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Opinions of African American adults about the use of apolipoprotein L1 (ApoL1) genetic testing in living kidney donation and transplantation

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Apolipoprotein L1 (ApoL1) predictive genetic testing for kidney disease, and its emerging role in transplantation, remains controversial as it may exacerbate underlying disparities among African Americans (AAs) at increased risk. We conducted an online simulation among AAs (N = 585) about interest in ApoL1 testing and its cofactors, under 2 scenarios: as a potential living donor (PLD), and as a patient awaiting transplantation. Most respondents (61%) expressed high interest in genetic testing as a PLD: age ≥35 years (adjusted odds ratio [aOR], 1.75; 95% confidence interval [CI], 1.18, 2.60, $P = .01$), AA identity (aOR, 1.67; 95% CI, 1.02, 2.72, $P = .04$), perceived kidney disease risk following donation (aOR, 1.68; 95% CI, 1.03, 2.73, $P = .03$), interest in genetics (aOR, 2.89; 95% CI, 1.95, 4.29, $P = .001$), and genetics self-efficacy (aOR, 2.38; 95% CI, 1.54, 3.67, $P = .001$) were positively associated with ApoL1 test interest. If awaiting transplantation, most (89%) believed that ApoL1 testing should be done on AA deceased donors, and older age (aOR, 1.85; 95% CI, 1.03, 3.32, $P = .04$) and greater interest in genetics (aOR, 2.61; 95% CI, 1.41, 4.81, $P = .002$) were associated with interest in testing deceased donors. Findings highlight strong support for ApoL1 testing in AAs and the need to examine such opinions among PLDs and transplant patients to enhance patient education efforts.

KEYWORDS
clinical research/ practice, disparities, ethics and public policy, ethnicity/ race, genetics, kidney transplantation/ nephrology, kidney transplantation: living donor, social sciences, survey

1 | INTRODUCTION

Variants in the apolipoprotein L1 (ApoL1) gene are associated with higher risk of end-stage renal disease (ESRD).[1-3] Having 2 ApoL1 risk alleles (G1 and G2) increases lifetime risk of ESRD and progression from kidney disease to ESRD.[4,5] This high-risk genotype is found predominantly in those with African ancestry. Approximately 13% of African Americans (AAs) in the United

Abbreviations: AA, African American; aOR, adjusted odds ratio; ApoL1, apolipoprotein L1; CI, confidence interval; ESRD, end stage renal disease; OPTN, Organ Procurement and Transplantation Network; OR, odds ratio; PLD, potential living donor.

States have the ApoL1 high-risk genotype, with a 15% lifetime risk of ESRD.[6,7]

Transplanted kidneys from diseased donors with high-risk genotype have shorter graft survival than kidneys from donors without this genotype, regardless of recipient's race.[8-10] Whether this genotype-graft function relationship also pertains to kidneys from living donors is unknown. However, recent reports indicate that living donors with high-risk genotype may have worse kidney function postdonation than donors without it,[11-13] suggesting this genotype may contribute to higher rates of renal failure in AA living kidney donors.[14,15] Controversy persists within the transplant community about whether AA deceased donors should be ApoL1 tested, whether findings should factor into kidney allocation and acceptance decisions, and whether programs should require that AA potential living donors (PLDs) undergo testing.[16-18]

Largely missing from this conversation about ApoL1 testing are opinions of AA community members. What little is known suggests that most would support genetic testing for PLDs, but the risks and benefits of testing have not been sufficiently characterized in representative samples.[19,20] Given the nascent state of the literature, and the emergence of genetic testing in transplantation, we sought to assess ApoL1 testing attitudes among AAs using a clinical simulation and opinion survey. We measured attitudes in the context of living and deceased donation, and examined associations with sociodemographic characteristics, AA identity, knowledge, risk perceptions, genetics self-efficacy, and genetic testing interest. We hypothesized that most respondents would support ApoL1 testing for both PLDs and deceased donors of African ancestry and would report an intention to undergo testing as a PLD. Moreover, we hypothesized that interest in ApoL1 testing would be associated with knowledge and interest in genetic testing generally.

