



# Living Donor Candidates' Self-reported Health and Health Perceptions and Completion of Donor Evaluation: A Cohort Study

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**Rationale & Objective:** Given the organ shortage in the United States, increasing living donation is vital to improving access to kidney transplantation, but many donor candidates do not complete the donor evaluation. Our objective was to understand potential living donors' perceived health and its association with the likelihood of completing the donor evaluation process.

**Study Design:** Potential donors' self-reported health was ascertained using the Patient Reported Outcomes Measurement Information System (PROMIS) global physical and mental health and the Davies and Ware Health Perceptions surveys.

**Setting & Participants:** Potential living donors who expressed interest in donation at a single medical center were recruited prospectively between 2017 and 2022.

**Exposure:** Donors' self-reported health and health perceptions.

**Outcomes:** Completion of the donor evaluation.

**Analytical Approach:** Adjusted linear and logistic regression models were used to examine the association between self-reported health and health perceptions with outcomes.

**Results:** A total of 1,347 individuals were included for study; 46% (N = 613) were < 40

years of age, 71% (n = 951) were female, 22% (n = 294) were of Hispanic ethnicity, and 16% (n = 215) completed the donor evaluation. The mean PROMIS global physical health ( $17.0 \pm 1.9$ ) and mental health ( $15.5 \pm 2.7$ ) raw scores were higher among donor candidates proceeding to completion of the donor evaluation when compared with those who withdrew early in the process ( $16.3 \pm 2.2$  for physical health and  $14.9 \pm 3.1$  for mental health). Every z-score change in the PROMIS physical health score was associated with 1.48-fold higher odds of completing the donor evaluation (95% CI, 1.19-1.85). Fully adjusted models incorporating the PROMIS scores for predicting the completion of donor evaluations had a c-statistic of 0.70. Potential donors' Davies and Wares health perceptions did not predict the likelihood of completing the donor evaluation in fully adjusted models.

**Limitations:** Data are derived from a single center and may not generalize to the donor evaluation process at other transplant centers.

**Conclusions:** Donor candidates' self-reported physical health may serve as a predictor of the likelihood of completing the donor evaluation process and a potential avenue for future interventions.

Complete author and article information provided before references.

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In 2019, the Advancing American Kidney Health Initiative was launched by the federal government to encourage the pursuit of kidney transplantation as the preferred modality for kidney replacement therapy.<sup>1,2</sup> Given the current organ shortage in the United States, meeting this goal would require expansion of access to donors—both deceased and living. However, rates of living donor transplantation have declined since 2005 despite the implementation of multiple policies and programs to address potential barriers to donation—including coverage of donor income loss, travel costs, and dependent care.<sup>3,4</sup> Furthermore, many potential living donors ultimately do not complete the evaluation process or decline to donate, even if deemed to be acceptable candidates.<sup>5,6</sup>

The rates of living donation among candidates who begin the evaluation process have varied in the literature, but have been reported to be as low as 10%.<sup>6</sup> Although previous studies identified reasons individuals who had completed the donor evaluation ultimately did not donate,<sup>7-12</sup> potential donors who abort the donor evaluation early (eg, after first

contact with the transplant center for screening for absolute contraindications) are likely to be excluded from such studies. It is possible those who do not move forward in the donor evaluation are less healthy and therefore at higher risk for complications after donation. It is also possible that an individual's perceptions of their own health (eg, reflecting guilt surrounding unhealthy behaviors) may influence their willingness to complete the donor evaluation process or engage with transplant centers in the evaluation process.<sup>13-15</sup> However, one study found that those with healthier lifestyles tended to be more pessimistic about their health.<sup>16</sup>

The objectives of this study were to examine potential donors' self-rated physical and mental health and health perceptions (with a particular focus on capturing potential donors early in the evaluation process) and to examine the association between potential donors' perceived health and the odds of completing the donor evaluation. We hypothesized that less favorable perceived health would predict lower odds of completion of the donor evaluation process.

### PLAIN LANGUAGE SUMMARY

This study was designed to understand the health perceptions of living donor candidates. We found that donor candidates' self-reported physical health strongly predicted their likelihood of completing the donor evaluation process. Further studies are needed to understand whether addressing donors' self-perceptions of health may increase rates of completion of the donor evaluation.

