

# Global Kidney Exchange

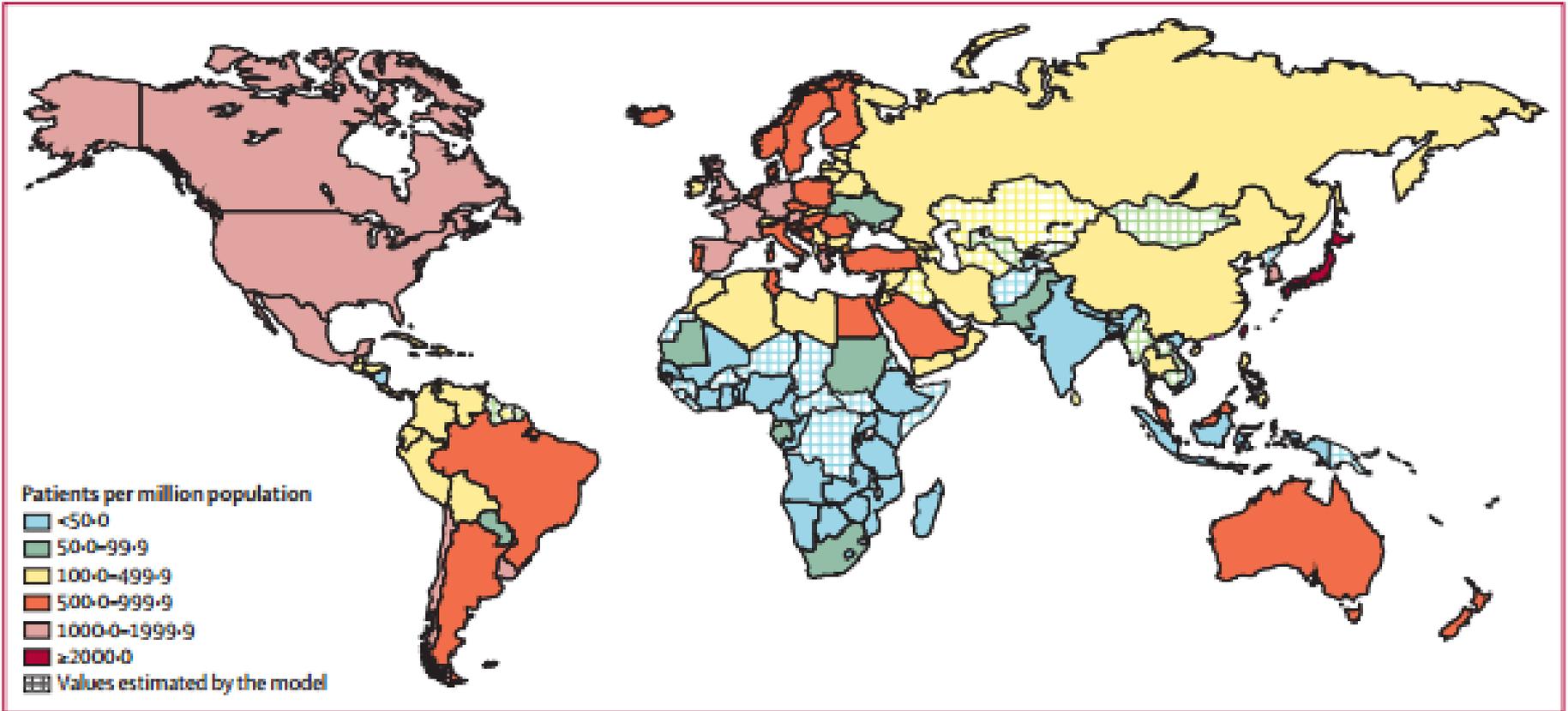
Alvin E. Roth

Stanford University

LI Reunión Anual de la Asociación Argentina de Economía Política

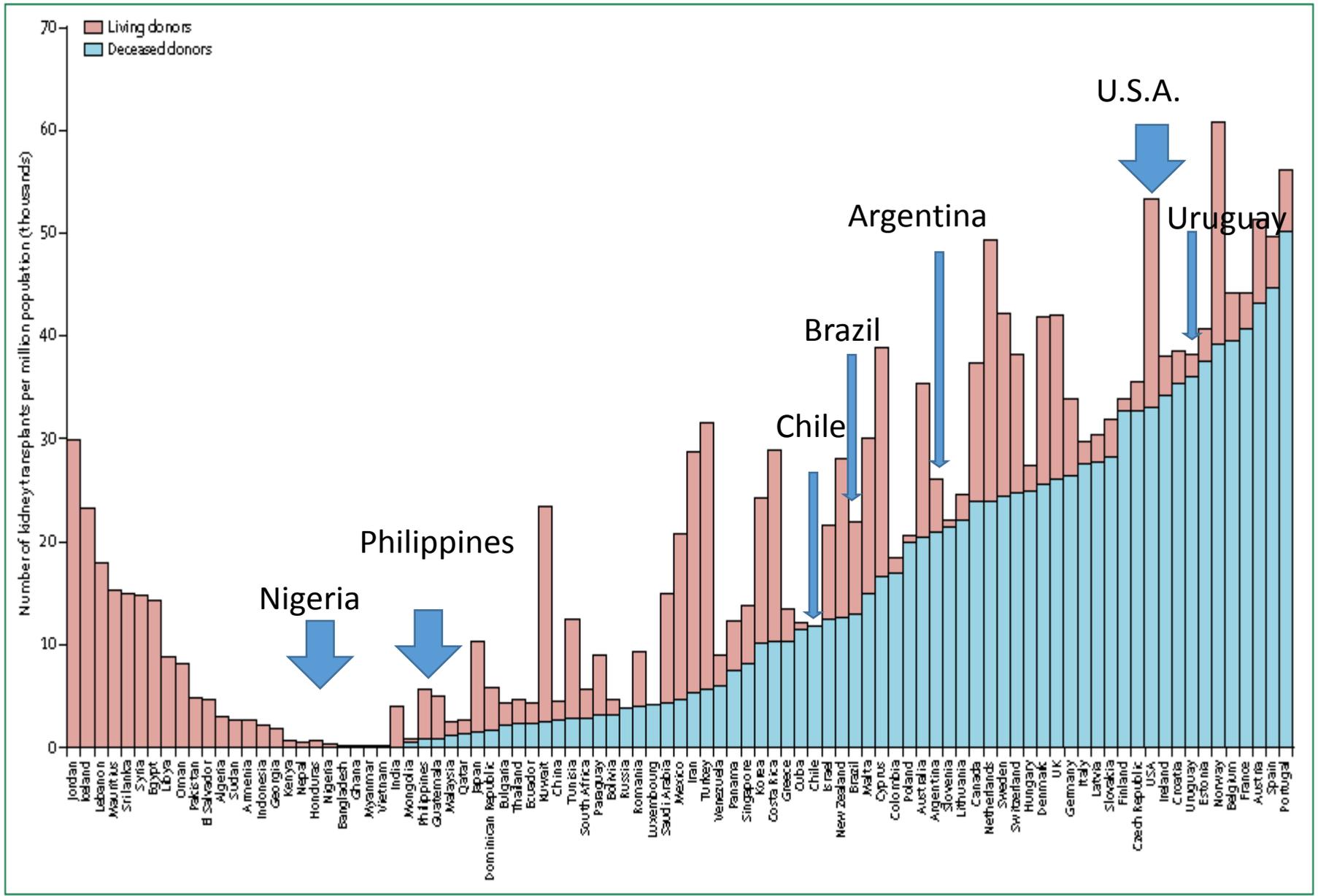
18 Noviembre

# Patients receiving renal replacement therapy (dialysis) in 2010 (estimate)



Liyanage T, Ninomiya T, Jha V, et al. Worldwide access to treatment for end-stage kidney disease: a systematic review. *Lancet* 2015;385:1975-82.

# Kidneys Transplanted per million population



**In the U.S., 100,000 people are on the deceased donor waiting list, but we only have 12,000 deceased donor transplants per year**