2 | METHODS

2.1 | Clinical simulation and opinion survey

Based on risk communication and genetic testing literature,[21] a clinical simulation and opinion survey to understand ApoL1 testing attitudes in the general AA population was designed. The survey included sociodemographic characteristics and potentially important cofactors, including AA identity, knowledge, risk perceptions, and beliefs and interests about genetics. The simulation and survey were reviewed for content accuracy, completeness, and logical progression by 3 nephrologists, 3 transplant surgeons, a transplant psychologist, a survey methodologist, an epidemiologist, a health communications expert, and 2 genetics researchers. All procedures were piloted (via Amazon Mechanical Turk) with 25 AAs using the think-aloud technique to clarify content organization and flow, points of confusion, difficulty, and understanding.[22] After modifications, the following independent variables were assessed as part of the clinical simulation:

Sociodemographic characteristics: Sex, age, Organ Procurement and Transplant Network (OPTN) region, and personal and family history of kidney disease.

Perceived general health literacy: *"How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?"* (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always).[23] Score > 2 indicates high risk for literacy problems.

AA identity: From the Multidimensional Inventory of Black Identity questionnaire: *"Being Black/African American is an important reflection of who I am"* (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).[24] Score > 3 indicates high AA identity.

Risk perceptions: Perceived genetic contribution to kidney disease: *"How much of kidney disease do you think is due to genetics (or your DNA)?* (1 = none, 2 = some, 3 = about half, 4 = most, 5 = all). Score > 2 indicates high perceived genetic contribution to kidney disease. Perceived risk of kidney disease after living kidney donation: *"What do you think the chances are of getting kidney disease after donating a kidney?"* (1 = a much lower chance than someone who is not a kidney donor, 2 = a lower chance than someone who is not a kidney donor, 3 = about the same chance as someone who is not a kidney donor, 4 = a higher chance than someone who is not a kidney donor, 5 = a much higher chance than someone who is not a kidney donor).

Awareness of a genetic test for kidney disease: *"Have you ever heard about a genetic test for kidney disease?"* (yes, no).

Interest in genetic testing: *"In general, how interested are you in learning about your genetic risk for certain types of diseases?"* (1 = not at all interested, 2 = somewhat interested, 3 = very interested).[25] Score > 2 indicates high interest in genetic risks.

Genetics self-efficacy: *"I am confident in my ability to understand information about genetics"* (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).[26] Score > 3 indicates high genetics self-efficacy.

Clinical scenario: To better equate for potential differences in respondents' familiarity with genetic contributions to health, kidney disease, and ApoL1, participants were asked to read an information sheet describing normal kidney function, noting that some people develop kidney disease and need dialysis or transplantation, and stating that kidney disease rates are higher in AAs compared to other races. Respondents were then given information about genes and health and were informed that (1) some people with recent African ancestry (13:100) have a genotype that places them at higher risk of kidney disease (population prevalence); (2) people with high-risk genotype are 7-10 times more likely to develop kidney disease than those without it (relative risk); (3) it is not yet possible to determine which people with high-risk genotype will develop kidney disease or when (lifetime risk); and (4) a genetic test exists to determine whether someone has a high-risk genotype.

Next, respondents were informed about living donation, and instructed to imagine themselves as a PLD:

> *Now, let's suppose that you have a friend or family member who has kidney disease and that person needs a kidney transplant. Let's also suppose that you want to see if you are healthy enough to donate one of your kidneys to this person. In other words, you want to be a living kidney donor.*

The likelihood of undergoing ApoL1 testing as a PLD if it was made available was the primary dependent variable. Response options were: 1 = I definitely would not take the test, 2 = I probably would not take the test, 3 = I am not sure if I would take the test, 4 = I probably would take the test, 5 = I definitely would take the test. Additionally, we asked participants how transplant programs should approach ApoL1 testing with AA PLDs (1 = don't mention genetic testing until more research is done about the gene, 2 = give me the option to take the genetic test if I wish to, 3 = tell me that I must take the genetic test if I still want to be a donor), whether they should be permitted to donate with high-risk genotype (1 = doctors at the transplant program should not allow me to donate a kidney, 2 = doctors and I should work together to make a shared decision about donating a kidney, 3 = transplant program should leave the kidney donation decision up to me), whether the intended recipient has the right to know their PLD's ApoL1 test results (yes, no), and with whom they would share their ApoL1 finding (immediate family, primary care doctor, health insurer, life insurer, other).

