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Evaluating Barriers and Transtheoretical Model Constructs in Kidney Transplant Decision-Making

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EVALUATING BARRIERS AND TRANSTHEORETICAL

MODEL CONSTRUCTS IN KIDNEY TRANSPLANT

DECISION-MAKING

BY

ZOE MUSHKAT

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ABSTRACT

Living donor kidney transplant (LDKT) is an effective treatment for kidney disease but is underutilized compared to other treatment options. Understanding factors that influence LDKT decision-making has potential to enhance intervention effectiveness and increase pursuit of living transplant. The Transtheoretical Model (TTM) is one model of behavior change that has been applied to transplant decision-making in kidney disease populations. TTM constructs in this area have some empirical support, but evidence suggests that aspects of socioeconomic status also impact the decision to pursue LDKT.

The purpose of this study was to test a cross-sectional model of readiness for pursuing LDKT that was theoretically based in the TTM. Key socioeconomic status (SES) variables were incorporated into the model of TTM change constructs in an effort to study a wider range of variables that may improve understanding of LDKT decision-making.

Data were utilized from the completed baseline sample of Your Path to Transplant, a longitudinal randomized control trial that aimed to enhance decision-making to pursue kidney transplant by delivering TTM Stage-matched expert system coach-delivered feedback ($N = 799$ ESRD patients).

Prior to model testing, multivariate analysis of variance (MANOVA), analysis of variance (ANOVA), and chi-square tests were performed to examine relationships within TTM constructs (Stage of Change, Decisional Balance, and Self-Efficacy for pursuing LDKT) and between TTM constructs and five socioeconomic variables. Results revealed significant relationships between TTM variables, but no significant

relationships were observed between TTM and SES variables. Analyses between SES variables revealed significant relationships with small effect sizes.

Stepwise binary logistic regression was performed to test two models of readiness for pursuing LDKT (Stage of Change: Pre-Action Stages or Action). The replicated TTM model demonstrated expected relationships between independent and dependent TTM constructs. Decisional Balance and Self-Efficacy were related to Stage of Change, and later Stages exhibited significantly greater Self-Efficacy and Pros for pursuing LDKT and significantly lower Cons ($\chi^2(3) = 20.83$, $p < .001$, $R^2 = .047$, 95% CI [.01, .08]). In the full model, no statistically significant relationships were observed between TTM constructs and SES variables.

Findings from this study support the successful replication of TTM constructs in a large and diverse sample of ESRD patients. The replicated model demonstrated key differences in perceptions and motivations between patients who were in Action compared to Pre-Action Stages. However, this study was unable to detect significant improvement in model fit with the addition of SES variables. Future research should examine the LDKT readiness model longitudinally, and test for relationships with SES variables over time.

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CHAPTER 1

INTRODUCTION

End Stage renal disease (ESRD) affects over 650,000 adults in the United States (USRDS, 2016). ESRD is associated with kidney failure due to congenital or acquired disease. The two most common conditions responsible for acquired ESRD are uncontrolled diabetes and hypertension (USRDS, 2016). The economic burden of treating ESRD in 2014 was 32.8 billion dollars in Medicare expenditures (USRDS, 2016).

Treatment for ESRD involves dialysis or a kidney transplant from a deceased or living donor. Dialysis is the standard of care for ESRD with wide accessibility and health insurance coverage (Farney, Doares, Kaczmorski, Rogers, & Stratta, 2010; USRDS, 2016). Despite universal use, dialysis is the treatment option associated with the poorest health outcomes. Compared to kidney transplant, dialysis is associated with decreased quality of life and reduced lifespan (Mange, Joffe, & Feldman, 2001). Chronic dialysis treatment also increases the likelihood of future transplant failure, which affects patients who receive long-term dialysis while waiting for an available kidney transplant (Wolfe et al., 1999).

Kidney transplant is a more effective treatment for ESRD, with a projected life span increase of three to 17 years compared to dialysis (USRDS, 2016; Wolfe et al., 1999). Transplant recipients report greater quality of life, including reduced pain and

decreased fatigue, and have fewer lifestyle restrictions with discontinuation of dialysis (Neipp et al., 2006).

Deceased donor kidney transplant (DDKT) is the most common transplant option, accounting for two-thirds of all kidney transplants (USRDS, 2016). However, the demand for DDKT greatly outweighs supply. The average time spent on a wait list is 3.5 years, which may exceed the life expectancy of an ESRD patient (USRDS, 2016; Schold et al., 2009). In addition to a prolonged waiting period, DDKTs take longer to achieve kidney function once transplanted and have higher failure rates than living transplants (Cecka, 1998).

The most effective treatment for ESRD is living donor kidney transplant (LDKT) where a patient receives a kidney from a matched living donor. Studies have found that LDKT recipients achieve better health outcomes than DDKT or dialysis. In the immediate postoperative period, LDKT is associated with better graft survival and earlier kidney functioning than DDKT (Cecka, 1998). Longitudinal follow-up found that LDKT increased likelihood of five-year survival, with 85.5% of LDKT recipients alive five years after transplant versus 74.3% of DDKT recipients (OPTN, 2017a). Despite established benefits, LDKT continues to be underutilized compared to other treatment options. Data from the Organ Procurement and Transplantation Network (OPTN) in the US shows that 29.5% of kidney transplants are from living donors and 70.5% from deceased donors (2017b).

The process of pursuing LDKT is more complex than DDKT because it involves finding a healthy living donor after completing the transplant referral and candidacy evaluation common to both transplants. Patients interested in LDKT must

seek a potential donor from their network of family, friends and community. Potential

donors undergo testing to determine match suitability, a process that may be repeated

until a match is found. Because a patient's transplant is contingent upon finding a

suitable donor, the level of engagement after the transplant evaluation has potential to

affect whether the patient obtains an LDKT.

Transtheoretical Model of Behavior Change.

The transtheoretical model of behavior change (TTM) is an empirically

supported theoretical framework that has been used to understand and guide

interventions to support high quality decision-making to pursue kidney transplantation

(Waterman et al., 2014). The TTM is a decision-making model of intentional health

behavior change oriented towards wide-reaching public health interventions, in which

malleable behavior change processes are targeted to increase readiness to enact

behavior change (Prochaska & Velicer, 1997).

The key organizing principle of the TTM is the conceptualization of behavior

change as a process that occurs over time, which is the temporal dimension of the

model (Prochaska & Velicer, 1997). Readiness to enact or maintain a behavior change

is tracked across five Stages of Change: Precontemplation, Contemplation,

Preparation, Action, and Maintenance. In the *Precontemplation* Stage of Change,

there is no intention to change a behavior in the near future. Individuals in

Precontemplation may be unaware or resistant to changing a health behavior, and may

place greater value on the risks of behavior change over potential benefits. Those in

Contemplation are intending to make a change sometime within the next six months.

There are many reasons why a person may delay behavior change to the near future,

but this Stage does represent a defining change in recognizing and valuing need for behavior change. In *Preparation*, there is an intention to change a behavior in the next month. In *Action*, individuals are actively making observable behavior changes or modifications. The ability to enact behavior change is a product of the shifting motivation and value of changing a health behavior. Lastly, *Maintenance* is achieved when the given behavior change has been maintained for six months or longer.

Decisional Balance and Self-Efficacy are two intermediate TTM constructs that evaluate important cognitive shifts as behavior is modified. These constructs also inform researchers about specific change mechanisms that explain observed progression through the Stages of Change.

Decisional Balance is defined as the relative weighing of Pros and Cons towards making a health behavior change (Prochaska & Velicer, 1997). In relation to Stages of Change, Decisional Balance suggests the Cons of changing a behavior hold greater weight in earlier Stages of Change, shifting to the Pros of behavior change outweighing the Cons in later Stages (Velicer et al., 2012). This crossover of valuing benefits more greatly than the costs of making a behavior change typically occurs in the Contemplation Stage (Hall and Rossi, 2008).

Situation-specific Self-Efficacy, derived from Bandura's self-efficacy theory (1977), is the second intermediate construct in the TTM. In the context of health behavior change, Self-Efficacy is defined as an individual's confidence to make or sustain a behavior change across high-risk or difficult situations (Prochaska & Velicer, 1997). Self-Efficacy is expected to increase as individuals progress through later Stages of Change (Velicer et al., 2012).

Transtheoretical Framework of Decision-Making for Pursuing LDKT

Over decades of research, the TTM has served as a framework to evaluate change mechanisms in a wide range of health behaviors across varied populations, including cadaveric organ donation and blood donation (Robbins et al., 2001; Burditt et al., 2009). In 2014, Waterman and colleagues initiated Your Path to Transplant, a transplant education program that utilized the TTM to enhance decision-making for pursuing kidney transplants. In this application, Stage of Change was conceptualized as a measure of patients' readiness for pursuing living or deceased donor kidney transplant. Intermediate TTM constructs informed Stage-matched discussion of patients' transplant decision-making progress, and served as one indication of intervention effectiveness for the transplant education program (Waterman, Robbins & Peipert, 2016).

