Transplants

- 123,175 people waiting for lifesaving organ transplants in the U.S. (as of Fall 2014)
- 101,170 of them await kidney transplants.
  - 11,163 kidney transplants came from deceased donors
  - 5,733 came from living donors.
- 4,453 patients died while waiting for a kidney transplant.

Data: National Kidney Foundation
Kidney Transplants

- Transplants are standard treatment for patients with failing kidneys.
- Deceased donors: a centralized mechanism has long been in use. The mechanism allocates kidneys according to patients according to wait-time and other factors.
- Living donors: mostly friends and relatives of a patient.
The Shortage

- The demand for kidney transplants is increasing
  - kidney failure being a high risk for diabetics;
  - other reasons?
- The supply of kidneys is down thanks to safer cars, motorcycle helmet laws, decrease in crime
## History of Kidney Transplants

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Deceased</td>
<td>5,693</td>
<td>9,761</td>
<td>10,920</td>
<td>11,163</td>
</tr>
<tr>
<td>Live</td>
<td>1,817</td>
<td>4,422</td>
<td>4,928</td>
<td>5,733</td>
</tr>
</tbody>
</table>
Donors
Selling kidneys

- Buying and selling kidneys is illegal in the US: Section 301 of National Organ Transplant Act
  - “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.”
- The trade in organs is prosecuted when discovered.
- There is a rich literature on whether the ban on buying and selling of kidneys should be repealed (Becker & Elias 2007).
Deceased Donor Kidneys

- The National Organ Transplant Act of 1984 established the Organ Procurement and Transplantation Network (OPTN) (the law views deceased donor kidneys offered for transplantation as a national resource).

- Run by the United Network for Organ Sharing (UNOS), it has developed a centralized priority mechanism for the allocation of deceased donor kidneys.

- There are probably ways to increase the supply of cadaveric kidneys (e.g. make donation the default).
Live Donor Transplants: Until Recently Much Less Organized

• A patient identifies a willing donor and, if the transplant is feasible, it is carried out.
• Otherwise, the patient remains on the queue for a deceased donor kidney, while the donor returns home.

In mid-2000s, three economists, Al Roth, Tayfun Sonmez, and Utku Unver, proposed and helped implement a system to facilitate the use of living donor kidneys.
Compatibility Constraints

- Donor kidney must be compatible with patient
- Blood type match
  - O type patients can receive O kidneys
  - A type patients can receive O or A kidneys
  - B type patients can receive O or B kidneys
  - AB type patients can receive any blood type
- Also tissue type match (HLA compatibility): combination of six proteins. Prior to transplantation, the potential recipient is tested for the presence of preformed antibodies against donor HLA. If present (positive crossmatch), the transplantation cannot be carried out.
- Potential inefficiency: if a patient has a donor but can’t use the donor’s kidney, the donor goes home.
Live Donor Exchanges

• Until recently very rare: In the period 2000-2004 five paired exchanges in New England.

• In 2000 the transplantation community issued a consensus statement indicating it as “ethically acceptable.”
How to assign kidneys?
Incentives Constraints

What are the incentive constraints in kidney exchange?
Donor Chains

- In July 2007, Michael Rees and the Alliance for Paired Donations started an “Altruistic Donor Chain”
- Altruistic donor in Michigan donated kidney to woman in Phoenix.
- Husband of Phoenix woman gave kidney to woman in Toledo.
- Her mom gave kidney to patient A in Columbus, whose daughter simultaneously gave kidney to patient B in Columbus.
- The chain continued for 30 donations.
- We have seen many other chains.
10 transplants (7/2007-11/2009), and counting

Source: People, November 30, 2009
Why The Delays in Setting Up A National Kidney Exchange System?
More information

- Roth, Sonmez and Unver QJE 2004 and AER 2007

- 30-minute movie on kidney chains (recommended by Jeffrey Veale, MD): http://thechain.org