Respondents were then educated that kidneys from deceased donors with high-risk genotype may have shorter graft survival after transplantation compared to kidneys from donors without such genotype. They were also informed that it is not yet known whether the same is true for kidneys from PLDs with high-risk genotype. As part of this simulation, participants were then asked:

> *Now, imagine that you are a patient who has kidney disease and you need a kidney transplant. One day, you get a call from your transplant doctor that you are next on the waiting list and they have a deceased donor kidney for you.*

In this scenario, the dependent variable was a single yes/no item: *If the kidney comes from a deceased donor with African ancestry, they should test the donor to see if they have the high-risk gene for kidney disease*. Additional items asked about desire to know the donor's test result (yes, no) and whether the result should be considered by the transplant team in deciding whether to accept the kidney (yes, no). In an extension of this scenario, respondents were informed that living donor transplantation yields superior outcomes to deceased donor transplantation and that their transplant program requires ApoL1 testing for all AA PLDs. Subsequent items focused on whether a genetic testing requirement would affect their willingness to ask others about possible living donation (1 = I would be more likely to ask someone to be a living donor, 2 = I would be less likely to ask someone to be a living donor, 3 = would not make any difference about whether I ask someone to be a living donor), whether they would want to know the test results of any PLDs (yes, no), and their likelihood of accepting a kidney from someone with high-risk genotype (low, moderate, high).

2.2 | Participants and recruitment

Crowdsourcing survey methods, used commonly in social and behavioral research, yield high-quality data efficiently.[27-29] For this study, an online consumer research panel (Qualtrics, Provo, Utah) was recruited. Adults ≥18 years old with African ancestry, living in the United States and fluent in English were eligible; previous living donors and transplant recipients were excluded. Recruitment occurred over 4 days in July 2019: respondents were anonymous and incentivized via Qualtrics' rewards program. To maintain survey integrity, respondents who completed the survey in <5 minutes (median = 11 minutes) or who responded that they did not answer screening eligibility questions truthfully were excluded. An attention-filter item during the survey asked respondents to type "y-e-s" if they were completing the task in earnest. Those who did not were excluded from analysis. The Committee on Clinical Investigation at Beth Israel Deaconess Medical Center approved the study (Protocol #: 2018P000722).

2.3 | Statistical analysis

Descriptive statistics were calculated for all survey items. Multivariable logistic regression equations (odds ratio [OR] with 95% confidence interval [CI]) were computed to examine associations between independent and dependent variables. In the first scenario, likelihood of ApoL1 testing as a PLD was dichotomized as "low" (definitely would not/probably would not/not sure) vs "high" (definitely would/probably would). To ease model interpretation, respondents were categorized into 5 geographic clusters (OPTN regions): Southeast (3,11), Northeast (1, 2, 9), Midwest (7, 8, 10), Southwest (4, 5), and Northwest (6). Cases with missing cofactors/covariates were excluded from analysis. All analyses were performed using the Statistical Package for the Social Sciences (SPSS, Chicago, Illinois).

3 | RESULTS

3.1 | Response rate

Of 2130 respondents, 1206 (57%) met eligibility criteria and 780 provided survey responses (65% of eligible). Among the 780 respondents, 195 (25%) were excluded because they reported not answering eligibility questions truthfully (n = 63), did not answer the attention-filter question (n = 49), or completed the survey too quickly (n = 83). The final analytic sample included 585 participants.

3.2 | Respondent characteristics

Most respondents were female (76%) and ≤50 years old (18-34 years, 54%; 35-50 years, 26%; >50 years, 20%). All OPTN regions were represented. Forty (7%) and 187 (32%) participants reported a personal and family history of kidney disease, respectively (Table 1).

Most had high AA identity (82%), perceived themselves to be at low risk of health literacy problems (83%), believed that half or less of kidney disease is due to genetics (74%), and that kidney disease risk after living donation was similar to or lower than that for nondonors (78%), had no prior awareness about ApoL1 testing (69%), and had high interest in genetics (54%) and high genetics self-efficacy (74%).

3.3 | PLD Scenario

Most (n = 359, 61%) expressed high likelihood of ApoL1 testing as a PLD (Table 2). Age ≥ 35 years (adjusted odds ratio [aOR], 1.75; 95% CI, 1.18, 2.60; *P* = .01), residing in the Southeast (vs Midwest (aOR, 0.50; 95% CI, 0.27, 0.94; *P* = .03), high AA identity (aOR, 1.67; 95% CI, 1.02, 2.72; *P* = .04), greater perceived risk of kidney disease after living donation (aOR, 1.68; 95% CI, 1.03, 2.73; *P* = .03), high interest in genetic testing (aOR, 2.89; 95% CI, 1.95, 4.29; *P* = .001), and high genetics self-efficacy (aOR, 2.38; 95% CI, 1.54, 3.67; *P* = .001) were associated with high interest in ApoL1 testing (Table 3).

