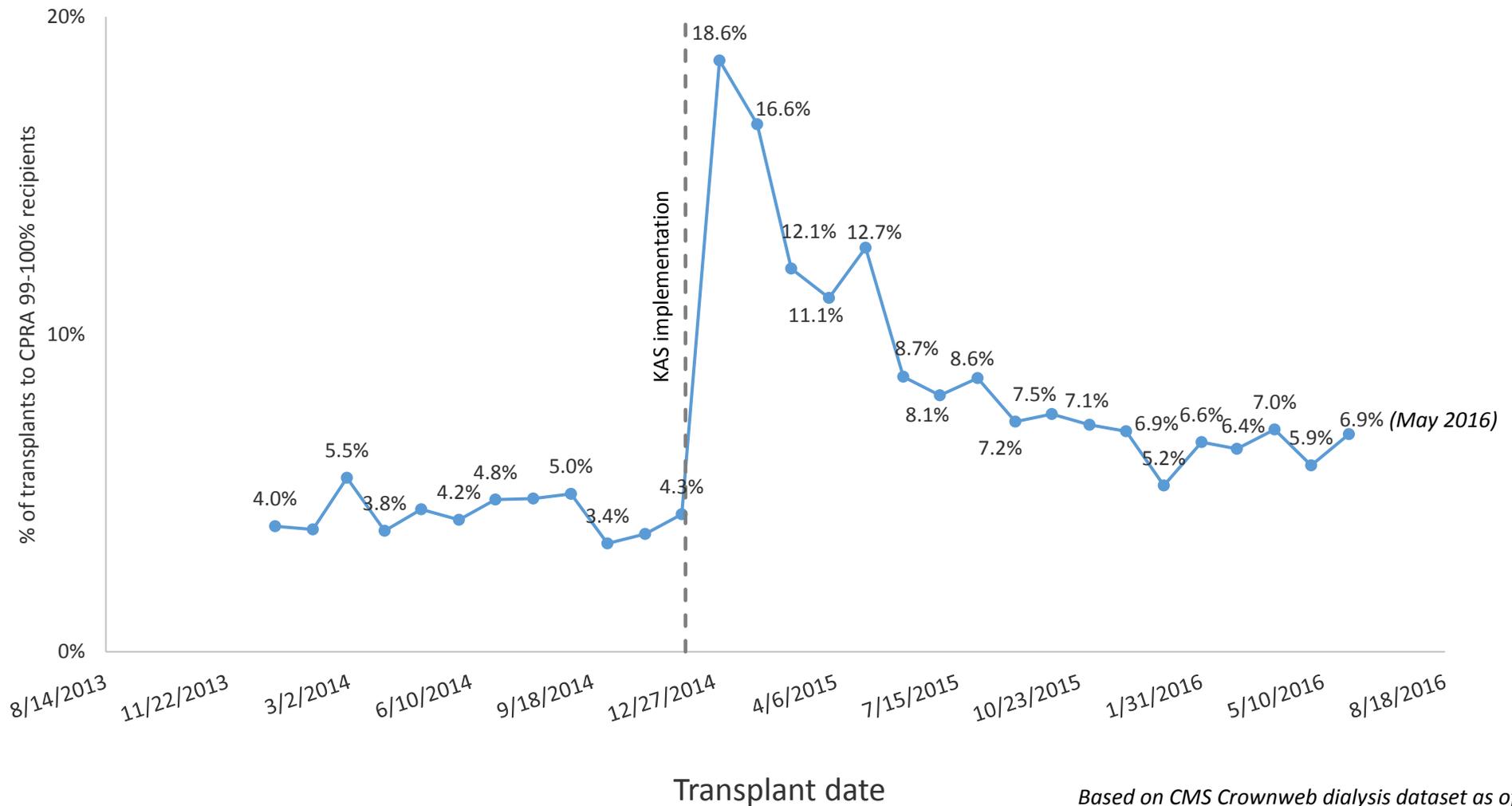
- Most regions had higher or similar percent of pediatric transplants post-KAS.
- However, the % of pediatric transplants occurring in region 5 dropped from 21.4% to 15.2%. 26.3% of pediatric candidates are registered in Region 5.

# CPRA 99-100% recipient “bolus effect”



- Transplants to CPRA 99-100% patients rose sharply after KAS but have tapered to around 10%.

