University of Cincinnati

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I, Angela Braggs-Brown, hereby submit this original work as part of the requirements for the degree of Master of Arts in Sociology.

It is entitled:
Effect of Race on Organ Recovery and Transplantation

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This work and its defense approved by:

Committee chair: Annula Linders, Ph.D.

Committee member: Steven Carlton-Ford, Ph.D.
The Effect of Race on Organ Recovery & Transplantation

A Thesis submitted to the
Graduate School
of the University of Cincinnati
in partial fulfillment of the
requirements for the degree of
Master of Arts
in the Department of Sociology
of the College of Arts and Sciences
by
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Committee: Annulla Linders, PhD (Chair) and Steve Carlton-Ford, PhD
ABSTRACT

Increasing the number of willing organ donors is critical to meeting transplantation demands. Despite research showing racial disparities throughout the transplantation process, there is limited research data on patterns of recovery and transplantation among minorities. Binary logistic regression was performed with data from the Scientific Registry for Transplant Recipients. The results show that black cadaveric donors were not significantly less likely to have kidneys recovered. The odds of black cadaveric donors having a kidney transplanted were 17% lower than whites, but the groups cease to be statistically different following the implementation of the extended donor criteria policy. These findings expand the understanding of racial stratification in health and provide important information for exploring racial disparities in health related outcomes.
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ACKNOWLEDGEMENTS

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CHAPTER I

Introduction

Racial differences in health status and outcomes as well as access to and use of preferred clinical treatments have been a consistent problem in the United States that has gained increasing attention with efforts to reveal the sources of health care inequities (Ayanian et al., 1999; Burns et al., 1996; Wilson et al., 1994; Williams and Collins, 2001). Numerous studies have also documented higher morbidity rates among non-whites with respect to diabetes and hypertension, which increases the likelihood of life threatening conditions such as end-stage renal disease (Burt et al, 1995; Carter et al., 1996; Cowie et al., 2010; Fujimoto et al., 1991; Fujimoto et al., 1987; Jose et al., 2013; Narayan et al., 2003; Zhao et al., 2008). Research has explored the role of nativity, socioeconomic status, neighborhood and environment as explanations of health differences by race (Browning, 2003; Hummer et al 1999a, 1999b; Johnson, 2000; LaVeist, 2000; Lewis, 2005; Liu et al, 1995; Morenoff, 2003). For instance, foreign-born individuals have been shown to have better mortality rates and display more positive health characteristics than similar others born in the U.S. (Hummer et al 1999a, 1999b). Medical history, health status, race and ethnicity are also indicators for a given socio-historical context which may vary to indirectly and directly contribute to patterns of difference.

This paper examines racial inequalities in kidney recovery and transplantation. It has been estimated that there is an adequate number of potential donors to meet the needs of end-stage renal disease (ESRD) patients (Bart et al, 1981). Yet all ESRD patients face
a situation in which demand for transplantable kidneys is greater than the availability of donors (Bart et al, 1981). As of March 21, 2014, the Organ Procurement and Transplant Network (OPTN) reported 99,755 potential transplant recipients on the waiting list. At the end of 2013, there had been 7,421 cadaveric kidney donors, and 11,161 kidney transplants performed (OPTN, 2014). The gap between the number of available organs for transplantation and the number of those in need of a transplant is a problem because lengthy wait times increase the likelihood of further health complications including death for the potential transplant recipient. This challenge has been viewed by those within the research community as the result of a lack of consenting donors, more so than one of an increase in the incidence and prevalence of conditions resulting in kidney failure. Non-whites have drawn particular focus since the 1980s due to low numbers in donor registries and high numbers of those with kidney failure (Task Force on Organ Transplantation, 1986; Siminoff et al, 2001). Potential non-white donors are also of interest, because they are viewed as a source for diversifying the blood types upon which donor organs and recipients are matched (Task Force on Organ Transplantation, 1986; Callender, 1987).

Over time, donation education programs aimed at non-white racial groups and increases in those populations have contributed to a growth in the number of non-white donors. (Tuttle-Newhall et al., 2009; Sung et al., 2008). Between 1998 and 2007 the proportion of black/African American donors went from 11.5 percent of donors to 15.6 percent and Hispanic/Latino donors moved from 9.9 percent to 14.1 percent of the total U.S. donor population. Asian Americans have remained relatively level around 2-2.6 percent (Tuttle-Newhall et al., 2009; Sung et al., 2008). The number of potential
recipients has continued to increase for these groups as well. Between 1998 and 2007 the percentage of black/African Americans on the recipient list changed from 17.3 to 19.4 percent. For Hispanics/Latinos it was 10.1 to 13.0 percent and Asians 3.7 to 4.6 percent of the total potential recipient population (Tuttle-Newhall et al., 2009). Gaps between the number of organs available for transplantation and the number of patients listed on waiting list registrations are a continual point of focus (Tuttle-Newhall et al., 2009). Still, there is little evidence to demonstrate that the increases in minority willingness to donate has or will result in significant increases in the number of eligible organs being recovered and transplanted.

