

# Removing Disincentives to Kidney Donation: A Quantitative Analysis

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Kidney transplantation is a modern medical miracle. It greatly improves the length and quality of life of patients suffering from kidney failure and, as a bonus, it saves money for the taxpayer: the discounted present value of taxpayer savings from each transplant is about \$146,000.<sup>1</sup> In view of this win-win situation, there is widespread agreement in the transplant community that all disincentives to kidney donation should be removed.<sup>2–6</sup> Even those who strongly oppose offering positive incentives to kidney donors favor removing the disincentives.<sup>7</sup>

Policymakers in Washington have responded to this consensus sentiment with several actions. In 2007, Congress funded the National Living Donor Assistance Center (NLDAC) to assist low-income organ donors and recipients with travel and lodging expenses.<sup>8</sup> The government is currently sponsoring clinical trials at seven research centers to determine the effects of reimbursing lost wages of organ donors.<sup>9,10</sup> In March of 2019, 34 members of Congress signed a letter to the Secretary of Health and Human Services, urging the Secretary to administratively expand the mandate of NLDAC to include lost wages and other expenses incurred by living organ donors.<sup>11</sup> On July 10, 2019, President Donald Trump issued an executive order to reimburse living donors for extra expenses associated with organ donation, such as lost wages and childcare.

It seems likely that the next major step in the continuing evolution of government policy toward transplantation will be to remove the remaining disincentives to donation. Although forecasting the future is always difficult, it is imperative that we do our best to quantitatively estimate the consequences of moving toward this consensus policy objective. That is the purpose of this Perspective, which focuses on the disincentives facing kidney donors. In it, we

1. identify seven disincentives facing living kidney donors and a single disincentive facing the families of deceased donors;
2. survey the literature and find credible estimates of four disincentives to living donors;
3. estimate the magnitudes of the other three disincentives to living donors;
4. provide a rough estimate of the increase in kidney donations if the government removes all disincentives; and
5. present a sensitivity analysis showing how our results would change if the responsiveness of living donors to the removal of disincentives was 50% greater or less than in our base case.

We show that the total monetary value of the seven disincentives facing a

typical living kidney donor is about \$38,000. Removing all disincentives would increase kidney donations by roughly 12,500 per year, which would cut the adult waiting list for transplant kidneys in half in about 4 years. This would require an initial government outlay of only about \$0.5 billion per year, but would ultimately result in net taxpayer savings of about \$1.3 billion per year. The value to society of the government removing the disincentives would be about \$14 billion per year, reflecting the great value of the additional donated kidneys to recipients and the savings from these recipients no longer needing expensive dialysis therapy.

It should be emphasized that considerable uncertainty surrounds these estimates, especially the likely increase in the number of living kidney donors in response to the government's removal of the disincentives. Detailed calculations of the estimates are shown in the Supplemental Material.

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## DISINCENTIVES FACING LIVING DONORS

We estimate living kidney donors face seven distinct disincentives, as listed in the left column of Table 1. The next four columns show published estimates of the magnitudes of some of these disincentives by earlier researchers: Gaston *et al.*,<sup>12</sup> Becker and Elías,<sup>13</sup> Rodrigue *et al.*,<sup>14,15</sup> and Przech *et al.*<sup>16</sup> (using midpoints of their ranges and adjusting their estimates to the prices and standard of living of the United States in 2017). The second column from the right indicates our own best estimates of the magnitudes of all disincentives, as discussed in detail below. The right column specifies the government actions needed to remove these disincentives within the constraints of the National Organ Transplant Act (Supplemental Appendix 1).<sup>17</sup>

### Disincentive 1: Costs of Travel and Lodging at a Transplant Center

The NLDAC reimburses the cost of travel and lodging for potential kidney

donors who have low incomes and who are donating to low-income recipients. Potential donors participating in this program spent an average of \$2767 for travel and subsistence in 2013.<sup>8</sup> Adjusting this amount to the prices and standard of living in 2017 yields \$3122 (Table 1, second column from right). This is the most accurate estimate of this disincentive because of the detailed accounting of expenses and the large sample size. If the government extends this program to include potential donors of all income levels, it could eliminate this disincentive for all donors.

### Disincentive 2: Loss of Income due to Kidney Donation

The loss-of-income disincentive to living kidney donors includes more than just lost wages (*i.e.*, time off work to donate for which no income is received). It also includes some time off work for which income is received in the form of sick pay, vacation pay, and employment/disability insurance payments which could have been used for purposes other

than donation. We conclude the total loss-of-income disincentive is equal to lost wages, plus two-thirds of the sum of sick pay, vacation pay, and employment/disability insurance payments, as detailed in Supplemental Appendix 2.

Rodrigue *et al.*<sup>14</sup> estimated these income components for United States donors during 2011–2013 and found that lost wages were \$1660, whereas vacation, sick leave, and insurance payments were \$3244. Furthermore, in an earlier related study of the costs incurred before donation, Rodrigue *et al.*<sup>15</sup> estimated that a donor and a companion lost \$263 in wages and \$504 in other payments. The total loss-of-income disincentive was \$4422 ( $= [\$1660 + \$263] + 2/3 \times [\$3244 + \$504]$ ), which is equivalent to \$5118 in 2017 (Table 1).