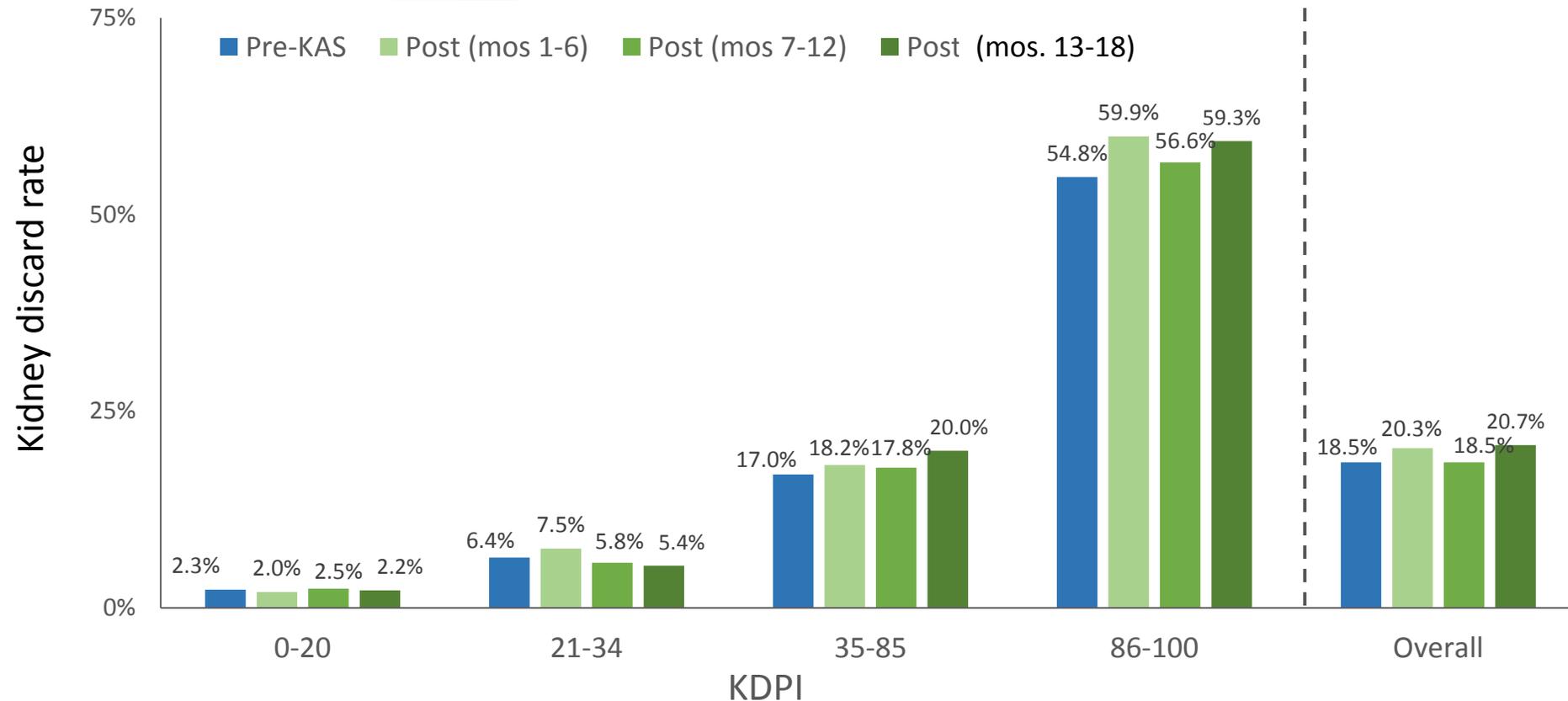
# High dialysis time recipient “bolus effect”



Based on CMS Crownweb dialysis dataset as of 3/31/2016

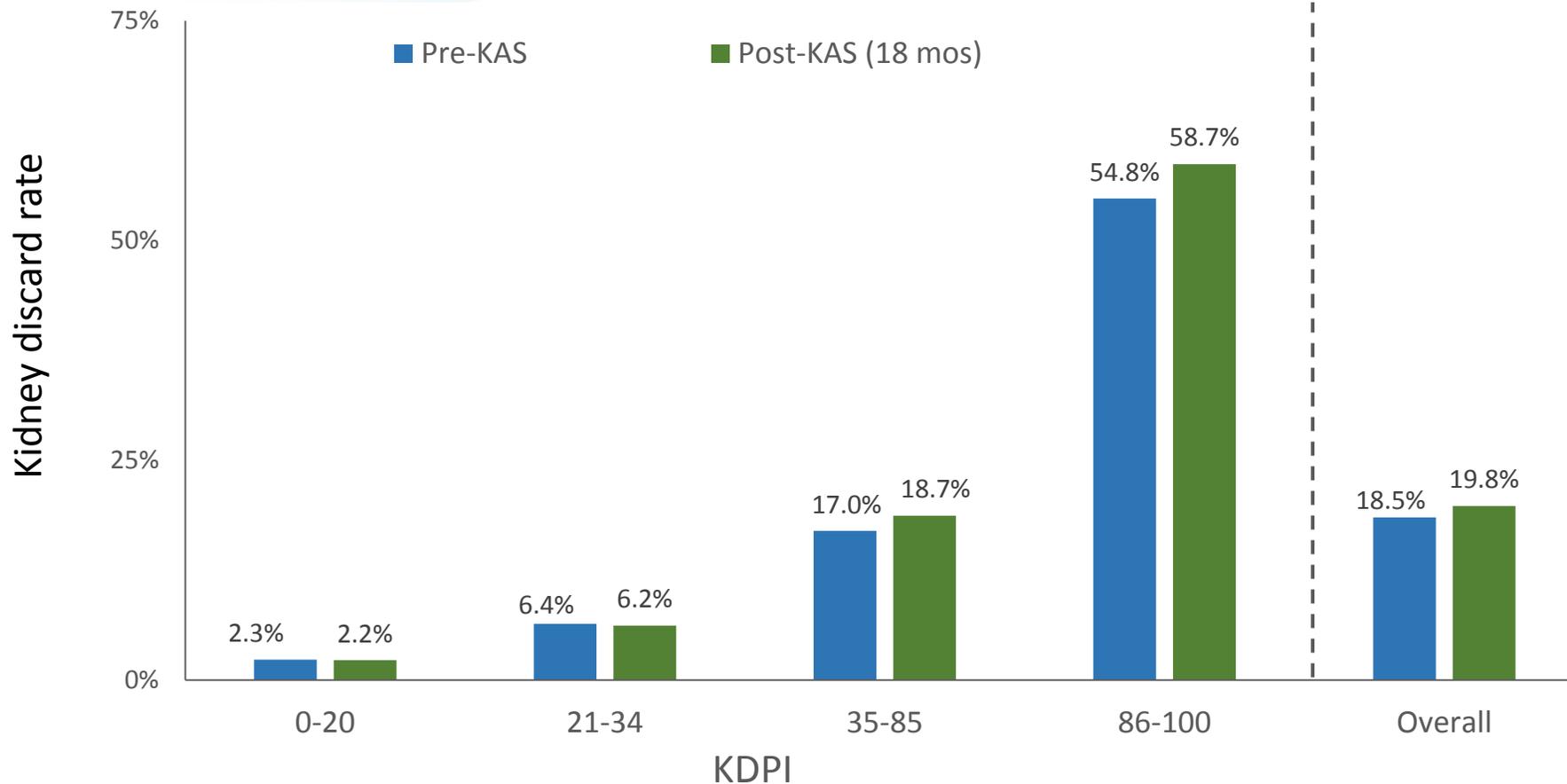
- After KAS, the % of transplants to recipients with 10+ years of dialysis rose sharply to nearly 19% but has tapered to about 7%.