Increasing the number of willing organ donors is critical to meeting transplantation demands. There is limited research data on patterns of recovery and transplantation among minorities. The purpose of this research study is to evaluate these patterns for kidney recovery and transplantation using race and time as predictors. The literature review will discuss racial differences in health, racialization and medicine. In chapter three, I describe the data and statistical methods utilized to analyze a national sample of organ donors. This is followed by a discussion of the data analysis and results, and answers the question, “what is the probability of having your organs recovered and transplanted if you are a black donor compared to being a white donor?” The final chapter will review limitations of the study and future directions for further research.
CHAPTER II

Literature Review

Murji and Solomos (2005:1-3) characterize racialization as a "process by which ideas about race are constructed, come to be regarded as meaningful, and are acted upon." The construction of racial hierarchies and divisions is an integral part of this process, laying the foundations of racism within society, going back to the Renaissance (Byrd and Clayton, 2001:14S). Melding with theories and practices within Western medicine and biology the "scientific legitimization of the concept of inferior races...by authoritative physicians and natural scientists...[has] justified and rationalized health policy stratification" (Byrd and Clayton, 2001:14S). During slavery in the American South, medical care beyond the subsystem of slave to slave care was provided when owners deemed it profitable and then done so using the substandard facilities of the times such as almshouses, poorhouse hospitals and medical schools (Byrd and Clayton, 2001:18S). Further, the delivery of health care was underpinned by the idea that poor health and disease were innate to the biological makeup of blacks (Byrd and Clayton, 2001:19S), preventing any examination of social factors as causal or related to health outcomes. The prevalence of this mindset was evident during World War II, when blood donation and transfusions hit a peak. The notion of white soldiers receiving a transfusion of blood from blacks prompted policies from the American Red Cross and the War Department requiring blood to be identified by racial category, labeled and stored to ensure racial segregation of blood (Nathoo, 2010:116-120).

From slavery to the Civil Rights Act of 1964, health among black Americans has been undermined by a pattern of "inferior, inconstant, or unavailable health care" (Byrd
and Clayton, 2001:19S). Between 1965 and 1980, black Americans saw notable improvements in health status (Byrd and Clayton, 2001:19S). Yet, research has shown a continuation in racial differences in health status as well as access and use of appropriate clinical treatments. For example, research published by Schulman and colleagues (1999) showed that blacks were less likely to be referred for cardiac catheterization and the importance of physician decision making toward understanding differences in medical treatment. Racial differences include the racialization of bodies even after death. For instance, Williams (2001) examines differences in health trends based on specific causes of death. There is a considerable amount of attention given to the racial misclassification of the dead by funeral home directors and other officials who record racial status on death certificates. This racial misclassification varies by death. For example, Native Americans and Alaskan Natives who die of alcohol related deaths are more likely to be correctly coded than others. Progress in the way of eliminating racial inequities in health has been minimal (van Ryn et al, 2011) and all areas exhibiting similar patterns of racial difference have yet to be explored.

This paper examines racial inequalities in kidney recovery and transplantation as health outcomes. A basic understanding of end-stage renal disease and the history of kidney transplantation is important for contextualizing racial inequalities. To begin, end-stage renal disease (ESRD), also known as kidney failure or the fifth stage of chronic kidney disease (CKD), occurs when the kidneys are unable to function at the level necessary to support the day to day excretion of waste, concentration of urine, and regulation of electrolytes (Norman DJ & Turka LA, 2001). Sudden kidney failure (i.e., acute kidney failure) or mild to severe kidney dysfunction leads to a range of
complications including anemia, increased potassium in the blood, cardiovascular
disease, reduced bone strength, hormonal imbalances, pulmonary edema, and central
nervous system damage (U.S. Renal Data System, 2012). The leading causes of kidney
disease are diabetes (152 new cases per million population in 2010), high blood pressure
(99 new cases per million population in 2010), glomerulonephritis (i.e., inflammation of
the kidney's glomeruli or filters; 22.7 new cases per million population in 2010) and
polycystic kidney disease\(^1\) (U.S. Renal Data System, 2012). A number of factors are
associated with increased risk of developing ESRD such as diabetes, high blood pressure,
age and cardiovascular disease (U.S. Renal Data System, 2012). Many of those with
kidney disease are unaware of either their condition or that they may be at risk for
developing the disease through unidentified or undertreated conditions such as
hypertension or diabetes (U.S. Renal Data System, 2003). While early screening and
detection of kidney dysfunction may prevent or delay the onset of ESRD, variations in
detection methods and treatment interventions as well as education and health care access
are evident in incidence rates. The racial differences in the disproportionate rates of
ESRD indicate that the need for dialysis and/or renal transplantation is much greater for
minority groups than for whites (Rostand et al, 1989).