Preliminary research identified Stage of Change as a significant predictor of future transplant receipt (Waterman et al., 2013). In a survival analysis that investigated receipt of a living donor kidney as the main outcome, patients in later Stages of Change (Action or Maintenance) at the onset of the transplant process were significantly more likely to have received an LDKT six years later compared to patients in earlier Stages of Change (Hazard Ratio = 4.3, 95% CI = 2.7, 6.8) (Waterman et al., 2013). This finding demonstrated the importance of readiness as a framework for understanding patients' decision-making to pursue transplant, but also as a point of intervention that could increase LDKT utilization.

Refined measures of Stage of Change, Decisional Balance, and Self-Efficacy for pursuing LDKT have since been developed and validated across two samples of

patients with ESRD (Waterman et al., 2015). Results from validation testing have demonstrated the expected trends across Stages of Change, as outlined above (Waterman et al., 2015).

While preliminary findings support this application of the TTM in modeling LDKT decision-making, it is unclear whether the model includes all relevant barriers previously found to impact the process of receiving a LDKT. Findings from a number of retrospective studies indicate that key aspects of socioeconomic status (SES) serve as barriers to transplant, which are particularly relevant when addressing ongoing racial disparities and inequities in LDKT receipt (Lockwood, Bidwell, Werner, & Lee, 2016). However, TTM studies do not typically test the utility of socio-demographic variables, possibly due to the expectation that concrete measures of SES influence broader constructs, such as Self-Efficacy, to have their effects on behavior change. Despite this hypothesis, it may be that LDKT decision-making is a considerably more complex process than is the case for many health behaviors because of the combined influence of individual-level motivation, external resources, and health implications for the living donor. Moreover, it is important to study the role of specific socioeconomic barriers to not only recognize and respond to consistent findings across key retrospective studies, which suggest that SES strongly relates to low LDKT rates in minority populations, but to also evaluate whether SES improves our understanding of TTM change processes in a model of readiness for pursuing LDKT.

Inequities in LDKT Receipt

A key issue in kidney transplantation is unequal access to living and deceased donor transplants in underserved and minority populations. Non-White ESRD patients receive considerably fewer kidney transplants than White patients despite higher rates of ESRD, which is due in part to higher rates of diabetes and hypertension (OPTN 2017c). This disparity is most evident in Black patients, who received 14% of LDKTs in 2016 despite an ESRD incidence rate 3.1 times greater than White patients (USRDS, 2016; OPTN, 2017c). In contrast, White patients have one of the lowest ESRD rates but received 68% of LDKTs in 2016 (OPTN, 2017c). Large discrepancies between ESRD rates and transplant rates in non-White ESRD patients has prompted research on barriers to transplant, with evidence suggesting that patients with lower SES encounter barriers to transplant that negatively impact their decision to pursue LDKT (Hall, 2011; Lockwood et al., 2016; Navaneethan & Singh, 2006).

Socioeconomic Barriers to Transplant. Socioeconomic status is defined as the relative social standing of an individual or group, often measured as a combination of education, income, and occupation (APA, 2017). In minority samples, studies have associated lower SES with a variety of circumstances that serve as barriers to kidney transplant (Gore, Danovitch, Litwin, Pham, & Singer, 2009; Navaneethan & Singh, 2006). However, it is less clear whether conditions that coincide with lower SES serve as universal barriers to transplant across race and ethnicity, or have a magnified effect in certain groups. One study found that patients of lower SES faced similar barriers towards transplant evaluation and receipt regardless of race (Sieverdes et al., 2015). Another retrospective study of 41,000 ESRD patients identified a number of

universal and race-specific characteristics associated with decreased likelihood of LDKT receipt, which included older adults, African Americans, those with less education, those who lived in lower income areas, or those insured by Medicare insurance rather than private health insurance (Gore et al., 2009).

Components of SES have been found to impact every step of the transplant process. Patients with lower SES have been found to experience inadequate access to healthcare at early stages of kidney disease, difficulty completing the transplant evaluation, reduced likelihood of undergoing transplant surgery, and difficulty affording immunosuppressive medication after insurance coverage ends (Purnell et al., 2013; Waterman et al., 2013).

Poverty. Poverty influences both disease progression and course of treatment for ESRD. Poverty is associated with higher risk for hypertension and diabetes, two conditions that damage kidney function (Crews, Pfaff, & Powe, 2013). Moreover, poverty is a predictor for the development of chronic kidney disease, with greater influence in Black patients than White (Crews, Charles, Evans, Zonderman & Powe, 2010).

Poverty has been found to affect many aspects of the transplant process, including reduced likelihood of referral for evaluation and completing the evaluation process (Patzer et al., 2012). Other indications of SES, such as education level, employment, and insurance type, have also been found to affect likelihood of transplant receipt. Full-time employment is one factor associated with increased likelihood of LDKT receipt and improved graft survival, even when controlling for health insurance (Petersen et al., 2008; Sandhu et al., 2013). In this area of research,

full-time employment has been studied as a function of mental and physical health status, education level, or financial resources (Sandhu et al., 2013).

Education.   Education level has broad implications for future health outcomes due to moderating effects on other facets of SES, such as employment, income, and living conditions. Retrospective studies have identified poorer ESRD outcomes in those with low levels of education, including increased risk for conditions that could influence ESRD onset or complicate treatment, such as diabetes and coronary heart disease (Green & Cavanaugh, 2015).

In the ESRD population, lower educational levels have been associated with decreased access to kidney transplants and poorer transplant outcomes, most notably in racial minorities (Goldfarb-Rumyantzev et al., 2012). Schaeffner, Mehta, and Winkelmayer (2008) reported a trend of increased likelihood of transplant graft failure in lower education levels, with high school education levels twice as likely to lose transplant function compared to college graduates.

Health Insurance Type.   Research suggests that health insurance type may partially explain minority disparities in transplantation (Johansen, Zhang, Huang, Patzer, & Kutner, 2012; Schold et al., 2011). Lack of private health insurance is associated with reduced likelihood of referral for evaluation and completing the evaluation process if referred (Schold et al., 2011). Findings by Patzer et al. (2012) suggest an increased likelihood of transplant receipt with private insurance, as 43.8% of their sample had private insurance at transplant referral and 74% had private insurance at transplant.

Insurance type influences the treatment options available to a person with ESRD. Dageforde et al. (2015) and Kazley et al. (2014) found that lack of coverage for immunosuppressive medication deterred patients from pursuing transplant. For example, Medicare provides coverage for dialysis, but only covers the first three years of immunosuppressive medications post-transplant (Farney et al., 2010). Without insurance coverage for expensive medications, a patient must decide whether they can afford anti-rejection drugs for the rest of their life.

Purpose of Study.

This study evaluated whether the integration of key socioeconomic barriers into an established TTM model enhanced our understanding of decision-making for pursuing LDKT in a diverse sample of kidney patients who were at different Stages of Change. Typically, behavior change studies using the TTM have not incorporated socio-demographic variables into main analyses, but likely considered SES to understand complexities of a behavior, identify important sample characteristics, or develop construct measures that included relevant barriers (Kazley, Simpson & Chavin, 2012; Prochaska et al., 2004). The addition of socioeconomic variables into an existing TTM model was an opportunity to evaluate whether empirically relevant socioeconomic variables were related to measures of behavior change.

This study aimed to supplement current research by (1) replicating previously established relationships between the TTM constructs Stage of Change, Decisional Balance, and Self-Efficacy, (2) examining the degree to which socioeconomic variables were related to three central TTM constructs, and (3) examining whether a

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model of readiness for pursuing LDKT was significantly improved with the inclusion of evidence-driven socioeconomic variables.

While this study evaluated the usefulness of socioeconomic barriers in understanding LDKT decision-making, it also provided an additional evaluation of TTM constructs in a relatively nascent content area. If measures of SES, in conjunction with TTM constructs, improve our understanding of a complex decision-making process, it may be important to incorporate a socioeconomic perspective into future models of health behavior change.

CHAPTER 2

METHODOLOGY

Sample.