# Kidney Utilization by KDPI



- “Discard rate” = percentage of kidneys recovered for transplant but not transplanted. Rate increased, fell, then rose again post-KAS.

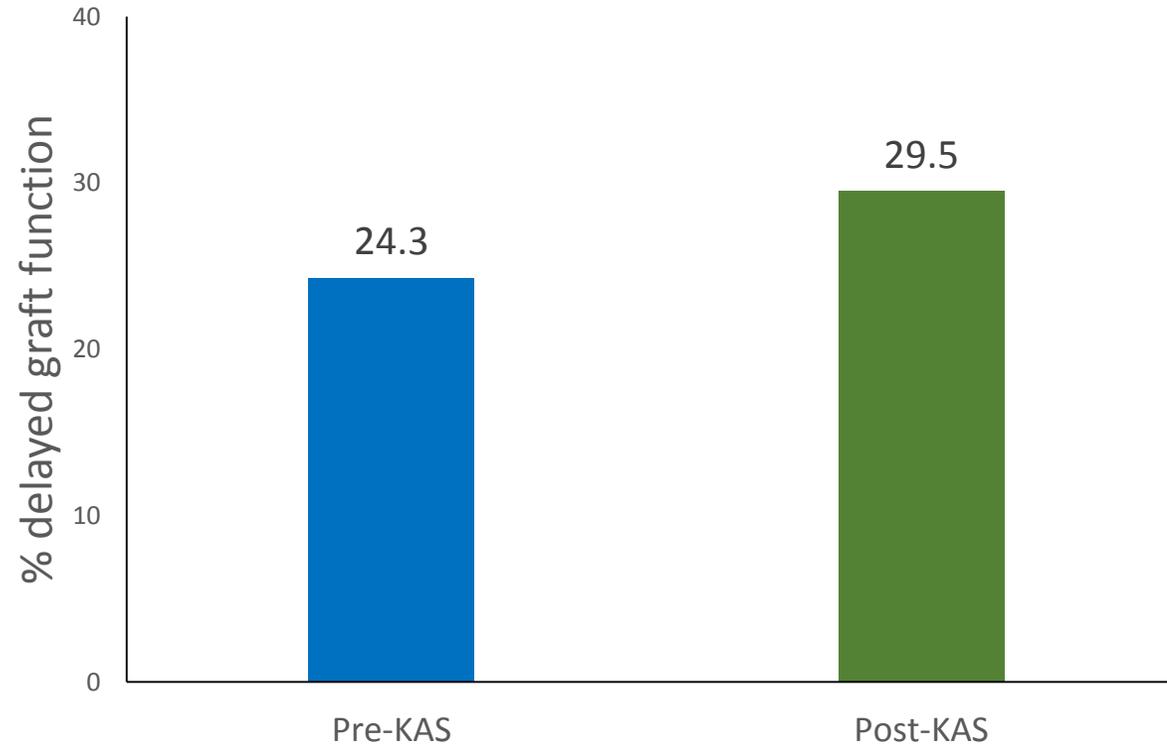
# Kidney Utilization by KDPI



- Overall, the discard rate rose from 18.5% to 19.8% ( $p=0.001$ ). The increase was most evident for KDPI 86-100% kidneys.

