Compared with long-term dialysis, renal transplantation generally offers a longer life span and a better quality of life. However, nearly every country has a shortage of kidneys for transplantation. In the United States, 50,000 individuals are waiting for kidney transplantation, yet only 15,000 kidneys are transplanted annually. The shortage is even more severe in developing countries. Despite India's having 4 times the population of the United States, Indian physicians transplant fewer than 4000 kidneys annually, and a number of the organs are received by non-Indians.4-7

In the United States, a majority of kidney transplants come from cadaveric donors; eg, brain-dead victims of motor vehicle crashes. In India, no national cadaveric program exists, and virtually all kidneys come from living donors. Because medically suitable living-related donors are often unavailable or unwilling to donate, most transplants are from living-unrelated donors.5,9,10 Moreover, long-term dialysis treatment is federally financed in the United States but not in India. As a result, only a small number of wealthy patients can pay for dialysis treatment in India.8

Paying people to donate kidneys is often proposed or justified as a way to increase the supply of cadaveric organs.11,12 Proponents argue that incentives such as paying for funeral expenses will supplement whatever altruistic motivations are already present. However, legal issues as well as concerns about weakening altruism and exploiting poor families have so far prevented these proposals from being implemented.13,14

In India, the purchase of kidneys from living-unrelated donors has occurred for more than a decade.4,5,9,15,16 This practice is justified as a way to save the life of patients with no other treatment options and simultaneously help a poor donor overcome extreme poverty.5,6,17-21 Supporters further argue that the seller has the right to choose the fate of his or her kidney and that taking away this option harms the seller financially. They also argue that there is little health risk to the donor from nephrectomy.21 Critics argue that purchasing kidneys amounts to exploiting poor individuals and a violation of their rights.22,23

Context Many countries have a shortage of kidneys available for transplantation. Paying people to donate kidneys is often proposed or justified as a way to benefit recipients by increasing the supply of organs and to benefit donors by improving their economic status. However, whether individuals who sell their kidneys actually benefit from the sale is controversial.

Objective To determine the economic and health effects of selling a kidney.

Design, Setting, and Participants Cross-sectional survey conducted in February 2001 among 305 individuals who had sold a kidney in Chennai, India, an average of 6 years before the survey.

Main Outcome Measures Reasons for selling kidney, amount received from sale, how money was spent, change in economic status, change in health status, advice for others contemplating selling a kidney.

Results Ninety-six percent of participants sold their kidneys to pay off debts. The average amount received was $1070. Most of the money received was spent on debts, food, and clothing. Average family income declined by one third after nephrectomy (P<.001), and the number of participants living below the poverty line increased. Three fourths of participants were still in debt at the time of the survey. About 86% of participants reported a deterioration in their health status after nephrectomy. Seventy-nine percent would not recommend that others sell a kidney.

Conclusions Among paid donors in India, selling a kidney does not lead to a long-term economic benefit and may be associated with a decline in health. Physicians and policy makers should reexamine the value of using financial incentives to increase the supply of organs for transplantation.

Author Affiliations: Department of Internal Medicine, Geisinger Health System, State College, Pa (Dr Goyal); Department of Nephrology, University of California, San Diego (Dr Mehta); Departments of Family and Preventive Medicine and Medicine, University of California, San Diego, School of Medicine (Dr Schneiderman); Division of Nephrology and Center for Health Care Research and Policy, MetroHealth Medical Center, and Departments of Medicine, Biomedical Ethics, and Epidemiology and Biostatistics, Case Western Reserve University, Cleveland, Ohio (Dr Sehgal).
tion of the poor, that the poor do not overcome poverty as a result of the sale, and that this practice prevents a national cadaveric transplant program from being established. They also view kidney sales not as expressions of individual autonomy but rather as acts of desperation by impoverished individuals. Moneylenders may also be more aggressive in demanding payment from debtors who live in areas where kidneys are sold to pay off debts. Middlemen in particular are criticized as misleading potential donors about what a nephrectomy involves and keeping a large share of the payment. In response to this concern, some clinics purchased organs directly from donors. A 1994 law banned the sale of kidneys and further required that all transplant centers have an authorization committee review potential living-unrelated donations to ensure that donations were made out of altruism and not for commercial reasons. Anecdotal reports suggest that sales of kidneys continue despite this law. In addition to identifying neighborhoods of Chennai where sellers resided, a team of 8 Tamil-speaking research assistants identified participants by going door to door in these neighborhoods. They also asked each interviewed participant for names and locations of other people who had sold a kidney. Answers ranged from next-door neighbors to people living in neighborhoods more than 15 km away. Each identified neighborhood was revisited until no more eligible participants were found.

