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CHARACTERIZING OCCUPATIONAL STATUS HISTORY AND ASSESSING OCCUPATIONAL STATUS AS A SOCIAL DETERMINANT OF HEALTH IN THE DECEASED ORGAN DONOR POPULATION

by

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A THESIS

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2022

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APPLIED EPIDEMIOLOGY

ABSTRACT

Transplant physicians review clinical data ranging from laboratory values to substance use history and use prediction models combining these factors, along with previous recipient outcomes, to evaluate deceased organ donors for organ suitability. Factors such as social determinants of health (SDOH) are not currently included in prediction models, despite evidence of relationships between SDOH and health outcomes in the general population. Occupational status is a SDOH routinely collected at the time of donation and stored in DonorNet, but not yet characterized in the deceased donor population. Despite well-documented relationships between occupational status and health outcomes in the general population, these relationships had not been explored in the deceased organ donor population prior to this study. This retrospective observational study is the first to characterize the occupational status of deceased donors. Disparities in factors of interest by the occupational status of deceased donors were studied using ANOVA and chi-square tests. Multivariable regression models were used to model relationships between occupational status and factors of interest in the deceased donor population. We found statistically significant disparities in organ quality factors and their association with occupational status within the deceased donor population, with a higher proportion of behavioral risk factors and premature mortality in lower skill level occupations. Adjusted

regression models exposed an increased odds of poorer outcomes of interest associated with lower occupational status. These associations between occupational status and important factors that influence organ quality establish a foundation to propose leveraging occupational status—an important social determinant of health—to improve prediction models.

Keywords: Transplant, Deceased Organ Donors, Donor Profile Index, Occupational Status, Social Determinants of Health

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INTRODUCTION

Transplant physicians evaluate deceased donors for organ quality and suitability by a review of a number of factors, including medical and surgical history, substance use history, laboratory values, imaging, vital signs, and biopsy results in a web-based data repository (DonorNet; https://portal.unos.org). Prediction models, such as the Kidney Donor Risk Index (KDRI),[1] Liver Donor Risk Index (LDRI),[2] and the University of Minnesota Donor Lung Quality Index[3] utilize demographic characteristics and laboratory values of deceased donors and outcomes of previous recipients to produce a summary score of organ quality to assist in the complex task of organ offer decision-making.[4]

Despite substantial research focused on the contribution of social determinants of health (SDOH) to health outcomes in the general population, such factors are absent in prediction models for solid organ transplant. Occupational status is a SDOH that is associated with the distribution of behavioral risk factors, chronic disease, and mortality in the U.S. population.[5] Occupational status is correlated with socioeconomic inequities in health outcomes through factors such as access to nutritious foods, adequate housing, physical activity, occupational exposures to hazardous substances, recreational facilities, and healthcare.[5] For example, trucking, labor, and construction jobs are associated with obesity,[6] disability and mortality,[7] and smoking.[8] In addition to physical strain (heat or cold, noise, physical exertion, and exposure to hazardous substances) causing poorer health outcomes, psychosocial challenges, such as job strain, have been found to be

associated with cardiovascular disease, depression, and obesity.[9] In the U.S., a documented segregation of occupational status reflective of populations already experiencing health disparities due to systemic inequities exists.[10] For instance, Black/African American and Hispanic/Latinx persons have been found to be least likely to be in occupations with higher skill level requirements and most likely to be in occupations with lower skill level requirements.[10] Previous studies have identified consistent associations between working in race-segregated occupations and poorer health outcomes.[11] Notably, workplace discrimination has been linked to allostatic stress, poor mental health, and substance use.[11] Occupational status is associated with health insurance coverage for a majority of the general U.S. population, and occupations with lower skill level requirements are less likely to offer health insurance.[12] This lack of insurance is associated with difficulties accessing preventive health services and medical care, leading to worse health outcomes.[13] Due to the established association between occupational status and health outcomes, we hypothesized that occupational status would be strongly associated with factors that diminish organ quality and could ultimately be useful in predicting organ quality and assist transplant clinicians in evaluating potential deceased organ donors (Figure 1). Establishing a better understanding of the occupational status of deceased donors may provide transplant clinicians a more holistic view of deceased donors, as social determinants of health are regularly considered when evaluating the health of individuals in the general population.

