Análisis del Mercado de Organos para Trasplantes

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Introduction

- Persistent excess demand for organ transplants.
- Loss of life while waiting.
- Reduced quality of life while waiting.
- What to do about it?
- Many discussions of reforms of the present system:

  Mild: Better allocation, Kidney paired donation, implied consent, etc.

  More Radical: Market solution. Pay for organs.

Introduction

- **Past Studies**

  - Evaluated mainly with qualitative and philosophical discussion of pros and cons.

  - Main Concentration on cadavers.

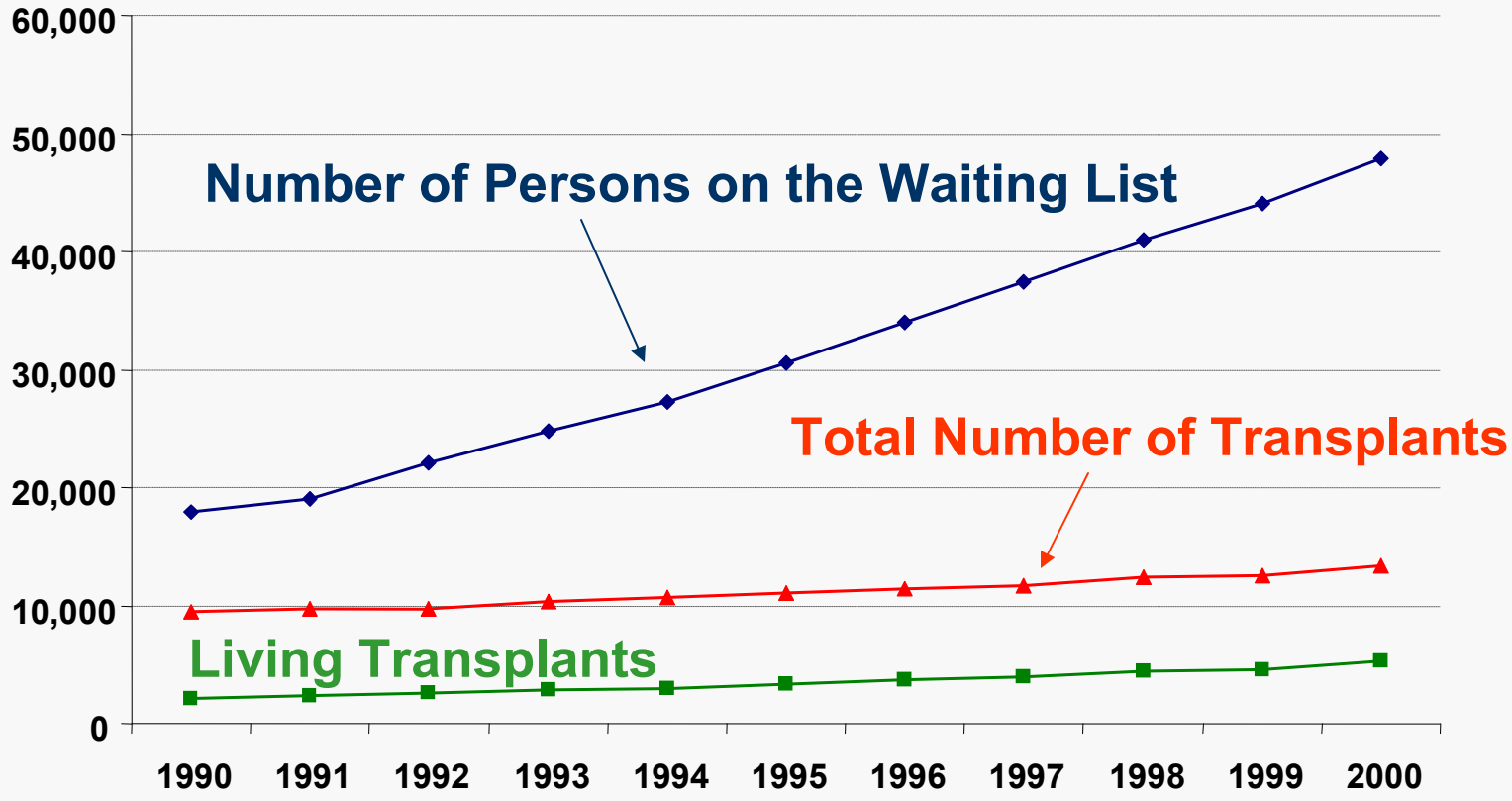
- We argue for use of market system, with emphasis on live donors when possible, although also discuss cadavers.

- We evaluate a market system quantitatively bringing to bear on the organ transplants issue empirical tools of economics.

- Also discuss some of the philosophical issues.

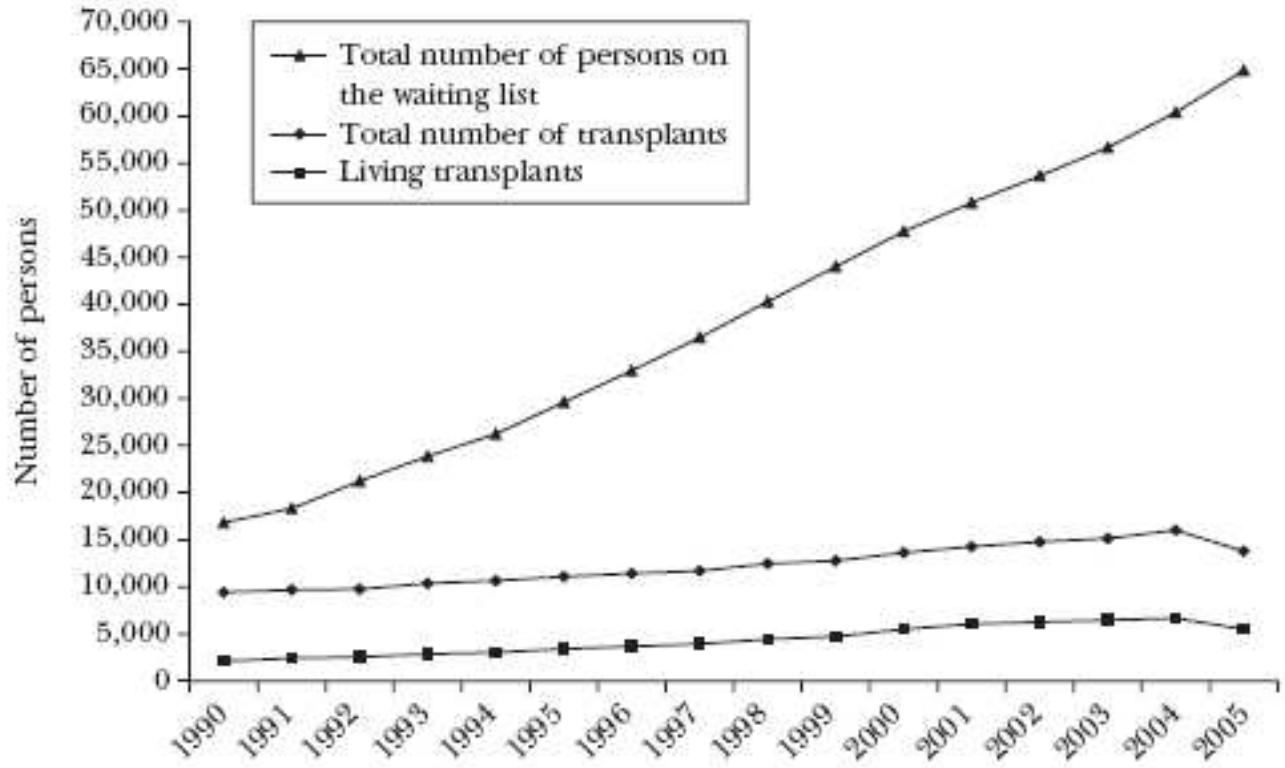
- Can present our analysis in a series of charts and tables.

Chart 1
Kidney Transplants
United States – 1990-2000



Source: UNOS

Kidney Transplants: Total Number of Transplants, Living Transplants, and Total Number of Persons on the Waiting List in the United States: 1990–2005



Source: United Network for Organ Sharing.