**Elsewhere, 2-7 million people die every year**

**worldwide due to inability to pay for either dialysis or kidney transplantation**

# Papers

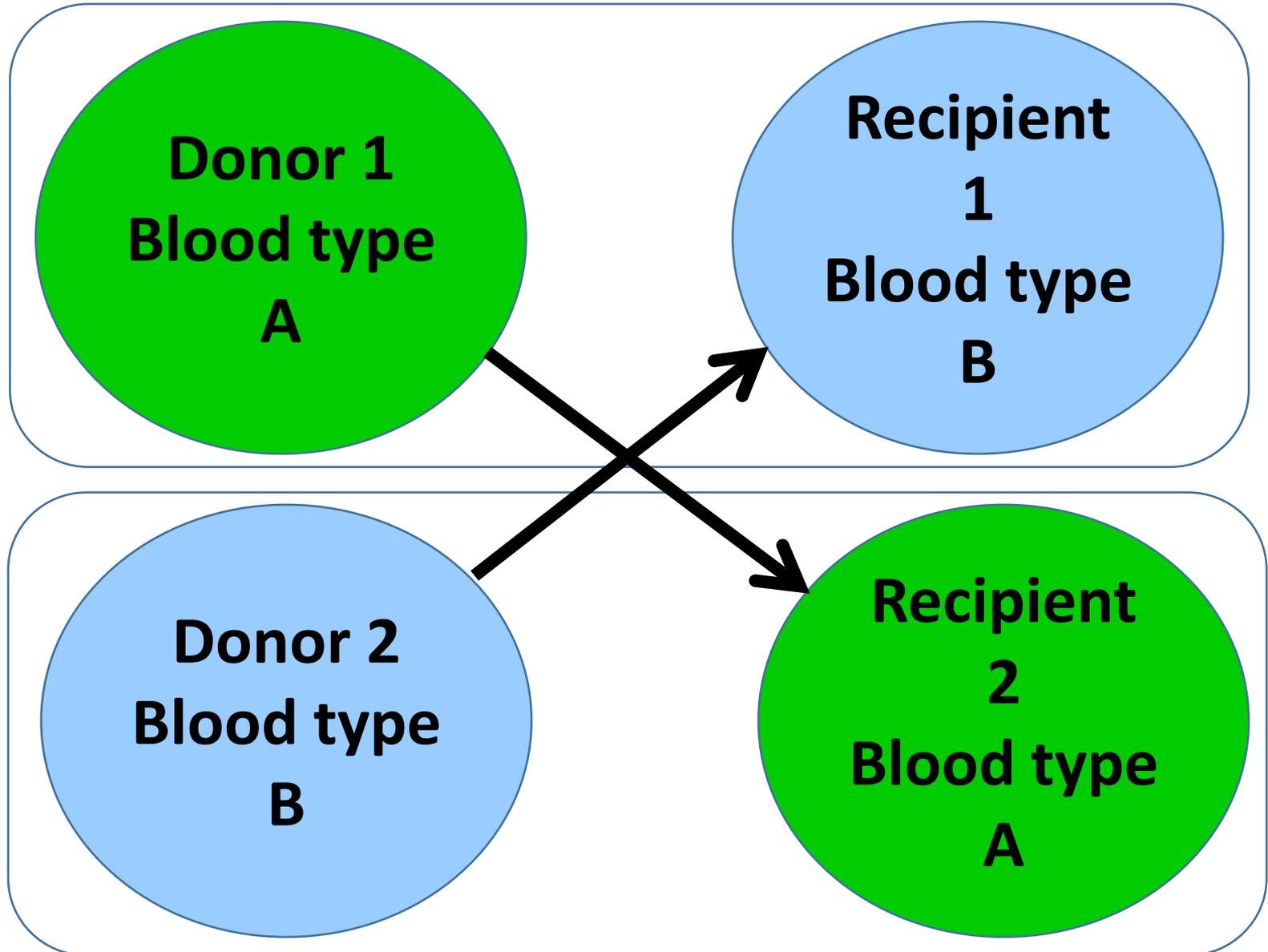
- Michael A. Rees, Ty B. Dunn, Christian S. Kuhr, Christopher L. Marsh, Jeffrey Rogers, Susan E. Rees, Alejandra Cicero, Laurie J. Reece, Alvin E. Roth, Obi Ekwenna, David E. Fumo, Kimberly D. Krawiec, Jonathan E. Kopke, Samay Jain, Miguel Tan and Siegfredo R. Paloyo, “**Kidney Exchange to Overcome Financial Barriers to Kidney Transplantation,**” *American Journal of Transplantation*, forthcoming.  
<http://onlinelibrary.wiley.com/doi/10.1111/ajt.14106/full>
- “**Financing Transplant Costs of the Poor: Global Kidney Exchange,**” Afshin Nikzad, Mohammad Akbarpour, Michael Rees, and Alvin E. Roth, working paper, 2016

# Kidney exchange—U.S.

## background

- Many more people need kidney transplants than there are available organs.
- The waiting list in the US has about 100,000 people
  - The wait can be years, and many die while waiting (4,448 in 2015, with another 4,377 removed from waiting list as “too sick to transplant”).
  - In 2015 we had 12,250 transplants from deceased donors
- Transplantable organs can also come from **living donors**.
  - In 2015 we had 5,628 transplants from living donors
- Sometimes donors are incompatible with their intended recipient.
- This opens the possibility of *exchange* .

# ***Simple two-pair kidney exchange***



# Notice that no money changes hands...

- Kidney exchange is an “in kind” exchange
- **Section 301, National Organ Transplant Act (NOTA), 42 U.S.C. 274e 1984: “it shall be unlawful for any person to knowingly acquire, receive or otherwise transfer any human organ for valuable consideration for use in human transplantation”.**