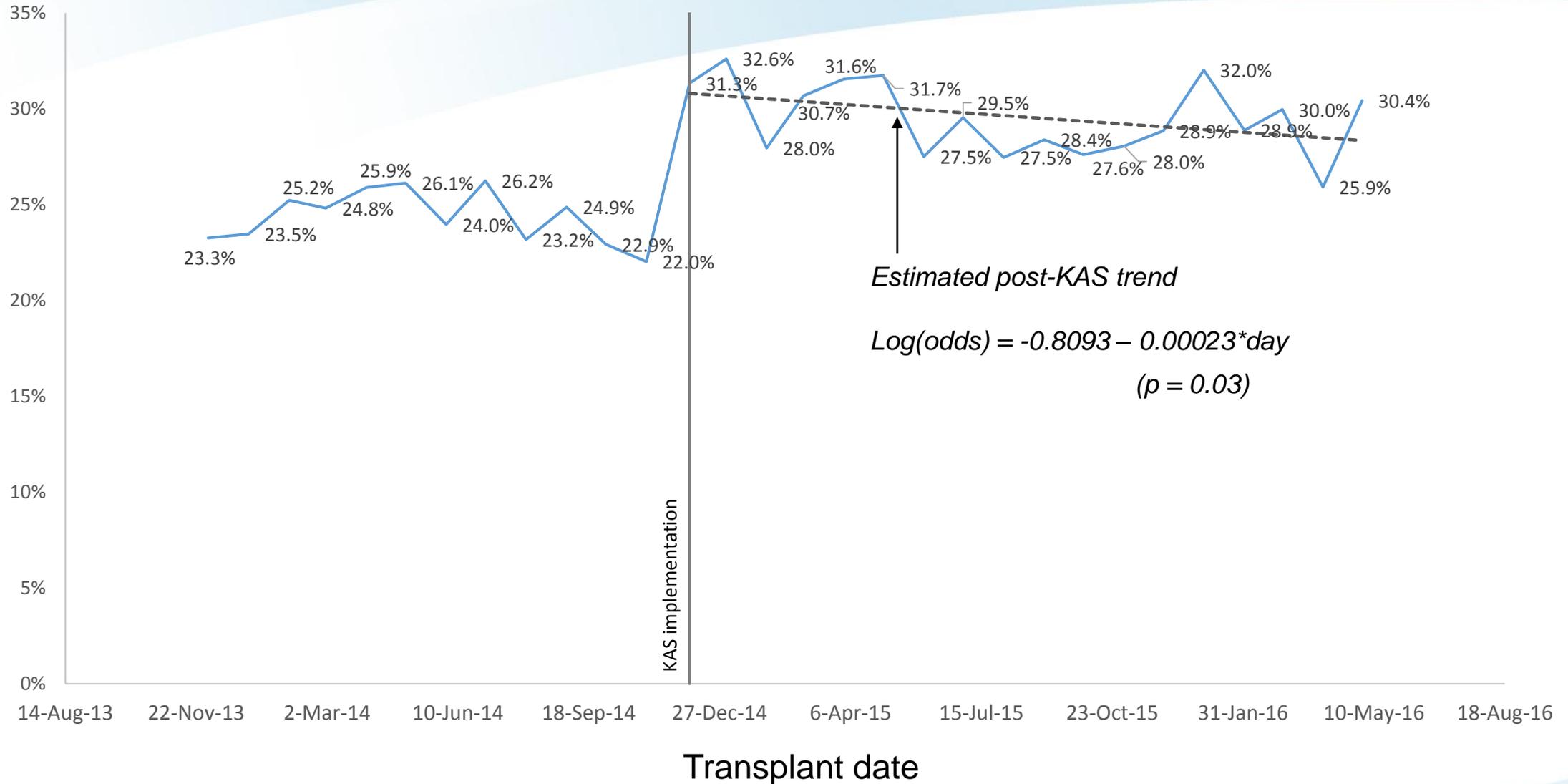
# Delayed graft function (DGF) rates (1 year pre vs. 18-months post KAS)

*DGF = dialysis within first week*



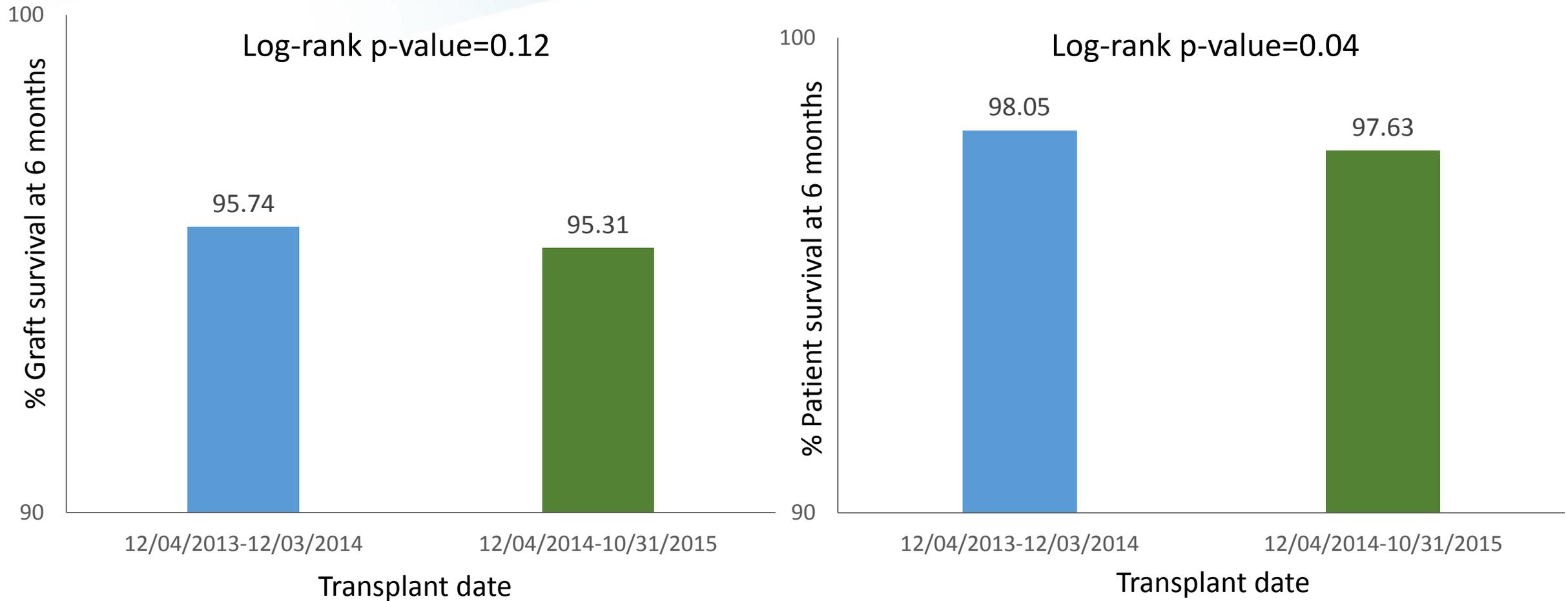
- The percentage of recipients requiring dialysis within the first week after transplant increased from 24.3% pre-KAS to 29.5% after KAS.
- Increase driven by more high dialysis time recipients and other factors.