## METHODS

### Study Population

We performed a prospective study at the University of California San Francisco between 2017 and 2022. At our center, the evaluation process starts with potential donors completing an online screening questionnaire to determine if there are clear medical contraindications to donation (eg, elevated body mass index and presence of insulin-dependent diabetes). Potential donors are also asked to view a video introducing the living donor process online at this stage of the evaluation process. If they complete this online screening questionnaire without having clear contraindications identified, they were able to participate in our research survey by clicking on a link.

After the completion of the online questionnaire, potential donors receive a telephone call from our donor coordinator and are interviewed to identify any other potential contraindications to donation (eg, history of recurrent kidney stones, cancer, and strong family history of early or unexplained cardiac death). If there are none, potential donors are asked to perform initial local laboratory testing and provide 2 self-reported blood pressure measurements. Additional consultations with experts (eg, a hematologist for a clotting propensity and rheumatologist for concern over connective tissue disease) would also be pursued as needed at the discretion of the evaluating clinician at this stage. If no contraindications are identified and the kidney function appears acceptable, potential donors are invited to present for an in-person evaluation and a computed tomography scan is completed. This is also the phase of the evaluation process when potential donors meet the social worker and all members of the transplant team, including a surgeon and nephrologist. After this in-person evaluation, the donor evaluation is considered complete, and the donor is presented to a selection committee. Shortly thereafter, potential donors are notified of the transplant center's decision surrounding their eligibility to proceed with donation.

Potential donors who clicked on our survey link after passing the initial online questionnaire screen were invited to answer questions about their self-rated physical and mental health and health perceptions (health outlook, resistance to illness, health worry, and sickness orientation). All survey participants were provided with a small gift card

in appreciation for their time. Potential donors were informed that their responses on this survey would not be shared with the transplant center and would have no bearing on the clinical evaluation of eligibility for donation.

Potential participants were recruited for study participation before the transplant center made any final decisions about their eligibility for kidney donation. Thus, some potential donors included for study were ultimately deemed ineligible for donation by the clinical teams. We also invited individuals who had previously completed our survey but who ultimately decided to abort the clinical workup as a living kidney donor to complete laboratory testing (serum creatinine and urine albumin to creatinine ratio ascertainment) as part of our research program (not for donation purposes).

The study protocol was approved by the University of California, San Francisco institutional review board. Informed consent was obtained from all participants.

### Survey Content

Our survey included questions from the validated Patient Reported Outcomes Measurement Information System (PROMIS) global health survey, which includes questions about the respondent's physical and mental health (Item S1). This survey has been validated in healthy populations and summative scores derived.<sup>17</sup> In addition, we also included questions about individuals' health perceptions leveraging a validated survey instrument developed by Davies and Ware known as the general health perceptions measures.<sup>18</sup> This instrument includes questions about an individual's health outlook, resistance to illness, health worry or concern, and sickness orientation. All responses were on a Likert scale from 1-5, with higher scores reflecting a more positive outlook. An overall score for each domain was calculated by summing the individual scores for each question within that domain, and average scores were derived.

### Outcomes

The primary outcome was whether the potential donor completed the evaluation process. We did not designate donor nephrectomy as our primary outcome because that is influenced by factors outside of the potential donor's control (eg, whether the intended recipient is ready for a transplant or the selection of an alternative donor candidate to proceed).

A secondary outcome was the predonation 15-year estimate of the risk for kidney failure for donors, which we used as an objective metric of a donor candidate's health using a validated tool.<sup>19</sup> This risk calculator uses the donor candidate's age, sex, race, eGFR, systolic blood pressure, use of hypertension medication, body mass index, non-insulin dependent diabetes, urine albumin to creatinine ratio, and smoking history (current, former, or never smoker) to compute their risk (as a linear outcome on a percentage scale).

## Statistical Analysis

Initially, *t* tests and  $\chi^2$  tests were used to compare the responses to our survey based on whether potential donors completed the donor evaluation process.