This study involved secondary data analysis of baseline data from the Your Path to Transplant study (Waterman et al., 2014). Your Path to Transplant (YPT) is a longitudinal randomized control trial with one aim of reducing racial disparities in LDKT by measuring and providing feedback on transplant decision-making and knowledge compared to a usual care education control group (Waterman et al., 2014). YPT is a computer-tailored intervention primarily delivered via telephonic coaching in which validated measures of TTM decision-making constructs were used to create individualized expert-system feedback reports tailored to each participant's degree of readiness for pursuing LDKT. Computer generated content, which included all measures and feedback reports, was delivered by trained coaches in-person and by telephone. Participants received tailored TTM feedback over four time-points after the baseline survey (baseline follow-up, an in-person evaluation focused on readiness, four-month, and eight-month follow-ups). The Institutional Review Boards at University of California Los Angeles Medical Center and the University of Rhode Island approved Your Path to Transplant.

Baseline Time Point.

Data were utilized from the completed baseline time-point of YPT, with a sample of 799 adults diagnosed with ESRD ($N = 799$). Participants were recruited

from the population of ESRD patients who had scheduled a transplant evaluation at the UCLA Kidney-Pancreas Transplant Program. Data collection occurred from December 2013 to May 2017. Patient demographics were stored in a research electronic data capture system (REDCap) and TTM decision-making and barrier-related data were stored in the expert system. Treatment and control groups were pooled for analysis; YPT conducted identical baseline surveys for treatment and control groups with the intervention delivered in later time-points.

Measures.

Demographics. The baseline demographics available for analysis included age, sex, race and ethnicity, dialysis status, and presence of hypertension and diabetes (Table 3).

Transtheoretical Model. TTM measures included Stage of Change, Decisional Balance, and Self-Efficacy, and were created and validated for LDKT decision-making (Waterman et al., 2015). Between two separate samples of ESRD patients, the scales demonstrated strong internal reliability and validity, and relationships between constructs were found to be externally valid and comparable to similar models of health decision-making (Waterman et al., 2015; Hall et al., 2007; Plummer et al., 2001).

 LDKT Readiness. Stage of Change was measured as self-reported readiness for pursuing LDKT. Seen in Table 1, the staging algorithm classified participants into four Stages of Change: *Precontemplation* (I am not considering taking actions in the next six months to pursue living donation), *Contemplation* (I am considering taking actions in the next six months to pursue living donation), *Preparation* (I am preparing to take actions in the next 30 days to pursue living donation), and *Action* (I am taking

actions to pursue living donation) (Waterman et al., 2015). Traditionally there are five Stages of Change, including a Maintenance Stage. For this context, however, a Maintenance Stage for pursuing LDKT was not conceptually appropriate since a patient in Maintenance would technically have received an LDKT. The Stage distribution of the sample was Precontemplation ($n = 101$, 12.8%), Contemplation ($n = 205$, 25.7%), Preparation ($n = 137$, 17.1%), and Action ($n = 356$, 44.6%) (Table 3). For some analyses, Stage of Change was dichotomized into Pre-Action ($n = 443$, 55.4%), which combined Precontemplation, Contemplation, and Preparation into one category, and Action ($n = 356$, 44.6%).

Construct validity was tested by examining whether patients in Action reported completion of certain LDKT behaviors compared to Pre-Action Stages, which included seven common behaviors such as "Generally talk to people about my interest in transplant" and "Accept someone's offer to donate" (Waterman et al., 2015). Results of the analyses showed that patients in Action had completed more LDKT behaviors than those in earlier Stages, and Action could be predicted by certain behaviors, such as sharing a need for a living donor to a larger community (Waterman et al., 2015).

In invariance testing, Stage was invariant for gender and education level (Brick et al., 2016). Stage distribution varied significantly by race/ethnicity, with Black participants more likely to have been in Pre-Action Stages of Change, but this variance was consistent with LDKT trends in minority groups (Brick et al., 2016).

Lastly, movement through the Stages of Change revealed that Pros increased 0.92 SD, Cons decreased 0.29 SD, and Self-Efficacy increased 0.80 SD from

Precontemplation to Action (Waterman et al., 2015). These relationships are congruent with changes by Stage in previous TTM models across a range of health behavior changes (Hall & Rossi, 2004).

Pros and Cons of Living Donation. This Decisional Balance scale is a 12-item measure of the Pros and Cons of LDKT, with six statements depicting each construct respectively. Scale items are listed in Table 2. Decisional Balance statements are oriented towards the health benefits of LDKT and interpersonal challenges surrounding the living donor (Waterman et al., 2015). The Pros scale is oriented towards the patient's improved health, and includes items such as "I will be healthier because I spent less time on dialysis," or "With a living donor transplant, I will be able to contribute to my family and friends sooner." The Cons scale addresses interpersonal challenges and donor wellbeing, which includes "A living donor could have health problems due to donating," or "Donation could harm my relationships with a living donor." The importance of a statement to a patient's decision to pursue LDKT is rated from 'Not Important' (1) to 'Extremely Important' (5). In the current study, responses to the Pros and Cons items were separately summed and analyzed as two separate variables. In this sample, Pros and Cons scores both ranged from 6 to 30, with a mean Pros score of 25.62 (SD = 4.87) and a mean Cons score of 18.26 (SD = 6.22).

In previous validation testing, the Decisional Balance scale appeared to measure the underlying construct, with best model fit as a two-factor correlated model across two samples of ESRD patients (r = 0.25 between Pros and Cons; Sample 1, Sample 2: Pros: a = 0.78, 0.86; Cons: a = .77, 0.80) (Waterman et al., 2015).

Self-Efficacy for Living Donation. The Self-Efficacy scale is a six-item measure of participants' confidence in their ability to pursue LDKT even when faced with a variety of difficult situations (Waterman et al., 2015). This measure includes statements such as "You don't know how to discuss living donation with potential donors," and "A potential living donor who was evaluated did not match you." All Self-Efficacy scale items are listed in Table 2. Self-Efficacy to continue pursuing LDKT, despite the given barrier, is rated on a five-point scale ranging from 'Not at all Confident' (1) to 'Completely Confident' (5). For the analyses in this study, the six Self-Efficacy items were summed to create a single variable. Self-Efficacy scores ranged from 6 to 30, with a mean score of 21.07 ($SD = 6.64$).

Previous validation testing found this measure to be internally consistent (Sample 1: $a = 0.90$, Sample 2: $a = 0.88$) and Self-Efficacy increased 0.80 SD from Precontemplation to Contemplation, consistent with previous TTM measures (Prochaska et al., 1994).

Socioeconomic Variables.

Evidence suggests that socioeconomic barriers may derail the transplant process, and may contribute to lower transplant utilization among patients with fewer socioeconomic resources (Gore et al., 2009). In the baseline survey, YPT measured socioeconomic vulnerability across eight variables: Education Level, Income Vulnerability, owning a Washer and Dryer, subjective Neighborhood Safety, owning a Vehicle, Employment Status, type of Health Insurance, and access to Care for Dependents.

Education Level. Participants' self-reported level of education was measured across seven response choices: '8th grade or less' (n = 19, 2.4%), 'Some high school' (n = 54, 6.8%), 'High school diploma or GED' (n = 199, 24.9%), 'Some college or vocational school' (n = 249, 31.2%), 'College or vocational school degree' (n = 182, 22.8%), 'Some professional or graduate school' (n = 22, 2.8%), and 'Professional or graduate degree' (n = 74, 9.3%). In this study, categories with low frequencies were collapsed to achieve a normal distribution. The categories '8th grade or less' and 'Some high school' were combined into 'Less than high school.' 'Some professional or graduate school' was combined with 'College or vocational school degree.'

Education Level was analyzed using five categories: 'Less than high school' (n = 73, 9.1%), 'High school diploma or GED' (n = 199, 24.9%), 'Some college or vocational school' (n = 249, 31.2%), 'College or vocational degree' (n = 204, 25.5%), and 'Professional or graduate degree' (n = 74, 9.3%).

Financial Security. Participants' Financial Security was measured with the question, "If your family lost your current income, how long could you continue to live in your current situation?" Participants could choose one of seven response choices: 'I do not have a current income' (n = 40, 5%), 'Less than 1 month' (n = 131, 16.4%), '1-2 months' (n = 121, 15.1%), '3-6 months' (n = 136, 17%), '7-12 months' (n = 46, 5.8%), 'More than a year' (n = 278, 34.8%), and 'Prefer not to answer' (n = 47, 5.9%).

The Financial Security categories were reclassified for the analyses in this study to reduce low frequencies in some response categories and to exclude the category 'Prefer not to answer.' Categories were consolidated into 'Less than 2

months' ($n = 292$, 36.5%), 'Less than 1 year' ($n = 182$, 22.8%), and 'More than 1 year' ($n = 278$, 34.8%).

Washer/Dryer. Owning a washer and dryer served as an additional measure of financial status, and was assessed with the question, "Do you have a washer and dryer at home?" Response choices included 'Yes' ($n = 671$, 84%) or 'No' ($n = 128$, 16%).