# Charlie W. Norwood Living Organ Donation Act

Public Law 110-144, 110th Congress, **2007**

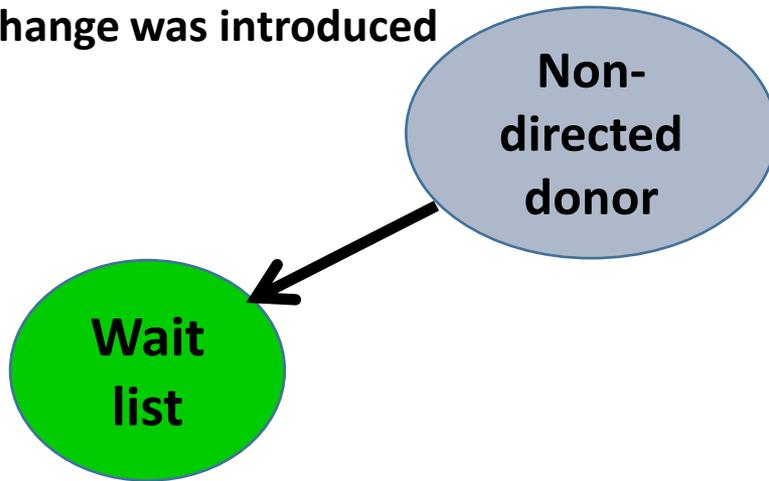
- Section 301 of the National Organ Transplant Act (42 U.S.C. 274e) is amended-- (1) in subsection (a), by adding at the end the following: **“The preceding sentence does not apply with respect to human organ paired donation.”**

# 2-way exchange involves 4 *simultaneous* surgeries



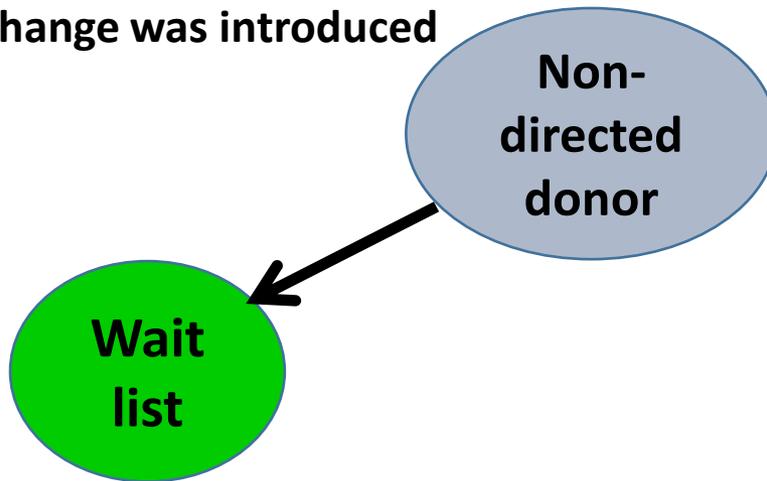
# ***Chains initiated by non-directed (altruistic) donors***

**Non-directed donation before kidney exchange was introduced**

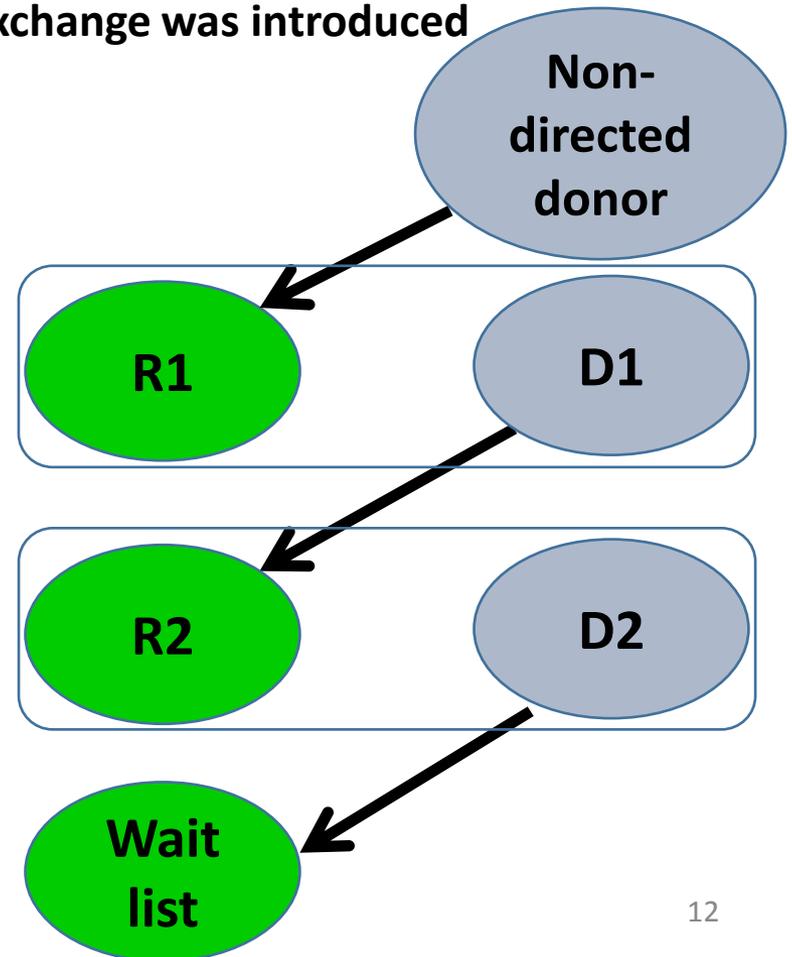


# ***Chains initiated by non-directed (altruistic) donors***

Non-directed donation before kidney exchange was introduced



Non-directed donation after kidney exchange was introduced



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## A Nonsimultaneous, Extended, Altruistic-Donor Chain