We used logistic regression to examine the association between perceived health and completion of the donor evaluation, adjusted for age, biological sex, race or ethnicity (by self-report), and relationship to the intended recipient. We included separate models using initially only the PROMIS global and mental health scores as predictors that were adjusted for age, sex, race or ethnicity, and donor relationship to the intended recipient, then repeated analyses including only the 4 Davies and Ware health perception domains, and finally performed a fully adjusted model that included both sets of self-reported health and health perceptions. For comparability across the survey domains and results, all scores were converted to *z*-scores using the sample mean within models, and outcomes were reported based on a per standard deviation change in the *z*-score. We explored the *c*-statistics of these models to assess the discrimination of the health perception responses for the likelihood of completing the donor evaluation process.

In sensitivity analysis, we excluded donor candidates who aborted the evaluation process early on (*n* = 171 who dropped out or were deemed ineligible after the telephone interview or laboratory testing, Fig 1) and repeated our logistic regression models.

To evaluate our secondary outcome, we used linear regression models to examine the association between self-reported physical health, mental health, and each of the domains of the health perceptions survey with the predicted risk of kidney failure for potential donors with such data available in multivariable analysis, adjusted for age, sex, race or ethnicity (by self-report), and relationship to the intended recipient to calculate the predicted risk of end-stage

kidney disease (as a % risk over a 15-year period). This risk was only computed among those who had laboratory data (*n* = 277, which included the 215 donors who presented for in-clinic evaluation and 62 donors who did not move forward to the in-clinic evaluation). Data required for calculating the predicted risk of kidney failure were missing for 40 individuals (*n* = 35 with missing urine albumin or creatinine ratio, *n* = 7 with missing body mass index, *n* = 7 missing serum creatinine, and *n* = 6 with missing systolic blood pressure) who otherwise had the required elements for an estimate of risk, and hence these missing datapoints were imputed with chained single imputation using data from other donor candidates.

All analyses were conducted using Stata 17 (StataCorp LLC, College Station, TX).

## RESULTS

### Participants

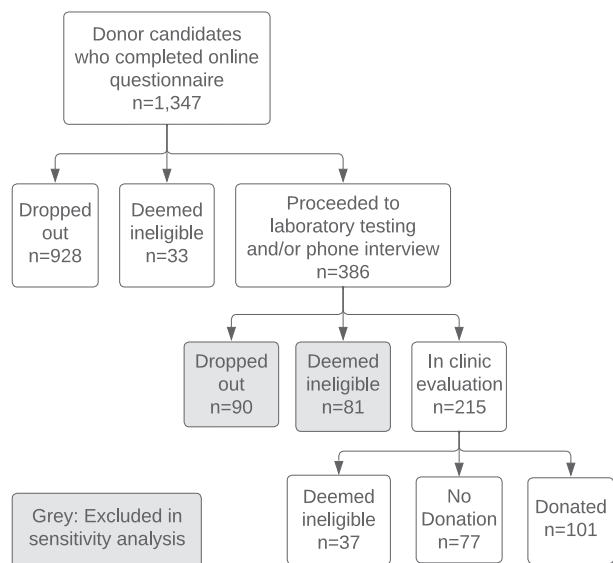
A total of 1,347 individuals were included for analysis. ~46% of participants (*n* = 613) were < 40 years of age, 71% (*n* = 951) were female, 294 (22%) were Hispanic, and 16% (*n* = 211) of Asian or Pacific Islander race or ethnicity. About 30% of participants (*n* = 404) were friends or coworkers, and ~23% were parents, children, or siblings of the intended recipient (Table 1).

Approximately 71% (*n* = 961) of individuals completed the survey at the time of their initial contact with the transplant center (during the online screening process) but did not move forward in the donor evaluation process, of whom 33 individuals were deemed ineligible for donation at this early stage after their questionnaire was reviewed by the donor team (Fig 1). Among donors who proceeded to a telephone interview and laboratory screening (*n* = 386), 21% (*n* = 81) were deemed ineligible, and 23% (*n* = 90) withdrew from the donor evaluation process. Only 16% of the initial cohort (*n* = 215) completed the donor evaluation process (Fig 1). Of those who completed the latter steps of the donor evaluation, which included an in-person visit and computed tomography scan, 47% donated (*n* = 101).