Neighborhood Safety. Participants' subjective Neighborhood Safety was measured with the question, "Which of the following statements best describes in general how safe you feel in your home or neighborhood?" Response choices included 'I feel very safe in my home or neighborhood' ($n = 660$, 82.6%), 'I feel somewhat safe in my home or neighborhood' ($n = 134$, 16.8%), and 'I do not feel safe at all in my home or neighborhood' ($n = 5$, 0.6%).

For purposes of analysis, the Neighborhood Safety variable was dichotomized into 'I feel very safe in my home or neighborhood' ($n = 660$, 82.6%), and 'I do not feel entirely safe in my home or neighborhood' ($n = 139$, 17.4%).

Vehicle. Participants' access to transportation was included to evaluate whether subjects had reliable transportation to a transplant center. Participants were asked, "Do you or does anyone in your household own a car or other vehicle?" and could either select 'Yes' or 'No.' In the sample, 90.6% had access to a vehicle ($n = 660$) and 9.4% did not have access ($n = 75$). This question is particularly relevant in the Los Angeles, CA metropolitan area as access to public transportation is limited.

Socioeconomic Variables Excluded from Analysis.

Care for Dependents. Participants' family responsibilities were measured with the question, "Do you have access to a source of care for children or other dependents in your home in an emergency?" Response choices included 'Yes' ($n = 232$, 29%), 'No' ($n = 70$, 8.8%), or 'Not needed' ($n = 497$, 62.2%). This variable was not included for analysis because meaningful data on participants' socioeconomic status could not be interpreted in the 62.2% of the sample that selected 'Not needed.' This suggests that emergency childcare was not a relevant barrier to most of the sample, and results would not be representative of the whole sample.

Employment Status. Participants' Employment Status was measured with the question, "Which of the following best describes where your income comes from?" Ten sources of income were presented and participants selected all that applied. Sources of income included: 'Full-time employment,' 'Part-time employment,' 'Employment of others in the household,' 'Retirement savings/pension,' 'Social Security,' 'Unemployment,' 'Welfare,' 'Disability due to kidney disease,' 'Disability due to other causes,' or 'Other' (e.g. student loans, homelessness).

Employment status was unable to be used for analysis due to a greatly reduced sample size when the income sources were organized into independent categories. In this measure, participants were asked to select as many types of employment as applicable, which resulted in substantial overlap between income sources. Independent income groups reduced the sample by 34.5% ($n = 523$), and results may not have been representative of the total sample.

Health Insurance Type. Participants' health insurance type was measured with the question, "What type of health insurance do you have?" Eight types of insurance were listed and participants were instructed to select all that apply. Health insurance types included: 'Medicare,' 'Medicaid,' 'Private insurance,' 'Other governmental insurance,' 'Don't know,' 'Other insurance,' 'I have no insurance and don't pay for my care,' and 'I have no insurance and pay cash for my care.'

Health Insurance was also excluded from analysis despite evidence that health insurance significantly impacts LDKT receipt (Gore et al., 2009; Schold et al., 2011). In preparation for analysis, this variable was grouped into four separate categories, without reducing sample size ('Single private health insurance,' 'Single government insurance,' 'Multiple private,' or 'Multiple government'). However, the quality of health insurance could not be determined because of substantial changes in insurance markets during the course of data collection that may have reduced coverage discrepancies between private and government insurance plans. Results would not be interpretable without additional information on potential coverage differences between government versus private health insurance plans.

Hypotheses and Planned Analyses.

All statistical analyses were conducted using SPSS Version 24.

Preliminary Analyses. All participants from treatment and control baseline surveys were included in the sample. Socio-demographic analyses were used to describe the sample by examining means and frequencies of TTM constructs (Pros, Cons, and Self-Efficacy), SES variables, and health measures across four Stages of Change and by race/ethnicity. In addition, a series of chi-square tests were conducted

to evaluate independence between SES variables; these tests aided in interpretation of results from Hypotheses 2 and 3.

Hypothesis 1: Replicating established transtheoretical model relationships.

Relationships between TTM constructs of LDKT decision-making were compared to the established TTM relationships found in measure development as well as TTM models developed in other health settings (Waterman et al., 2015; Hall & Rossi, 2008). It was predicted that relationships between baseline measures of Stage of Change, Decisional Balance, and Self-Efficacy would be consistent with previous studies of health behavior change.

Specifically, we expected Decisional Balance and Self-Efficacy to be significantly related to Stage of Change. For Decisional Balance, we predicted that higher Cons would be associated with earlier Stages of Change, Precontemplation and Contemplation, and higher Pros would be associated with later Stages of Change, Preparation and Action. We predicted that Self-Efficacy would increase across Stages of Change, with greater Self-Efficacy in later Stages of Change.

Analyses. Multivariate analysis of variance (MANOVA) was used to evaluate group differences between four Stages of Change by Decisional Balance and Self-Efficacy. Separate analysis of variance (ANOVA) tests were used to examine differences between Stage groups. Tukey's post hoc tests were used to test for significant differences between earlier and later Stages of Change. Standardized T-scores were used to clarify relationships, and differences in T-score standard deviations were used to aid in comparison with previous TTM models.

Hypothesis 2: Relationships between socioeconomic and TTM variables.

2.a. Decisional Balance and Self-Efficacy. This analysis explored the degree to which socioeconomic variables were related to two TTM constructs, Self-Efficacy and Decisional Balance. We predicted that indications of greater SES (higher level of education, lower income vulnerability, feeling safe in one's neighborhood, owning a washer and dryer, and owning a vehicle) would be associated with greater Self-Efficacy, greater Pros for pursuing LDKT, and lower Cons.

Analysis 2a. With each of the SES variables, a series of one-way ANOVAs were conducted to evaluate strength and direction of relationships with three continuous TTM variables: Pros, Cons, and Self-Efficacy.

2.b. Stage of Change. This analysis sought to understand the degree of relatedness between socioeconomic variables and our outcome variable, Stage of Change. It was predicted that indications of greater SES would be more strongly related to later Stages of Change than earlier Stages of Change.

Analysis 2b. A series of chi-square tests were conducted to determine the strength of relationship between Stage of Change and each SES variable.

Hypothesis 3: Modeling TTM Constructs with Socioeconomic Variables.

This hypothesis sought to evaluate whether socioeconomic variables significantly improved a TTM model of readiness for pursuing LDKT. The analyses involved a stepwise comparison of two models: a replicated TTM model and a full model that tested both TTM and SES variables. It was predicted that SES variables would be significant additions to the model and improve model fit, which could indicate that socioeconomic circumstances affected readiness for pursuing LDKT.

Analyses. Stepwise logistic regression was used to compare model fit over two steps. For this analysis, Stage of Change was dichotomized into Pre-Action (Precontemplation, Contemplation, and Preparation Stages) and Action. The first step examined Stage of Change as the dependent variable (DV) and Decisional Balance and Self-Efficacy as independent variables (IVs). In the second step, five SES variables were analyzed with Decisional Balance and Self-Efficacy to test for improvement in modeling Stage of Change. Logistic regression interpretation included chi-square statistics, Wald criterion, classification tables, goodness of fit, and odds ratios to examine whether improvement in model fit was statistically significant.

CHAPTER 3

FINDINGS

Sample.

A total of 799 subjects completed the baseline survey and were included for analysis. Distributions of participant characteristics across Stages of Change are shown in Table 3. The sample was 60.7% male ($n = 485$) and 39.3% female ($n = 314$), with a race/ethnicity distribution of 39% Hispanic ($n = 312$), 34.9% non-Hispanic White ($n = 279$), 24.8% Black ($n = 198$), and 1.3% multiracial or other ($n = 10$). The majority of the sample was on dialysis (69.6%, $n = 556$) and reported hypertension (82.4%, $n = 658$), while 43.7% ($n = 349$) reported having diabetes.

Multivariate assumptions were assessed for the three continuous variables in the following analyses: Pros, Cons, and Self-Efficacy. Non-normality was detected in Pros and Self-Efficacy, while Cons was within normal limits. Pros and Self-Efficacy also demonstrated heterogeneity of variance, which required the use of the more robust Welch's ANOVA. Multicollinearity was not evident as constructs demonstrated small but significant correlations. Reliability testing supported internal consistency for all three constructs (Pros: $a = .80$, Cons: $a = .78$, Self-Efficacy: $a = .88$).

Differences in measures of health status (dialysis, diabetes, and hypertension), TTM constructs, and SES were analyzed between Black, Hispanic, and non-Hispanic White participants through a series of exploratory chi-square and logistic regression

analyses to determine magnitude, direction, and odds ratios of relationships between racial-ethnic groups. These three groups represented 98.7% of the sample, and distributions of SES variables by race and ethnicity are summarized in Table 4.