# DGF Trend (transplants through May, 2016)



- Slight decline in DGF rate post-KAS (p=0.03), likely due to diminishing bolus effects (e.g., fewer high dialysis time recipients).

# Six Month Survival



- Six month graft survival rate over 95%. Patient survival over 97% but slightly lower than pre-KAS ( $p < 0.05$ ).

# Highlights: First 18 months of KAS

- Many very highly sensitized and high dialysis time patients have been transplanted under KAS
  - Transplants to these groups have tapered over 18 months
- Deceased donor transplant volume has increased 7%
- However, utilization of recovered kidneys has not improved
- Largest impact on pediatric transplants was observed in Region 5.
- DGF has increased but is slowly trending downward
- Post-KAS, 6-month graft (95.3%) and recipient (97.6%) survival are excellent, though slightly lower than pre-KAS.

# Additional information

For more detailed analyses of KAS's impact after 1 year, other resources are available:

- [https://www.transplantpro.org/wp-content/uploads/sites/3/KAS\\_12month\\_analysis.pdf](https://www.transplantpro.org/wp-content/uploads/sites/3/KAS_12month_analysis.pdf)
- Stewart, D. E., Kucheryavaya, A. Y., Klassen, D. K., Turgeon, N. A., Formica, R. N., & Aeder, M. I. (2016). Changes in Deceased Donor Kidney Transplantation One Year After KAS Implementation. *American Journal of Transplantation*, 16(6), 1834-1847.)

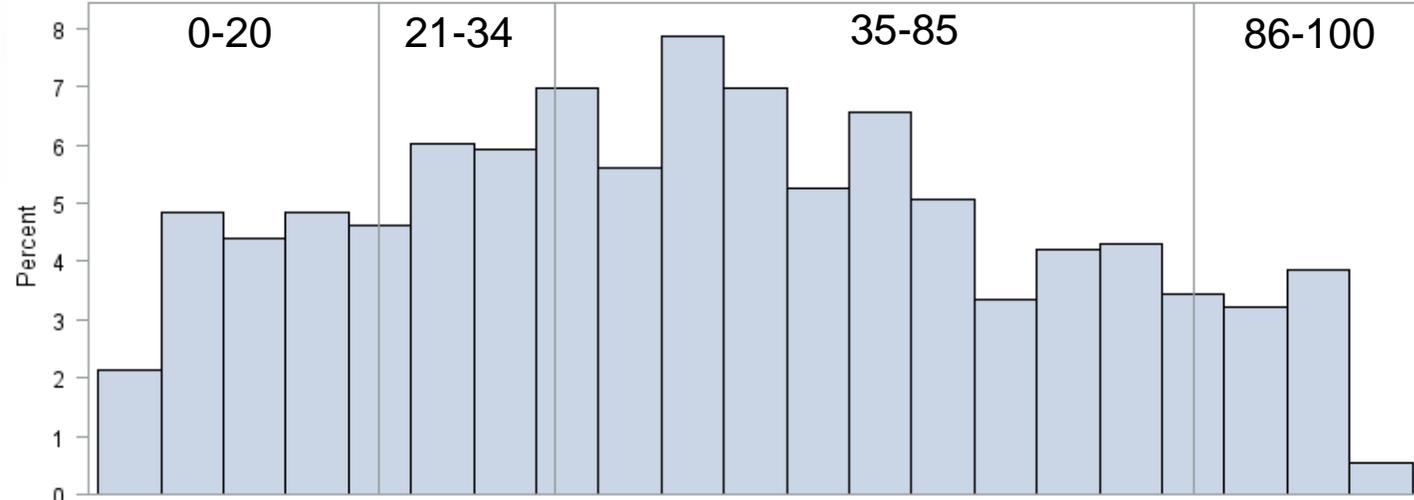
# Incorrect KDPI Mapping Table

# Background

- KDRI was incorrectly mapped to KDPI between April 20, 2016 – May 19, 2016
  - Start of problem: 2016-04-20 07:34:13.020
  - Problem fixed: 2016-05-19 11:31:34.640
- Source of problem: incorrect “mapping table” uploaded for converting KDRI to KDPI
- Impact:
  - All KDPI values\* displayed in DonorNet and used for allocation were higher than they should have been.
  - On average, the displayed KDPI was 17 points higher than the correct value. The maximum deviation was 21 points.