Table 1 shows mean raw scores for each question on the Global Physical and Mental Health Surveys and a breakdown of the health outlook scores derived from the Davies and Wares survey by question. The mean PROMIS global physical health ( $17.0 \pm 1.9$ ) and mental health ( $15.5 \pm 2.7$ ) raw scores were higher among donor candidates proceeding to completion of the donor evaluation compared with those who withdrew early in the process after initial online questionnaire ( $16.3 \pm 2.2$  for physical health and  $14.9 \pm 3.1$  for mental health). A similar pattern was noted for the health domains of the Davies and Ware survey.

### Potential Donors' Health Perceptions and the Odds of Completing Donor Evaluation

The PROMIS physical health score predicted the odds of presenting for an in-person clinic evaluation (OR 1.50; 95% CI, 1.22-1.84 per SD *z*-score change in physical



**Figure 1.** Cohort derivation.

**Table 1.** Donor Characteristics by Stage of Completion of the Donor Evaluation Process

<b>N (Column %), Median (25th and 75th Percentile), or Mean ± SD</b>	<b>Total 1,347 (100.0%)</b>	<b>Initial Online Screen 961 (71.3%)</b>	<b>Proceeded to Laboratory Testing or Telephone Interview 171 (12.7%)</b>	<b>Presented for In-person Donor Evaluation 215 (16.0%)</b>	<b>P</b>
Dropped out of the evaluation	1,018 (76)	928 (97)	90 (53)	0 (0)	<0.001
Deemed ineligible for donation	158 (12)	33 (3)	81 (47)	44 (20)	<0.001
Age (y)					0.044
<40	613 (46)	437 (45)	70 (41)	106 (49)	
40-64	607 (45)	430 (45)	78 (46)	99 (46)	
65+	127 (9)	94 (10)	23 (13)	10 (5)	
Female	951 (71)	672 (70)	130 (76)	149 (69)	0.25
Race					0.17
Asian/Pacific Islander	211 (16)	142 (15)	25 (15)	44 (20)	
Hispanic	294 (22)	200 (21)	46 (27)	48 (22)	
Non-Hispanic Black	98 (7)	73 (8)	9 (5)	16 (7)	
Non-Hispanic White	744 (55)	546 (57)	91 (53)	107 (50)	
Donor relationship to intended recipient					<0.001
Parent	61 (5)	37 (4)	12 (7)	12 (6)	
Child	110 (8)	72 (7)	10 (6)	28 (13)	
Sibling	135 (10)	91 (9)	17 (10)	27 (13)	
Spouse	104 (8)	68 (7)	5 (3)	31 (14)	
Extended family	192 (14)	147 (15)	13 (8)	32 (15)	
Friend/Coworker	404 (30)	304 (32)	50 (29)	50 (23)	
Altruistic	67 (5)	34 (4)	15 (9)	18 (8)	
Other/Unknown	274 (20)	208 (22)	49 (29)	17 (8)	
15-year predicted ESKD risk <sup>a</sup> (%)	N/A	N/A	0.08 (0.04-0.13) <sup>b</sup>	0.08 (0.05-0.15)	0.74
How do you rate your overall health?	3.8 ± 0.8	3.8 ± 0.8	3.4 ± 0.9	4.1 ± 0.8	<0.001
How well do you carry out your social activities & roles?	4.0 ± 0.9	4.0 ± 0.9	3.8 ± 1.0	4.1 ± 0.7	0.019
PROMIS physical and mental health					
Global physical health	16.3 ± 2.3	16.3 ± 2.2	15.3 ± 2.7	17.0 ± 1.9	<0.001
To what extent are you able to carry out your everyday physical activities?	4.7 ± 0.6	4.7 ± 0.6	4.5 ± 0.8	4.8 ± 0.5	<0.001
How would you rate your physical health?	3.6 ± 0.9	3.7 ± 0.9	3.1 ± 1.0	3.9 ± 0.8	<0.001
How would you rate your fatigue on average?	3.9 ± 0.8	3.9 ± 0.8	3.7 ± 0.9	4.1 ± 0.7	<0.001
How would you rate your pain, with 0 being none and 10 being the worst pain imaginable?	2.0 ± 2.1	2.1 ± 2.1	2.3 ± 2.3	1.5 ± 1.9	<0.001
Global mental health	14.9 ± 3.0	14.9 ± 3.1	14.3 ± 3.1	15.5 ± 2.7	<0.001
In general, how would you rate your quality of life?	4.0 ± 0.9	4.0 ± 0.8	3.7 ± 0.9	4.2 ± 0.8	<0.001
In general, how would you rate your mental health, including your mood and ability to think?	3.7 ± 1.0	3.7 ± 1.0	3.6 ± 1.0	3.9 ± 0.9	0.005