**Interview**

The research assistants explained the nature of the study, obtained informed written consent, verified that participants had nephrectomy scars, and asked the participants the following questions: why they sold their kidney, whether wanting to help a sick person with kidney disease was a major factor in their decision to sell, why they rather than their spouse had sold, how much money was received, whether they sold through a middleman or directly to a clinic, how the money was spent, their annual family income currently and before nephrectomy, their health status currently and before nephrectomy, and what advice they would give to others contemplating selling.

Participants also provided their age, sex, education, and date of nephrectomy. Before the interview, participants were given 40 rupees (approximately $0.89) as compensation for their time. They were told that they could keep the money even if they did not want to answer any or all of the questions. Participants were not asked to name particular physicians, middlemen, hospitals, or clinics where the nephrectomy was done. Each interview was recorded on a questionnaire and lasted approximately 20 minutes. The questionnaire was pilot tested on a separate group of 19 participants, and their responses were used to refine the questions. This study was approved by the institutional review board of the University of California, San Diego.

**Statistical Analysis**

Data are presented by using standard descriptive statistics (mean, median, range, and proportions). We used the paired t test to compare family income before and after nephrectomy (Stata, version 6; Stata Corp, College Station, Tex). Monetary figures were first adjusted for inflation by using the Indian consumer price index and then converted from rupees to dollars by using the exchange rate at the time of the interview ($1 = 45 rupees). The poverty line for Tamil Nadu is $538 a year for an average-sized family.

**RESULTS**

**Participant Characteristics**

Of 305 eligible sellers identified, all agreed to participate (Table 1). Sixty percent of female participants and 95% of male participants worked as laborers or street vendors. Seventy percent of participants sold their kidneys through a middleman, and 30% sold directly to a clinic.

**Reasons for Selling a Kidney**

Almost all the participants sold their kidneys to pay off debts (Table 2). Food and household expenses, rent, marriage expenses, and medical expenses were the most common sources of these debts. When asked a separate question about wanting to help a sick person with kidney disease, 95% of participants said this was not a major factor in their decision to sell.

---

**Table 1. Participant Characteristics (N = 305)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (Median, Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>35 (35, 20-55)</td>
</tr>
<tr>
<td>Female, %</td>
<td>71</td>
</tr>
<tr>
<td>Education, y</td>
<td>2.7 (0, 0-12)</td>
</tr>
<tr>
<td>Annual family income, $</td>
<td>420 (381, 0-1730)</td>
</tr>
<tr>
<td>Income below poverty line, %</td>
<td>71</td>
</tr>
<tr>
<td>Time since nephrectomy</td>
<td>6.0 y (6.4 y, 2 wk-19 y)</td>
</tr>
<tr>
<td>No. of people in household</td>
<td>4.2 (4.0, 1-8)</td>
</tr>
</tbody>
</table>

**METHODS**

**Participants**

The study was conducted during February 2001 in Chennai (formerly called Madras), a large city of 6 million people that is the capital of the state of Tamil Nadu in southern India. Adult residents of Chennai were eligible for inclusion if they had sold a kidney. Because most of these transplants are done in secrecy, written records are often unavailable. We therefore relied on snowball sampling, a standard method for contacting difficult-to-reach populations for face-to-face interviews. We used newspaper articles and information provided by transplant professionals to identify neighborhoods of Chennai where sellers resided. A team of 8 Tamil-speaking research assistants identified participants by going door to door in these neighborhoods. They also asked each interviewed participant for names and locations of other people who had sold a kidney. Answers ranged from next-door neighbors to people living in neighborhoods more than 15 km away. Each identified neighborhood was revisited until no more eligible participants were found.

**Interview**

The research assistants explained the nature of the study, obtained informed written consent, verified that participants had nephrectomy scars, and asked the participants the following questions: why they sold their kidney, whether wanting to help a sick person with kidney disease was a major factor in their decision to sell, why they rather than their spouse had sold, how much money was received, whether they sold through a middleman or directly to a clinic, how the money was spent, their annual family income currently and before nephrectomy, their health status currently and before nephrectomy, and what advice they would give to others contemplating selling.

Participants also provided their age, sex, education, and date of nephrectomy. Before the interview, participants were given 40 rupees (approximately $0.89) as compensation for their time. They were told that they could keep the money even if they did not want to answer any or all of the questions. Participants were not asked to name particular physicians, middlemen, hospitals, or clinics where the nephrectomy was done. Each interview was recorded on a questionnaire and lasted approximately 20 minutes. The questionnaire was pilot tested on a separate group of 19 participants, and their responses were used to refine the questions. This study was approved by the institutional review board of the University of California, San Diego.