Trasplantes Renales
Argentina – 1998 – 2009

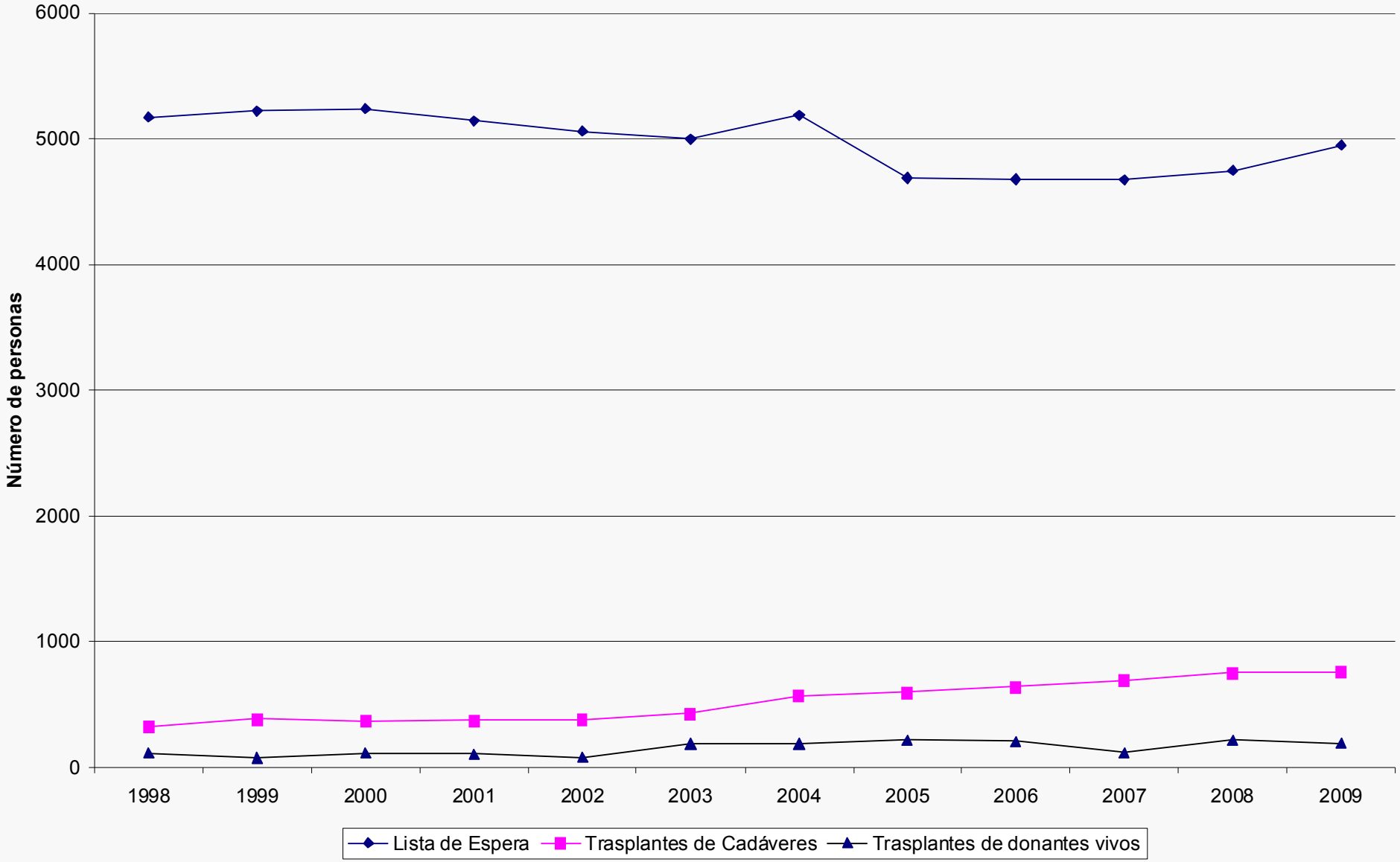
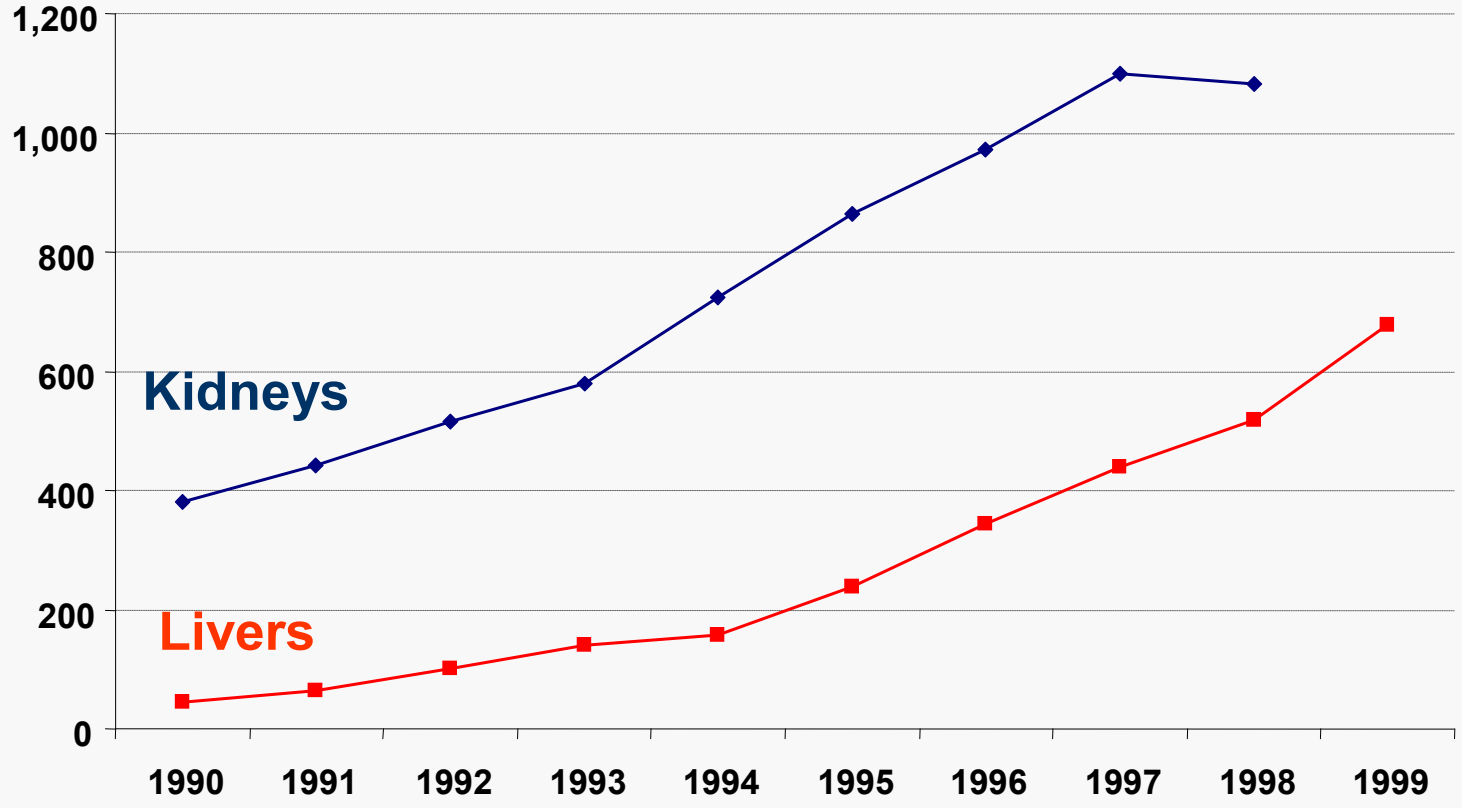
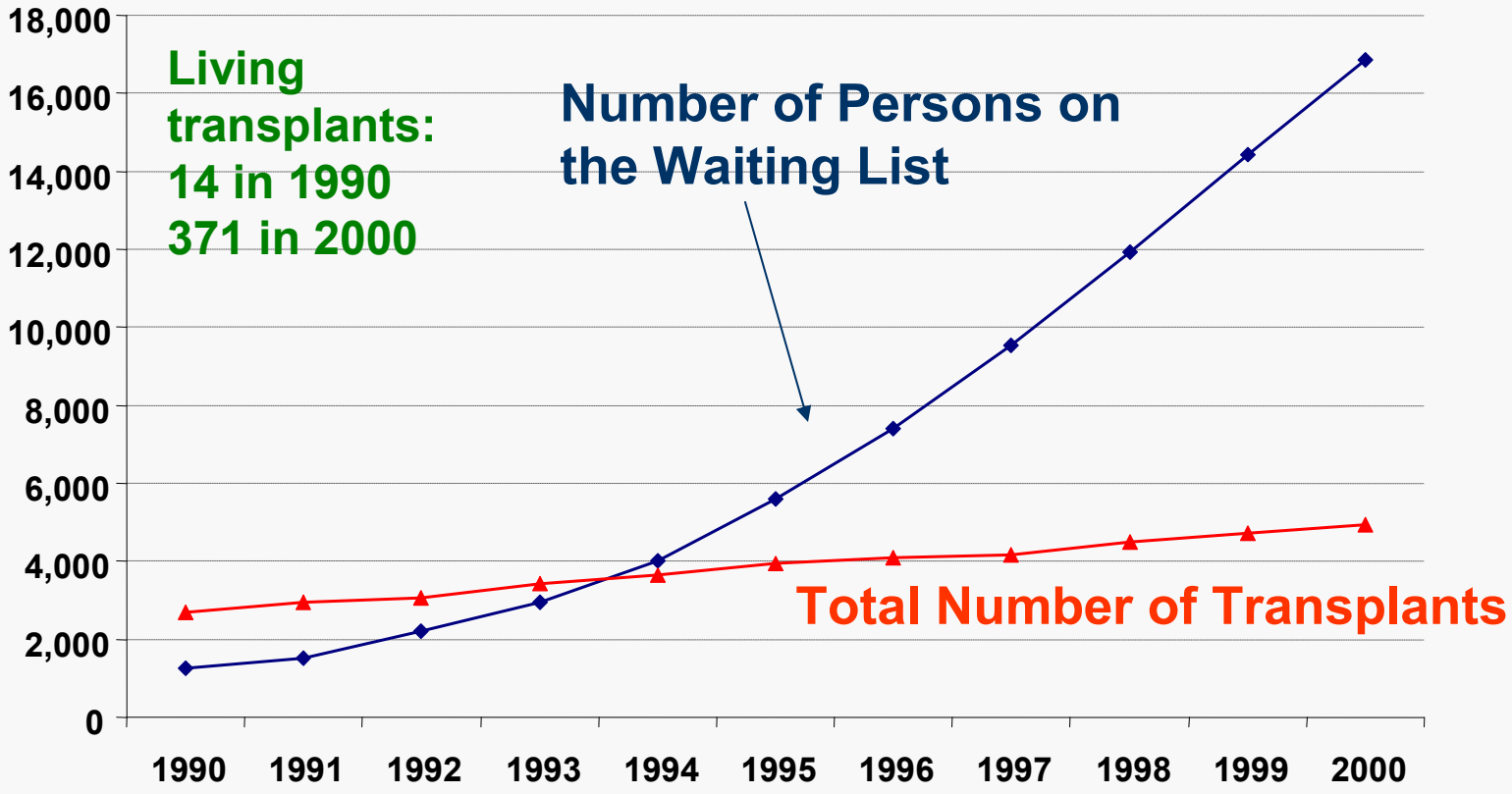