Currently, the distribution of occupational status in the deceased donor population prior to death is unknown. Characterization of occupational status of the U.S. deceased donor population will provide a comprehensive understanding of its potential impact on

the health of deceased donors and, subsequently, the quality of their organs. While no current characterization of occupational status exists for deceased donors, occupational status of deceased donors is routinely collected in the process of deceased donor evaluations. The main barrier to characterizing occupational status in the deceased donor population is due to the format in which the social history of donors is collected and stored, as it is often handwritten, scanned into DonorNet, and not easily abstracted in comparison to other variables commonly used in organ evaluation. Abstracting occupational status data will permit the evaluation of the relationship between occupational status and donor characteristics used in organ evaluation. Depending on the strength of those relationships, occupational status could plausibly be incorporated into models of organ quality to enhance their predictive capabilities of recipient outcomes. The characterization of occupational status and the study of associations between occupational status and factors that contribute to organ quality in the deceased donor population is novel. Thus, this study aimed to characterize occupational status of the adult deceased donor population and analyze the association between occupational status and health outcomes that affect organ quality such as behavioral risk factors, comorbidities, and premature mortality in the adult deceased donor population.

METHODS

Study Population

The study population consisted of a total of 15,895 adult (≥18 years of age) deceased organ donors evaluated for heart, lung, liver, kidney, pancreas, and/or small bowel transplant donation from January 1, 2014 through December 31, 2015 in the U.S. These years were specifically chosen because they will allow for linkage to the data of recipients of those deceased donor organs, providing long-term recipient follow-up, for future studies that build on this work. Donors who did not have occupational status listed (n=1,546, 9.7%) were excluded. A comparison of excluded and included donors in the study is detailed in Supplemental Table 1.

The deceased donor population is distinct from the general population due to the nature of criteria considered for listing as a deceased donor. For instance, for a situation to arise in which organs can be maintained for procurement, organ donors must pass away due to circumstances resulting in brain or cardiac death during a hospital admission. If a person has an active malignancy (with exceptions for some central nervous system tumors and some skin cancers), they will not typically be evaluated for donation. Deceased donors tend to be younger due to the many factors that are likely to prevent

individuals from being listed as an organ donor as they age. Additionally, this study's population is even more specific due to the inclusion of only deceased donors whose organs were procured and transplanted.

We hypothesized that organ donors who were unemployed or had occupations with lower skill level requirements were more likely to pass away at a younger age due to factors that are associated with occupational status—such as behavioral risk factors, comorbidities, reduced access to healthcare, and other SDOH.

Data Source

Occupational status of deceased donors was documented as a nominal variable abstracted from the medical and social history of each deceased donor. These data are procedurally collected from the next of kin at the time of the donation, then posted by organ procurement organizations on DonorNet[14] (Figure 2), a secure, online portal housing all clinical and demographic data on all deceased donors in the U.S. that transplant clinicians use to assess donor organs for suitability for transplant. These data were augmented by linkage to data (demographic, behavioral risk factors, laboratory values, etc.) from the Scientific Registry of Transplant Recipients (SRTR) deceased donor standard analytic files[15] (Figure 2). 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). 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.

Exposure

Our primary exposure of interest was occupational status. Following the abstraction of data, occupational status of deceased donors was categorized using classification systems rooted in the Current Population Survey (CPS)[16] (Figure 2). The CPS is a monthly survey of approximately 60,000 U.S. households conducted by the U.S. Census Bureau jointly with the Bureau of Labor Statistics (BLS) and is intended to be representative of the entire population.[17] Labor force statistics from the CPS are used across various government agencies and research organizations for public policy planning and economic research.[18]

Deceased donors in the labor force were categorized into nine occupation major groups from the 2008 International Standard Classification of Occupations (ISCO-08).[19] The ISCO-08 occupation classifications were produced by the International Labor Organization (ILO), a widely utilized and well-established international organization focused on producing comprehensive data on labor force statistics. The ILO labor force statistics are derived from CPS data for all U.S. data. The nine ISCO-08 major groups include: managers; professionals; technicians and associate professionals; clerical support workers; service and sales workers; skilled agricultural, forestry, and fishery workers; craft and related trades workers; plant and machine operators, and assemblers; and elementary occupations. These nine major groups are grouped into three overarching skill

levels (low, medium, high) (Figure 3). Skill level is defined by the ILO as a function of the complexity and range of tasks an individual is expected to perform for an occupation and is measured through the nature of the work performed, the level of formal education required, and the amount of informal on-the-job training or previous experience expected.[19] We found that skill level served as clear and relevant framing of deceased donors in the labor force relative to the SDOH; therefore, skill level will be the main reference for those in the labor force hereafter.