Michael A. Rees, M.D., Ph.D., Jonathan E. Kopke, B.S., Ronald P. Pelletier, M.D.,  
Dorry L. Segev, M.D., Matthew E. Rutter, M.D., Alfredo J. Fabrega, M.D.,  
Jeffrey Rogers, M.D., Oleh G. Pankewycz, M.D., Janet Hiller, M.S.N.,  
Alvin E. Roth, Ph.D., Tuomas Sandholm, Ph.D., M. Utku Ünver, Ph.D.,  
and Robert A. Montgomery, M.D., D.Phil.

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### SUMMARY

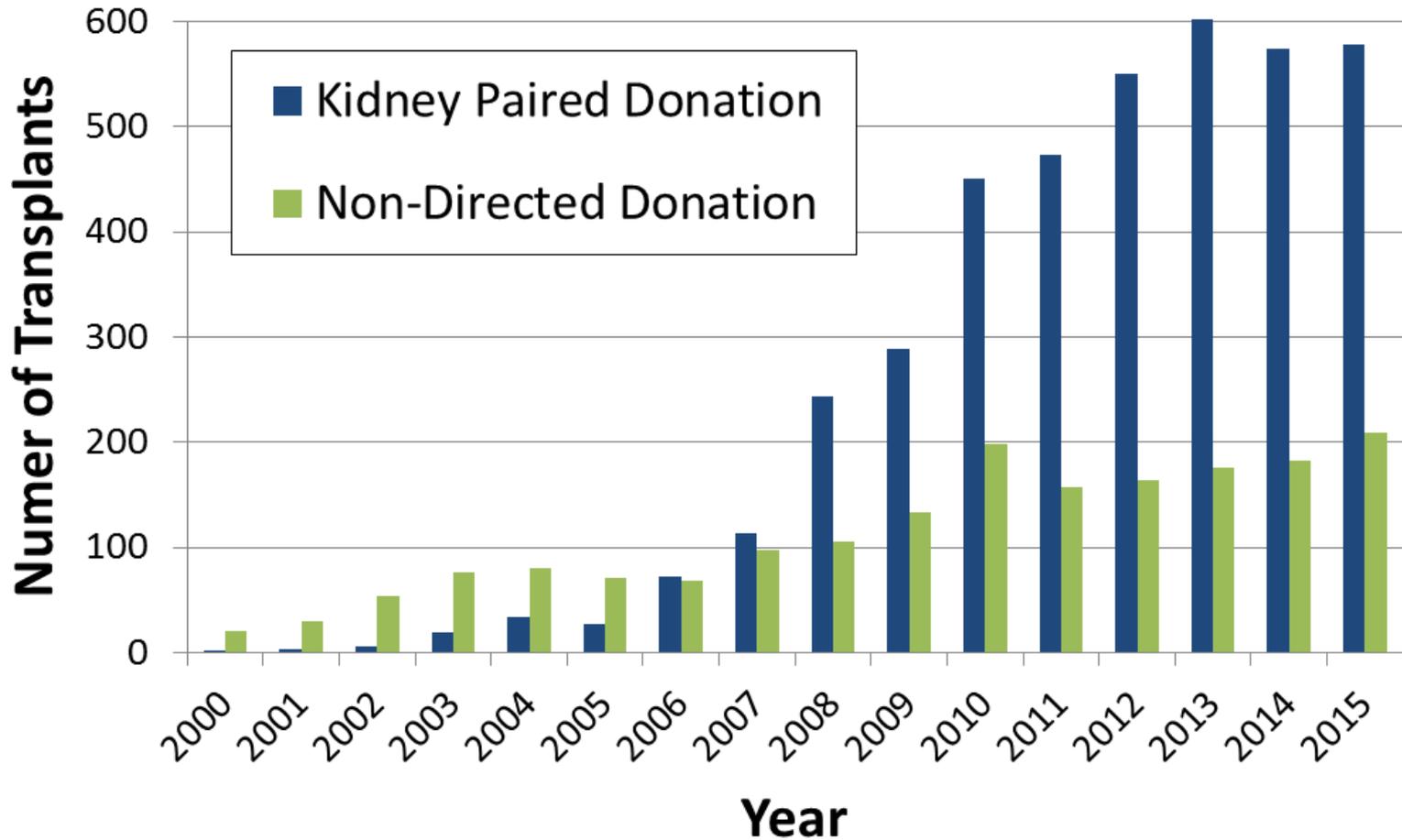
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We report a chain of 10 kidney transplantations, initiated in July 2007 by a single altruistic donor (i.e., a donor without a designated recipient) and coordinated over a period of 8 months by two large paired-donation registries. These transplantations involved six transplantation centers in five states. In the case of five of the transplantations, the donors and their coregistered recipients underwent surgery simultaneously. In the other five cases, “bridge donors” continued the chain as many as 5 months after the coregistered recipients in their own pairs had received transplants. This report of a chain of paired kidney donations, in which the transplantations were not necessarily performed simultaneously, illustrates the potential of this strategy.