(Continued)

**Table 1 (Cont'd).** Donor Characteristics by Stage of Completion of the Donor Evaluation Process

<b>N (Column %), Median (25th and 75th Percentile), or Mean ± SD</b>	<b>Total 1,347 (100.0%)</b>	<b>Initial Online Screen 961 (71.3%)</b>	<b>Proceeded to Laboratory Testing or Telephone Interview 171 (12.7%)</b>	<b>Presented for In-person Donor Evaluation 215 (16.0%)</b>	<b>P</b>
How often are you bothered by emotional problems such as feeling anxious, depressed, or irritable?	3.4 ± 0.9	3.4 ± 0.9	3.4 ± 0.9	3.4 ± 0.8	0.84
In general, how would you rate your satisfaction with your social activities and relationships?	3.8 ± 1.0	3.8 ± 1.0	3.7 ± 1.0	4.0 ± 0.9	0.002
<b>Davies and Ware Health Perceptions</b>					
Summary score: health outlook	15.3 ± 2.5	15.3 ± 2.5	14.6 ± 2.6	15.8 ± 2.1	<0.001
You probably will get sick a lot in the future.	4.3 ± 0.8	4.3 ± 0.8	4.1 ± 1.0	4.5 ± 0.7	<0.001
You expect to have better health than others.	3.6 ± 0.9	3.6 ± 0.9	3.4 ± 0.9	3.7 ± 0.9	0.005
Your health will be worse in the future compared to now.	3.4 ± 1.1	3.4 ± 1.1	3.3 ± 1.1	3.4 ± 1.1	0.31
You expect a healthy life.	4.1 ± 0.8	4.1 ± 0.8	3.9 ± 0.8	4.2 ± 0.7	<0.001
Summary score: resistance to illness	15.4 ± 2.7	15.4 ± 2.7	15.2 ± 2.7	15.7 ± 2.4	0.21
You get sick easier than others.	4.4 ± 0.9	4.3 ± 0.9	4.2 ± 0.9	4.5 ± 0.8	0.011
People get sick easier than you do.	3.7 ± 0.9	3.6 ± 0.9	3.7 ± 0.9	3.7 ± 0.9	0.70
Your body resists illness.	3.4 ± 0.9	3.4 ± 1.0	3.5 ± 0.9	3.4 ± 0.9	0.99
Whenever something is going around, you catch it.	3.9 ± 0.8	3.9 ± 0.8	3.8 ± 0.9	4.0 ± 0.7	0.054
Summary score: health worry*	13.1 ± 2.4	13.2 ± 2.4	12.8 ± 2.4	13.2 ± 2.3	0.19
You never worry about your health.*	3.3 ± 1.1	3.3 ± 1.1	3.5 ± 1.0	3.1 ± 1.1	<0.001
You worry about your health more than others.*	2.5 ± 1.1	2.5 ± 1.1	2.6 ± 1.0	2.3 ± 1.0	0.089
Others are more concerned about their health than you are yours.*	3.6 ± 1.0	3.6 ± 1.0	3.4 ± 1.0	3.9 ± 0.9	<0.001
Your health is a concern (a priority).*	3.7 ± 1.0	3.8 ± 1.0	3.3 ± 1.0	3.8 ± 1.0	<0.001
Summary score: sickness orientation	7.4 ± 1.5	7.4 ± 1.5	7.4 ± 1.5	7.5 ± 1.5	0.69
Getting sick is part of life.	3.5 ± 1.0	3.5 ± 1.0	3.6 ± 1.0	3.6 ± 1.0	0.35
You accept that sometimes you are sick.	3.9 ± 0.8	3.9 ± 0.7	3.8 ± 0.7	3.9 ± 0.8	0.95

*Note:* Higher scores represent more positive health status or positive health perception with the exception of the health worry summary score and its components, denoted by an asterisk (\*), where greater values indicate greater concern for one's health.

ESKD, end-stage kidney disease.