Chart 2
Kidney and Liver Transplants: Median Waiting Time (in days) - United States – 1990-1999



Source: UNOS

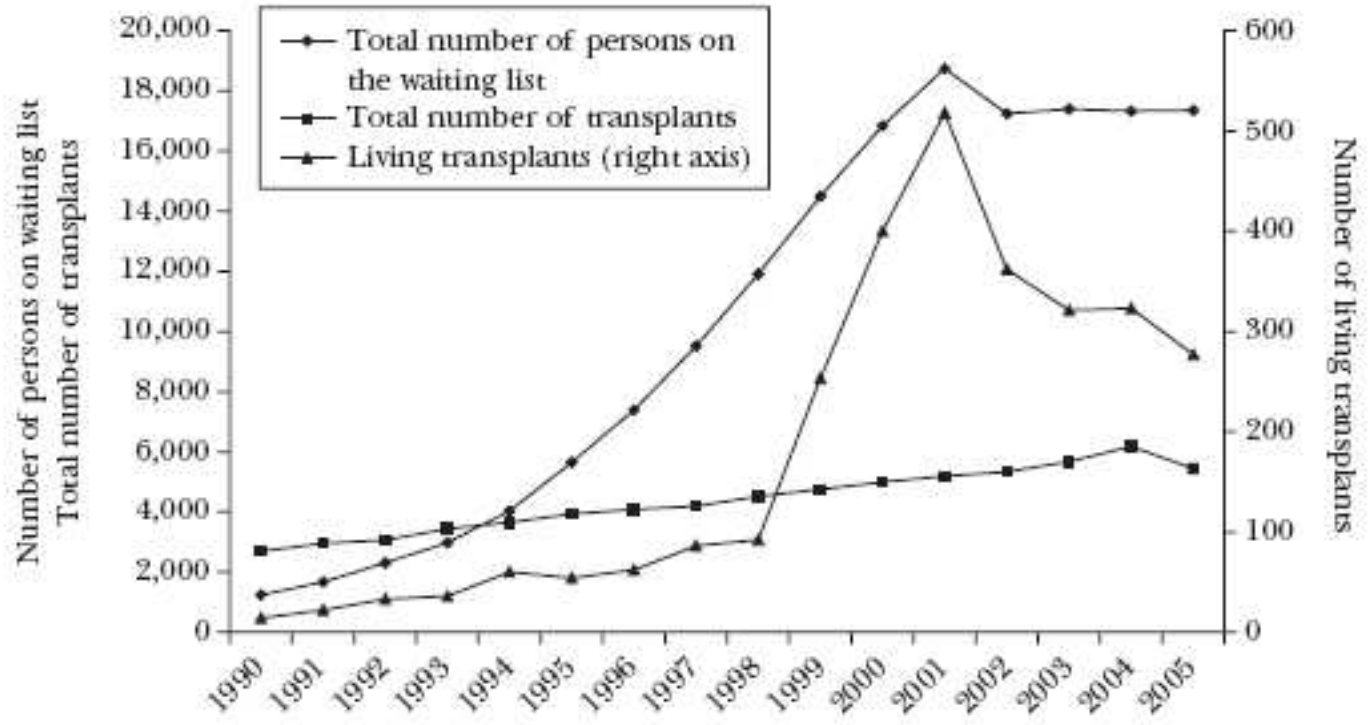
Chart 3
Liver Transplants
United States – 1990-2000



Source: UNOS

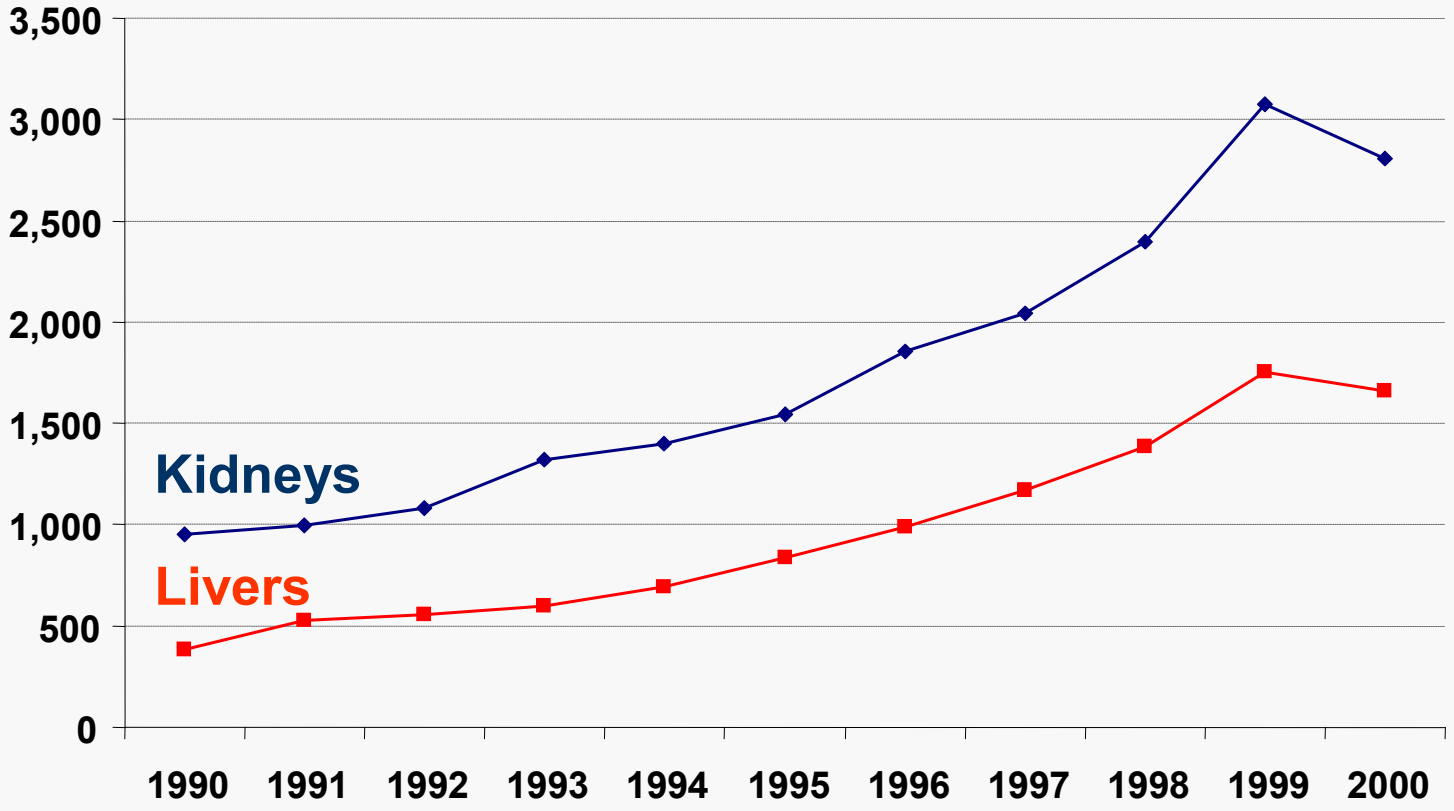
Figure 2

Liver Transplants: Total Number of Transplants, Living Transplants, and Total Number of Persons on the Waiting List in the United States: 1990–2005