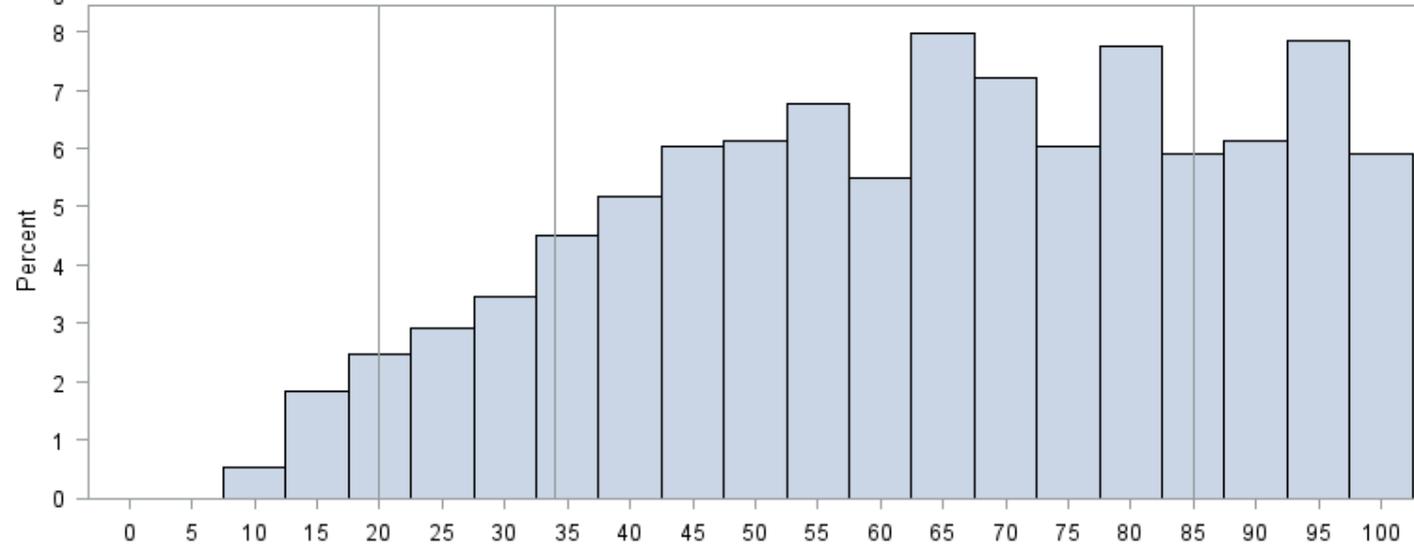
# Shift in KDPI values due to incorrect mapping for 930 affected transplants

Actual KDPI's



Mean=46.4

Incorrectly mapped KDPI's



Mean=63.7

KDPI

# KAS sequences dependent upon KDPI

## **A: KDPI 0-20%**

CPRA 98-100%  
0 ABDR mismatch (EPTS 0-20%)  
Local prior living donors  
Local pediatrics  
Local A2/A2B-->B (EPTS 0-20%)  
Local EPTS 0-20%  
0 ABDR mismatch (EPTS 21-100%)  
Local A2/A2B-->B (EPTS 21-100%)  
Local EPTS 21-100%  
Regional pediatrics  
Regional A2/A2B-->B (EPTS 0-20%)  
Regional EPTS 0-20%  
Regional A2/A2B-->B (EPTS 21-100%)  
Regional EPTS 21-100%  
National pediatrics  
National A2/A2B-->B (EPTS Top 20%)  
National EPTS 0-20%

## **B: KDPI 21-34%**

CPRA 98-100%  
0 ABDR mismatch  
Local prior living donors  
Local pediatrics  
Local A2/A2B-->B  
Local candidates  
Regional pediatrics  
Regional A2/A2B-->B  
Regional candidates  
National pediatrics  
National A2/A2B-->B  
National candidates