The PROMIS global physical and mental health scores range from a minimum of 4 and maximum of 20, with greater scores indicating better health. The individual questions on the PROMIS survey have responses on a Likert scale of 1 to 5, with the exception of the pain score which ranges from 0-10 (but is rescaled to a scale of 1-5 during computation of the summative PROMIS scores).

For the Davies and Ware Health Perceptions, individual question responses were scored on a Likert scale between 1 and 5, with higher scores represent more positive health status or positive health perception with the exception of the health worry summary score and its components, where greater values indicate greater concern for one's health. Davies and Ware Summary Scores were a simple summation of their constituent scores, with a maximum score of 20 for health outlook, resistance to illness, and health worry summary scores, and maximum of 10 for the sickness orientation summary score.

\*This is the predicted % risk of the donor developing kidney failure over a 15-year horizon if they undergo donation.

<sup>b</sup>N = 62 who completed laboratory testing and had sufficient data elements for a 15-year ESRD risk to be computed.



**Table 2.** Association Between Potential Donors' Characteristics and Perceived Health With the Odds of Completing the Donor Evaluation Process

	Model 1 (PROMIS Health)			Model 2 (Davies and Ware Health Perceptions)			Model 3 (PROMIS Health + Davies and Ware Health Perceptions)		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
PROMIS physical and mental health (per SD change in z-score)									
Global physical health	1.50	(1.22-1.84)	< 0.001				1.48	(1.19-1.85)	0.001
Global mental health	1.04	(0.85-1.26)	0.72				1.02	(0.84-1.24)	0.84
Davies and Ware Health Perceptions (per SD change in z-score)									
Health outlook				1.32	(1.09-1.59)	0.004	1.15	(0.94-1.40)	0.19
Resistance to illness				1.04	(0.86-1.26)	0.66	0.95	(0.78-1.16)	0.62
Health worry				0.97	(0.84-1.13)	0.74	0.98	(0.84-1.14)	0.79
Sickness orientation				1.15	(0.98-1.35)	0.08	1.16	(0.99-1.36)	0.06
C-statistic	0.70	(0.66-0.73)		0.69	(0.65-0.72)		0.70	(0.67-0.74)	

Note: All models adjusted for age, sex, race/ethnicity, and donor relationship to the intended recipient.

health score, Model 1; Table 2). This association between the physical health score and completion of the donor evaluation persisted even when models included the Davies and Ware health perceptions, with every standard deviation in z-score change being associated with 1.48 times higher odds (95% CI, 1.19-1.85; Model 3; Table 2) of completing the donor evaluation. Potential donors' self-reported mental health score did not predict the odds of completing the donor evaluation (OR 1.02 per SD in z-score change; 95% CI, 0.84-1.24) in fully adjusted analysis. Models incorporating the PROMIS mental and physical health scores had a c-statistic of 0.70.

The Davies and Ware health outlook of potential donors was associated with the odds of completing the donor evaluation (OR 1.32 per SD change in health outlook z-score; 95% CI, 1.09-1.59; Model 2 in Table 2), but this association was attenuated in models including both the PROMIS and Davies and Ware Health Perceptions and was no longer statistically significant. The addition of the Davies and Ware health perception domains to models did not improve the c-statistic (0.70, Table 2).

In sensitivity analysis, when we excluded potential donors who were deemed ineligible or dropped out of the evaluation process after telephone screening or laboratory testing (n = 171), results were similar (Table S1).

### Exploration of the Association of Potential Donors' Health Perceptions With the Predicted Risk of Kidney Failure After Donation

The mean 15-year predicted risk of post-donation kidney failure among potential donors who completed laboratory testing was 0.08% (25th and 75th percentiles; 0.04%, 0.13%). In adjusted analysis, there was no statistically significant association between potential donors' self-reported global or physical mental health and the predicted risk of end-stage kidney disease following donation in the subset of donor candidates with such data available (Table S2).

## DISCUSSION

In this study, we found consistent and statistically significant differences in donors' self-reported physical and mental health and health perceptions among those who completed the donor evaluation when compared with those who did not. Donor candidates' self-reported physical health predicted the likelihood of progression to completion of the donor evaluation with moderate risk discrimination. At our transplant center, ~76% of individuals who initially expressed an interest in considering living kidney donation and participated in our study dropped out of the donor evaluation process, despite only a small percentage (2.4%) being deemed ineligible early on after passing an initial online questionnaire-based screening tool. Ultimately, only 16% completed the donor evaluation, and 8% underwent donation.