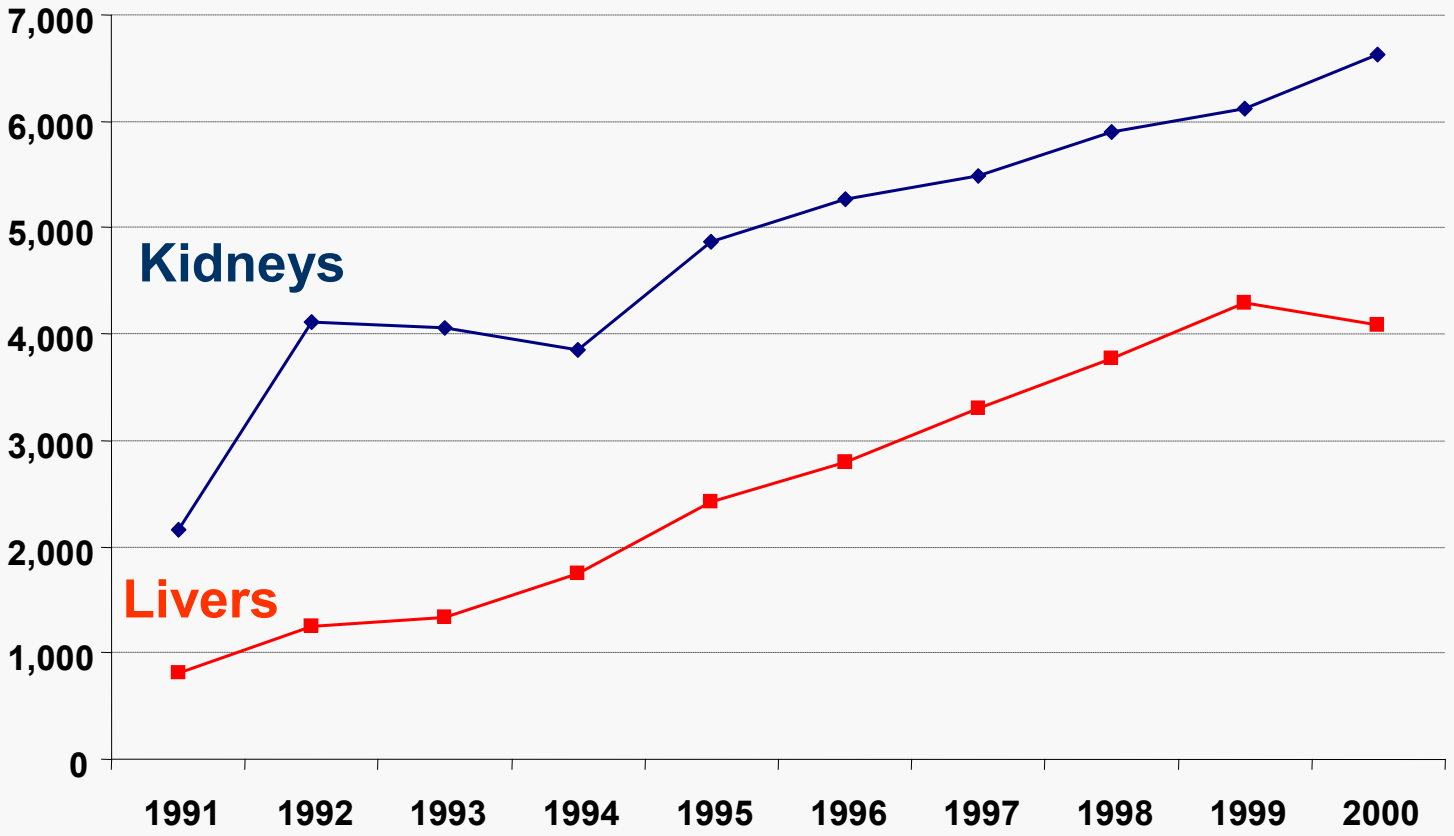
Source: United Network for Organ Sharing.

Chart 4
Kidney and Liver Transplants: Deaths on the Waiting List United States – 1990-2000



Source: UNOS

Chart 5
Gap Between Demand and Supply
Kidney and Liver Transplants
United States – 1991-2000



Source: UNOS

Brecha entre Oferta y Demanda
Trasplantes renales
Argentina – 1999 – 2009

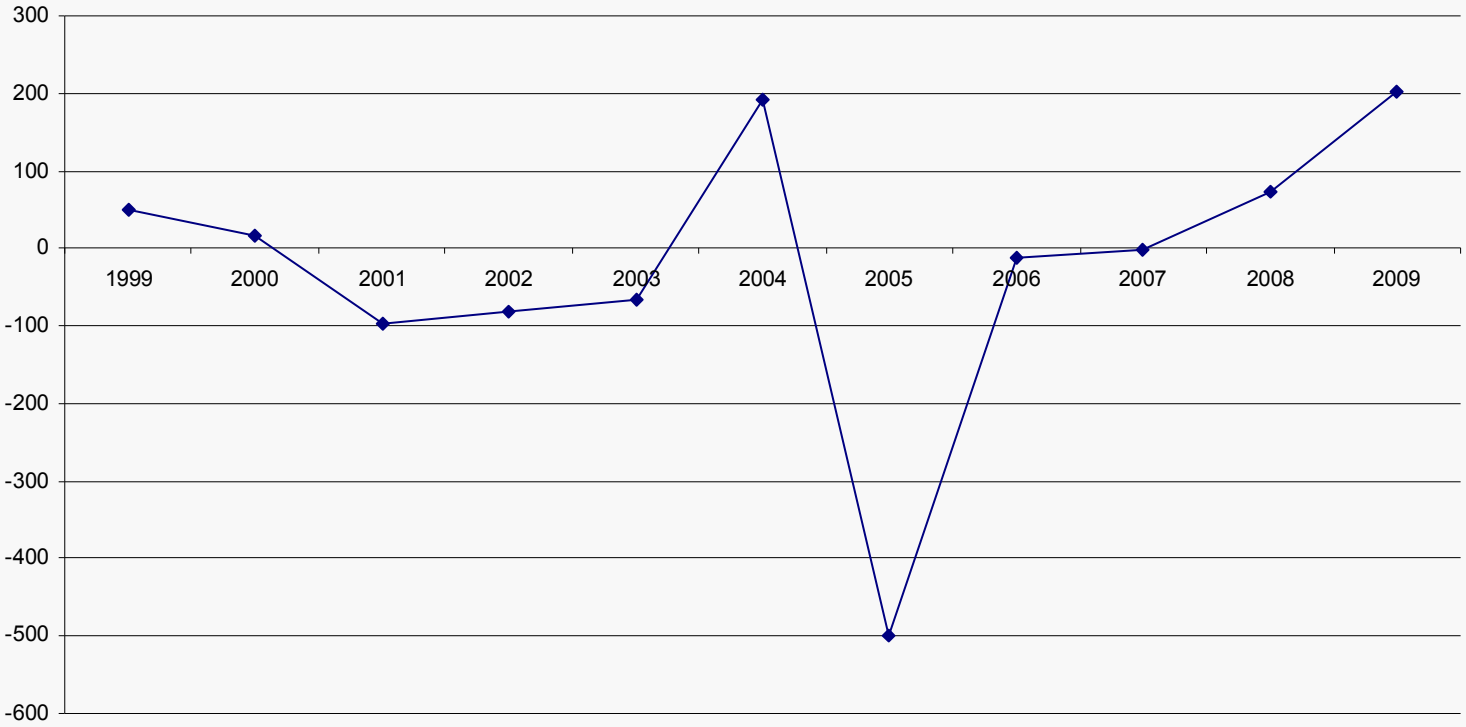
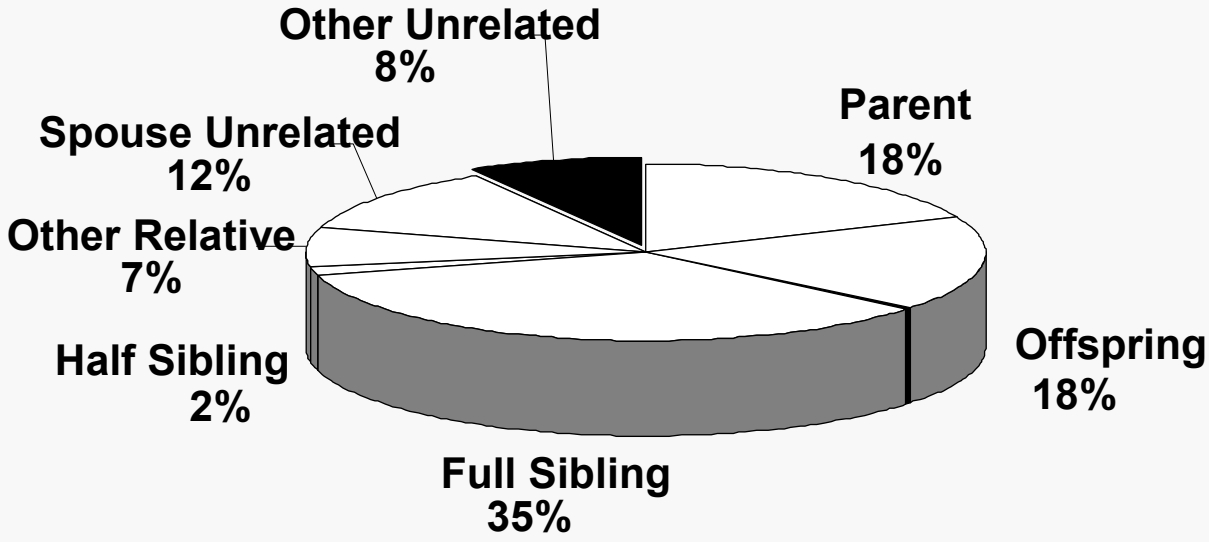