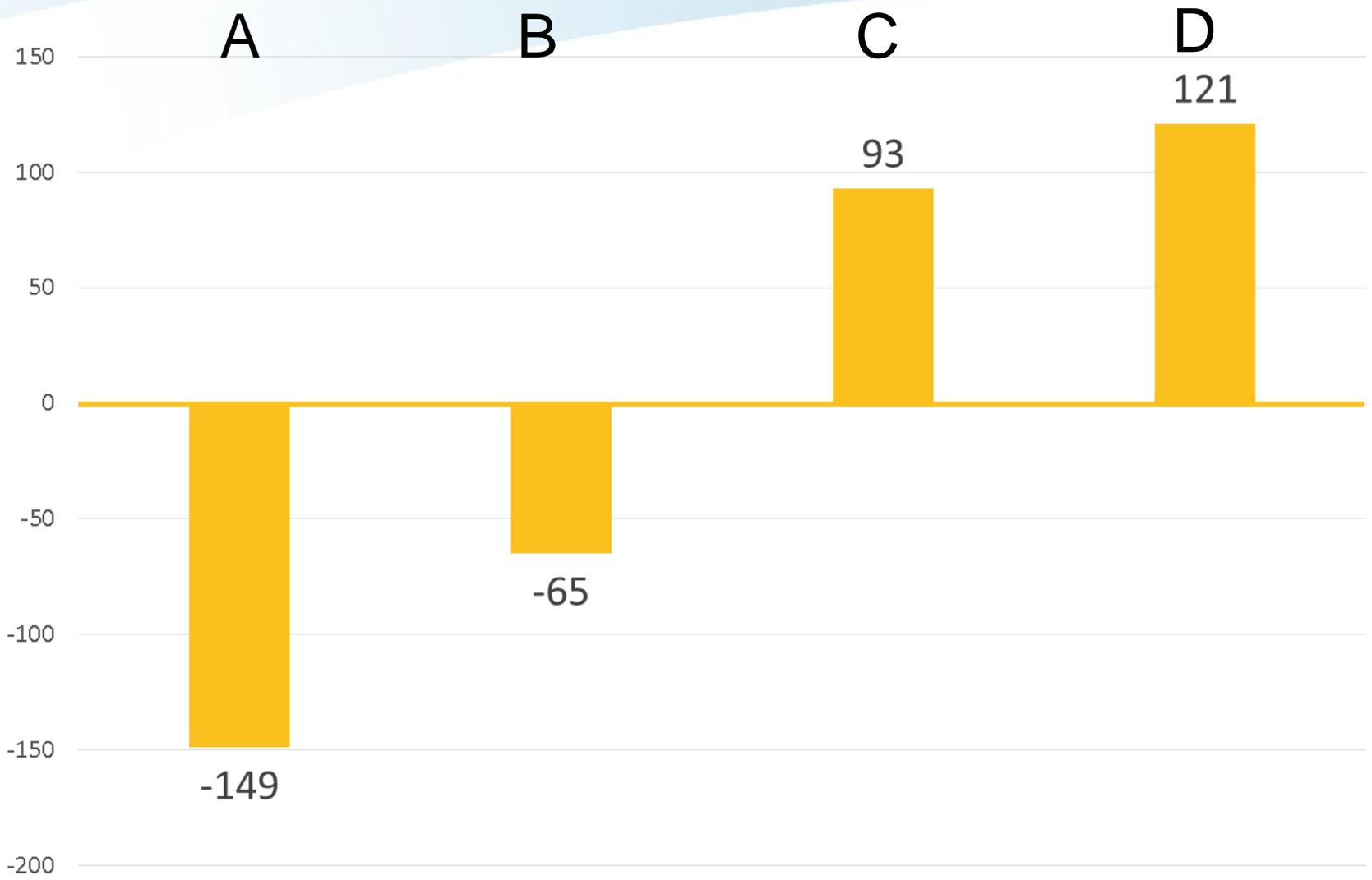
## **C: KDPI 35-85%**

CPRA 98-100%  
0 ABDR mismatch  
Local prior living donors  
Local A2/A2B-->B  
Local candidates  
Regional A2/A2B-->B  
Regional candidates  
National A2/A2B-->B  
National candidates

## **D: KDPI 86-100%**

CPRA 98-100%  
0 ABDR mismatch  
Local + regional A2/A2B-->B  
Local + regional candidates  
National A2/A2B-->B  
National candidates

# Differences in allocation sequence due to incorrect KDPI

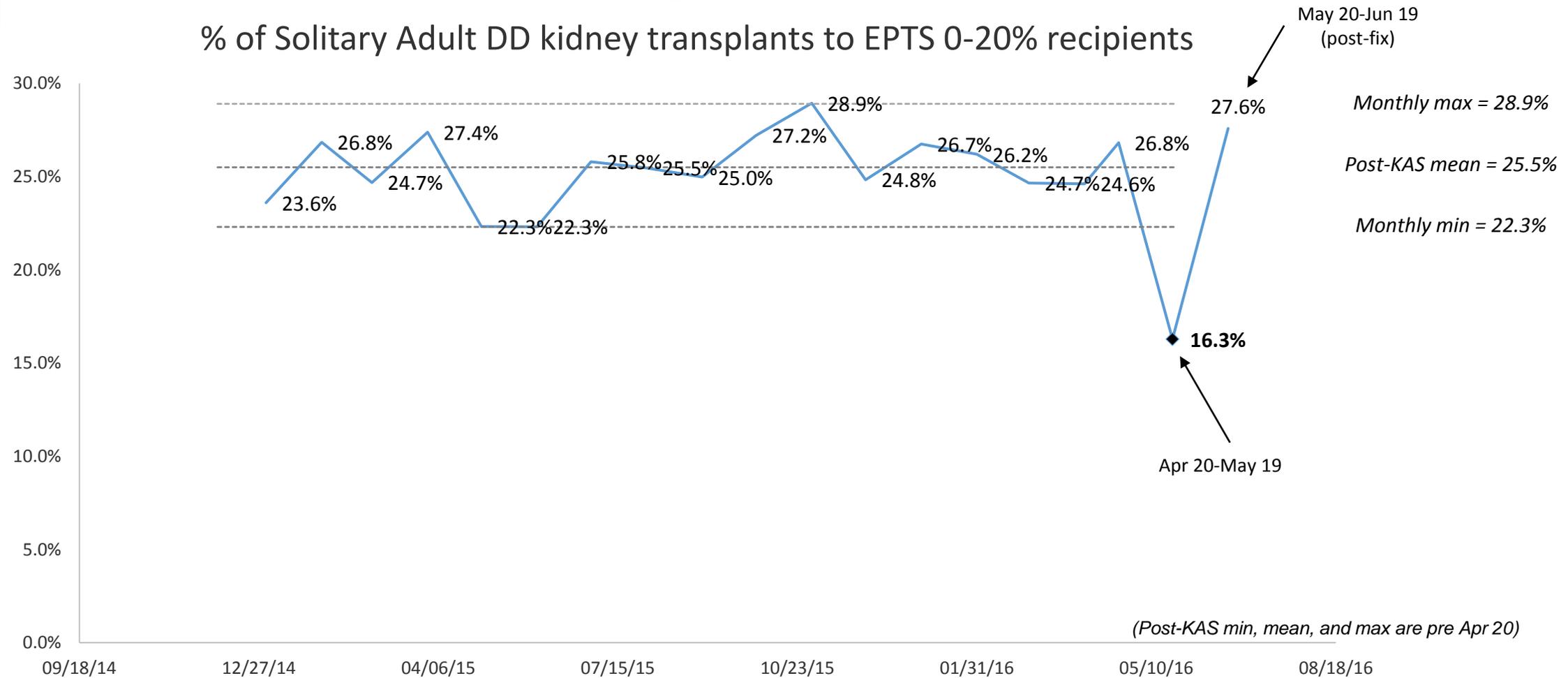


149 fewer transplants were allocated per sequence A (KDPI 0-20).