The ISCO-08 classifications do not go outside the scope of the labor force, so we referred to the Current Population Survey methodology[17] to identify groupings for deceased donors outside of the labor force. We identified three additional levels of occupational status outside of the labor force in the CPS to represent donors who were unemployed, disabled and not employed, or not in the labor force (i.e., retirees, veterans, homemakers, or students).

As stated, these occupational status classifications stem from the U.S. Census Current Population Survey. Due to the limitations of census surveying and classification methods, some populations are not well recorded and therefore do not have sufficient data available for general population comparisons. Deceased donors who were actively in the Armed Forces (n=52, 0.3%), incarcerated (n=28, 0.2%), or experiencing homelessness (n=8, 0.05%) at the time of death were also excluded due to limited census data collected on these populations due to their housing status. Deceased donors who were self-employed (n=45, 0.3%) at the time of death were excluded due to this occupation type not being specific enough to be classified.

Outcomes of Interest

Variables representative of outcomes associated with occupational status in the general population and used in organ evaluation—such as behavioral risk factors, comorbidities, and age of death—were abstracted from the SRTR standard analytic file.[15] Continuous variables such as body mass index (BMI), age of death, and serum creatinine (peak and terminal [i.e., last value prior to organ procurement]) were collected. Serum creatinine was included due to being a focal parameter in assessing kidney function. Categorical variables such as cause of death, history of hypertension, diabetes, myocardial infarction, hepatitis C virus (HCV), heavy alcohol use (defined as a pattern of >2 alcoholic drinks per day ever), cigarette use (defined as ≥20 pack years ever), intravenous drug use (any history ever), and Centers for Disease Control and Prevention (CDC) increased risk classification were included as outcome variables.

Donors were classified as increased risk according to the CDC Increased Risk Donor Estimates from the 2013 Public Health Service (PHS) Guideline for Reducing Human Immunodeficiency Virus, Hepatitis B Virus, and Hepatitis C Virus Transmission through Organ Transplantation.[20] These guidelines indicate that those who meet one or more of the following criteria are to be considered increased risk organ donors: people who have had sex with a person known or suspected to have HIV, HBV, or HCV infections in the preceding 12 months; men who have had sex with men (MSM) in the preceding 12 months; women who have had sex with men with a history of MSM behavior in the preceding 12 months; people who have had sex in exchange for money or drugs in the preceding 12 months; people who have had sex with people who have had sex in exchange for money or drugs in the preceding 12 months; people who have or who

have had sex with a person that has injected drugs by intravenous, intramuscular, or subcutaneous route for nonmedical reasons in the preceding 12 months; people who have been in lockup, jail, prison, or a juvenile correctional facility for more than 72 hours in the preceding 12 months; people who have been newly diagnosed with or have been treated for syphilis, gonorrhea, Chlamydia, or genital ulcers in the preceding 12 months; and people who have been on hemodialysis in the preceding 12 months.

Following univariate comparisons of occupational status, donors who had a missing response for one or more outcome variables (n=178, 1.1%) were excluded. A comparison of excluded and included donors in the study is presented as Supplemental Table 2. Our final study population analysis consisted of 14,038 deceased donors.

Method of Analysis

Descriptive statistics along with a series of ANOVA and chi-square analyses were performed to identify statistically significant differences in outcomes of interest across occupational status. Multivariable logistic and linear regression models were produced for each outcome of interest to assess the extent to which occupational status is associated with variables of behavioral risk factors, comorbidities, and premature mortality. Significance levels were set at an alpha of 0.05. All analyses were conducted in SAS 9.4 (Cary, NC).

Characterizing Outcomes by Occupational Status

Behavioral risk factors, comorbidities, and premature mortality were described by occupational status. Mean and standard deviation were provided for continuous outcomes and number and percent were provided for categorical outcomes. Continuous outcomes of interest were assessed for statistically significant differences by occupational status through ANOVA tests, while categorical outcomes of interest were assessed for statistically significant differences by occupational status through chi-square analyses.