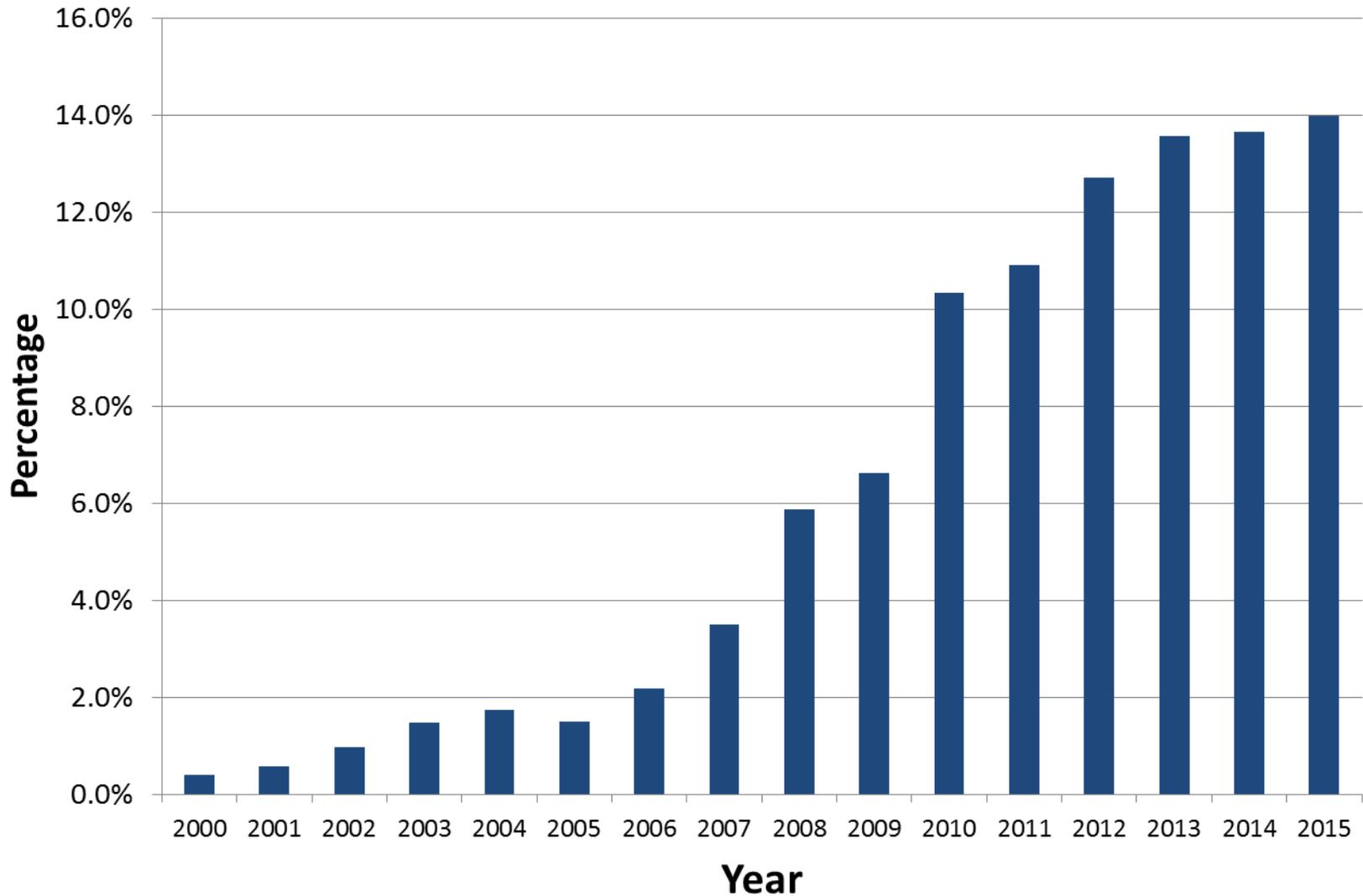
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# KPD and NDD Transplants in U.S.