**Statistical Analysis**

Data are presented by using standard descriptive statistics (mean, median, range, and proportions). We used the paired t test to compare family income before and after nephrectomy (Stata, version 6; Stata Corp, College Station, Tex). Monetary figures were first adjusted for inflation by using the Indian consumer price index and then converted from rupees to dollars by using the exchange rate at the time of the interview ($1 = 45 rupees). The poverty line for Tamil Nadu is $538 a year for an average-sized family.
Forty-seven participants noted that their spouse had also sold a kidney. The other 221 married participants (159 female participants and 62 male participants) were asked why they sold rather than their spouse. The most common responses by female participants were that their husbands were the breadwinners (30%) or were ill (28%). The most common responses by male participants were that they sold voluntarily (52%) or that their wives were ill or pregnant (19%). Two female participants stated that they had been forced by their husbands to sell a kidney.

**Amount Received From Sale**
The amount promised for selling a kidney averaged $1410 (range, $450-$6280), while the amount actually received averaged $1070 (range, $450-$2660). Both middlemen and clinics promised on average about one third more than they actually paid.

**How Money Was Spent**
Most of the money received was spent on debts (60%), food and clothing (22%), or marriage (5%). Only 11% was retained as cash equivalents (cash, jewelry, bank deposit, or other investment).

**Change in Economic Status**
Although the economic status of individuals in Tamil Nadu has improved throughout the last decade, many of the participants reported a worsening of their economic status. Among all participants, the average annual family income declined from $660 at the time of nephrectomy to $420 at the time of the survey, a decrease of one third ($P<.001). The percentage of participants below the poverty line increased from 54% to 71% ($P<.001). Of the 292 participants who sold a kidney to pay off debts, 216 (74%) still had debts at the time of the survey.

**Change in Health Status**
Participants rated their health status before and after nephrectomy by using a 5-point Likert scale ranging from excellent to poor (Table 3). Forty participants (13%) reported no decline in their health after nephrectomy, 117 (38%) reported a 1- to 2-point decline, and 147 (48%) reported a 3- to 4-point decline. Of all participants, 50% complained of persistent pain at the nephrectomy site and 33% complained of long-term back pain.

**Advice for Others**
Participants were asked what advice they would give someone else with the same reasons they had for selling. Of 264 participants who answered this question, 79% would not recommend selling a kidney, while 21% would.

**Time Since Nephrectomy vs Participant Responses**
Increased time since nephrectomy was associated with a larger amount received from selling a kidney and a larger decline in economic status. The 47 participants who sold a kidney more than 10 years ago received $1603 compared with $975 for participants who sold within the last 10 years ($P<.001). Participants who sold more than 10 years ago also reported a 56% decline in annual family income compared with a 29% decline among participants who sold more recently ($P<.001). There was no relationship between time since nephrectomy and reasons for selling, how the money was spent, changes in health status, and advice for others.

**Importance of Results**
Our quantitative findings, along with those of previous qualitative studies,9,16,31,32,34,35 undercut 5 key assumptions made by supporters of the sale of kidneys. First, although paying people to donate may have increased the supply of organs for transplantation, the financial incentive did not supplement underlying altruistic motivations. Only 5% of participants said wanting to help a sick person was a major factor in their decision to sell. Second, selling a kidney did not help poor donors overcome poverty. Family income actually declined by one third, and most participants were still in debt and living below the poverty line at the time of the survey. Third, regardless of these poor economic outcomes, sellers arguably have a right to make informed decisions about their own bodies. However, most participants would not recommend that others sell a kidney, which suggests that potential donors would be unlikely to sell a kidney if they were better informed of the likely outcomes.

**Table 2. Reasons for Selling a Kidney**

<table>
<thead>
<tr>
<th>Reason</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay off debts</td>
<td>292 (96)</td>
</tr>
<tr>
<td>Food/household expenses</td>
<td>160 (55)</td>
</tr>
<tr>
<td>Rent</td>
<td>71 (24)</td>
</tr>
<tr>
<td>Marriage expenses</td>
<td>65 (22)</td>
</tr>
<tr>
<td>Medical expenses</td>
<td>54 (18)</td>
</tr>
<tr>
<td>Funeral expenses</td>
<td>23 (8)</td>
</tr>
<tr>
<td>Business expenses</td>
<td>23 (8)</td>
</tr>
<tr>
<td>Other debts</td>
<td>49 (17)</td>
</tr>
<tr>
<td>Future marriage expenses</td>
<td>10 (3)</td>
</tr>
<tr>
<td>for daughters</td>
<td></td>
</tr>
<tr>
<td>Extra cash</td>
<td>4 (1)</td>
</tr>
<tr>
<td>Start business</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Other reason</td>
<td>3 (1)</td>
</tr>
</tbody>
</table>

*Percentages do not add up to 100% because some participants had more than 1 reason for selling or more than 1 source of debt.