NLDAC recently began a pilot program to reimburse lost wages of low-income living kidney donors and recipients. If this program were extended to cover income losses of all donors of all income levels, it would eliminate this disincentive. Administratively, it would

**Table 1.** Disincentives to kidney donation facing living donors

Disincentive	Estimated Magnitudes of Disincentives (Adjusted to United States prices and standard of living in 2017)					Proposed Government Action To Remove the Disincentive
	Gaston <i>et al.</i> <sup>12</sup>	Becker and Elías <sup>13</sup>	Rodrigue <i>et al.</i> <sup>14,15</sup>	Przech <i>et al.</i> <sup>16</sup>	McCormick and Held <i>et al.</i> (this study) <sup>a</sup>	
1 Travel to, and lodging near, a transplant center	\$4313 <sup>b</sup>	–	\$1945	\$1653	\$3122	Expand current NLDAC program to include donors of all income levels
2 Loss of income while recovering from surgery	–	\$3631	\$5118	\$4368	\$5118	Expand current NLDAC pilot program to include donors of all income levels, providing donors with a tax credit of \$5000
3 Cost of home/dependent care	–	–	–	\$5592	\$5592	Include cost of home/dependent care in NLDAC program, providing donors with a tax credit of \$6000
4 Risk of dying during kidney removal	\$2951	\$6723	–	–	\$1860	Provide donors with a \$5 million short-term life insurance policy
5 Pain and discomfort of kidney removal	\$6414	–	–	–	\$6414	Provide donors with a tax credit of \$6500
6 Decrease in the long-term quality of life	\$23,250	\$10,085	–	–	\$7910	Provide donors with an insurance policy covering death, disability, and long-term health problems due to donation
7 Concern that a relative or close friend may need a kidney in the future	–	–	–	–	\$7728	Promise to provide a kidney in the future for a specific person in exchange for a donation now
Total	\$36,928	\$20,439	–	–	\$37,745	

<sup>a</sup>Shows results of the current study.

<sup>b</sup>The sum of both disincentive 1 and 2.

probably be simplest to offer potential donors either (1) a \$5000 refundable tax credit, which would be available to everyone, even to those who do not pay any federal income taxes, to offset the average disincentive; or (2) a tax credit of up to \$10,000 if donors can substantiate a greater loss of income.

### Disincentive 3: Cost of Home/Dependent Care while Donors Are Recovering from Surgery

Przech *et al.*<sup>16</sup> estimated “home productivity costs” for Canadian donors in 2009–2014 using a “microcosting” approach, which multiplies average wage rates by the time donors were not able to perform household activities or care for dependents. The result was \$5949 in 2016 Canadian dollars, which is equivalent to \$5592 in the United States in 2017 (Table 1).

This estimate is an order of magnitude higher than estimates on the basis of the usual method of calculating these costs, which counts only out-of-pocket spending. The latter approach significantly underestimates the magnitude of this disincentive to donors and their families because much of the burden of home/dependent care is assumed by nonremunerated caregivers, such as family members or friends. Additionally, dependents may receive a decreased amount of care and the donors themselves may require care.

The cost of home/dependent care could easily be included in the NLDAC program and extended to donors of all income levels. Again, it would probably be administratively easiest to give a refundable tax credit of about \$6000 to all living kidney donors.

### Disincentive 4: Risk of Dying from Kidney Removal

The risk of dying from a nephrectomy is very small, at 3.1 deaths per 10,000 operations.<sup>18</sup> However, the value of a statistical life in the United States is very large. We estimate the value at \$5 million, which is consistent with the consensus \$200,000 value of a quality-adjusted life year (see Supplemental Appendix 3).

Our estimate of the risk-of-dying disincentive is the product of these two numbers: \$1550 ( $=3.1/10,000 \times \$5,000,000$ ). Adding 20% for administration costs brings

the total to \$1860 (Table 1). The government could partly offset this disincentive by providing all kidney donors with a \$5 million short-term life insurance policy to cover the risk of death from donor nephrectomy at a cost to the government of  $< \$2000$  per donor.

### Disincentive 5: Pain and Discomfort of Kidney Removal

Removal of a kidney from a living donor involves significant pain and discomfort. Donors typically spend 2–5 days in the hospital, during which time they are at risk of experiencing an adverse reaction to the anesthesia, hospital-acquired infection (including pneumonia or catheter-associated bacteremia), and venous thromboembolic disease. Donors also may suffer from fatigue for the first month after surgery, and must avoid strenuous activity for up to 6 weeks. Female kidney donors are advised to wait 3–6 months after donation before becoming pregnant, and they are at increased risk of pre-eclampsia.<sup>19</sup>

A systematic review and meta-analysis found postoperative complications after minimally invasive nephrectomy occurred in 7.3% of living donors.<sup>20</sup> Also, in a recent national study of nearly 15,000 United States donors, 16.8% of donors experienced a perioperative complication.<sup>21</sup> Moreover, a questionnaire study of donors 3 months after their operation found that 18.5% rated their overall health as “somewhat worse” than before.<sup>22</sup>

The only study to address compensation for pain and discomfort after kidney donation was a collaborative effort by Gaston, Danovitch, Epstein, Kahn, Matas, and Schnitzler in 2006.<sup>12</sup> These six experts recommended a nontaxable lump sum payment such as a refundable tax credit of \$5000 or a tax deduction of \$10,000. We have no reason to disagree with this consensus judgment. We will adopt the first alternative because a refundable tax credit benefits all kidney donors, including those who do not pay any federal income taxes, whereas a tax deduction is of greater value to higher-income donors with large deductions. Adjusted to the prices and

standard of living of 2017, this tax credit would be \$6414 (Table 1).