# KPD and NDD as % of LD in the United States

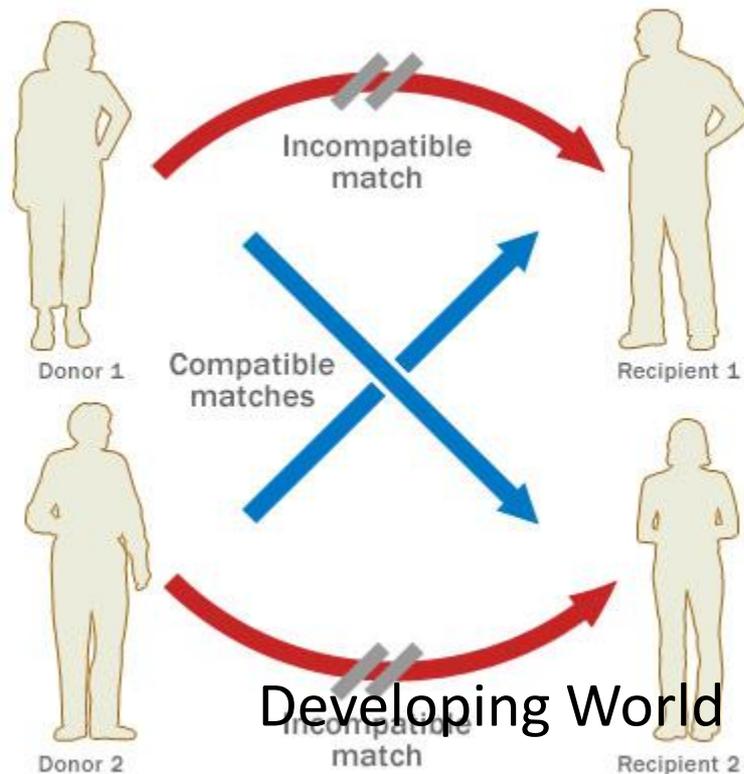


## ***Kidney exchange outside the U.S.***

- Wednesday, August 3, 2016 [First kidney exchange in Nepal](#)
- March 7, 2016 [First paired kidney exchange transplant done in Singapore](#)
- Friday, July 24, 2015 [Kidney exchange in Turkey](#) (1<sup>st</sup> exchanges there)
- April 10, 2015 [A first non-directed donor kidney exchange chain in Italy](#)
- March 30, 2015 [A first kidney exchange in Argentina](#) at **Fundacion Favaloro**
- March 5, 2015 [First kidney exchange in Poland](#)
- Friday, November 7, 2014 [Kidney exchange in Spain: now more than 100 transplants](#)
- June 7, 2014 [Kidney exchange in France](#)
- December 19, 2013 [Kidney exchange in Vienna](#)
- August 19, 2013 [Ten kidney exchange transplants on World Kidney Day in Ahmedabad, India](#)
- July 28, 2013 [First Kidney Exchange in Portugal:](#)
- July 23, 2013 [Kidney exchange chain in India](#)
- June 6, 2013 [Kidney exchange between Jewish and Arab families in Israel](#)
- December 26, 2012 [Kidney exchange in Canada](#)
- December 1, 2012 [Kidney exchange in India](#)
- June 1, 2012 [Mike Rees and Greece: an intercontinental kidney exchange](#)
- March 27, 2012 [Kidney exchange in Britain](#)
- February 5, 2012 [Kidney exchange in Australia, 2011](#)
- April 29, 2011 [First kidney exchange in Spain](#)
- December 8, 2010 [National kidney exchange in Canada](#)
- August 3, 2010 [Kidney Exchange in South Korea](#)
- Friday, July 30, 2010 [Kidney transplantation advice from the Netherlands](#)
- March 9, 2010 [Kidney exchange from Britain](#) (1<sup>st</sup> 3-way there)
- January 27, 2010 [The Australian paired Kidney eXchange \(AKX\) goes live](#)
- June 25, 2009 [Kidney exchange in Canada](#) (1<sup>st</sup> exchange there)
- February 27, 2009 [Kidney Exchange in Australia](#) (in Western Australia)