Modeling Outcomes by Occupational Status

A series of multivariable logistic regression models were produced to assess whether occupational status is associated with dichotomous categorical outcomes of interest. Additionally, a series of multivariable linear regression models were produced to assess whether occupational status is associated with continuous outcomes of interest. We adjusted our models for potential confounding by keeping sex, race/ethnicity, and age constant in the models. In addition to these demographic variables, we also kept potential confounding variables specific to the outcome of interest, such as history of cigarette use for the outcome of hypertension. After running the models with and without donors with "unknown" or "not done" responses to outcome variables, there were no statistically significant differences in the models; therefore, these donors were excluded from the analysis (n=444, 3.2%) to maintain binary outcomes for ease of interpretation. A comparison of excluded and included donors from the models is presented as Supplemental Table 3.

RESULTS

Demographics

The deceased donor sample was composed of 14,038 donors (5,621 [40.0%] female) with a mean age of 43.3 (SD: 15.0) years. Deceased donors were more commonly non-Hispanic white (67.2% non-Hispanic white versus 16.0% Black/African American versus 13.3% Hispanic/Latinx versus 2.7% Asian versus 0.5% American Indian/Alaska Native versus 0.3% Native Hawaiian and Other Pacific Islander) and had a mean BMI of 28.6 kg/m^2 (SD: 7.0). The mean peak serum creatinine was 2.0 mg/dL (SD: 1.9) and the mean terminal serum creatinine was 1.6 mg/dL (SD: 1.6) (Table 1).

Occupational Status of Deceased Donors

Deceased donors were grouped into nine ISCO-08 occupation major groups. These nine major groups were then collapsed into three skill level categories (Figure 3). The sum of managers (n=645, 6.0%); professionals (n=1,946, 18.1%); along with technicians and associate professionals (n=357, 3.3%) accounted for the high skill level group (n=2,948, 27.4%). The sum of clerical support workers (n=722, 6.7%); service and sales workers (n=2,582, 24.0%); skilled agricultural, forestry, and fishery workers (n=187, 1.7%); craft and related trades workers (1,740, 16.2%); along with plant and

machine operators, and assemblers (n=649, 6.0%) accounted for the medium skill level group (n=5,880, 54.7%). Elementary occupations (n=1,913, 17.8%) alone accounted for the low skill level group (n=1,913, 17.8%). Deceased donors without an occupation were grouped into three additional categories: unemployed (n=1,313, 9.2%); disabled (n=828, 5.8%); and not in the labor force [i.e., homemakers, students, retirees, veterans] (n=1,334, 9.4%) (Figure 2).

Bivariate Analysis of Outcomes of Interest by Occupational Status

Demographics by Occupational Status

In the bivariate analysis, all comparisons of differences in demographics, behavioral risk factors, comorbidities, and premature mortality were statistically different across the categories of occupational status (Table 1). The distribution of sex by occupational status yielded a statistically significant difference with a higher proportion of females not in the labor force (64.4% versus 35.6%; P<0.001) and a higher proportion of males in low skill level occupations (80.5% versus 19.5%; P<0.001). Non-Hispanic white donors were more likely to have a high skill level occupation (74.4%) than Black/African American donors (12.4%) and Hispanic/Latinx (8.0%) donors (P<0.001). Donors who were unemployed and those in the low skill level group exhibited a younger age of death compared to donors in the high skill level group (36.3 [22.8-49.8] versus 40.4 [26.1-54.7] versus 48.2 [34.4-62.0]; P<0.001). Donors who were unemployed and those in the low skill level group exhibited a lower BMI compared to donors in the high

skill level group and donors who were disabled (27.5 [20.3-34.7] versus 27.7 [21.5-33.9] versus 29.2 [22.4-36.0] versus 29.9 [21.5-38.3]; P<0.001). Donors who were disabled exhibited the highest peak and terminal serum creatinine levels and donors not in the labor force exhibited the lowest peak and terminal serum creatinine levels (2.4 [-0.5-5.3] peak creatinine and 1.8 [-0.3-3.9] terminal creatinine versus (1.8 [0-3.6] peak creatinine and 1.4 [0-2.8] terminal creatinine; P<0.001).