### Disincentive 6: Long-Term Health Consequences of Donating a Kidney

There is considerable uncertainty about the long-term effects of nephrectomy on the health of living kidney donors.<sup>23</sup> Several studies have concluded that the long-term risk of death is no higher for living donors than for a control group, either the general population or an age- and comorbidity-matched sample.<sup>20,24–26</sup> A 2018 survey of 52 studies found no evidence that suggested a higher risk for all-cause mortality, cardiovascular disease, hypertension, type 2 diabetes, or adverse psychosocial health outcomes in living kidney donors than in nondonor populations.<sup>27</sup> However, donors had higher diastolic BP, lower eGFRs, and a higher risk for developing ESRD.

To estimate the disincentive to kidney donation caused by a decrease in the donor’s long-term quality of life, we focus on the higher probability of developing ESRD because that is by far the most serious negative long-term consequence of donation. We conclude the disincentive to kidney donation in 2017 because of an increased probability of developing ESRD is about \$6328 (Supplemental Appendix 4).

We lack data on the probability of incurring the other less serious long-term consequences of donation, but we will assume the total magnitude of these disincentives is about one-fourth that of developing ESRD. Therefore, the total disincentive due to a decrease in the long-term quality of life is about \$7910 (Table 1).

Whatever the exact magnitude of this disincentive, the government could offset it by providing a comprehensive insurance policy to cover the long-term risks of death, disability, and physical/mental health problems resulting from donor nephrectomy. This policy could also address other long-term issues, such as unemployment and difficulty obtaining private insurance, as well as legal expenses and short-term medical expenses not otherwise covered by insurance.

The goal would be to provide a blanket of protection for kidney donors to safeguard

them from any long-term negative consequences of kidney donation. Ideally, disagreements about whether a particular medical problem was due to donation or not would be generously resolved in favor of the donor. Although such a government insurance policy would be a great comfort to living kidney donors, it would probably cost the government <\$9000 per donor because these negative outcomes are unlikely (Supplemental Appendix 4).

### Disincentive 7: Concern That a Relative or Close Friend Might Need a Kidney in the Future

Many potential donors are concerned that in the future a relative or close friend might need the kidney they are donating. This can be a significant disincentive to donating it to someone else now. This disincentive has been emphasized by Matas *et al.*<sup>28</sup> and Veale *et al.*<sup>29</sup> Although this is an important consideration, calculating the magnitude of this disincentive—as well as the effect its removal would have on the number of living donors—is challenging.

The expected future value of the donor's kidney to a close relative or friend is the product of five factors:

1. The value of a transplant to a future recipient.
2. The probability the potential recipient will develop ESRD during the recipient's lifetime.
3. The fraction of the recipient's lifetime that the donor's kidney is available.
4. The average quality of the donor's kidney.
5. The probability the recipient is healthy enough to benefit from a living donor kidney transplant.

The details of the calculation are given in Supplemental Appendix 5, and the result is \$7728 (Table 1). This is the expected value of the donor's kidney to a potential future recipient. Although few potential donors would actually perform this sort of explicit calculation, many might reach the conclusion that their second kidney is valuable and they might want to save it for a relative or close friend.

Whatever the magnitude of this disincentive, the government could offset it. In exchange for the donor agreeing to donate to someone on the kidney waiting list (or likely to be placed on the list), the government or its designated agent, the Organ Procurement and Transplantation Network (OPTN), could promise to give priority to a specific relative or friend of the donor to receive a kidney in the future should that specific person develop ESRD, just as OPTN currently does for kidney donors themselves. Note that this proposal would not require any increase in government spending (see Supplemental Appendix 6).

### THE SINGLE DISINCENTIVE FACING THE FAMILIES OF DECEASED DONORS

Turning to the disincentives facing the families of deceased donors, currently in the United States all medical expenses associated with donation of the organs of the deceased are covered by the government through organ procurement organizations. The major disincentive to donation is psychological or emotional. Some families are reluctant to allow the organs of a loved one to be removed, especially because the patient's heart is usually still beating and the family may be in a state of shock if the death was unexpected. This is a substantial disincentive to donation in many cultures, as evidenced by the low rates of deceased donor donation in most countries of the world.

The government could offset this disincentive by using the same approach suggested in the discussion of disincentive 7 above. The government could promise to give priority to a specific named relative or friend of the next of kin to receive a kidney in the future should that person develop ESRD. If this policy were adopted, the rate at which the next of kin approve the donation of the kidneys of their deceased loved ones would likely increase.

Deceased donor kidneys currently account for the majority of donated kidneys, 14,077 out of 19,849 in 2017,<sup>30</sup> but there is little room for them to increase

further. The OPTN system claims it currently recovers about 75% of potential deceased donor kidneys<sup>31</sup> under current institutional arrangements. If promising to give a specific relative priority in receiving a transplant kidney raises the recovery rate to 80%, as we estimate, deceased donor kidneys would increase by only a modest 938 ( $=14,077 \times [0.80 - 0.75] / 0.75$ ). This would benefit, not harm, patients already on the waiting list (see Supplemental Appendix 7).