Despite a long history of social and legislative support working to ensure the
availability and use of this medical procedure, differences among racial groups exists
throughout the transplantation process. During the 1950s, dialysis was considered to be
the optimal treatment for patients with ESRD (Norman DJ & Turka LA, 2001). The first
successful living-related kidney transplant was achieved during that decade, but was
undergoing refinement as a new medical treatment. Then in the 1960s maintenance
\(^1\) The development of cysts primarily within your kidneys.
dialysis for the treatment of ESRD along with progress in immunosuppression medications led to a new era in kidney transplantation (Norman DJ & Turka LA, 2001).

Over time, the demonstrated increases to lifespan, quality of life, and cost effectiveness associated with kidney transplantation caused the treatment to quickly surpass dialysis as the treatment of choice (Norman DJ & Turka LA, 2001). In 1973, the United States Congress enacted the Medicare End Stage Renal Disease Program, enabling access to the available treatments of hemodialysis, peritoneal dialysis, and renal transplantation to patients with chronic kidney disease who also qualified for Medicare (Norman DJ & Turka LA, 2001). Through the National Organ Transplant Act of 1984, a unified transplant network was mandated and a task force created to examine organ transplantation. In addition, the U.S. government made an amendment to extend the provisions of the Medicare End Stage Renal Disease Program for maintenance immunosuppression\(^2\) after renal transplant from 46 months to the life of the graft (i.e., organ) for patients who are disabled, Medicare eligible, and over the age of 65 (Friedman et al, 1978; Norman and Turka, 2001). Today, federal funds also support organ procurement programs, require all ESRD patients to be evaluated for transplant suitability and reimburse costs related to kidney transplantation (Rettig et al, 1991; Gaston, 2000).

The advantage of longer life has been demonstrated in all racial and ethnic groups (Wolfe et al 1999; Ojo et al 1994). With the help of the transplant recipient’s transplant team\(^3\), many individuals who may not qualify for government provisions, such as those who are

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\(^2\) These drugs are important for the prevention of graft rejection after transplantation, and are often required for the life of the graft. They are also very expensive, which may make it difficult to continue the maintenance drug regimen required.

\(^3\) The transplant team is made up of many different specialists. In addition to a transplant physician and nurse, it may also include nutrition specialists, social workers and pharmacists to ensure that patients receive comprehensive care and support during and after the transplant.
not Medicare eligible, are able to maintain the complex medication regimens needed to keep a functioning graft with resources from various social and private contributors.

Still, access to this life saving and enhancing procedure is not equally accessible or utilized among all racial groups in need. Research indicates that those racial groups at a disproportionate risk for ESRD are also more likely to encounter barriers across all stages of the transplant process. Specifically, stages of note include assessment for ESRD, referral as a potential candidate for transplantation, pre-transplant evaluation, identification as an acceptable candidate for transplantation, placement on the waiting list, and transplant operation. Epstein and coauthors (2000) found African Americans to be less likely to be rated eligible candidates for transplantation and more likely to have incomplete pre-transplant evaluations. Of those deemed eligible, African Americans were less likely to be referred for pre-transplant evaluation, to be placed on the waiting list, or to undergo transplantation (Ayanian et al 1999). Research has also shown black Americans to be less likely to be identified as eligible candidates for transplantation, and a third less likely to appear on the transplant waiting list within the first year of Medicare eligibility (Eggers 1988; Soucie et al 1992; U.S. Renal Data System, 1999). The median waiting time for a cadaveric kidney is twice as long for black ESRD patients compared to similar white patients (UNOS 1999). Unfortunately, there is a limited amount of research examining the social factors that account for these inequalities.