Behavioral Risk Factors by Occupational Status

We observed a statistically significant difference in history of cigarette use, history of heavy alcohol use, and history of intravenous drug use, and CDC increased risk status by occupational status (Table 1); P<0.001. The low skill level and the unemployed group had the highest prevalence of these behavioral risk factors, while the high skill level group had the lowest prevalence. The unemployed group (11.6%) and low skill level group (8.2%) were statistically significantly more likely to be HCV antibody positive than the high skill level group (2.2%) (P<0.001). The unemployed group (42.8%) and low skill level group (27.2%) were statistically significantly more likely to be a CDC increased risk donor when compared to the high skill level group (12.2%) (P<0.001).

Comorbidities by Occupational Status

A higher prevalence of a history of comorbidities was found among donors in the high skill level group, medium skill level group, and donors who were disabled, in contrast to the prevalence of a history of comorbidities among donors who were unemployed and donors in the low skill level group (Table 1). Hypertension was most common among donors who were disabled (48.7%) followed by donors in the high skill level group (41.8%) and least common among donors in the low skill level group (23.6%) ($P<0.001$). A similar trend was seen in the prevalence of diabetes, as diabetes was most prevalent among donors who were disabled (23.9%) along with donors in the medium skill level group (12.5%) and least common among donors who were unemployed (11.7%) and donors in the low skill level group (10.4%) ($P<0.001$). And lastly, a history of myocardial infarction (MI) was most prevalent among donors who were disabled (5.7%), followed by donors in the high skill level group (4.3%) and least common among donors in the low skill level group (2.9%) ($P<0.001$).

Regression Analysis of Outcomes of Interest by Occupational Status

We built regression models (Tables 2-12) to test the association between behavioral risk factors, comorbidities, and premature mortality and occupational status. Statistically significant differences previously mentioned in which unemployed and low skill level groups were associated with a higher risk of behavioral risk factors and premature mortality were further supported by these models, and adjustment for age and

additional relevant predictors revealed associations with poorer health outcomes among unemployed deceased donors not seen in bivariate analyses or unadjusted models. For example, on univariate analysis, unemployed donors were 3% less likely to have a history of diabetes, but after adjusting for age, sex, race, and BMI, donors who were unemployed were 73% (aOR: 1.73; 95% CI: 1.53-1.93; P<0.001) more likely to have a history of diabetes when compared to donors in high skill level occupations.

Occupational Status and Behavioral Risk Factors

In examining relationships between occupational status and behavioral risk factors, a statistically significant contrast was seen when comparing low skill level groups to high skill level groups. For instance, the low skill level group was 126% (aOR: 2.26; 95% CI: 1.92-2.66; P<0.001) more likely to have a history of cigarette use when compared to the high skill level group, adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of heavy alcohol use, and history of intravenous drug use. Similarly, the low skill level group was 161% (aOR: 2.61; 95% CI: 2.05-3.31; P<0.001) more likely to have a history of intravenous drug use when compared to the high skill level group, adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of heavy alcohol use, and history of cigarette use. In the deceased donor population, the low skill level group was 86% (aOR: 1.86; 95% CI: 1.58-2.19; P<0.001) more likely to be classified as a CDC increased risk donor when compared to the high skill level group, adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of heavy alcohol use, and history of cigarette use.

Further contrasts exist in the comparison of donors who were unemployed to donors in the high skill level group regarding behavioral risk factors. For instance, donors who were unemployed were 164% (aOR: 2.64; 95% CI: 2.20-3.18; P<0.001) more likely to have a history of cigarette use when compared to the high skill level group, adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of heavy alcohol use, and history of intravenous drug use. Donors who were unemployed were 325% (aOR: 4.25; 95% CI: 3.35-5.41; P<0.001) more likely to have a history of intravenous drug use when compared to the high skill level group, adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of heavy alcohol use, and history of cigarette use. Additionally, donors who were unemployed were 237% (aOR: 3.37; 95% CI: 2.84-3.98; P<0.001) more likely to be classified as a CDC increased risk donor when compared to the high skill level group, adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of heavy alcohol use, and history of cigarette use.