### POTENTIAL KIDNEY DONORS SHOULD BE INFORMED OF THE MAGNITUDE OF THE DISINCENTIVES

Note in Table 1 that the estimated disincentives facing a typical living kidney donor total almost \$38,000. This is much larger than the numbers usually mentioned in discussions about removing disincentives (see Delmonico *et al.*<sup>7</sup>), although it is close to the sum estimated by Gaston *et al.*<sup>12</sup> Potential kidney donors should be apprised of these (and all other credible) estimates of the magnitudes of the disincentives to enable them to give their informed consent to donation.

Some may fear that this knowledge may dissuade some potential kidney donors from making the donation. If that occurs, the proper remedy is for the government to reimburse donors for these disincentives, not to withhold this information from them. Indeed, government reimbursement of \$38,000 is small compared with the estimated \$146,000 that each additional transplant saves taxpayers, let alone the \$1,132,000 net welfare gain it confers on society (see Held *et al.*<sup>1</sup> Table 3, left column).

### THE INCREASE IN LIVING KIDNEY DONORS IN RESPONSE TO THE REMOVAL OF ALL DISINCENTIVES

The total disincentive of almost \$38,000 is a substantial deterrent to kidney donation. It goes a long way toward explaining why only 5811 patients (4.6%) of 125,400

**Table 2.** Rough estimate of increase in living donors per year if all disincentives are removed

Source	Magnitude of Disincentive Removed	Percent Increase in Living Donors	Rough Estimate of Increase in United States Living Donors per year if All Disincentives Are Removed
Schnier <i>et al.</i> <sup>35</sup>	\$3122	14	9836
New Zealand <sup>36,37</sup>	\$5118	22	9428
Halpern <i>et al.</i> <sup>38</sup>	\$10,000	61	13,380
State of Israel <sup>39</sup>	\$37,745	231	13,423
Average			11,517

In the Schnier case (top row), removing \$3122 of disincentives resulted in a 14% increase in living donors. So removing all \$37,745 of disincentives might cause a proportionate 169.3% ( $=[\$37,745/\$3122] \times 14\%$ ) increase in living donors. Since the initial level of living donors in 2017 was 5811, the increase in living donors would be 9836 ( $=5811 \times 1.693$ ) per year (right column). See also Supplemental Appendix 8.

patients diagnosed with ESRD in the United States in 2017, most<sup>32</sup> of whom could have benefited from a kidney transplant, received a kidney from a living donor. Conversely, if the government removes this large disincentive, it would likely boost donations from living donors substantially.

Ideally to estimate the increase in kidney donations by living donors if

all disincentives were removed, we would like to have the results of clinical trials on this subject. But the National Organ Transplant Act has created such uncertainty about what research is permitted that no such results exist. To remove this uncertainty, a bill has recently been introduced in Congress to clarify that government-run pilot programs to provide incentives to increase organ

donation are legal.<sup>33</sup> Until results of such research are available, the best we can do is rely on indirect evidence, such as the four sources of information shown in Table 2 on the percentage increase in living donors in response to the removal of different disincentives (Supplemental Appendix 8).

Although each of these four sources of evidence has significant shortcomings,

**Table 3.** Government outlays to remove disincentives, taxpayer savings, and net welfare gain (in 2017 dollars per year)

Response of living donors to removal of disincentives (annual data)		Low Response Case (-50%)	Base Case <sup>a</sup>	High Response Case (+50%)	
Living donors before disincentives removal <sup>b</sup>		5811	5811	5811	
Increase in living donors due to removal		+5758	+11,517	+17,275	
Living donors after disincentives removal		11,569	17,328	23,086	
Disincentive		Outlays per Donor (in \$) <sup>c</sup>	Outlays for All Donors (in \$ per yr)		
1	Travel to, and lodging at, transplant center	\$3122	\$36m	\$54m	\$72m
2	Loss of income while recovering from surgery	\$5118	\$59m	\$89m	\$118m
3	Cost of home/dependent care	\$5592	\$65m	\$97m	\$129m
4	Risk of dying during kidney removal	\$1860	\$22m	\$32m	\$43m
5	Pain and discomfort from kidney removal	\$6414	\$74m	\$111m	\$148m
6	Decrease in the long-term quality of life	\$7910	\$92m	\$137m	\$183m
7	Concern that a relative or close friend may need a kidney	\$0	\$0	\$0	\$0
Total government outlays		\$30,017	\$347m	\$520m	\$693m
Savings and Welfare Gain					
Gross savings for all taxpayers (billions of \$/yr) (\$146,000/transplant × increase in transplants)			\$1.0B	\$1.8B	\$2.7B
Net savings for all taxpayers (billions of \$/yr) (gross savings–total government outlays)			\$0.6B	\$1.3B	\$2.0B
Net welfare gain for society (billions of \$/yr) (\$1,132,000–\$30,017) per transplant times increase in transplants			\$7.4B	\$13.7B	\$20.1B

m, millions; B, billions.