Chart 6
Characteristics of Living Donors: Donor Relation
United States - 2001

Almost all living donors are related



Source: UNOS

Table 1

Kidney Transplants in 2005: Total Number of Transplants, Living Transplants, and Number of Persons on the Waiting List

(*per million of population*)

	Total number of transplants	*Living transplants*	*Number of persons on the waiting list*
Germany	30.5	6.3	104.5
Spain	50.3	1.9	96.4
United Kingdom	29.1	9.1	94.9
United States	46.2	18.4	217.4

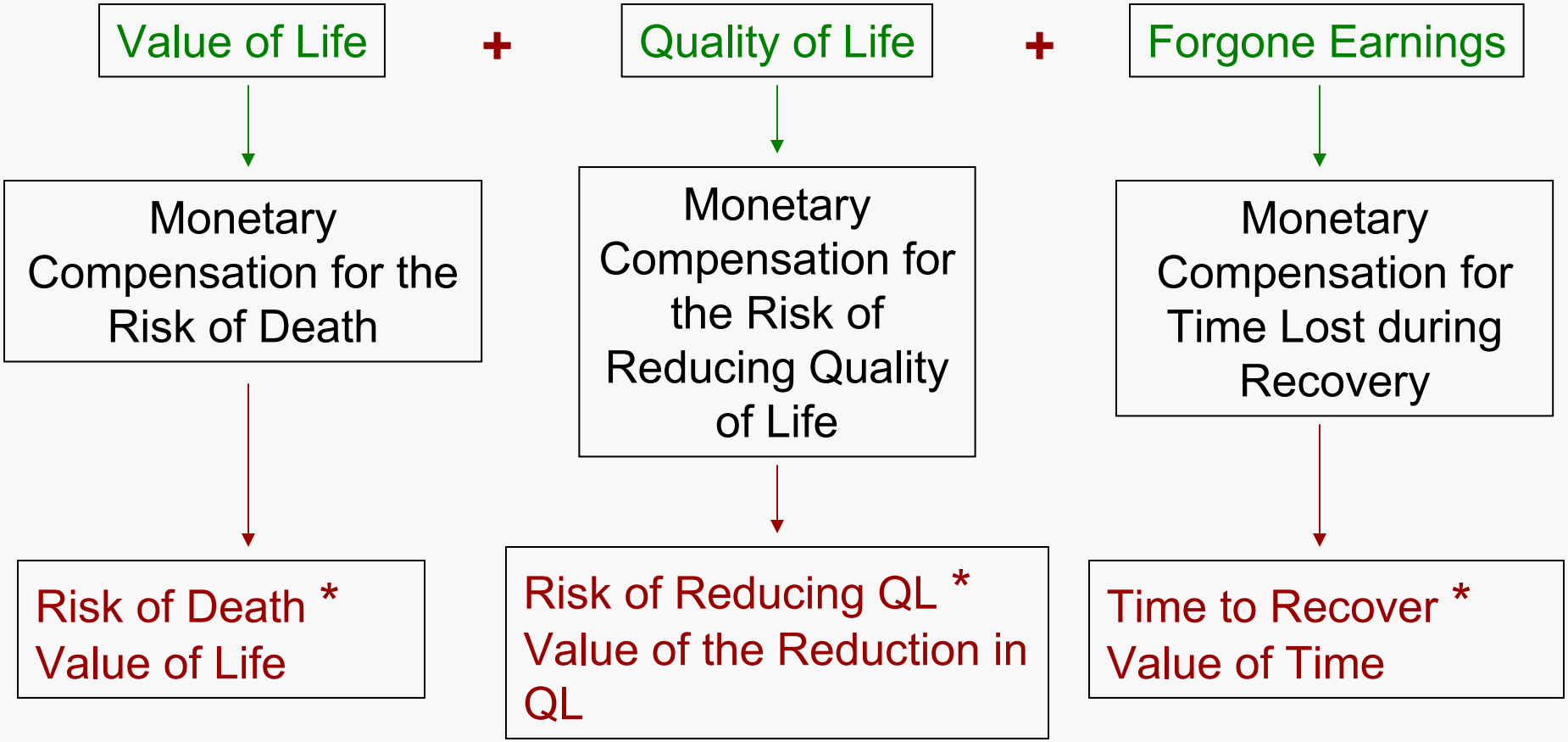
Source: Own calculations using data from Eurotransplant; Organizacion Nacional de Transplantes; UK Transplant; United Network for Organ Sharing; and the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.

Table 2
Average Cost of Kidney and Liver Transplants
United States - 1999-2000

	United States[1]	United States[2]	Illinois[3]
Kidney	$51,000 ($25,000-$130,000)	$111,400	$92,627
Liver	$235,000 ($66,000-$367,000)	$244,600	N/A

Source: (1) Battelle Institute. (2) United Network for Organ Sharing, estimated U.S. average billed charges per transplantation as of July 1, 1999, first year following transplantation. (3) Illinois Health Care Cost Containment.

Components of the Price of an Organ



Value of Life Component of the Price

	Risk of Death	Value of Life	Total
Kidney	1/1000	$3,000,000	**$3,000**
Liver	1/300	$3,000,000	**$10,000**

Price of Kidneys and Livers

	Value of Life	Quality of Life	Forgone Earnings	Total
Kidney	$3,000	$8,800		
Liver	$10,000	$15,000		

Forgone Earnings Component of the Price

	Weeks for Recovery	Value of Time	Total
Kidney	4 weeks	$800 per week	**$3,200**
Liver	8 – 9 weeks	$800 per week	**$7,000**

Price of Kidneys and Livers

	Value of Life	Quality of Life	Forgone Earnings	Total
Kidney	$3,000	$8,800	$3,200	**$15,000**
Liver	$10,000	$15,000	$7,000	**$32,000**

Price of Kidney in United States using International Evidence

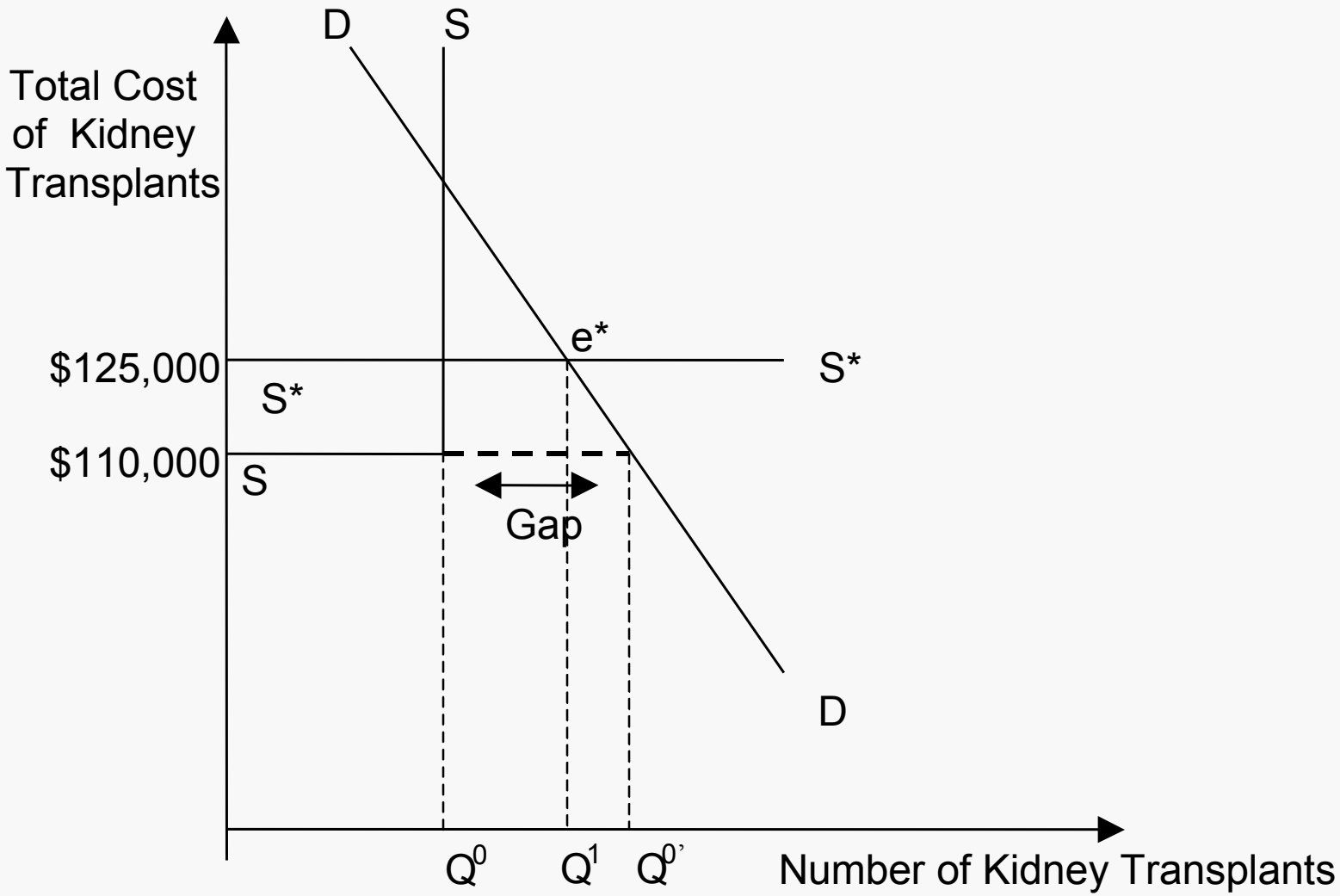
$$\text{Price of a Kidney in US} = \text{Price of a Kidney in Country i} * \frac{\text{Income Per Capita in US}}{\text{Income Per Capita in Country i}}$$