**Table 3. Health Status Before and After Nephrectomy**

<table>
<thead>
<tr>
<th>Health Before Nephrectomy</th>
<th>Health After Nephrectomy, No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Good</td>
<td>0</td>
</tr>
<tr>
<td>Fair</td>
<td>0</td>
</tr>
<tr>
<td>Poor</td>
<td>0</td>
</tr>
</tbody>
</table>

©2002 American Medical Association. All rights reserved.
Fourth, safeguards such as eliminating middlemen or having an authorization committee did not appear to be effective. Middlemen and clinics paid less than they promised, and the authorization committees did not ensure that donations were motivated by altruism alone. Fifth, nephrectomy was associated with a decline in health status. Previous qualitative reports suggest that a diminished ability to perform physical labor may explain the observed worsening of economic status.31-33 Persistent pain and decline in health status have not been reported in previous long-term follow-up of volunteer donors in developed countries.37

Our findings have important implications for developing and developed countries. In developing countries such as India, potential donors need to be protected from being exploited. At a minimum, protection might involve education about the likely outcomes of selling a kidney. Some have commented that rather than protecting poor people, authorization committees simply provide a cover for illegal cash-for-kidneys deals.9,33,34 Indian legislators should consider modifying the 1994 transplantation act to prevent the sale of organs under such cover. Physicians and policy makers need to work together to develop alternatives for treating renal failure patients. A national cadaveric program is needed, as is an increased emphasis on primary prevention of common diseases that lead to kidney failure. Since paying off debts was the most common reason for selling a kidney, social and economic efforts to reduce or prevent indebtedness are also essential. In developed countries such as the United States, our findings may give pause to efforts to provide financial incentives to encourage donation. In particular, our findings raise concerns about whether providing financial incentives may be viewed by the public as taking advantage of poor families.34 If perceptions about transplantation are adversely affected, such incentives may actually lead to fewer total donations.

A majority of donors were women. Given the often weak position of women in Indian society, the voluntary nature of some donations is questionable.46 In fact, 2 participants said that their husbands forced them to donate. Because the interviews were generally conducted with other family members present, other participants may have been reluctant to mention being forced to donate. In the United States, women are also more likely to be donors than men,46 but in both countries, men are more likely to receive transplants.5,50

Limitations

Several alternative interpretations of our results must be considered. First, our findings may simply represent general declines in the economic and health status of poor people in India and not declines linked to the sale of a kidney. However, although data on self-reported health status are lacking, per capita income for Tamil Nadu has increased by 10% over the last 5 years and by 37% over the last 10 years after adjustment for inflation.51,52 Additionally, the proportion of people living below the poverty line has declined by more than 50% since 1988.33,34

Second, participants may have overestimated their economic and health status before nephrectomy. Among poor people in India, virtually all financial transactions are conducted in cash, and bank accounts are nonexistent. As a result, there are no written financial records that can be used to independently verify participant responses.9 Written medical records are similarly lacking. However, participant responses to questions about their current economic and health status would not be susceptible to a similar recall bias. According to these responses, we can still conclude that participants have debt, live in poverty, have a fair to poor health status, and would not recommend that other people sell a kidney.

Third, the adverse experiences of our participants may not represent those of other sellers. For example, some sellers may have obtained such a large economic benefit that they moved out of the low-income neighborhoods that were the focus of our study. However, no interviewed participant mentioned such individuals when asked for locations of other people who had sold a kidney. In addition, our findings are consistent with those of other qualitative reports.9,16,31,32 These alternative interpretations could be further addressed in studies involving a comparison group, prospective follow-up, independently verified measures of economic and health status, and additional geographic areas. Other topics not explored in this study include the nature of any relationship between participants and recipients, the reasons sellers failed to realize an economic benefit, the reasons their health deteriorated, the reasons the amount received for selling has declined, and the perspectives and roles of recipients, transplant surgeons, middlemen, and donors’ families.

CONCLUSION

The sale of kidneys by poor people in India does not lead to a tangible benefit for the seller. The value of paying for donations must be reexamined in light of these findings. Although patients with kidney failure deserve access to optimal treatment, such treatment should not be based on the exploitation of poor people.

Author Contributions: Study concept and design: Goyal, Mehta, Sehgal. Acquisition of data: Goyal. Analysis and interpretation of data: Goyal, Schneiderman, Sehgal. Drafting of the manuscript: Goyal, Mehta, Sehgal. Critical revision of the manuscript for important intellectual content: Goyal, Mehta, Schneiderman, Sehgal. Administrative, technical, or material support: Mehta. Study supervision: Sehgal.

Acknowledgment: We are grateful for the assistance of transplant professionals who helped us locate sellers, for the hard work of the research assistants, and for the willingness of the participants to share their experiences with us. We also appreciate the input of students and lecturers in the course Activism and Medicine at Case Western Reserve University.

REFERENCES

CONSEQUENCES OF SELLING A KIDNEY