Half (51%, n = 297) believed that transplant programs should offer ApoL1 testing to PLDs; 18% (n = 104) believed it should be required and 21% (n = 123) believed it should not be offered until more is known about the gene-health relationship.

If required to undergo ApoL1 testing, 79% (n = 463) would want to know their test result, 11% (n = 65) were uncertain, and 10% (n = 57) would decline. If they met all other donation eligibility criteria, but testing revealed high-risk genotype, 53% (n = 310) believed the physician and PLD should make a shared decision about donation, 24% (n = 139) thought donation should be prohibited, and 23% (n = 136) thought the donation decision should be left to the PLD. Upon learning of their high-risk genotype, 83% (n = 484) would share the result with family members and 84% (n = 489) felt the intended transplant recipient should know the PLD's ApoL1 genotype.

3.4 | Awaiting kidney transplantation scenario

If offered an AA deceased donor kidney, 89% (n = 522) believed the donor should undergo ApoL1 testing. Older age (aOR, 1.85; 95% CI, 1.03, 3.32; *P* = .04) and higher interest in genetic testing (aOR, 2.61; 95% CI, 1.41, 4.81; *P* = .002) were positively associated with interest in ApoL1 testing for their deceased donor (Table 4). Among those who believed the donor should be tested, 82% (n = 428) would want to know testing results; half (49%; n = 208) expressed low likelihood of accepting a kidney from a donor with high-risk genotype.

If transplant programs required AA PLDs to undergo ApoL1 testing, 33% (n = 195) believed it would not make any difference in whether they approached others about living donation on their behalf. In contrast, 49% (n = 287) and 18% (n = 103) would be more and less likely, respectively, to ask others about donation if they were awaiting transplantation. Most (93%; n = 545) wanted to know the genotype of AA PLDs evaluated on their behalf; 48% (n = 259) expressed low likelihood of accepting a kidney if their PLD had a high-risk genotype.

4 | DISCUSSION

ApoL1 has raised many clinical and ethical issues for the transplant community.[16,17,30-32] In this first nationally representative AA community sample study, we found that interest in ApoL1 testing was high, with 61% saying they would undergo testing as a PLD and 89% reporting they would want an AA deceased donor tested before accepting the kidney. Moreover, most believed transplant programs should offer ApoL1 testing to PLDs, that having high-risk genotype should not preclude living donation, and that transplant candidates should be informed about their donor's genotype. These perspectives differ from what is currently done in practice. Most transplant programs do not offer ApoL1 testing and, when it is offered, view high-risk genotype as an absolute contraindication to donation.[33] This is surprising considering that two thirds of programs accept PLDs with other risk factors, such as hypertension and obesity.[34] Our survey findings are consistent with prior qualitative studies suggesting that high-risk genotype should be considered only as 1 factor in overall decision-making about living donation. Broader inclusion of AA perspectives in discussions about ApoL1 testing in transplantation is warranted.[19,20,35]

That most AAs would undergo ApoL1 testing as PLDs mirrors the level of testing support reported by transplant providers, AA community leaders, and former AA LDs.[19,20,36] Testing interest in this study was highest among older adults and those who believed that living donors incurred a higher lifetime risk of kidney disease, had higher AA identity, greater confidence in their ability to understand genetic information, and stronger interest in genetic testing. Others have similarly shown that genetics self-efficacy and cultural identity are associated with more favorable attitudes toward and greater willingness to undergo genetic testing.[37-39] Considering the disproportionately higher ESRD rate among AAs, those with stronger AA identity may be more likely to seek genetic risk information to inform decision-making and possibly mitigate racial disparity. Additionally, there may be stronger interest in ApoL1 testing, especially in regions (eg, Southeast) where such racial disparity is greatest and this should be further studied. Family history of kidney disease was not associated with ApoL1 testing likelihood, which is surprising since AAs with a parent or sibling with ESRD are more likely than those without to have a high-risk genotype.[40] However, the relationship between family history and ApoL1 genotype was not described in our scenarios and it may not be widely known in the general population. Nevertheless, ApoL1 education should consider these factors in meeting the needs of AA PLDs who are contemplating genotype testing.