The use of dialysis was reported in 84.3% ($n = 167$) of Black, 74.4% ($n = 232$) of Hispanic, and 54.1% ($n = 151$) of White patients. Compared to Whites, dialysis utilization was significantly greater among Black and Hispanic patients ($\chi^2(1) = 47.6$, $p < .001$, $\Phi = .32$; $\chi^2(1) = 26.45$, $p < .001$, $\Phi = .21$). The odds of using dialysis were 1.86 times greater in Black patients compared to Hispanic, and 4.57 times greater compared to Whites (Table 5).

The highest diabetes rate in the sample was found in Hispanic patients (51.1%, $n = 159$) followed by 45.2% of Black patients ($n = 89$), both of which demonstrated significantly greater proportions than the 35% of Whites ($n = 97$) ($\chi^2(1) = 15.46$, $p < .001$, $\Phi = .16$; $\chi^2(1) = 4.99$, $p < .05$, $\Phi = .10$). The odds of diabetes were almost twice as great for Hispanic patients than Whites (Table 5).

Hypertension was reported in 82.6% ($n = 658$) of the total sample, with highest rates found amongst Black patients (87.8%, $n = 173$), followed by Hispanics (83.7%, $n = 261$), and then Whites (78.4%, $n = 218$). Compared to White patients, Blacks had significantly higher rates of hypertension ($\chi^2(1) = 6.70$, $p < .05$, $\Phi = .12$), and the odds of having hypertension were nearly twice as great (Table 5).

No significant differences in Stage distribution were observed between Black and Hispanic patients ($\chi^2(3) = 0.53$, $p > .05$), Black and White patients ($\chi^2(3) = 2.88$, $p > .05$), or White and Hispanic patients ($\chi^2(3) = 7$, $p > .05$). ANOVA tests of intermediate TTM variables across racial-ethnic groups demonstrated significantly

higher Cons scores among Black and Hispanic patients than Whites, with small effect sizes ($F(1, 475) = 6.5, p < .05, \eta^2 = .04; F(1, 589) = 24.8, p < .001, \eta^2 = .05$). Hispanic patients also reported significantly higher Pros scores than Whites, with a small to medium effect size, but were not found to differ significantly from Pros scores among Black patients ($F(1, 540) = 11.2, p < .01, \eta^2 = .05; F(1, 508) = 1.75 \ p > .05$). No significant differences in Self-Efficacy were detected across racial-ethnic groups.

In this sample, White patients were associated with indications of higher SES compared to Blacks or Hispanics. Whites reported the highest education levels, with the odds of having a college degree 3.58 times greater than Hispanics and 2.44 times greater than Black patients (Table 5). Hispanic participants had the lowest education levels of the sample, and had the highest proportion of subjects who had not obtained a high school diploma or GED (15.4%, $n = 48$). No significant differences in college diploma prevalence were detected between Black and Hispanic patients.

White patients were found to have significantly greater financial security than Black or Hispanic participants ($\chi^2 (2) = 27.15, p < .001$, Cramer's V = .24; $\chi^2(2) = 37.19, p < .001$, Cramer's V = .26). The odds of having more than one year of financial security were 2.76 times greater in White participants compared to Hispanic, and 2.67 times greater compared to Blacks (Table 5).

Black patients reported feeling significantly less safe in their homes or neighborhoods than White ($\chi^2 (1) = 26.39, p < .001, \Phi = .24$) and Hispanic patients ($\chi^2 (1) = 16.97, p < .001, \Phi = .18$). Compared to Black patients, the odds of feeling completely safe in one's home or neighborhood was 3.35 times greater in Whites and

2.45 times greater in Hispanics (Table 5). No significant differences were detected between subjective neighborhood safety between White and Hispanic groups.

Hypothesis 1: Replicating established TTM relationships. TTM measures of LDKT decision-making were compared to established TTM relationships reported in other health settings (Waterman et al, 2015; Hall & Rossi, 2008). Stage of Change was expected to significantly relate to Decisional Balance and Self-Efficacy. Decisional Balance was predicted to demonstrate significantly higher Pros in later Stages of Change and higher Cons in earlier Stages. Self-Efficacy was predicted to increase across Stage of Change, with greater Self-Efficacy in later Stages. MANOVA and ANOVA tests were conducted to examine the effect of Decisional Balance and Self-Efficacy on readiness for pursuing LDKT.

Decisional Balance. MANOVA testing revealed a significant effect for Stage of Change on Pros, Cons, and Self-Efficacy for pursuing LDKT (Wilk's $\Lambda = .86$, $F(9, 1930.1) = 14.02$, $p < .001$, $\eta^2 = .05$). Results from follow-up ANOVAs demonstrated significant differences between the four Stages of Change groups for Pros ($F(3, 795) = 18.92$, $p < .001$, $\eta^2 = .07$) and for Cons ($F(3, 795) = 6.26$, $p < .001$, $\eta^2 = .02$). Both relationships had a small effect size. Follow up Tukey's post-hoc tests revealed that, compared to those in Precontemplation, patients in Action reported significantly higher Pros for pursuing LDKT and significantly lower Cons at the .05 significance level.

Self-Efficacy. A follow-up ANOVA test for Self-Efficacy revealed significant differences between Stage groups ($F(3, 795) = 18.50$, $p < .001$, $\eta^2 = .085$), with a

small to medium effect size. Follow up Tukey's post hoc tests revealed significantly greater Self-Efficacy among those in Action versus Precontemplation.

Standardized T-scores of Pros, Cons, and Self-Efficacy scales ($M = 50$, $SD = 10$) were calculated to assist with the interpretation of TTM relationships. T-score differences between Precontemplation and Action indicated that Pros increased 0.81 SD, Cons decreased 0.45 SD, and Self-Efficacy increased 0.91 SD (Table 6). In Figure 1, mean T-scores for Self-Efficacy, Pros, and Cons are graphed across the Stages of Change.

Hypothesis 2: Relationships between socioeconomic and TTM variables.

A series of ANOVA and chi-square tests were conducted to evaluate whether significant relationships exist between SES and TTM variables, as well as the direction of such relationships.

2.a. Decisional Balance and Self-Efficacy. Analyses involved three one-way ANOVA tests per SES variable. We expected indications of greater SES to be related to higher Self-Efficacy, higher Pros, and lower Cons.

Education Level. Education Level was significantly related to Decisional Balance variables. No significant relationships were detected between Education Level and Self-Efficacy ($F(4, 794) = 2.29$, $p > .05$).

Education Level was significantly related to Pros ($F(4, 267.8) = 4.07$, $p < .01$, $\eta^2 = .02$). The effect size was small. Contradictory to our hypothesis, Education Level and Pros for pursuing LDKT demonstrated an inverse relationship; as Education Level increased, Pros decreased. Results from Tukey's post-hoc tests identified significantly higher Pros among participants with a high school education or less ($n =$

28

272, $M = 26.5$) compared to those with a professional or graduate degree ($n = 74$, $M = 24.1$).

There was a statistically significant relationship between Education Level and Cons, which had a small effect size ($F(4, 794) = 9.13$, $p < .001$, $\eta^2 = 0.04$). Results from Tukey's post-hoc analyses identified an inverse relationship between Education Level and Cons for pursuing LDKT; Cons decreased as Education Level increased, with significantly higher Cons in subjects with a high school education or less ($n = 272$, $M = 20.5$) compared to those with some college education ($n = 249$, $M = 17.7$) and subjects with a professional or graduate degree ($n = 74$, $M = 15.4$), but was not significantly different than subjects with a college degree ($n = 204$, $M = 18$).

Financial Security. No significant relationships were detected between Financial Security and Pros, Cons, or Self-Efficacy (Table 7).

Neighborhood Safety. Neighborhood Safety was not significantly related to Pros, Cons, or Self-Efficacy (Table 7).

Washer/Dryer. Owning a Washer or Dryer was not significantly related to Pros, Cons, or Self-Efficacy (Table 7).

Vehicle. Owning or having access to a vehicle was not significantly related to Pros or Self-Efficacy for pursuing LDKT (Table 7). A significant relationship was detected between access to a Vehicle and Cons for pursuing LDKT, with a small effect size, $F(1, 797) = 5.35$, $p < .05$, $\eta^2 = .001$.

2.b. Stage of Change. A series of chi-square analyses were conducted to evaluate the relationship between Stage of Change and five SES variables. Seen in Table 8, no statistically significant relationships were detected.

Hypothesis 3: Modeling TTM Constructs with Socioeconomic Variables.

Two binary logistic regression models were tested to evaluate whether the addition of five SES measures into an existing TTM model significantly improved Stage grouping in this sample. We predicted that model fit would be significantly improved with the inclusion of SES variables in the TTM model, and that indications of greater SES would be related to being in Action compared to Pre-Action Stages.