What the literature does provide is some indication of the complex and varied series of social interactions leading to recovery and transplantation outcomes. Linda Hogle (1995) asserts that medical practice is both heterogeneous and interactive, and that the standardize knowledge and practices around human bodies has a direct effect on the
health status and outcomes of those bodies. Through the passage of the National Organ Transplant Act of 1984 and the creation of a unified transplant network, the transplant community moved into a period of standardized protocols as to who would be defined as a viable donor. Despite the presence of fixed rules, guidelines and oversight, Hogle (1995) observed variations in the way the protocols were carried out and determined that his was related to differences in interpretation within the local context of the given hospital. Hogle (1995) argues that the attitudes, beliefs and experiences of those taking part in carrying out the procurement procedures have a large role in negotiating the identity and the status of any potential donor. For example, she cites an instance when an organ procurement coordinator described a potential donor as a “thirty-four-year-old drive-by-shooting” and asserts that the meaning and interpretation of such information played a critical role in determining donor eligibility and the viability of organs. Hogle’s qualitative research provides an important contribution to understanding the social pathways that may lead to not only the continued rationalization of medicine, but also the ways in which it intersects with the organ recovery and transplantation process.

This paper focused on the implementation of the expanded donor policy as a specific time point when these social interactions may have changed as a result of an additional effort to standardize organ procurement and transplant practices. The need to increase the donor pool acted as the catalyst for the aggressive recovery of donor organs, which was carried out through the implementation of the expanded criteria donor policy in 2002 (Metzger et al, 2003). Expanded criteria donor organs are characterized by factors commonly associated with delayed organ function or decreased organ survival such as advanced age (>50 years old), diabetes, renal insufficiency or hypertension.
(Metzger et al, 2003). Applying Hogle’s (1995) suggestions, it may be that organ procurement and transplant centers may interpret the requirements or guidelines in such a way that recovery and/or utilization may not occur based on the local social context of the given hospital. This may result in difficulty finding a recipient for the transplant, or not finding one in time and discarding the organ (Cadillo-Chavez et al, 2006; Lee et al, 1996; Sonnenday et al, 2003). For example, between 1998 and 2007 the number of cadaveric kidneys recovered and subsequently discarded increased from 10 to 17 percent (Tuttle-Newhall et al, 2009). Tuttle-Newhall and coauthors (2009) acknowledge that the shift to more high-risk kidneys has resulted in a decrease in utilization given that those are associated with high rates of discard. Sung and coauthors (2008) note the decrease in the number of organs recovered or transplanted per donor as possibly being related to an increase in older or less healthy donors.

While the discard numbers for expanded criteria donors may seem to bring the use of these organs into question, there is a growing body of literature producing evidence of success placing organs previously refused. The research is also demonstrating that these organs can provide benefit toward extending the life of a recipient compared to those wait-listed (Cadillo-Chavez et al, 2006; Lee et al, 1996; Sonnenday et al, 2003; Lee et al, 1998). Researchers have asserted that the increasing discard rates are related to organ procurement organization (OPO)\textsuperscript{4} policies toward obtaining donor types that were not previously considered eligible or acceptable donors (Tuttle-Newhall et al., 2009; Sung et al., 2008). Still, it remains unclear whether the perceived viability of an organ and the willingness or ability of the transplant team/center

\footnote{OPOs are responsible for increasing the number of registered donors and coordinating the donation process. This includes assessing donor suitability, verifying potential donors on the state donor registry, donor to recipient matching, and arranging for organ recovery and transport.}
to utilize the medical and technical criteria for expanded criteria donor organs accordingly is significantly associated with patterns of recovery and transplantation by race (United Network for Organ Sharing, 2003).

Based on the literature reviewed, one may conclude that 1) racial inequalities in health and specifically the field of transplantation exist and 2) the social interactions play a role in determining recovery and transplant outcomes may be influenced by social forces working to standardize and change existing practices. What is not known and is the primary research question is whether or not a pattern of racial inequalities exists in the recovery and use of organs. In examining this unknown, we may also examine if this pattern changes based on external social forces such as policy changes. This research will provide important information for understanding patterns of racial inequality in health and outcomes. The purpose of this study was to determine whether or not race was predictive of cadaveric kidney recovery or transplantation (i.e., do racial inequalities exist in the recovery and use of organs). Additionally, it sought to determine whether implementation of the expanded donor criteria policy (represented as dummy coded time variable) would act as an important predictor in this relationship. Three hypotheses were examined:

1) Black cadaveric donors will be significantly less likely to have kidneys recovered than white donors,

2) Black cadaveric donors will be significantly less likely to have kidneys transplanted than white donors, and

3) Black cadaveric donors will be significantly less likely to have kidneys transplanted after the implementation of the expanded donor criteria policy.
CHAPTER III
Research Methods

This research study was approved by the University of Cincinnati Institutional Review Board. Funding was provided from the Charles Phelps Taft Research Center at the University of Cincinnati. This study uses data from the Scientific Registry of Transplant Recipients (SRTR). The SRTR data system includes data on all donor, wait-listed candidates, and transplant recipients in the U.S., submitted by the members of the Organ Procurement and Transplantation Network (OPTN), and has been described elsewhere.5