Many have recommended that transplant programs make ApoL1 testing available—but not mandatory—for AA PLDs.[16,17,30,41,42] However, debate continues regarding whether PLDs with high-risk genotype should be allowed to donate and, if so, under what

TABLE 1 Respondent characteristics (N = 585)

Characteristic	n (%)
Sex, female	445 (76)
Age	
18–34 y	314 (54)
35–50 y	154 (26)
>50 y	117 (19)
OPTN region[a]	
1	24 (4)
2	81 (14)
3	50 (9)
4	23 (4)
5	126 (22)
6	19 (3)
7	41 (7)
8	37 (6)
9	66 (11)
10	78 (13)
11	40 (7)
Personal history of kidney disease, yes	40 (7)
Family history of kidney disease, yes	187 (32)
How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?	
Never	392 (69)
Rarely	92 (16)
Sometimes	62 (11)
Often	30 (5)
Always	9 (2)
Being Black/African American is an important reflection of who I am	
Strongly disagree	38 (7)
Disagree	17 (3)
Neutral	53 (9)
Agree	138 (24)
Strongly agree	339 (58)
How much of kidney disease do you think is due to genetics (or your DNA)?	
None	63 (11)
Some	170 (29)
About half	202 (35)
Most	115 (20)
All	35 (6)
What do you think the chances are of getting kidney disease after donating a kidney?	
A much lower chance than someone who is not a kidney donor	83 (14)
A lower chance than someone who is not a kidney donor	64 (11)
About the same chance than someone who is not a kidney donor	309 (53)
A higher chance than someone who is not a kidney donor	102 (17)
A much higher chance than someone who is not a kidney donor	27 (5)
Have you ever heard about a genetic test for kidney disease? yes	184 (31)
In general, how interested are you in learning about your genetic risk for certain types of diseases?	
Not at all interested	36 (6)
Somewhat interested	233 (40)
Very interested	316 (54)
I am confident in my ability to understand information about genetics	
Strongly disagree	29 (5)
Disagree	16 (3)
Neutral	110 (19)
Agree	199 (34)
Strongly agree	231 (40)

Note: Percentages in a category may not add up to 100 due to rounding error.

[a]OPTN, Organ Procurement and Transplantation Network; 1 (CT, VT, ME, MA, NH, RI), 2 (DE, DC, MD, NJ, PA, WV), 3 (AL, AR, FL, GA, LA, MS, PR), 4 (OK, TX), 5 (AZ, CA, NV, NM, UT), 6 (AK, HI, ID, MT, OR, WA), 7 (IL, MN, ND, SD, WI), 8 (CO, IA, KS, MO, NE, WY), 9 (NY, VT), 10 (IN, MI, OH), 11 (KY, NC, SC, TN, VA).

circumstances.[32,36,42] While study participants strongly supported transplant programs offering ApoL1 testing, their support was lower than that observed in 2 prior qualitative studies.[19,20] More than one third of participants would either not undergo ApoL1 testing or were uncertain about it, and some thought it was too premature to require testing for AA PLDs. As others have noted, unintended social and psychological consequences of ApoL1 testing are possible in the context of insufficient data, low risk of ESRD even among those with high-risk genotype, lack of treatment for those with high-risk genotype, and existing racial disparities in living donor transplantation.[3,31] Indeed, these concerns were cited by the American Society of Transplantation[17] and the Kidney Disease: Improving Global Outcomes Clinical Practice Guideline on the Evaluation and Care of Living Kidney Donors[43] in recommending against mandated ApoL1 testing for all AA PLDs.

In the context of ApoL1 testing, transplant candidates—regardless of race—also face important ApoL1 questions when offered a kidney from AA deceased and living donors. Most study participants would want an AA deceased donor tested for high-risk genotype before accepting a kidney for transplantation, which is consistent with perspectives of AA community members and leaders.[35] About half of our sample would not accept a kidney if the deceased donor had a high-risk genotype. Cautious interpretation should be exercised

TABLE 2 Primary dependent variables (N = 585)