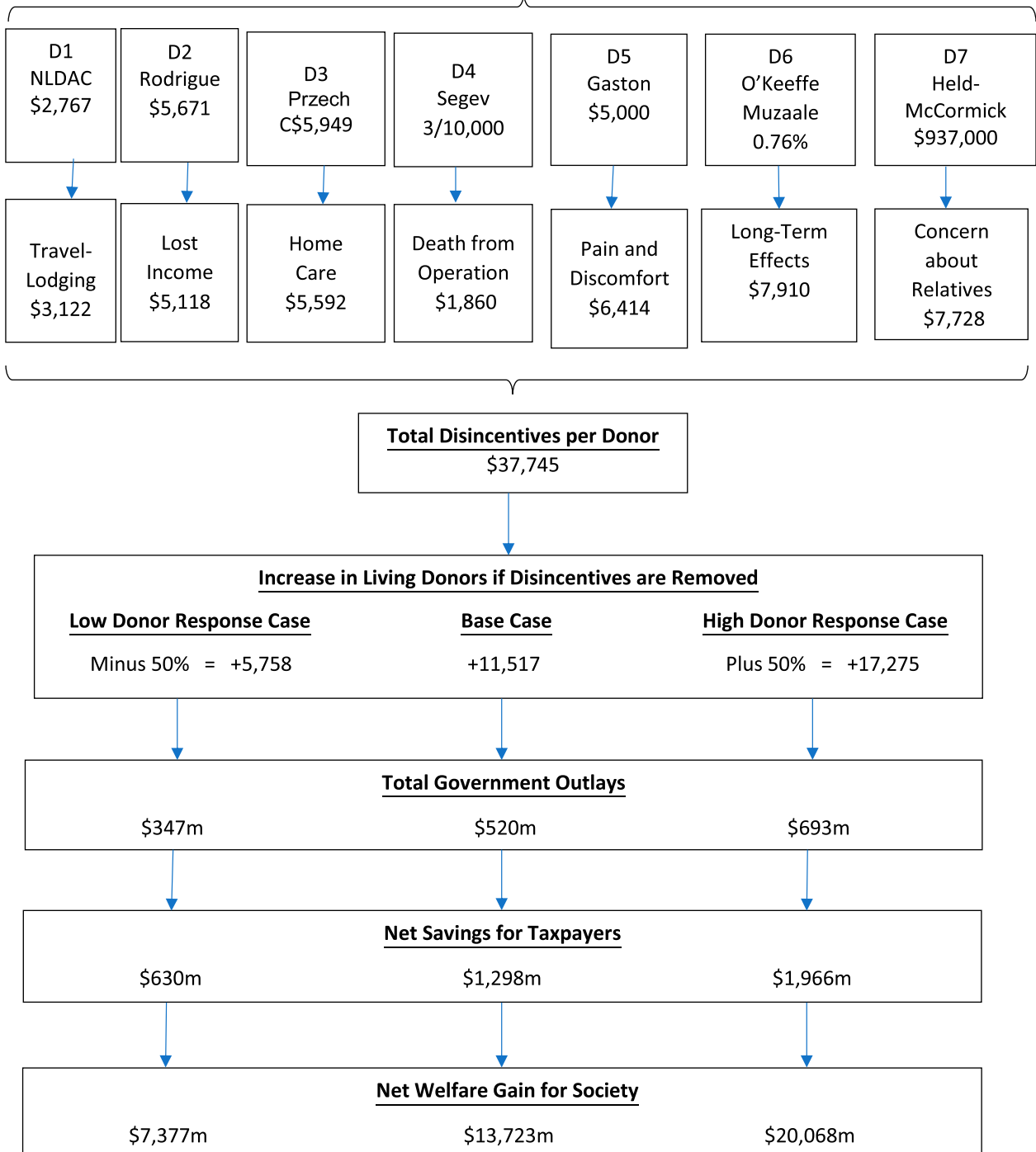
<sup>a</sup>Base case is the most likely outcome.

<sup>b</sup>Living Donors in the United States (<https://optn.transplant.hrsa.gov/data/view-data-reports/national-data/>).

<sup>c</sup>From Table 1.

### Summary Diagram

#### Primary Source of Published Data to Estimate Each Disincentive



**Figure 1.** Summary diagram: from primary data sources to estimates of living donors, government outlays, taxpayer savings, and net welfare gain per year.

it is reassuring that they all point toward a similar result, \$11,517. Nonetheless, given the uncertainty surrounding this estimate, we conduct in Table 3 a

sensitivity analysis using two alternative scenarios with donor responsiveness to the removal of disincentives plus and minus 50% of that in the base case. This

gives some idea of the wide range of outcomes that are possible. Note that we assume the uncertainty surrounding the increase in living donors is symmetric around

the base case, *i.e.*, there is an equal chance the increase will be above the base case as below it (Supplemental Appendix 8).

An increase in kidneys from living donors of 11,517, combined with the 938 rise in kidneys from deceased donors, is estimated to cause the waiting list for transplant kidneys to decline rapidly from 92,685 at the end of 2017 to half that level in about 4 years (details of this calculation are provided in Supplemental Appendix 9).

### WHAT WOULD IT COST TAXPAYERS TO REMOVE THE DISINCENTIVES TO LIVING DONORS?

Before policymakers can act to remove the disincentives facing living kidney donors, they would like to have a reasonable idea of the total cost of doing so. Table 3 shows our estimates of annual government outlays, savings to taxpayers, and the net welfare gain for society for each of the three cases (detailed calculations for the top 11 rows are given in Supplemental Appendix 10).