Table 3
Price of Kidney in United States - International Evidence

Country	Year	Price of a Kidney	Equivalent Cost of Kidney in US
Iran	1997	$1,345	$7,760
Iran	1996	$471	$2,717
India	1985-1999	$1,070	$16,050
England	1990	$5,691 - $7,648	$8,252 - $11,090
India	1997	$1,035	$15,525

Source: Goyal, Madhav, et al, 2002; Salahuden, A. K. et al, 1990; The Hindu India's National Magazine, 1997, and Zargooshi, Javaad, 2001.

Market for Live Kidney Transplants



Estimates of the Change in the Number of Organ Transplants with the Introduction of Monetary Incentives

Change in the Number of Transplants = Actual Demand * (1 - elasticity of demand * % Change in price)

Elasticity of Demand: Response of the Quantity Demanded to a Change in price

	Actual Number of Transplants (A)	Gap (B)	Actual Demand (A + B)	Demand elasticity	% Change in Price	Increase in the Number of Transplants
Kidneys	13,000	7,000	20,000	-1	14%	**4,200 (32%)**
Livers	5,000	4,000	9,000	-0.5	18%	**3,000 (60%)**

Table 3

Estimation of the Price of Organs for Transplantation and the Impact on the Total Number of Kidney and Liver Transplants under Different Assumptions about the Value of a Statistical Life

Value of a Statistical Life	*Risk of Death Component*[a]	*Quality-of-life Component*	*Value of Time*[b]	*Total Price of Organ*	*% Change in Price*[c]	*% Change in Total Number of Transplants*[d]
Kidneys						
$2,000,000	$2,000	$2,997	$2,692	$7,689	4.8%	52%
$3,000,000	$3,000	$4,496	$2,692	$10,188	6.4%	49%
$5,000,000	$5,000	$7,493	$2,692	$15,185	9.5%	44%
$7,000,000	$7,000	$10,490	$2,692	$20,182	12.6%	39%
$10,000,000	$10,000	$14,985	$2,692	$27,677	17.3%	32%
Livers						
$2,000,000	$6,667	$5,980	$6,058	$18,705	5.6%	72%
$3,000,000	$10,000	$8,970	$6,058	$25,028	7.5%	70%
$5,000,000	$16,667	$14,950	$6,058	$37,675	11.2%	67%
$7,000,000	$23,333	$20,930	$6,058	$50,321	15.0%	64%
$10,000,000	$33,333	$29,900	$6,058	$69,291	20.7%	59%

Note: The Quality-of-life Component is computed as the product of the expected change in the quality of life and the value of statistical life. We assume a risk of nonfatal injury of 1% and 2% for kidneys and livers, respectively, and that quality of life, as measured on a scale from 0 to 1, decreases 0.15 in case of a bad outcome from being a kidney or liver donor.

[a] Risk of Death Component = Risk of Death * Value of a Statistical Life. We assume a risk of death of 0.1% for kidneys and 0.33% for livers.

[b] Value of Time = Annual Income * Time for Recovery in years. Value of Time for Kidney Transplants = $35,000 * 4 weeks/52 weeks. Value of Time for Liver Transplants = $35,000 * 9 weeks/52 weeks.

[c] % Change in Price of Transplant = (Price of the Organ/Cost of Surgery) * 100. We assume a Cost of Surgery of $160,000 and $335,000 for kidney and liver transplants respectively.

[d] % Change in Total Number of Transplants = {[(Gap + Actual Number of Transplants) * (1 − price elasticity of demand for transplants * % Change in Price of Transplant/100)]/Actual Number of Transplants − 1} * 100.

Live Versus Cadaver Organ Markets

- Paying live donors raise less thorny issues than paying heirs for organs from deceased individuals.

- Heirs can make the organs of deceased relatives unusable by delaying the legal proceeding.

- There is little religious objection to individuals supplying their own organs for live transplants.

- Better Outcome: The long-term outcome of medical transplantation depends on the quality of the match between organs of donors and recipients, and the "timing" of surgical interventions.

Live Versus Cadaver Organ Markets

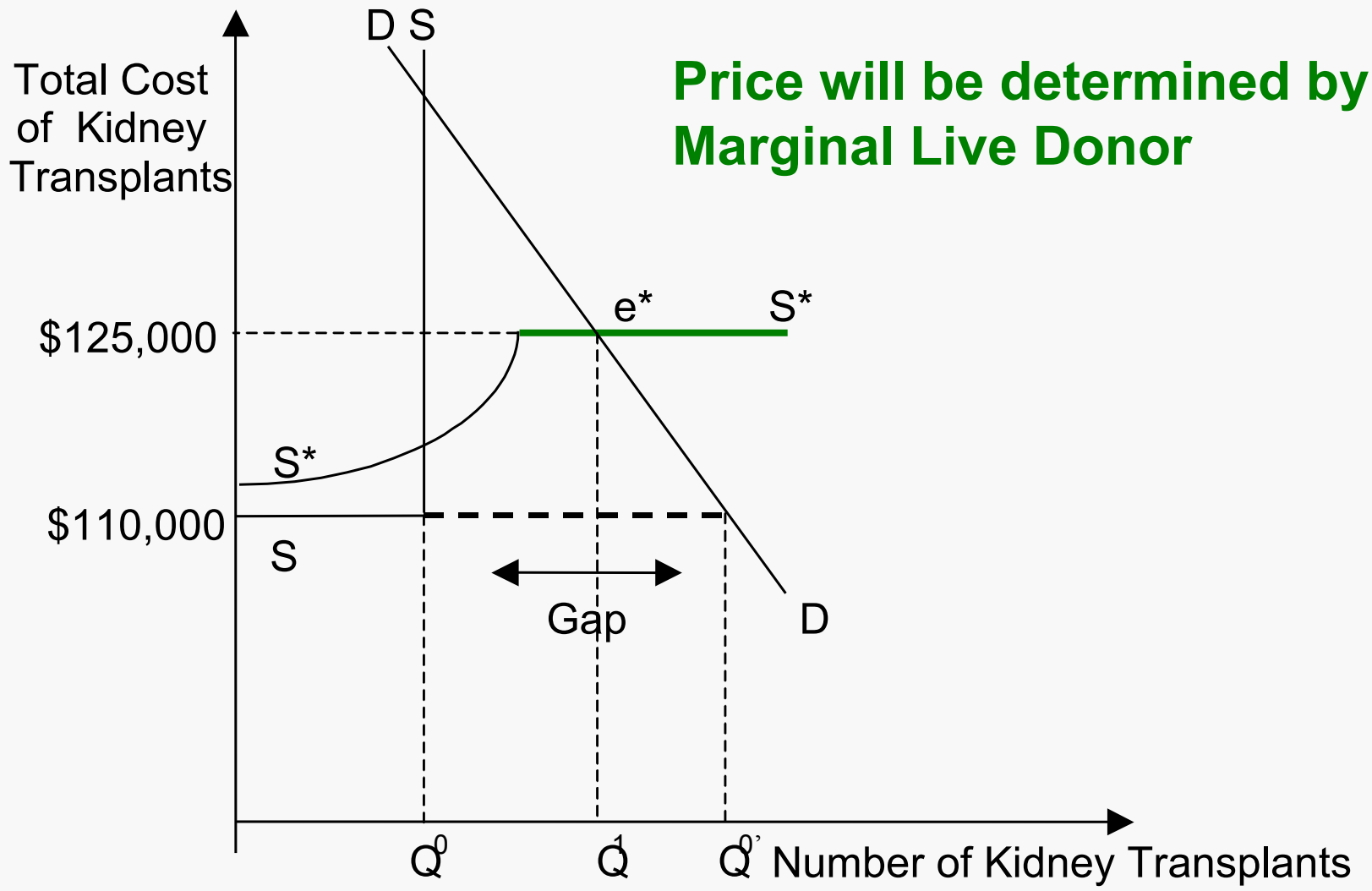
- Perhaps most crucially, the present gap between demand and supply of kidneys could not be fully met from cadavers even with full payments for cadaver organs.
  - To be usable, donors must have healthy, well functioning organs and be free of infections at the time of their death.
  - Taking into account the need to have healthy organs, estimates suggests that between 10,000 and 15,000 of those dying annually are considered medically suitable for organ donation.
  - This implies a maximum number of cadaveric kidneys between 19,000 and 25,000, and a maximum number of livers between about 8,800 and 11,000

Table 4
Estimates of Potential Supply of Cadaver Donors

Population	Year	Study	Donors PMP	Estimated Number of Donors in the Year of the Study	Estimated Number of Donors in 2002*
United States	1986	National Task Force on Organ Transplantation	68	16,912	**19,000**
			104	25,865	**29,000**
United States	1991	Evans, et al (1992)	28.5	6,900	**8,000**
			43.7	10,700	**12,300**
35 OPOs – 27 states	1997-1999	AOPO Death Record Review Sample		10,900-13,700	**10,900-13,700**

*Based upon 280,562,489 United States population in July 2002 (est.).