121 more transplants were allocated per sequence D (KDPI 86-100).

# Impact of incorrect KDPI mapping

## EPTS 0-20% recipients

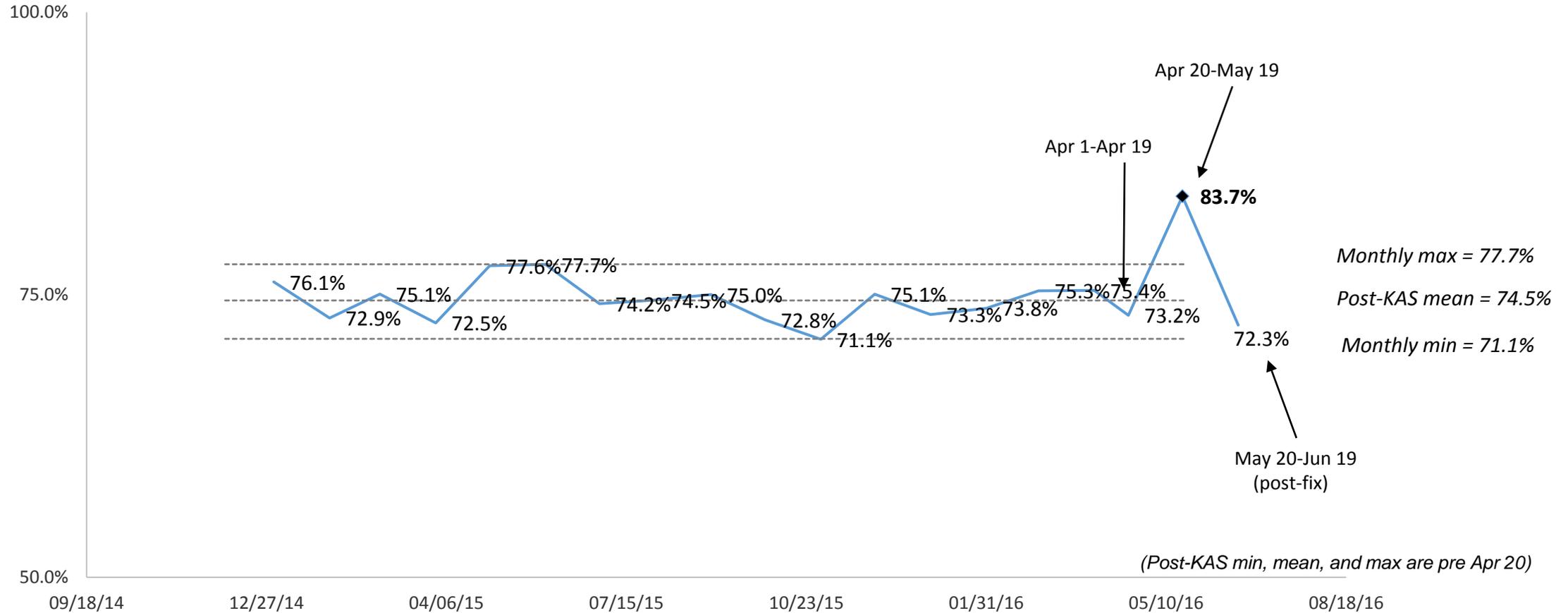


Transplants to EPTS 0-20% adults dropped and rebounded after the system was fixed.

# Impact of incorrect KDPI mapping

## EPTS 21-100% recipients

% of Solitary Adult DD kidney transplants to EPTS 21-100% recipients



Transplants to EPTS 21-100% adults increased then returned to previous levels after the fix.

## Fixing the problem

- The correct table was uploaded on May 19<sup>th</sup>, 2016
- Tested by IT department and validated by Research department
- Working as expected since May 19<sup>th</sup>, 2016
- New processes put in place to prevent future problems of this nature
- All programs that performed a transplant during this period were informed of the correct (lower) KDPI value for each recipient.

# Impact on distribution of deceased donor kidney transplants

*% of transplants received by groups of recipients*

Recipient characteristic	Pre-KAS (12/4/13- 12/3/14)	Post-KAS (12/4/14 – 4/19/16)	KDPI mapped incorrectly 4/20/16 – 5/19/16	After correction 5/20/16 – 6/19/16
EPTS 0-20%	(n/a)	25.5%	16.3%	27.6%
EPTS 21-100%	(n/a)	74.5%	83.7%	72.3%
Age 18-34	8.7%	12.7%	9.5%	12.0%
Age 65+	23.0%	18.3%	25.0%	17.8%
Pediatric recipients	4.2%	3.8%	2.4%	5.1%

The distribution of transplants shifted toward older recipients during this one month period but subsequently returned to previous levels.

# Impact of KDPI mapping error: summary of findings

- Deceased donor kidney transplant volume remained on par with post-KAS average and was 9% above the pre-KAS average.
  - The kidney discard rate was slightly higher (22.9%, vs. 19.7% post-KAS average) but not outside normal, observed monthly variation
- For this one month period, the distribution of transplants resembled pre-KAS with respect to longevity matching and recipient ages.
- Pediatric transplants declined slightly but rebounded sharply post-fix.
- Transplants to highly sensitized and African American patients were unaffected.

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