Preliminary Analyses. Relationships between SES variables were tested over a series of nine chi-square tests, with effect size reported with Cramer's V or Phi coefficients (Table 9). Results of the chi-square tests revealed that all five socioeconomic variables were significantly related to each other at the $p < .001$ significance level. Effect sizes for this set of analyses were small and ranged from .14 to .21. Small effect sizes supported the inclusion of all five SES variables into the tested model, as the variables appeared to have measured related dimensions of SES without substantial overlap.

Analysis 3.a. Stepwise binary logistic regression analysis was used for model testing. The first step sought to replicate previous TTM relationships and the second step evaluated whether the addition of SES variables improved model fit.

Step one included Decisional Balance and Self-Efficacy as IVs, and baseline Stage of Change (Action versus Pre-Action) as the outcome measure. The TTM model was statistically significant compared to a constant-only model, $\chi^2(3) = 30.83$, $p < .001$, which indicated that readiness to engage in LDKT actions was influenced by perceptions of the benefits and costs of transplant as well as the degree of confidence to continue pursuing LDKT even in difficult situations. Nagelkerke's R^2 was .047,

which suggests that the TTM IVs had a small effect on Stage grouping. Significant Wald tests provided evidence that all three TTM constructs significantly contributed to the grouping of Action versus Pre-Action Stages of Change. Seen in Table 10, the odds ratios for intermediate TTM constructs suggest that increased Self-Efficacy (OR = 1.04, 95% CI [1.01, 1.05]) and Pros (OR = 1.05, 95% CI [1.01, 1.08]) for pursuing LDKT were related to being in Action versus Pre-Action. Higher Cons were found to reduce the odds of being in Action (OR = 0.96, 95% CI [.94, .99]). Correct classification was 57.6%, with correct identification of Pre-Action in 76.1% of cases and Action in 34.4%.

Analysis 3.b. In step two of the logistic regression analysis, five socioeconomic variables were added to the TTM model. This full model contained one binary DV, Stage of Change (Action versus Pre-Action), and eight IVs: three continuous TTM constructs (Pros, Cons, Self-Efficacy), and five categorical SES measures (Education Level, Financial Security, Neighborhood Safety, owning a Vehicle, and owning a Washer and Dryer).

Results from step two of logistic regression analysis detected no statistically significant improvement in model fit with the addition of SES variables (Table 10). Non-significant Wald tests indicated that effects on Stage grouping were undetectable at the .05 significance level. Without the addition of significant SES variables, this second model was essentially identical to the replicated TTM model in step 1, with a minor increase in correct classification to 58.9% (Pre-Action: 75.6%, Action: 38%). Odds ratios for Pros, Cons, and Self-Efficacy remained unchanged from step one.

CHAPTER 4

DISCUSSION

The pursuit of living donor kidney transplant requires resources and opportunities that may not be available to many patients with lower socioeconomic status. This study examined relationships between readiness for pursuing living donor transplant and socioeconomic barriers that could negatively influence efforts to pursue transplant from a living donor. Socioeconomic barriers did not add to a model of readiness for pursuing LDKT when analyzed with a set of dynamic TTM constructs.

Results from MANOVA and ANOVA analyses supported the use of the transtheoretical model of readiness for pursuing LDKT, and the relationships found between the TTM constructs were successfully replicated in a new sample of ESRD patients. Consistent with prior research, Self-Efficacy and Pros were the main drivers of Stage progression, while Cons had a weaker effect on readiness (Prochaska, 1994). From participants in Precontemplation to those in Action, Self-Efficacy increased 0.91 SD, Pros increased 0.81 SD, and Cons decreased 0.45 SD. This relationship is presented in Figure 1, and is consistent with the results reported in initial TTM measure development for pursuing LDKT (Waterman et al., 2015). The Pros and Cons intersected between Contemplation and Preparation Stages, consistent with the relationship of these variables seen in a meta-analytic review of cross-sectional TTM models in other behavior change areas (Hall & Rossi, 2008).

Moreover, the replicated model demonstrated dynamic relationships between constructs when modeled with logistic regression. For every one-unit increase, the odds of being in Action increased 1.05 for Pros and 1.04 for Self-Efficacy, and decreased 0.96 for Cons. Therefore, the odds of being in Action were 6.3 times greater for patients who valued the Pros of LDKT as 'Very Important' to their decision to pursue transplant compared to 'Moderately Important.' These findings suggest that patients in Action were clearly distinguished from earlier Stages by their perception of transplant benefits and degree of confidence for pursuing LDKT.

The successful model replication in this study provides additional evidence that the TTM can model decision-making processes in complex behavior change areas. Pursuing LDKT is a particularly complex set of behaviors because a patient's success relies on the behavior of a second person, the living donor. Moreover, the staging algorithm did not identify a defining behavior that clearly separated Action from Pre-Action, which typically requires the adoption or extinction of a specific behavior. Lastly, being in Action does not guarantee that a patient will receive an LDKT despite engaging in LDKT behaviors. While patient-level change plays an important role in LDKT receipt, factors outside the patient's control also weigh heavily on outcomes, such as matching with a living donor or meeting certain health criteria.

Transplant readiness has been identified as an important predictor of LDKT receipt, and a body of literature has identified racial and socioeconomic disparities in LDKT utilization (Gore et al., 2009; Waterman et al., 2013). However, this is the first study to directly test whether the inclusion of socioeconomic variables would improve

our understanding of LDKT readiness. After testing variables independently and as

covariates, this study did not find significant improvement in model fit when

socioeconomic variables were added to the readiness model. Socioeconomic status

did not appear to account for differences between patients in Pre-Action Stages

compared to those in Action. However, it is possible that the cross-sectional

constraints of the present study design limited our ability to detect relationships with

socioeconomic variables.

The sample in Your Path to Transplant represented a highly selective group of

ESRD patients that had already scheduled their transplant evaluation, and it is

important to interpret our findings under this context. Taking into account the

literature on barriers to referral and completion of the transplant evaluation, it is

possible that this study sample did not include patients who faced the most significant

socioeconomic barriers to transplant because they may not have been able to schedule

the transplant evaluation from which this study recruited (Lockwood et al., 2016).

The participants in this study may not have been challenged by, or may have already

overcome barriers to pursuing transplant and thus represent a somewhat select sample

of kidney patients who could potentially pursue LDKT. For example, 90% of the

study sample had access to private transportation, the majority felt completely safe in

their home or neighborhood, and all participants had health insurance. Future research

should consider the feasibility of representing the full array of kidney patients who

could benefit from DDKT or LDKT.

Race & Differences in Stage

When socio-demographic variables were analyzed across racial-ethnic groups, an overall pattern of higher socioeconomic status was observed in White patients and lower socioeconomic status was observed among Black and Hispanic patients. Moreover, key health markers for ESRD indicated that Black and Hispanic patients had a poorer health status compared to White patients. When TTM constructs were examined, no significant differences were observed between Stage of Change and race/ethnicity despite the presence of socioeconomic and health disparities. This finding was inconsistent with previous research by Waterman et al. (2013), which reported lower readiness for pursuing LDKT in Black patients compared to Whites in a sample of patients who had also presented for transplant evaluation. The discrepancy may be explained by more equal representation of non-White patients in the present sample, or on cultural or geographic characteristics, but ultimately further research is needed to draw a conclusion.

Statistically significant relationships were detected between Decisional Balance and Education Level, but the directions of the relationships were unexpected. Results demonstrated that groups with lower education levels had the highest Pros and Cons scores, and the group with the highest education level reported the lowest Pros and Cons scores. A similar effect was reported in invariance testing results for this Decisional Balance scale, in which some Pros and Cons items were variant across education level and race/ethnicity (Brick et al., 2016).

This result could be a function of health literacy, which takes into consideration patients' reading literacy, capacity for critical thinking, understanding of

the disease and treatment options, provider communications, and ability to navigate

the healthcare system (Paasche-Orlow & Wolf, 2007).   The Decisional Balance items

(see Table 2) are socially oriented and require only a basic understanding of medical

and health-related costs and benefits, which is appropriate because this intervention

was designed to enhance LDKT decision-making in marginalized groups. It is

possible that participants with a less-than-high-school education perceived social

consequences related to the living donor as the most important deciding factors for

pursuing LDKT, and the Decisional Balance items were relevant to their decision-

making process. On the other hand, participants with graduate degrees may have had

more in-depth understandings of the health-related implications for transplant. If this

group based their Pros and Cons on more technical concerns, such as cancer related to

anti-rejection therapy, the Pros and Cons items would not be as important to their

transplant decision-making.

Limitations.