Using two data sets, donor deceased and donor disposition, I identified 141,703 deceased organ donors, defined by SRTR as those from whom consent was obtained and had at least one solid organ (i.e., heart, liver, lung, kidneys, lungs, pancreas and intestine) procured, between 1987 and 2011. There were 215 cases with missing information on donor race. There was no missing information on donor gender. There were 57,064 (40.3%) female and 84,622 (59.7%) male deceased organ donors. There were 103,403 (73%) white deceased donors and 18,694 (13.2%) black deceased donors. There were

5 Under a federal mandate from the 1984 National Organ Transplant Act, all U.S. organ procurement and transplantation services are coordinated and supported by the Organ Procurement Transplantation Network (OPTN). The Scientific Registry of Transplant Recipients (SRTR) provides support through the collection and evaluation of data on solid organ transplantation. The data reported here have been supplied by the Minneapolis Medical Research Foundation (MMRF) as the contractor for the Scientific Registry of Transplant Recipients (SRTR). The interpretation and reporting of these data are the responsibility of the author and in no way should be seen as an official policy of or interpretation by, the SRTR or the U.S. Government. The Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services provides oversight to the activities of the OPTN and SRTR contractors. For more information about the SRTR, please see http://www.srtr.org/.
23,739 (16.8%) deceased donors aged 0-17, 62,529 (44.1%) aged 18-44, 45,126 (31.8%) aged 45-64 and 10,264 (7.2%) over 64 years of age. I examined my hypotheses using hierarchical binary logistic regression with SPSS statistical software (version 20). This technique was used to test whether or not race, time or race-time variables improved the probability of predicting cadaveric kidney recovery or transplantation while controlling for the relationship between the two variables. The dependent variables were kidneys recovered and kidneys transplanted. For kidneys transplanted there were codes for double kidney, left kidney and right kidney. These were recoded to only indicate whether or not a kidney was recovered for each donor. Independent variables included race and time as well as a race-time interaction variable. The race variable excluded all categories initially in the data set except for black and whites. The time variable reflects the time period between 1987 and 2002 before the expanded donor criteria policy was implemented and the period following that between 2003 and 2011. The race-time interaction variable was coded to provide information on black and white cadaveric donors whose kidneys were recovered and possibly transplanted in either time frame. Control Variables included age and gender. Age was transformed from a continuous variable into four dichotomous variables reflecting age ranges 0-17, 18-44, 45-64 and over 64. The variables were coded as follows:

Kidney transplanted (0=no, 1=yes)  Age 18-44 (0=Not 18-44, 1=18-44)
Race (0=white, 1=black)  Age 45-64 (0=Not 45-64, 1=45-64)
Gender (0=male, 1=female)  Age >64 (0=Not >64, 1=>64)
Age 0-17 (0=Not 0-17, 1=0-17)
Hierarchical binary logistic regression requires a dichotomous dependent variable and a dummy coding of categorical independent variables. The variables summarized above met these requirements.
CHAPTER IV

Findings

Prior to hypothesis testing, crosstab frequencies were produced showing the demographic differences for donors whose kidneys were recovered and donors whose kidneys were transplanted.

Table 1. Kidney Donor Recovered (n=141,703)

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Not Recovered</td>
<td>105</td>
<td>.1</td>
</tr>
<tr>
<td>Recovered</td>
<td>141,598</td>
<td>99.9</td>
</tr>
</tbody>
</table>

Table 2. Kidney Donor Transplanted (n=141,703)

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Transplanted</td>
<td>7,557</td>
<td>5.3</td>
</tr>
<tr>
<td>Transplanted</td>
<td>134,146</td>
<td>94.7</td>
</tr>
</tbody>
</table>

There were 103,403 (84.7%) white cadaveric donors in the sample. Of those 60,390 (58.4%) were male and 43,013 (41.6%) were female. There were 18,694 (15.3%) black cadaveric donors in the sample. Of those 11,647 (62.3%) were male and 7,047 (37.7%) were female. Donor age ranged from zero years to 120 years (SD=18.941, Mean=37.09, Median=38).