Market for Live and Cadaveric Kidney Transplants



Price will be determined by Marginal Live Donor

Table 5
Comparison between "Payment to Living Donors" and "Voluntary Army"

Payment to Living Donors	Voluntary Army
• "Commodification" of Body Parts.	• "Commodification" of life. • Worked well.
• Mainly Desperate poor donors. • If can help poor, Why bad?	• Poor Man's Army. • Not really: Healthy poor and middle class.
• Difficulty in calculating risks, impulsive. • Low real risks? • Can have cooling-off period, Written Consent.	• Worked here.

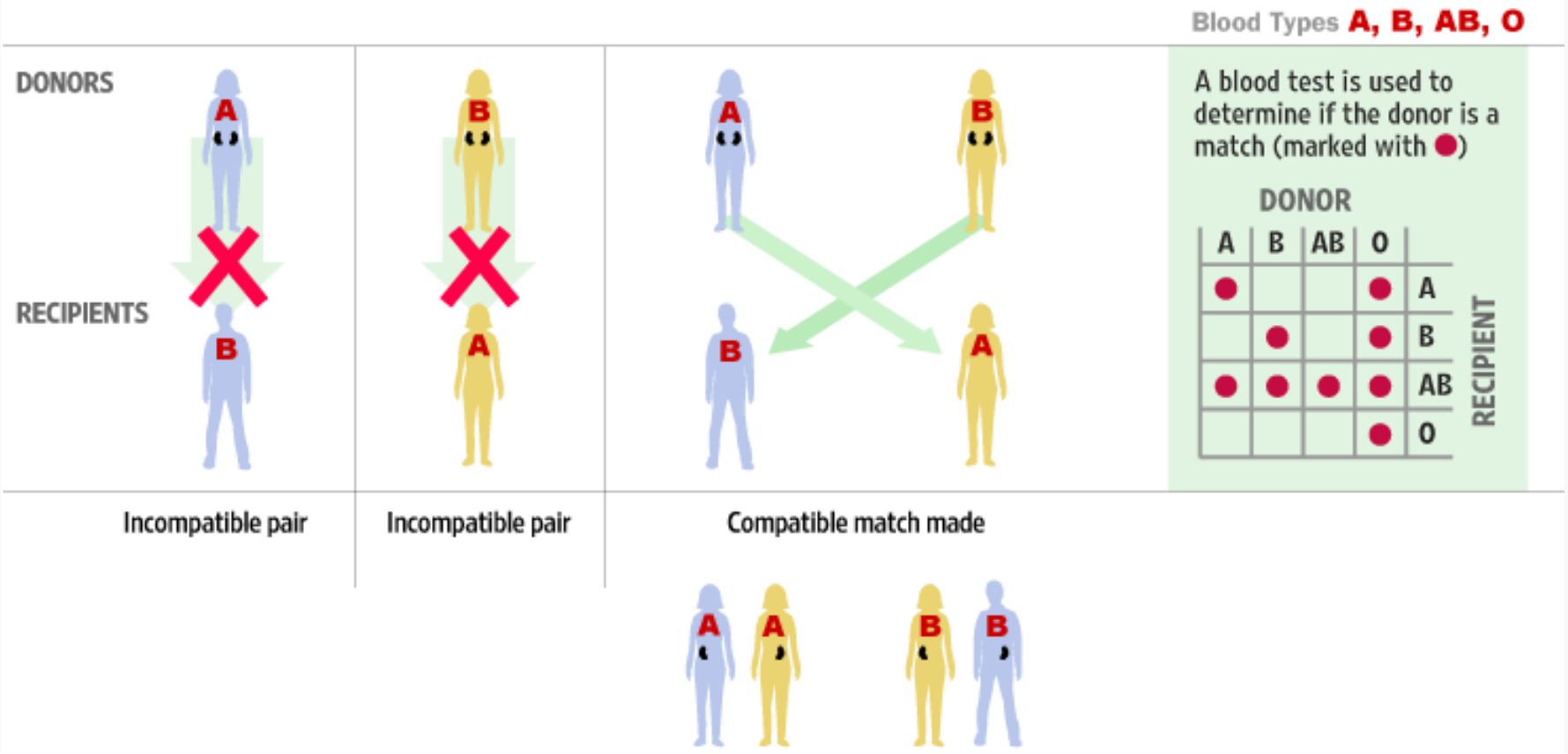
Table 5 (Continued)
Comparison between "Payment to Living Donors" and "Voluntary Army"

Payment to Living Donors	Voluntary Army
• Pay does not prevent other motives, such as to help relatives who are sick.	• Can volunteer for patriotism. • And non-monetary motives.
• Eliminates "Black Market" in organ transplants: - Healthier Conditions. - Better Matches.	
• Save lives of those needing transplants, Improve quality.	• Defend Nation more effectively.

Conclusions

- Organ Transplant problem is grave: Long waits, low quality of life, and many deaths while waiting.
- Solution? Use monetary incentives to attract organs from either live donors or from cadavers.
- These incentives would not raises cost of transplants by a lot, but would eliminate waits, raise life quality, and greatly cuts deaths.
- Arguments against financial incentives are weak and do not face the challenge created by this badly functioning system.

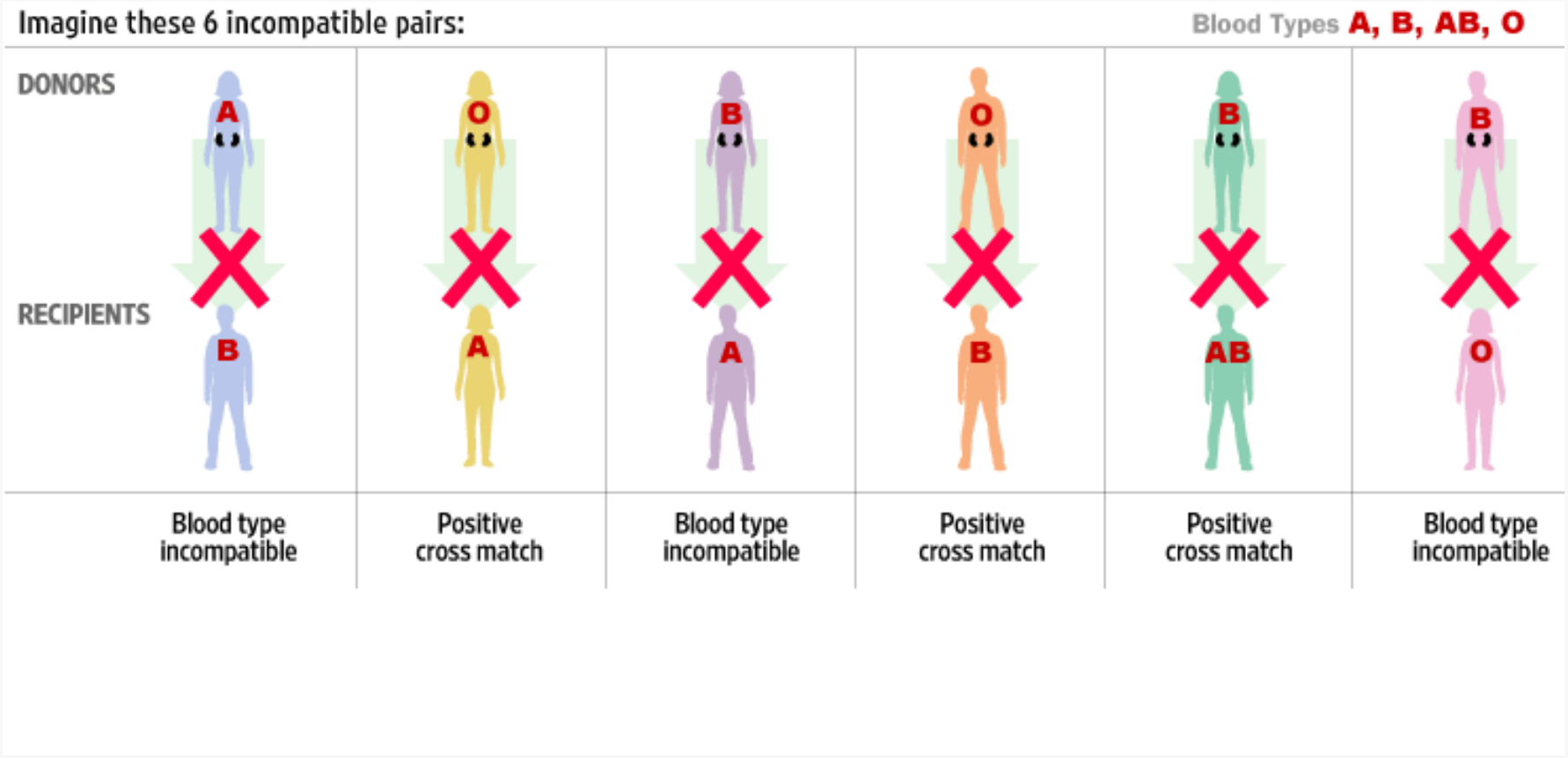
Kidney Paired Donation



Para poder recibir el riñón, los pacientes deben tener el mismo tipo de sangre que los donantes potenciales.