This study was limited by a cross-sectional design, which examined baseline

data from the longitudinal study Your Path to Transplant. Results are not

generalizable without examining how TTM constructs and socioeconomic barriers

interact over time. Cross-sectional analysis was useful for the goals of this study,

which were to perform preliminary evaluations of theory-driven relationships in the

more recent content area of readiness for pursuing living donor kidney transplant.

However, the relationships tested were correlational in nature and do not represent

predictive or causal relationships.

Another important limitation is the selective recruitment of patients who had recently scheduled a transplant evaluation. Transplant promotion research faces a number of difficulties in recruiting non-biased samples. Studies are time-limited and need to recruit a sample that is likely to make progress in pursuing transplant over the course of the study. This could result in a sample that is motivated for transplant but may also have fewer barriers to pursuing transplant. In this study, the characteristics of the recruited sample may have impacted our ability to detect relationships between SES variables and behavior change constructs. It is possible that stronger relationships would be detected if our sample were drawn from the national population of transplant eligible kidney patients.

The method used to test socioeconomic variables may have also limited our ability to detect relationships to TTM constructs. An index of SES may be more reflective of reality than testing independent SES markers. Aspects of socioeconomic status do not operate in isolation; instead, they interact and compound across different circumstances, such as the widespread effects that education level can have on employment, income, and other domains of life. Lastly, this study was limited by the exclusion of employment and health insurance variables in analyses. Both variables have important implications for patients pursuing LDKT and have been found to effect transplant decision-making (Patzer et al., 2012; Petersen et al., 2008).

Future Directions. While readiness for pursuing LDKT did not appear to be related to socioeconomic barriers or advantage in this study, more research is needed to substantiate these findings. An important next step is to examine the LDKT readiness model longitudinally, which would be important for determining predictive

relationships within the model. Researchers should also test for relationships between socioeconomic barriers and readiness longitudinally.

Additionally, future research should investigate the relationship between readiness for pursuing LDKT and transplant receipt. While readiness was found to predict transplantation in a previous study, this relationship has not been established with the validated TTM scales used in the present study (Waterman et al., 2013; Waterman et al., 2015).

In conclusion, living donor kidney transplant has proven to be the treatment of choice for enhancing wellbeing and survival of patients with chronic renal failure. Transplant research continues to investigate inequities that impact the decision to pursue kidney transplants from living donors. Reducing barriers to kidney transplant, with focus on the dynamic factors that are emphasized by the TTM, has potential to lead to greater use of LDKT and ultimately improve treatment outcomes for end-stage renal disease.

Figure 1. Relationships between TTM Constructs using Standardized Scores
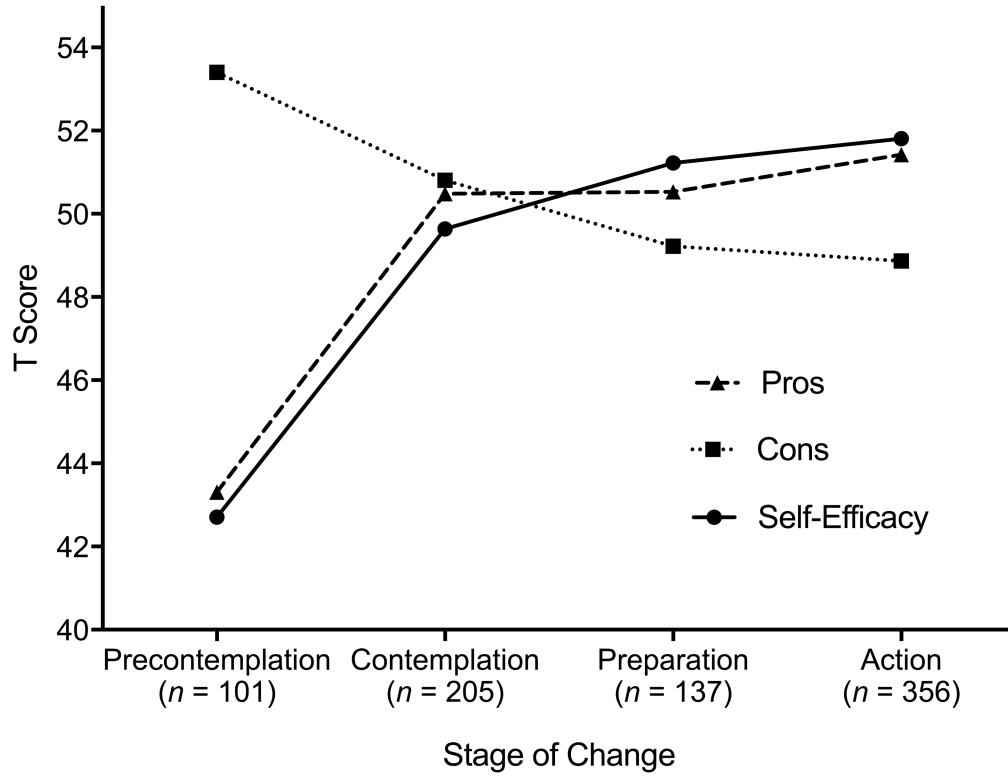
Table 1. Staging Algorithm & LDKT Action Items

Staging Algorithm: Readiness for Pursuing LDKT		
	Precontemplation	I am not considering taking actions in the next six months to pursue living donation.
	Contemplation	I am considering taking actions in the next six months to pursue living donation.
	Preparation	I am preparing to take actions in the next 30 days to pursue living donation.
	Action	I am taking actions to pursue living donation.
LDKT Actions		
	Read information/watch videos about getting a living donor transplant	
	Share education materials about living donation with people in your life	
	Generally talk to people you trust about whether to get a living donor transplant	
	Make a list of people who might be a living donor for you	
	Ask another person to tell others about your need for a living donor transplant	
	Ask potential donors to be tested	
	Give potential donors the transplant center phone number	
	Share my need for a living donor with a large community	

(Waterman et al., 2015)

Table 2. Decisional Balance and Self-Efficacy Scale Items

Scale	Item
Pros	With a living donor transplant, I will be able to contribute to my family and friends sooner
	I will be healthier because I spent less time on dialysis
	With a living donor transplant, I can return to my normal activities sooner
	A living donor kidney generally lasts longer than a deceased donor kidney
	A living donor transplant could happen more quickly because I don't have to wait for a kidney on the waiting list
	My living donor will feel good seeing my health improve
Cons	The surgery will inconvenience the living donor's work or life too much
	I will feel guilty having someone donate to me
	I don't want to involve anyone else in my health problems
	Donation could harm my relationship with a living donor
	The living donor could not donate again if someone closer to them every need a kidney
	A living donor could have health problems due to donating
Self-Efficacy	You asked someone to donate and they turned you down
	A potential living donor changed their mind and decided not to be evaluated
	A potential living donor who was evaluated did not match you
	You don't know anyone who might be a living donor for you
	You don't know how to discuss living donation with potential donors
	Other people were not supportive of you having a living donor transplant

(Waterman et al., 2015)

Table 3. Demographics by Stage of Change

	Precontemplation % (n)	Contemplation % (n)	Preparation % (n)	Action % (n)	Total Sample (N = 799) % (n)
Stage of Change	12.6 (101)	25.7 (205)	17.1 (137)	44.6 (356)	100 (799)
Sex					
Male	12.2 (59)	26.4 (128)	18.8 (91)	42.7 (207)	60.7 (485)
Female	13.4 (42)	24.5 (77)	14.6 (46)	47.4 (149)	39.3 (314)
Age					
Mean (SD)	54.1 (13)	5 (54)	52.7 (14)	51.1 (13.2)	52.5 (13.2)
Race					
Black/African American	12.1 (24)	24.7 (49)	18.2 (36)	44.9 (89)	198 (24.8)
Non-Hispanic White	14 (39)	30.1 (84)	14.3 (40)	41.6 (116)	279 (34.9)
Hispanic	11.9 (37)	22.1 (69)	18.9 (59)	47.1 (147)	312 (39)
Other	10 (1)	30 (3)	20 (2)	40 (4)	10 (1.3)
Ethnicity					
Non-Hispanic	13.1 (64)	27.9 (136)	16 (78)	42.9 (209)	61 (487)
Mexican American	10 (23)	24 (55)	19.2 (44)	46.7 (107)	28.7 (229)
Other Hispanic Origin	16.9 (14)	16.9 (14)	18 (15)	48.2 (40)	10.3 (83)
Dialysis					
Yes	13.6 (76)	24.6 (137)	18.8 (105)	42.8 (238)	556 (69.6)
No	10.2 (25)	27.9 (68)	13.1 (32)	48.5 (118)	243 (30.4)
Hypertension					
Yes	12.3 (81)	25.8 (170)	17.7 (117)	44 (81.5)	658 (82.6)
No	13.6 (19)	25.1 (35)	13.6 (19)	47.4 (66)	139 (17.4)
Diabetes					
Yes	14.8 (52)	23.4 (82)	20.6 (72)	40.6 (142)	349 (43.9)
No	10.5 (47)	26.9 (120)	14.3 (64)	47.9 (214)	446 (56.1)