It is well recognized that there are medical and nonmedical barriers to living kidney donation and that better strategies are needed to increase living kidney donation rates in the United States.<sup>5,9,12,20-24</sup> Previous studies of barriers to living donation have identified medical factors such as obesity,<sup>25-27</sup> travel costs,<sup>10,28</sup> financial costs of donation, and income loss as some important factors.<sup>29,30</sup> However, few studies have focused on potential donors' perceived health as a predictor of the likelihood of completing the donor evaluation process. Although there have been multiple advances in the last decade to protect living donors from income loss and to support travel and time off from work, our data suggest that a larger source of dropout in the living donor process could be related to the candidates' self-perceived health, and particularly, physical health. When raising awareness of the benefits of donation to the public,<sup>31,32</sup> addressing perceptions about whether one is physically healthy enough to serve as a living donor could be an intervention that deserves further investigation to increase rates of living donation.

Although several qualitative studies have been performed to identify barriers to living donation, it may be difficult to capture donor attitudes and beliefs regarding living donation if only those who have completed the entire donor evaluation are included, and only small numbers of individuals can be recruited for in-depth interviews or focus groups.<sup>7,8,24</sup> In addition, recall bias and knowledge of the intended recipient's outcome (in non-altruistic donors) may influence potential donors' rationale for declining or agreeing to donate.<sup>33</sup> Our study's strength lies in the systematic capture of donors' perceived health early in the donor evaluation process and before the potential donors' knowledge of the subsequent clinical course of their intended recipient. We believe that this is one of the largest studies that has included potential donors who did not progress in the donor evaluation process after their initial contact with the transplant center where they passed an online questionnaire that screened for donation eligibility. This is supported by a lower rate of completion of donor evaluation and donor nephrectomy when compared with previous studies.<sup>5,34,35</sup>

It is known that systemic barriers contribute to attrition during the donor evaluation process, such as poor communication among providers and also limited provider knowledge surrounding living donor eligibility.<sup>23,36</sup> The lengthy donor evaluation process has also been identified as one reason for high dropout rates during donor evaluation.<sup>34,37</sup> Our data suggest that screening candidates' perceived physical health at the time of first donor contact with the transplant center could potentially help identify a subgroup of potential donors who are more likely to complete the donor evaluation process and expedite the time to identification of a kidney donor.

However, there are a few limitations to note in our study. First, we do not know whether all of those who initially contacted the transplant center to express interest in donation would ultimately have been deemed eligible for donation because they declined to proceed with the donor evaluation, though the rates of ineligibility were generally low after donors passed an initial screen online. Second, we do not know the reasons for the failure to proceed with the donor evaluation, including whether potential donors' social networks or intended recipients may have influenced the decision to move forward with completion of the donation evaluation or donor nephrectomy.<sup>21,27,31</sup> Third, transplant centers are known to have large variations in their donor evaluation processes, and hence our findings may not generalize to all centers.<sup>38</sup> Although we examined the association between self-reported health and health perceptions and the likelihood of completing the donation evaluation in aggregate, we acknowledge that reasons that led donor candidates to abort the evaluation process may have differed at different stages. Finally, potential donors who consented to participate in our study may have differed from those who declined to participate.

In conclusion, potential donors' self-reported physical health was strongly predictive of completion of the donor

evaluation process. Future interventions may be needed to address potential donors' self-reported physical health in addition to other medical or nonmedical barriers to donation to increase the number of living kidney donors in the era of organ shortage.

## SUPPLEMENTARY MATERIALS

### Supplementary File (PDF)

**Item S1:** Survey instruments.

**Table S1:** Association Between Reported Health Measures and Donor Candidates' Odds of an In-Person Evaluation Excluding 171 Donors Deemed Ineligible at the Phone Interview/Laboratory Testing Phase Before In-person Clinic Evaluation.

**Table S2:** Association Between Reported Health Measures and Donor Candidates' Estimated 15-Year Risk of Kidney Failure (as a %) After Donation Among 277 Patients With Sufficient and Clinical Laboratory Data Available in Adjusted Linear Regression.\*

## ARTICLE INFORMATION

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