The third row from the bottom of Table 3 shows our estimates of the gross savings for all taxpayers because patients on the waiting list who receive the additional transplant kidneys would no longer need expensive dialysis therapy. The discounted present value of taxpayer savings from each such transplant is estimated to be \$146,000.<sup>1</sup> In the base case, the annual gross taxpayer savings from the 11,517 increase in kidneys from living donors plus the 938 increase in kidneys from deceased donors is estimated to be \$1.8 billion ( $=\$146,000 \times [11,517 + 938]$ ) per year (with a range of \$1.0 billion to \$2.7 billion between the low donor response case and the high donor response case).

The second row from the bottom shows our estimates of the net savings for all taxpayers after subtracting from gross savings the initial total government outlays for all taxpayers. For the base case, the net taxpayer savings are about \$1.3 billion ( $=\$1.8 \text{ billion} - \$0.5 \text{ billion}$ ) per year. In the long run, removing the

disincentives to donation does not cost taxpayers anything, rather it saves them about \$1.3 billion per year. Moreover, it does not take long for taxpayer savings to turn positive. Dialysis is so expensive compared with transplantation that a transplant pays for itself in 2 years. Thereafter, the taxpayer savings steadily accumulate for the rest of the budget planners' 10-year time horizon.

Note in Table 3 that even in the low response case, where living donors increase only 5758 in response to the removal of disincentives, the net savings is still \$0.6 billion. Indeed, as long as the increase in living donors is  $>326$  per year (3% of the response in the base case), taxpayers would save money (Supplemental Appendix 10). Consequently, it is highly unlikely that removing the disincentives to kidney donors will cost taxpayers anything in the long run.

The bottom row of Table 3 shows our estimates of the net economic welfare gain for society, the total economic benefit of removing the disincentives minus the total economic cost. The discounted present value of the welfare gain for society from each additional transplant is estimated to be \$1,132,000, which is mainly due to the value of the additional donated kidneys to recipients and the savings from these recipients no longer needing expensive dialysis therapy.<sup>1</sup> In the base case, the net welfare gain for society, after subtracting the initial government outlays, is \$13.7 billion ( $=[\$1,132,000 - \$30,017] \times [11,517 + 938]$ ) per year (with a range of \$7.4 billion to \$20.1 billion between the low and high response cases). Note that this net welfare gain for society is 26 ( $=\$13,700 \text{ million} / \$520 \text{ million}$ ) times larger than the initial government outlays needed to unlock this welfare gain.

Finally, the government can afford to err on the side of generosity in reimbursing living kidney donors (Supplemental Appendix 11), and such reimbursements should not be taxable (Supplemental Appendix 12).

Figure 1 summarizes the entire argument about how the removal of disincentives to living kidney donors will

affect the number of living donors, initial government outlays, net taxpayer savings, and the net welfare gain for society for the three cases. It underscores the wide range of outcomes that are possible, given the uncertainty about the responsiveness of living donors to the removal of disincentives.

### LIMITATIONS OF THIS STUDY

The most important limitation of this analysis is the uncertainty surrounding the large number of assumptions and calculations that must be made to estimate the consequences of taking this likely next step in the evolution of United States transplantation policy. In particular, there is considerable uncertainty about (1) the likely response of potential living kidney donors to the removal of all disincentives, and (2) the magnitude of disincentive 7, especially the number of specific persons to whom the average donor would be willing and able to donate their second kidney.

### CONCLUSIONS

There is widespread support in the transplant community for removing the disincentives to kidney donation. This study is an effort to quantitatively analyze such a policy. We estimate the disincentives facing living kidney donors total almost \$38,000. This estimate is much higher than is commonly assumed although close to a previous estimate by Gaston *et al.*<sup>12</sup> in 2006. If the government removes all of these disincentives, we estimate kidney donations from both living and deceased donors would increase about 12,500 per year, which would cut the kidney waiting list in half in about 4 years. Removing all the disincentives would require an initial government outlay of only about \$0.5 billion per year, which would quickly be recouped leading to net taxpayer savings of about \$1.3 billion per year. Most importantly, society would reap a net welfare gain of about \$14 billion per year, reflecting the great value of the additional

donated kidneys to recipients and the savings from these recipients no longer needing expensive dialysis therapy.

Although we hope this study moves the discussion of removing disincentives significantly forward, it is hardly the last word. Reasonable critics are sure to find some specific assumptions and calculations in this plethora of numbers with which they disagree. Nevertheless, we suggest there is broad agreement about the need to reduce the disincentives facing kidney donors and the benefits of doing so.

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The authors of this Perspective are solely responsible for any errors. The interpretation and reporting of these data are the responsibility of the authors and in no way should be seen as an official policy or interpretation of the United States Government.

Dr. McCormick and Dr. Held were responsible for the conception and design of the paper, acquisition of data, drafting the paper, and revising it. Dr. Chertow, Dr. Peters, and Dr. Roberts were responsible for designing and revising the paper. All authors approved the final version of the manuscript.

## DISCLOSURES

Dr. Chertow reports personal fees from Akebia, personal fees from AMAG, personal fees from Amgen, personal fees and other from Ardelyx, personal fees from Astra Zeneca, personal fees from Baxter, other from Cricket Health, other from Durect, other from DxNow, personal fees from Gilead, other from Outset, personal fees from Reata, personal fees from Sanifit, personal fees from Bayer,

personal fees from ReCor, personal fees from Vertex, outside the submitted work. All of the remaining authors have nothing to disclose.