Table 4. Socioeconomic Variables across Race/Ethnicity

	Black / African American % (*n*)	Non-Hispanic White % (*n*)	Hispanic % (*n*)	Total Sample (N = 799) % (*n*)
Race/Ethnicity	24.7 (198)	34.9 (279)	39 (312)	100 (799)
Education				
Less than High School	24.6 (18)	9.5 (7)	65.7 (48)	9.1 (73)
High School Diploma or GED	21.6 (43)	21.1 (42)	56.2 (112)	24.9 (199)
Some College or Technical School	31.7 (79)	35.3 (88)	32.9 (82)	31.1 (249)
College or Technical Degree	24 (49)	44.1 (90)	29.9 (61)	25.5 (204)
Professional or Graduate Degree	13.5 (10)	70.2 (52)	12.1 (9)	9.2 (74)
Financial Security				
Less than 2 Months	29.7 (87)	23.6 (69)	45.8 (134)	36.5 (292)
Less than 1 Year	27.4 (50)	32.9 (60)	38.4 (70)	22.7 (182)
More than 1 Year	19.7 (55)	49.6 (138)	28.4 (79)	34.7 (278)
Neighborhood Safety				
I do not feel entirely safe	43.1 (60)	23 (32)	33.8 (47)	17.3 (139)
I feel completely safe	20.9 (138)	37.4 (247)	40.1 (265)	82.6 (660)
Vehicle				
Yes	22 (160)	37.5 (272)	39.2 (284)	90.6 (724)
No	50.6 (38)	9.3 (7)	37.3 (28)	9.3 (75)
Washer/ Dryer				
Yes	21.7 (146)	38.5 (259)	38.5 (259)	83.9 (671)
No	40.6 (52)	15.6 (20)	41.4 (53)	16 (128)

Other = Multiracial, Other Asian, American Indian or Alaska Native, or Other (*n* = 10)

Table 5. Odds Ratios for Socioeconomic Differences across Race/Ethnicity

Indicator	Non-Hispanic White (n = 278) vs. Black (n = 198)	Non-Hispanic White (n = 278) vs. Hispanic (n = 312)	Black (n = 198) vs. Hispanic (n = 312)	Hispanic (n = 312) vs. Black (n = 198)	Hispanic (n = 312) vs. White (n = 278)	Black (n = 198) vs. Non-Hispanic White (n = 278)
Education						
College Degree vs. No College Degree	2.44*** [1.66, 3.59]	3.58*** [2.51, 5.11]	1.47 [.98, 2.20]	0.68 [.46, 1.02]	0.28*** [.20, .40]	0.41*** [.28, .60]
Financial Security (> 1 year)	2.67*** [1.8, 3.95]	2.76*** [1.94, 3.93]	1.04 [.69, 1.56]	0.97 [.64, 1.45]	0.36*** [.25, .52]	0.38*** [.25, .56]
Neighborhood Safety	3.35*** [2.08, 5.41]	1.37 [.85, 2.22]	0.41*** [.26, .63]	2.45*** [1.59, 3.78]	0.73 [.45, 1.18]	0.30*** [.19, .48]
Vehicle	9.23*** [4.03, 21.15]	3.83** [1.65, 8.92]	0.43** [.26, .73]	2.41** [1.43, 4.07]	0.26* [.11, .61]	0.11*** [.05, .25]
Washer/Dryer	4.61*** [2.65, 8.03]	2.65*** [1.54, 4.56]	0.58* [.37, .89]	1.74* [1.13, 2.68]	0.38*** [.22, .65]	0.22*** [.13, .38]
Dialysis	0.22*** [.14, .34]	0.41*** [.29, .56]	1.86** [1.17, 2.94]	0.54** [.34, .85]	2.46*** [1.74, 3.48]	4.57*** [2.91, 7.16]
Diabetes	0.65* [.45, .95]	0.51*** [.37, 0.72]	0.79 [.55, 1.13]	1.27 [.87, 1.82]	1.94*** [1.39, 2.71]	1.53* [1.05, 2.22]
Hypertension	0.50** [.30, .84]	0.71 [.47, 1.07]	1.41 [.84, 2.37]	.71 [.42, 1.2]	1.41 [.93, 2.13]	1.98** [1.19, 3.32]
Stage of Change Action vs. Pre-Action	0.87 [.60, 1.26]	0.80 [.58, 1.11]	0.92 [.64, 1.31]	1.09 [.76, 1.56]	1.25 [.90, 1.73]	1.15 [.79, 1.66]

***$p < .001$; **$p < .01$; *$p < .05$

Table 6. TTM Relationships: Standardized T Scores and ANOVA Tests

	Precontemplation (n = 101)	Contemplation (n = 205)	Preparation (n = 137)	Action (n = 356)	F	Tukey HSD	η^2
Pros							
M	43.31	50.48	50.53	51.42	10.43***	A > PC	.065
SD	(13.76)	(8.98)	(9.31)	(8.77)			
Cons							
M	53.4	50.81	49.22	48.87	6.26***	PC > A	.049
SD	(10.21)	(10.07)	(9.13)	(10)			
Self-Efficacy							
M	42.71	49.64	51.22	51.81	18.5***	A > PC	.116
SD	(11.54)	(9.48)	(9.28)	(9.14)			

***$p < .01$

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Table 7. ANOVA Results for Socioeconomic Variables and Pros, Cons, and Self-Efficacy

		Pros	Cons	Self-Efficacy
Education				
	F	4.07	9.13	2.29
	Sig.	$p < .01$*	$p < .001$*	$p = .058$
	η^2	0.019	0.044	
Financial Security				
	F	0.12	1.05	0.32
	Sig.	$p = .888$	$p = .351$	$p = .723$
Neighborhood Safety				
	F	0.04	0.03	0.00
	Sig.	$p = .992$	$p = .842$	$p = .992$
Vehicle				
	F	0.55	5.35	0.03
	Sig.	$p = .458$	$p < .05$*	$p = .863$
	η^2		0.001	
Washer/Dryer				
	F	3.17	0.82	0.10
	Sig.	$p = .075$	$p = .367$	$p = .755$

* Indicates a significant relationship

Table 8. Chi-Square Analyses of SES Variables and Stage of Change

Variable	Stage of Change		
	χ^2 Value	DF	*p*-value
Education	2.80	12	.997
Financial Security	8.51	6	.203
Neighborhood Safety	1.8	3	.616
Vehicle	2.74	3	.433
Washer/Dryer	.87	3	.833

Table 9. Chi-Square Analyses between Socioeconomic Variables

	Financial Security	Neighborhood Safety	Vehicle	Washer and Dryer
Education Level	$\chi^2(8) = 66.06$*** Cramer's V = .21	$\chi^2(4) = 14.6$** Cramer's V = .14	$\chi^2(4) = 27.79$**** Cramer's V = .19	$\chi^2(4) = 25.39$*** Cramer's V = .18
Financial Security		$\chi^2(2) = 16.59$*** Cramer's V = .15	$\chi^2(2) = 30.44$*** Phi = .20	$\chi^2(2) = 27.44$*** Phi = .19
Neighborhood Safety			$\chi^2(1) = 22.89$*** Phi = .17	$\chi^2(1) = 33.45$*** Phi = .21

Note. *χ^2 p-values < .05. **χ^2 p-values < .01. ***χ^2 p-values < .001. .1=small, .3=medium, .5=large

Table 10. Logistic Regression Models of Readiness for Pursuing LDKT

Baseline Variables	Stage of Change Action vs. Pre-Action	Correct Classification
Model 1: TTM		
Pros	1.05** 95% CI [1.02, 1.08]	Model 1: 57.6%
Cons	0.96** 95% CI [.94, .99]	Pre-Action: 76.1% Action: 34.4%
Self-Efficacy	1.04** 95% CI [1.01, 1.06]	
Model 2: Combined TTM and SES Variables		
Pros	1.05** 95% CI [1.01, 1.08]	Model 2: 58.9%
Cons	0.96** 95% CI [.94, .99]	Pre-Action: 75.6% Action: 38%
Self-Efficacy	1.04*** 95% CI [1.01, 1.06]	
Education	Wald = 1.88, p = .759	
Financial Security	Wald = .70, p = .705	
Neighborhood Safety	Wald = .15, p = .699	
Vehicle	Wald = 1.21, p = .272	
Washer/Dryer	Wald = .24, p = .621	

***p < .001; **p < .01; *p <.05

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