Correlations among the variables were performed. Missing values were addressed using the listwise option. The results are summarized in Table 3.
Table 3. Variable Correlations (n=141,453)

<table>
<thead>
<tr>
<th></th>
<th>Age 0-17</th>
<th>Age 18-44</th>
<th>Age 45-64</th>
<th>Age &gt;64</th>
<th>Race</th>
<th>Gender</th>
<th>Transplanted</th>
<th>Recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0-17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 18-44</td>
<td>-.399**</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 45-64</td>
<td>-.307**</td>
<td>-.608**</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age &gt;64</td>
<td>-.125**</td>
<td>-.249**</td>
<td>-.191**</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>.013**</td>
<td>-.018**</td>
<td>.009**</td>
<td>-.001</td>
<td>.009**</td>
<td>.740</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-.037**</td>
<td>-.115**</td>
<td>.111**</td>
<td>.073**</td>
<td>.009**</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transplanted</td>
<td>.075**</td>
<td>.126**</td>
<td>-.099**</td>
<td>-.172**</td>
<td>-.011**</td>
<td>.020**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovered</td>
<td>-.116**</td>
<td>-.050**</td>
<td>.108**</td>
<td>.069**</td>
<td>.003</td>
<td>.014**</td>
<td>-.035**</td>
<td>.000</td>
</tr>
</tbody>
</table>

**. Pearson Correlation is significant at the 0.01 level (2-tailed).

b. Listwise N=141453

The number of those who did not have a kidney recovered, was .1% and therefore further statistical testing was not performed. Binary logistic regression for race as a predictor of a donor having a cadaveric kidney transplanted, without control variables, was performed. I will refer to this as model 1a. The block chi-square was used to assess the hypothesis that there is a difference in kidney transplantation between black and white cadaveric donors before accounting for demographic variables as controls. The block chi-square (1, N=122,097) = 2.781, p = .095, was not statistically significant at an alpha of .05. The probability of the Wald statistic for the independent variable race ($\chi^2$ (1, N=122,097) = 2.814, p = .093) was not statistically significant at an alpha of .05. The
probability of the Wald statistic for the constant ($\chi^2 (1, N=122,097) = 43270.413, p = .000$) was statistically significant at an alpha of .05. The standard error for race was .034.

For model 1b, a binary logistic regression for race as a predictor of a donor having a cadaveric kidney transplanted, while controlling for gender and age, was performed. The standard error for race was .034. The block chi-square was used to assess the hypothesis that there is a difference in cadaveric kidney transplantation between black and white donors. The block chi-square ($\chi^2 (1, N=122,095) = 30.595, p = .000$) was statistically significant. The results indicate that there was a significant difference between the use of kidneys from black donors and white donors for transplantation. This also suggests that the age and gender variables create a suppression effect, based on the notable increase in the ability of race to predict the transplant outcome in this model.

The probability of the Wald statistic for the independent variable race ($\chi^2 (1, N=122,095) = 31.715, p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was .819, indicating that the odds of black donors having their kidney transplanted was 18% lower than whites of similar age and gender. The probability of the Wald statistic for the control variable gender ($\chi^2 (1, N=122,095) = 17.816, p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was 1.117, indicating that female donors had 1.117 increase in the odds of having a kidney transplanted. The probability of the Wald statistics for the control variable pertaining to ages zero to 17 ($\chi^2 (1, N=122,095) = 1868.539, p = .000$) was statistically significant at .05 compared to those aged 65 and older. The value of the Exp(B) for the variable was 14.518, indicating that donors aged birth to 17 had 14.518 increase in the odds of having a kidney transplanted than those aged 65 and older. The
probability of the Wald statistic for the control variable pertaining to ages 18-44 ($\chi^2 (1, N=122,095) = 3505.704, p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was 10.814, indicating that donors aged 18-44 had 10.814 greater odds of having a kidney transplanted than those aged 65 and over. The probability of the Wald statistic for the control variable pertaining to ages 45-64 ($\chi^2 (1, N=122,095) = 837.240, p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was 2.534, indicating that donors aged 45-64 had 2.534 greater odds of having a kidney transplanted than those aged 65 and over.

The results indicate that there is a significant difference in the odds of a having a kidney transplant based on the donor characteristics of race, age and gender. The results for age are consistent with trends showing a higher demand for organs from younger donors, as indicated in the literature review. The slight increase in odds for women over men is less than the odds projected for those aged 45-64 and both have lower odds than the constant (white, males over the age of 64). Together age and gender play an important role in the contribution to the model, as indicated by the suppression effect mentioned above.

The usefulness of model 1b was assessed by comparing the overall percentages given in the classification table in Block 0 and Block 2. The correction classification rates were 94.6 percent for both, with no difference from the previous model, showing no change and indicating little to no usefulness for the model.