Fuente: WSJ online.

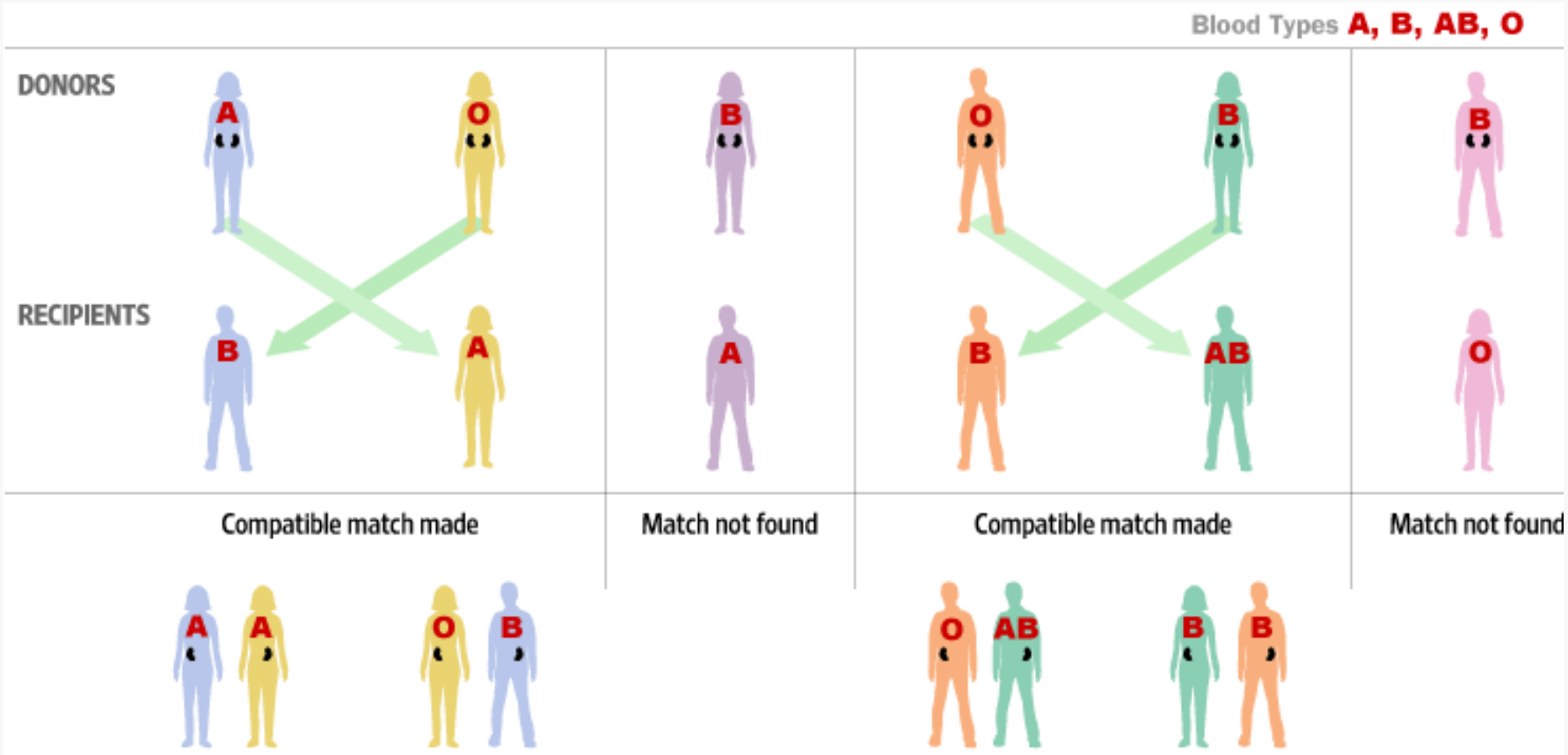
Kidney Paired Donation



Cuando hay muchas parejas (paciente-donante vivo) incompatibles, la pregunta es: ¿Cuál es la mejor forma de asignarlos?

Fuente: WSJ online.

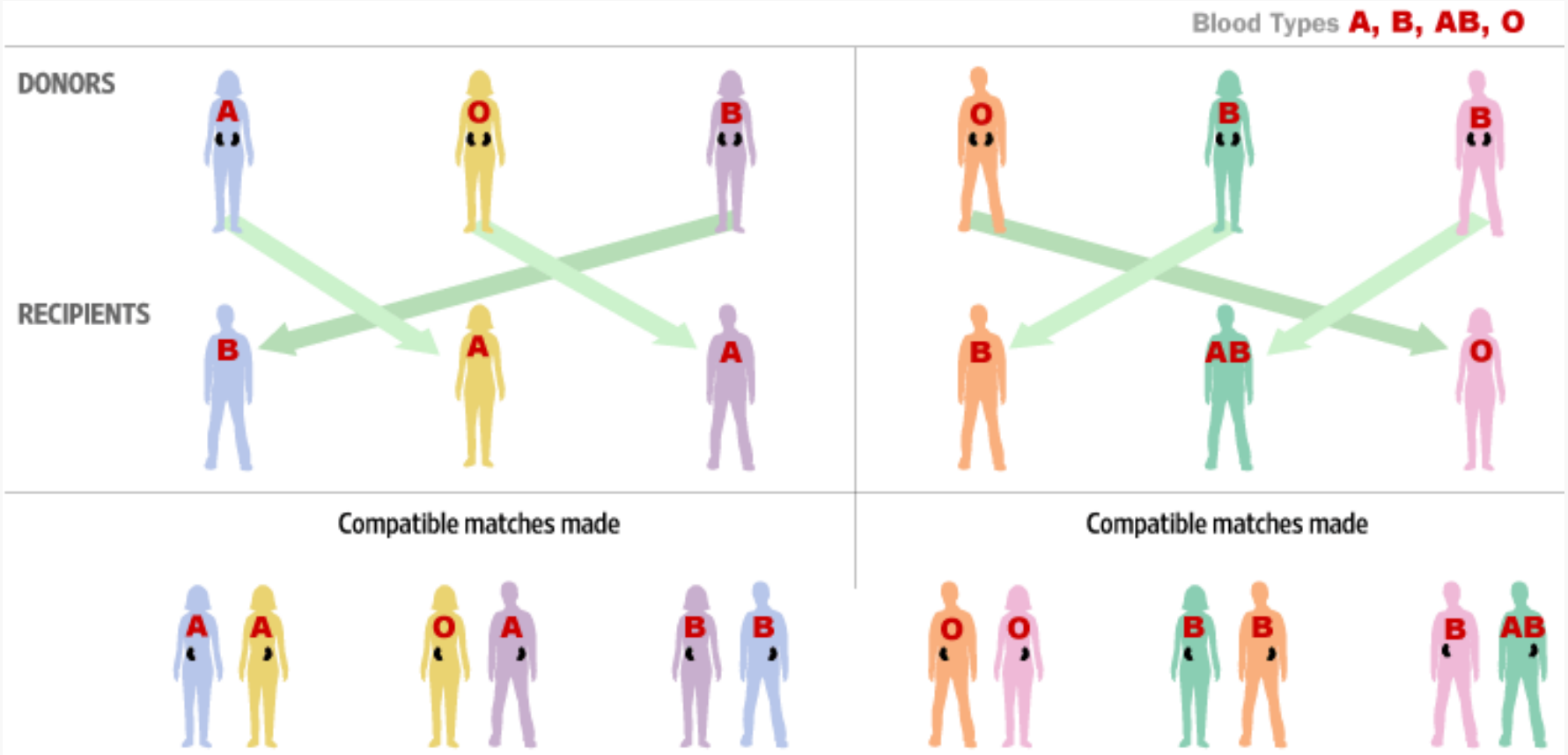
Kidney Paired Donation



Una manera simple es asignar a una pareja dada la primer pareja compatible que se logre identificar. Algunas parejas quedarán afuera.

Fuente: WSJ online.

Kidney Paired Donation



La optimización, que es realizada con la ayuda de complejísimos programas de computadoras, analiza todas las posibilidades y encuentra aquella que maximiza el número de transplantes. En este caso, permitiendo un intercambio entre tres parejas de manera que los seis pacientes encuentran un donante compatible.

Fuente: WSJ online.