Variable	N (%)
As a potential living kidney donor, likelihood of taking free ApoL1 testing if it was made available	
I definitely would not take the test	35 (6)
I probably would not take the test	42 (7)
I am not sure if I would take the test	149 (26)
I probably would take the test	172 (29)
I definitely would take the test	187 (32)
As a patient awaiting kidney transplantation, should kidney from a deceased donor with African ancestry that is being offered to you undergo ApoL1 testing?	
Yes	522 (89)
No	63 (11)

here because our vignettes, while highlighting the possibility of shorter graft survival for kidneys from deceased donors with high-risk genotype, did not describe other factors that could reasonably influence decisions to accept or reject kidneys from such donors. For instance, in their decision-making about organ acceptance, transplant candidates must balance dialysis duration and access considerations, mortality risk with prolonged waitlist time, donor characteristics, and current quality of life. Different patients may prioritize ApoL1 test results differently in the context of these considerations and others. Regardless of whether or how ApoL1 findings are used, there is strong support for such testing to occur in the context of deceased donation and this warrants further examination by the transplant community, which presently recommends against routine screening and use of ApoL1 genotype in organ allocation and acceptance algorithms.[17]

Living donor kidney transplantation confers the best long-term outcome for patients with kidney failure, yet AAs are less likely to receive this treatment relative to white patients (based on OPTN data as of April 4, 2020). Moreover, the annual living donation rate among AAs has declined.[44] Thus, there is concern in the transplant community that routine ApoL1 testing of AA PLDs may widen this disparity gap. For instance, programs may reject AA PLDs with high-risk genotype who are otherwise healthy or PLDs themselves may decide not to donate based on ApoL1 findings.[45,46] We also found that transplant candidates might further contribute to fewer living donor transplants. Nearly all study participants expressed a desire to know their PLD's genetic test result and half would not accept the kidney if the PLD had a high-risk genotype, even if all other evaluation metrics were favorable. Interestingly, however, half of the participants said the availability of ApoL1 testing for PLDs would make them more likely to ask others about possible donation, perhaps easing some concern about widening racial disparities in living donor kidney transplantation in the context of ApoL1 testing. Overall, there is potential for routine ApoL1 testing of donors to mitigate and deepen racial disparities in both living donation and living donor kidney transplantation among AAs. On the one hand, testing that confirms the lack of high-risk genotype may offer reassurance

TABLE 3 Multivariable predictors of high likelihood of ApoL1 testing as a potential living donor

Variables	Adjusted odds ratios (95% CI)	*P* value
Sex, female (vs male)	0.68 (0.43,1.08)	.10
Age, ≥35 y (vs < 35 y)	1.75 (1.18,2.60)	.01
Region		
Southeast (reference)	—	—
Northeast	0.74 (0.39,1.38)	.34
Midwest	0.50 (0.27,0.94)	.03
Southwest	0.63 (0.33,1.19)	.15
Northwest	0.46 (0.14,1.53)	.21
Personal history of kidney disease, yes (vs no)	1.07 (0.48, 2.37)	.87
Family history of kidney disease, yes (vs no)	0.80 (0.52,1.23)	.31
Perceived health literacy, high risk (vs low risk)	0.63 (0.38,1.06)	.08
AA identity, high (vs low)	1.67 (1.02,2.72)	.04
Perceived genetic contribution of kidney disease, high (low)	1.53 (0.96,2.44)	.07
Perceived kidney disease risk post–living donation, high (vs low)	1.68 (1.03,2.73)	.03
ApoL1 awareness, yes (vs no)	1.15 (0.75,1.76)	.52
Interest in genetics, high (vs low)	2.89 (1.95,4.29)	.001
Genetics self-efficacy, high (vs low)	2.38 (1.54,3.67)	.001

Abbreviations: AA, African American; ApoL1, apolipoprotein L1; CI, confidence interval.

for both PLDs and their recipients about future kidney health of the donor, thus potentially leading to more AA living donors. On the other hand, more AA PLDs may be excluded by programs due to high-risk genotype, and this may exacerbate disparities in both living and deceased donor transplantation. Future research should evaluate the impact—both positive and negative—of routine ApoL1 testing on rates of transplantation in AAs.