For model 2, binary logistic regression for race and time as predictors of transplanting cadaveric kidneys with age and gender as control variables was performed. The block chi-square was used to assess the hypothesis that there is a difference between
cadaveric kidney transplantation between black and white cadaveric donors after implementing the 2002 expanded criteria donor policy. The first block included the control variables and the second block included race, time, and the race-time interaction variables. The block chi-square ($\chi^2$ (3, N=122,095) = 34.818, $p = .000$), was statistically significant at an alpha of .05. The standard error for race was .036 and the standard error for the time variable was .026. The results indicate that there was a significant difference between the transplantation of kidneys between 2002 and 2011 compared to the 1987 to 2002 timeframe. The results also indicate that there is a significant difference between the transplantation of kidneys from black donors compared to white donors.

The probability of the Wald statistic for the independent variable race ($\chi^2$ (1, N=122,095) = 28.869, $p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was .826, indicating black donors odds of having a kidney transplanted was 17% lower. The probability of the Wald statistic for the independent variable time ($\chi^2$ (1, N=122,095) = 4.224, $p = .040$) was statistically significant at .05. The value of the Exp(B) for the variable was .947, indicating that after the implementation of the 2002 expanded donor criteria the odds of having a kidney transplanted was 5% lower. The probability of the Wald statistic for the control variable gender ($\chi^2$ (1, N=122,095) = 17.557, $p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was 1.117, indicating that female donors had 1.117 increase in the odds of having a kidney transplanted. The probability of the Wald statistics for the control variable pertaining to ages zero to 17 ($\chi^2$ (1, N=122,095) = 1823.226, $p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was 14.304, indicating that donors aged birth to 17 had 14.304 greater odds of
having a kidney transplanted compared to those 65 years of age and over. The probability of the Wald statistic for the control variable pertaining to ages 18-44 ($\chi^2 (1, N=122,095) = 3438.366, p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was 10.716, indicating that donors aged 18-44 had 10.716 greater odds of having a kidney transplanted compared to those 65 years of age and over. The probability of the Wald statistic for the control variable pertaining to ages 45-64 ($\chi^2 (1, N=122,095) = 831.445, p = .000$) was statistically significant at .05. The value of the Exp(B) for the variable was 2.528, indicating that donors aged 45-64 had 2.528 greater odds of having a kidney transplanted compared to those 65 years of age and over. These results were not substantially different from the previous model excluding the time variable.

The log likelihood for this model (46572.448) was compared to the log likelihood from the initial model (46576.671) with race as the only predictor variable. The difference was not substantial, indicating that the revised model did not largely improve in producing the observed sample values. The usefulness of the model was assessed by comparing the overall percentages given in the classification table in Block 0 and Block 2. The correction classification rates were 94.6 percent for both, showing no change and indicating little to no usefulness for the model.

In model 3, binary logistic regression for independent variables race, time and race-time interaction with age and gender as control variables was performed using transplantation as the dependent variable. The standard error for race was .053; the standard error for the time variable was .028; and the standard error for the interaction variable (race*time) was .071. The block chi-square was used to assess the model. The block chi-square ($\chi^2 (3, N=122,095) = 52.665, p = .000$) was statistically significant at an
alpha of .05. The null hypothesis that there is no difference between the model without the race, time and race-time interaction variables was rejected. The probability of the Wald statistic for the independent interaction variable of race-time ($\chi^2 (1, N=122,095) = 18.009, p = .000$) was statistically significant at .05.

In order to clarify the results of the regression analysis with the interaction term, model 1b was performed again for each of the two time ranges. The statistical test was repeated with the dummy coded variables for the four levels of age and the gender variable entered as controls for the years 1987 to 2002. The block chi-square ($\chi^2 (1, N=70,014) = 44.261, p = .000$) was statistically significant at an alpha of .05. The probability of the Wald statistic for the independent variable race ($\chi^2 (1, N=70,014) = 47.449, p = .000$) was statistically significant at an alpha of .05. The standard error for race was .053. The value of the Exp(B) for the variable was .693, indicating that black donors has 30.7% lower odds of having a kidney transplanted after recovery than white donors. The statistical test was repeated for race and kidneys transplanted between 2003 and 2011, with the same control variables. The block chi-square ($\chi^2 (1, N=52,081) = 1.515, p = .218$) was not statistically significant at an alpha of .05. The probability of the Wald statistic for the independent variable race ($\chi^2 (1, N=52,081) = 1.530, p = .216$) was not statistically significant at an alpha of .05. The results are consistent with those of the previous models. The results indicate that there is a significant difference between kidneys transplanted from black donors compared to white donors, however, this difference only exists between 1987 and 2002. The difference is not evident between 2003 and 2011.
CHAPTER V