## SUPPLEMENTAL MATERIAL

This article contains the following supplemental material online at <http://jasn.asnjournals.org/lookup/suppl/doi:10.1681/ASN.2019030242/-/DCSupplemental>.

Supplemental Appendix 1. NOTA Would Not Have to Be Amended.

Supplemental Appendix 2. Sick, Vacation, and Employment/Disability Insurance Pay.

Supplemental Appendix 3. Value of a Statistical Life.

Supplemental Appendix 4. Economic Loss from ESRD.

Supplemental Appendix 5. Expected Value of Donor's Kidney.

Supplemental Appendix 6. Priority Proposal Would Not Require Any Increase in Government Spending.

Supplemental Appendix 7. Waiting List Patients Would Benefit from More Deceased Donors.

Supplemental Appendix 8. The Increase in Living Donors in Response to the Removal of Different Disincentives.

Supplemental Appendix 9. Removing Disincentives Would Rapidly Reduce the Kidney Waiting List.

Supplemental Appendix 10. What Would It Cost Taxpayers to Remove the Disincentives to Living Donors?

Supplemental Appendix 11. The Government Can Afford to Err on the Side of Generosity in Reimbursing Living Kidney Donors.

Supplemental Appendix 12. Government Reimbursement of Disincentives Should Not Be Taxable.

## REFERENCES

- Held PJ, McCormick F, Ojo A, Roberts JP: A cost-benefit analysis of government compensation of kidney donors. *Am J Transplant* 16: 877–885, 2016
- Salomon DR, Langnas AN, Reed AI, Bloom RD, Magee JC, Gaston RS; AST/ASTS Incentives Workshop Group (IWG): AST/ASTS workshop on increasing organ donation in the United States: Creating an "arc of change" from removing disincentives to testing incentives. *Am J Transplant* 15: 1173–1179, 2015

- LaPointe Rudow D, Hays R, Baliga P, Cohen DJ, Cooper M, Danovitch GM, et al.: Consensus conference on best practices in live kidney donation: Recommendations to optimize education, access, and care. *Am J Transplant* 15: 914–922, 2015
- Tushla L, Rudow DL, Milton J, Rodrigue JR, Schold JD, Hays R; American Society of Transplantation: Living-donor kidney transplantation: Reducing financial barriers to live kidney donation—recommendations from a consensus conference. *Clin J Am Soc Nephrol* 10: 1696–1702, 2015
- Hays R, Rodrigue JR, Cohen D, Danovitch G, Matas A, Schold J, et al.: Financial neutrality for living organ donors: Reasoning, rationale, definitions, and implementation strategies. *Am J Transplant* 16: 1973–1981, 2016
- OPTN/UNOS Public Comment Proposal: A white paper addressing financial incentives for organ donation. 2014
- Delmonico FL, Martin D, Domínguez-Gil B, Muller E, Jha V, Levin A, et al.: Living and deceased organ donation should be financially neutral acts. *Am J Transplant* 15: 1187–1191, 2015
- Ndote M: Press Release: Transplantation: Funding Renewed for Nationwide Program to Reduce Financial Disincentives for Living Organ Donors. NLDAC, October 15, 2014
- Gifford KA, Merion RM, Mathur AK, Ojo AO: Effect of lost wage reimbursement to kidney donors on living donation rates, 2017. Available at: <https://clinicaltrials.gov/ct2/show/NCT03350269>. Accessed July 6, 2019
- Rodrigue JR, Fleishman A, Carroll M, Evenson AR, Pavlakis M, Mandelbrot DA, et al.: The living donor lost wages trial: Study rationale and protocol. *Curr Transplant Rep* 5: 45–54, 2018
- Cartwright M, Beutler JL: Letter from members of Congress to Health and Human Services Secretary urging him to expand the mandate of the National Living Donor Assistance Center. March 6, 2019
- Gaston RS, Danovitch GM, Epstein RA, Kahn JP, Matas AJ, Schnitzler MA: Limiting financial disincentives in live organ donation: A rational solution to the kidney shortage. *Am J Transplant* 6: 2548–2555, 2006
- Becker GS, Elías JJ: Introducing incentives in the market for live and cadaveric organ donations. *J Econ Perspect* 21: 3–24, 2007
- Rodrigue JR, Schold JD, Morrissey P, Whiting J, Vella J, Kayler LK, et al.: KDOC Study Group: Direct and indirect costs following living kidney donation: Findings from the KDOC study. *Am J Transplant* 16: 869–876, 2016
- Rodrigue JR, Schold JD, Morrissey P, Whiting J, Vella J, Kayler LK, et al.: KDOC Study Group: Predonation direct and indirect costs incurred by adults who donated a kidney: Findings from the KDOC Study. *Am J Transplant* 15: 2387–2393, 2015