Older age and higher interest in genetic testing were associated with higher interest in ApoL1 screening in our 2 clinical scenarios. This is consistent with research showing that older adults have more interest in learning about genetic risk for future medical conditions.[47] Younger adults may place less importance on genetic testing, relative to other factors, in medical decision-making and may have more concern about how genetics data may adversely impact them (eg, health and life insurance, employment). However, in clinical transplantation, there is likely more heightened concern about the lifetime risk of kidney disease for AA PLDs who are younger with high-risk genotype, as they have more life-years ahead for possible exposure to additional risk factors (eg, obesity, hypertension,

TABLE 4 Multivariable predictors of wanting ApoL1 testing for deceased donor

Variables	Adjusted odds ratios (95% CI)	*P* value
Sex, female (vs male)	0.72 (0.37,1.43)	.35
Age, ≥35 y (vs < 35 y)	1.85 (1.03,3.32)	.04
Region		
Southeast (reference)	—	—
Northeast	0.61 (0.21,1.75)	.36
Midwest	0.48 (0.17,1.36)	.17
Southwest	0.39 (0.14,1.09)	.07
Northwest	0.33 (0.07,1.61)	.17
Personal history of kidney disease, yes (vs no)	1.24 (0.40,3.86)	.71
Family history of kidney disease, yes (vs no)	0.83 (0.43,1.59)	.57
Perceived health literacy, high risk (vs low risk)	0.82 (0.42,1.61)	.57
AA identity, high (vs low)	1.00 (0.50,2.00)	.99
Perceived genetic contribution of kidney disease, high (low)	1.10 (0.56,2.16)	.79
ApoL1 awareness, yes (vs no)	0.79 (0.43,1.46)	.45
Interest in genetics, high (vs low)	2.61 (1.41,4.81)	.002
Genetics self-efficacy, high (vs low)	1.08 (0.58,1.99)	.81

Abbreviations: AA, African American; ApoL1, apolipoprotein L1; CI, confidence interval.

diabetes).[32,41,48] Similarly, the decision to accept a kidney from an AA donor (living or deceased) with high-risk genotype may be more challenging for the younger recipient when trying to maximize organ quality for longer graft survival. In contrast, the risk-benefit analysis seems clearer for the older transplant candidate who, in accepting a kidney from a high-risk genotype donor (living or deceased), is likely to achieve sufficient graft survival while also eliminating mortality risk on the waiting list. Clearly, more information is needed about how PLDs and transplant candidates across the lifespan weigh ApoL1 genotyping relative to other organ acceptance factors.

The current study has several strengths, including its large sample size, broad geographic representation, and effective use of a crowdsourcing platform to recruit AAs into a simulation study. However, there are important limitations that should be considered in interpreting study findings. First, there is the potential for selection bias when using crowdsourcing platforms, thus limiting generalizability of findings. For instance, compared to United States living donors and transplant candidates, our sample had a higher proportion of younger and female participants. Second, while we used an iterative process in its development, the survey has not undergone independent validation. Third, participants' responses to hypothetical scenarios may not reflect decision-making when confronted with actual living donation or waiting for a transplant. Whether someone would pursue ApoL1 testing as a PLD, or whether a transplant candidate would consider accepting a kidney from a donor with high-risk genotype, may vary based on the type, closeness, and circumstances of the donor-recipient relationship, something we did not measure in this study. Fourth, we did not assess perceived benefits and risks of ApoL1 testing; thus, we are unable to comment on those factors that drive ApoL1 testing interest in the context of either living or deceased donation. Finally, we selected a single item to assess AA identity and different findings pertinent to this construct may have emerged had the entire Multidimensional Inventory of Black Identity questionnaire been used.

We join others in advocating for including AA perspectives in discussing the role of ApoL1 testing in transplantation.[35,46] Unfavorable attitudes toward genetic testing among AAs are commonly reported,[49-51] and such mistrust is justified in the context of historical maltreatment and discrimination in healthcare.[52] However, more recent data show heightened interest among AAs in learning about genetic risk for diseases.[53-55] There is a need for standardized, culturally tailored patient education protocols in kidney genetics and the role of genetic counseling should be explored. Additional research is needed to determine the most optimal content and amount of ApoL1 information to give PLDs and transplant candidates to support decision-making as well as to ascertain the benefits and unintended consequences of providing ApoL1 test findings to PLDs and patients. Such scientific inquiry has potentially relevant clinical, educational, ethical, and policy implications.

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DISCLOSURE

The authors of this manuscript have conflicts of interest to disclose as described by the *American Journal of Transplantation*. Dr Pollak is a coinventor on patents related to ApoL1 diagnostics and therapeutics. He receives research support from and has consulted for Vertex Pharmaceuticals. He also has equity in Apolo1Bio.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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