Discussion

This study was used to examine racial inequalities in kidney recovery and transplantation as health outcomes. The methods and analysis determined whether or not race was predictive of cadaveric kidney recovery and transplantation. It also looked at whether implementation of the expanded donor criteria policy would act as an important predictor in this relationship. Based on the results, black cadaveric donors were not significantly less likely to have kidneys recovered. As seen in the crosstabs from Table 1, almost all donors had kidneys recovered. This result may be influenced by the portion of the sample examined. This dataset only includes consenting donors who had at least one organ recovered. It does not include those who consented to be donors and had no organs obtained. Data on this missing segment of the population is not publically available at a national level. This is unfortunate, given that the data exists as a result of required reporting from hospitals to organ procurement organizations and it would most likely provide a great deal of useful information on recovery patterns. However, there is information of this kind available locally and would be a good starting point for future research exploring recovery patterns by race and time.

Since the implementation of the National Organ Transplant Act of 1984 and the final report of the Task Force on Organ Transplantation, the United States has institutionalized efforts to improve the organ transplantation process and improve the organ shortage on a national level. Prior to this time, organ procurement and transplantation was managed according to the regulations and practices of each state. The national effort approved by Congress removed the ability to commercialize this
process as well as numerous other stipulations and federal funding for participating organizations. Two alternative explanations for this pattern of kidney recovery by race are that the demand for kidneys for transplantation has had a strong influence on organ recovery practices and that there are monetary factors, such as federal program funding, having an effect on recovery practices. There is some research looking at the relationship between supply-demand dynamics and race. Balbach and colleagues (2003) describe strategies of the tobacco industry in marketing tobacco products to black Americans. This article offers an opportunity for theorizing the role of capitalism in establishing and/or continuing racial/ethnic disparities by indiscriminately marketing so-called unhealthy practices to social minorities already at a higher risk for not being diagnosed and treated for illnesses. Supply and demand are often used in illustrating the state of organ donation and transplantation, and the market dynamics of the recovery system may have an important role in cadaveric organ recovery over time.

For the second hypothesis, I found the odds of black cadaveric donors having a kidney transplanted were 17% lower than whites. When this was broken down by time I noted that between 1987 and 2002, those odds were 30.7% lower than whites, with no difference from 2003 and later. These results may have to do with the donor characteristics such as age and the perceived quality of the organs being offered for use. There is ample research examining physician perceptions of patients. Van Ryn and Burke (2000) examined clinician perceptions of patients and found them to be more negative toward blacks as well as low to mid SES than other groups. Previous research examining the role of health providers in racial/ethnic differences in health care is summarized by van Ryn and Fu (2003). The authors primarily focus on actions brought about by
subconscious/conscious beliefs of the clinician toward the patient (i.e., social cognition theory). Clinicians are central to an examination and explanation of variation among cadaveric organ recovery. Doctor-patient interactions may also be important. This is challenging in that cadaveric donors are not interacting with the clinician, and there is usually more than one person managing the recovery process with arguably his/her own measurable social cognition outcomes. Further research into this area may involve examination of hospital charts and interviews to determine the existence of social processes not evident using quantitative methods.

Finally, the results show that the odds of a black donor having a kidney transplanted was lower than whites between 1987 and 2002. After 2002 there is no difference between blacks and whites. These findings are counter to the third hypothesis and one has to wonder why this change occurred. There is limited research on the relationship between organ demand or policy change on transplant decision making patterns. It may be that growing demand influences surgeons to make different decisions than they would if they were under less pressure. It could also be that there are policies similar to the expanded donor criteria policy that have contributed to changes in the way determinations are being made about utilizing recovered organs. The market dynamics of the recovery system suggested as an explanation for the results of the first hypothesis may also have a role here. However, Roggenkamp and coauthors (2007) found that market characteristics were not associated with rates of organ donation. This is an important direction to continue with future research whether it is taken as an indication of something that worked to eliminate racial disparities or an indicator of other processes that have only suppressed the underlying racial difference that exists in so many areas of
the transplantation process. Sehgal (2004) for example examined the transfer of organs from donors to transplant recipients by race, and found that the net transfer of organs was greater from blacks to whites for heart-lung combinations, kidney-pancreas combinations, liver, lung, pancreas, and intestine. Axelrod and coauthors (2008) had similar findings using data on transplantation rates for those waitlisted for a heart, liver, and kidney. The results showed that those living in rural areas wait longer than those living in urban areas for a heart transplant. Ultimately, the study compels further research to understand what factors influence these patterns.

In closing, this study has provided much needed information on patterns of kidney recovery and transplantation by race. This information is another step toward understanding racial differences in health. Such steps provide essential information for the ongoing exploration of racialization in modern American society. The hope is that our society will make greater strides to ensure the decisions regarding health will not be made to the detriment of any individual or group.
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