16. Przech S, Garg AX, Arnold JB, Barnieh L, Cuerden MS, Dipchand C, et al.; Donor Nephrectomy Outcomes Research (DONOR) Network: Financial costs incurred by living kidney donors: A prospective cohort study. *J Am Soc Nephrol* 29: 2847–2857, 2018
17. Charlie Norwood Act, amendments to the National Organ Transplant Act of 1984. Public Law 110-144-December 21, 2007. Available at: <http://optn.transplant.hrsa.gov/policiesAndBylaws/nota.asp>
18. Segev DL, Muzaale AD, Caffo BS, Mehta SH, Singer AL, Taranto SE, et al.: Perioperative mortality and long-term survival following live kidney donation. *JAMA* 303: 959–966, 2010; doi: 10.1001/jama.2010.237
19. Segev D: What to Expect as a Living Donor - Johns Hopkins Medicine. Available at: [https://www.hopkinsmedicine.org/transplant/programs/.../living\\_donors/expect.html](https://www.hopkinsmedicine.org/transplant/programs/.../living_donors/expect.html). Accessed July 6, 2019
20. Kortram K, Ijzermans JN, Dor FJ: Perioperative events and complications in minimally invasive live donor nephrectomy: A systematic review and meta-analysis. *Transplantation* 100: 2264–2275, 2016
21. Lentine KL, Lam NN, Axelrod D, Schnitzler MA, Garg AX, Xiao H, et al.: Perioperative complications after living kidney donation: A national study. *Am J Transplant* 16: 1848–1857, 2016
22. Hosseini K, Omorou AY, Hubert J, Ngueyon Sime W, Ladrière M, Guillemin F: Nephrectomy complication is a risk factor of clinically meaningful decrease in health utility among living kidney donors. *Value Health* 20: 1376–1382, 2017
23. Cook PJ, Krawiec KD: If we allow football players and boxers to be paid for entertaining the public, why don't we allow kidney donors to be paid for saving lives? *Law Contemp Probl* 81: 9–35, 2018
24. Reese PP, Bloom RD, Feldman HI, Rosenbaum P, Wang W, Saynisch P, et al.: Mortality and cardiovascular disease among older live kidney donors. *Am J Transplant* 14: 1853–1861, 2014
25. Lam NN, Lentine KL, Levey AS, Kasiske BL, Garg AX: Long-term medical risks to the living kidney donor. *Nat Rev Nephrol* 11: 411–419, 2015
26. Ibrahim HN, Foley R, Tan L, Rogers T, Bailey RF, Guo H, et al.: Long-term consequences of kidney donation. *N Engl J Med* 360: 459–469, 2009
27. O'Keefe LM, Ramond A, Oliver-Williams C, Willeit P, Paige E, Trotter P, et al.: Mid- and long-term health risks in living kidney donors: A systematic review and meta-analysis. *Ann Intern Med* 168: 276–284, 2018
28. Matas AJ, Satel S, Munn S, Richards JR, Tan-Alora A, Ambagtsheer FJ, et al.; Working Group on Incentives for Living Donation: Incentives for organ donation: Proposed standards for an internationally acceptable system. *Am J Transplant* 12: 306–312, 2012
29. Veale JL, Capron AM, Nassiri N, Danovitch G, Gritsch HA, Waterman A, et al.: Vouchers for future kidney transplants to overcome "chronological incompatibility" between living donors and recipients. *Transplantation* 101: 2115–2119, 2017
30. Scientific Registry of Transplant Recipients (SRTR): *Annual Data Report, I. Kidney*, Washington, DC, US Department of Health and Human Services, HRSA, 2018
31. Bolton L: The Ethics of Deceased Organ Recovery without Requirements for Explicit Consent or Authorization. OPTN/UNOS Ethics Committee. August 15, 2016. Available at: [https://optn.transplant.hrsa.gov/media/1917/ethics\\_deceased\\_organ\\_recover\\_without\\_requirements\\_20160815.pdf](https://optn.transplant.hrsa.gov/media/1917/ethics_deceased_organ_recover_without_requirements_20160815.pdf). Accessed July 7, 2019
32. McCormick F, Held PJ, Chertow GM: The terrible toll of the kidney shortage. *J Am Soc Nephrol* 29: 2775–2776, 2018
33. Cartwright M: Organ Donation Clarification Act of 2018, H.R.6448 -115th Congress. Introduced 07/19/2018. Available at: <https://www.govinfo.gov/bulkdata/BILLSTATUS/115/hr/BILLSTATUS-115hr6448.xml>. Accessed July 8, 2019
34. US Renal Data System: *Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States*, Bethesda, MD, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, 2017
35. Schnier K, Merion RM, Turgeon N, Howard DH: Subsidizing altruism in living organ donation. *Econ Inq* 56: 398–423, 2018
36. Press Release: New Zealand National Party: Heroic live organ donors receive fair compensation, December 4, 2018. Available at: <http://www.scoop.co.nz/stories/PA1812/S00038/heroic-live-organ-donors-receive-fair-compensation.htm?from-mobile=bottom-link-01>. Accessed July 8, 2019
37. Organ Donation New Zealand: Statistics: Number of Transplant Operations in New Zealand (2014–2018). Available at: <https://www.donor.co.nz/facts-and-myths/statistics/>. Accessed July 6, 2019
38. Halpern SD, Raz A, Kohn R, Rey M, Asch DA, Reese P: Regulated payments for living kidney donation: An empirical assessment of the ethical concerns. *Ann Intern Med* 152: 358–365, 2010
39. State of Israel Ministry of Health: Organ Transplants. Available at: [https://www.health.gov.il/English/Topics/organ\\_transplant/Pages/Transplants.aspx](https://www.health.gov.il/English/Topics/organ_transplant/Pages/Transplants.aspx). Accessed November 10, 2018