# Global kidney exchange: a possibility of mutual aid

United States



Two-way  
exchange

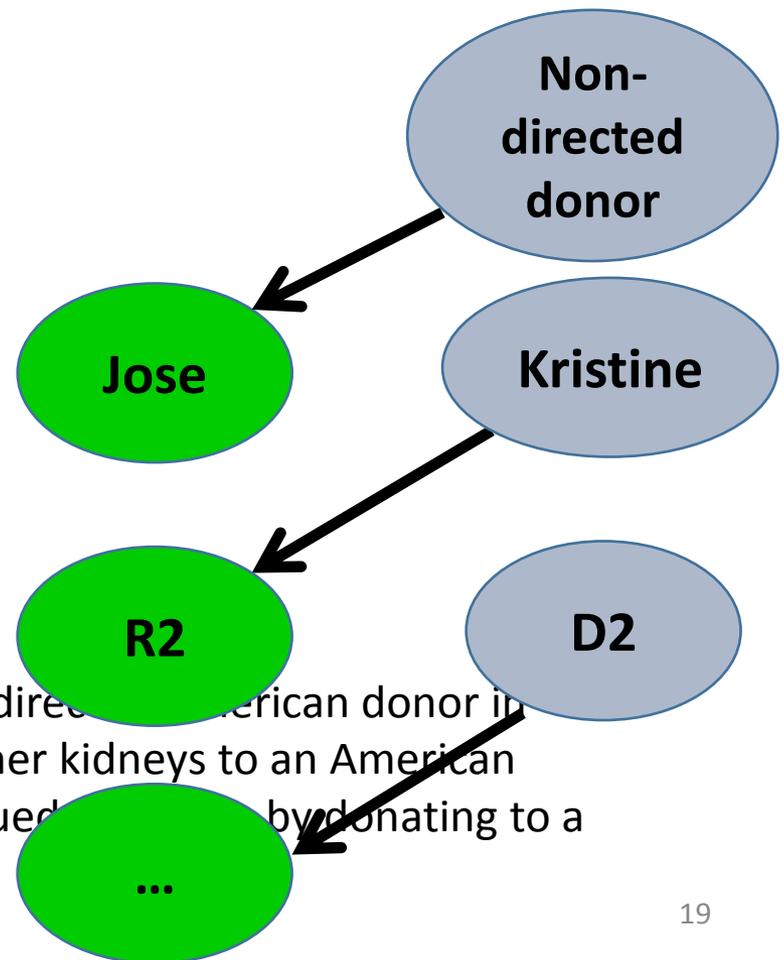
Transplants  
unavailable

# First global kidney exchange, with a pair from the Philippines—January 2015, Alliance for Paired Donation (Rees et al.)



**Jose Mamaril** received a kidney from a non-directed American donor in Georgia. His wife, **Kristine**, donated one of her kidneys to an American recipient in Minnesota, whose donor continued the chain by donating to a patient in Seattle.

*THE BLADE/JETTA FRASER*





# Safely home...

- \$50,000 escrow fund for post-surgical care



# Global Kidney Exchange

The GKE proposal is “self-financing”.

- Back of the envelope calculation:
  - cost of hemodialysis  $\approx$  \$90, 000 per year
  - average time under dialysis  $\approx$  5 years
  - cost of transplant  $\approx$  \$120, 000 per surgery (plus \$20,000 in maintenance therapy costs per patient per year)
- But in steady state, waiting time decreases. So dialysis costs will go down...how long will GKE remain self financing?

# GKE remains self financing even when it becomes widespread.

Intuition:

- Some domestic pairs immediately find a match
- Some other do not find a match upon arrival.
  - They increase the average waiting cost
- International pairs get matched to those the latter type of domestic pairs
- So even if the *average* dialysis cost is less than the surgery costs, GKE can still be self-financing because it matches domestic patients with higher-than-average dialysis costs.

The medical logistics may not  
be the hard part

# Financial flows

- Savings:
  - Medicare—complex legislative/bureaucratic
  - Private insurers (33 months)
- Costs:
  - Surgeries—transplant centers
  - Post surgical treatment in home countries
  - Infrastructure development in home countries
- USAID?--Same Federal budget, but no change needed in Medicare
- Allow insurance companies to nominate patients?

# Repugnance constraints

- Living donors
  - From poor countries
- As a first reaction, many people are going to conflate global kidney exchange with buying kidneys (which is illegal everywhere except Iran—a ‘repugnant transaction’)

# Repugnance

- 1. **“the plan is really not about the international recipient (nor...about the international donor), but only about getting organs for US citizens. So it is exploitative.”**
- 2. **“Lets solve problems at home first...We should encourage programs that allow Americans to help Americans.”**
- 3. **“There is an exploitation of a social condition (being destitute in a foreign country) that kidney transplantation should not be the remedy of resolving social inequities.”**

- Repugnance Concerns:
  - Inadequate post-surgical care
    - Escrow funds for immunosuppressive drugs and post surgical care (in Philippines)
    - Basic infrastructure (in Nigeria)—USAID?
  - Inappropriate/illegal/unethical donor solicitation (how can we ensure that foreign donors aren't selling their kidney?)
    - Family requirement?
    - For non-directed donors too?