Occupational Status and Comorbidities

With respect to associations between a history of comorbidities and occupational status, the highest odds were among donors who were disabled. Donors who were disabled were 205% (aOR: 3.05; 95% CI: 2.03-4.59; P<0.001) more likely to be HCV antibody positive when compared to donors in the high skill level group after adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of incarceration, history of heavy alcohol use, history of cigarette use, and history of intravenous drug use. Donors who were disabled were 148% (aOR: 2.48; 95% CI: 1.99-3.09; P<0.001) more likely to have a history of

diabetes compared to donors in the high skill level group after adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of hypertension, and BMI. Donors who were disabled were 31% (aOR: 1.31; 95% CI: 1.08-1.58; P=0.01) more likely to have a history of hypertension compared to donors in the high skill level group after adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of cigarette use, history of diabetes, and BMI. A statistically significant 1.12 kg/m^2 decrease in BMI (aβ: -1.12; SE: 0.24; P<0.001) was found among donors who were unemployed when compared to donors in the high skill level group after adjusting for demographic variables. Additionally, we observed a statistically significant 0.28 mg/dL increase in peak creatinine (aβ: 0.28; SE: 0.07; P<0.001) and a statistically significant 0.12 mg/dL increase in terminal creatinine (aβ: 0.12; SE: 0.06; P=0.05) among donors who were disabled when compared to donors in the high skill level group after adjusting for demographic variables, BMI, history of hypertension and diabetes, cause of death, and a history of cigarette use.

Similarly, we observed an increased odds of being HCV antibody positive among donors who were in low skill level occupations (aOR: 2.23; 95% CI: 1.58-3.14; P<0.001) or unemployed (aOR: 2.00; 95% CI: 1.40-2.85; P<0.001) when compared to donors who were in high skill level occupations after adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of incarceration, history of heavy alcohol use, history of cigarette use, and history of intravenous drug use. Lastly, donors who were unemployed were 73% (aOR: 1.73; 95% CI: 1.53-1.93; P<0.001) more likely to have a history of diabetes compared to donors who were in high skill level occupations after adjusting for age, sex, race and Hispanic/Latinx ethnicity, history of hypertension, and BMI.

Occupational Status and Premature Mortality

Being an unemployed donor was associated with a shorter life span of 8.20 (aβ: -8.20; SE: 0.43; P<0.001) years when compared to donors in the high skill level group after adjusting for age, sex, race and Hispanic/Latinx ethnicity, BMI, comorbidities, and behavioral risk factors. Additionally, donors in the low skill level group were found to have shorter life span of 4.82 (aβ: -4.82; SE: 0.37; P<0.001) years when compared to donors in the high skill level group. Donors who were disabled were found to have a shorter life span of 5.04 (aβ: -5.04; SE: 0.49; P<0.001) years than donors in the high skill level group.

DISCUSSION

In the current study, we found that occupational status exhibited statistically significant associations with factors used in evaluating organ quality of deceased donors—with patterns reflective of occupational status-based health disparities most deleterious to those in low skill level occupations or unemployed. To our knowledge, this study is the first to characterize occupational status in the deceased organ donor population. In the general population, evidence suggests a disproportionate burden of poor health outcomes by occupational status.[21] Our findings in the deceased donor population are consistent with occupational status disparities previously reported on the general population in the literature, including statistically significant associations between occupational status and health outcomes. In the case of diabetes, when adjusted for potential confounders (such as age and BMI), we see a change in the direction of odds in which donors who are unemployed were 73% (aOR: 1.73; 95% CI: 1.53-1.93; P<0.001) more likely to have a history of diabetes compared to donors in the high skill level group, compared to the unadjusted model in which donors who are unemployed were 3% less likely to have a history of diabetes compared to donors in the high skill level group. This was despite the mean age of death of donors who are unemployed being statistically significantly younger than those in the high skill level group (36.3 years versus 48.2 years; P<0.001) and the mean BMI being statistically significantly lower among those in the low skill level group when compared to those in the high skill level

group (27.5 kg/m² versus 29.2 kg/m²; P<0.001). These results suggest that occupational status is associated with health outcomes in the deceased donor population, and in some cases health outcomes may have a stronger association with occupational status than with usual biological determinants such as age or BMI.

The relationships between SDOH, such as occupational status, and outcomes in the general population are routinely leveraged to better inform clinicians and public health officials, providing a more holistic view of a patient or population to better explain symptoms or patterns. The findings of this study highlight occupational status-based differences in factors used to evaluate deceased organ donors and suggest a potential role for occupational status in organ evaluation, as each of the outcomes of interest in our study factor into organ quality. In future directions, we plan to assess associations between occupational statuses of deceased organ donors and organ recipient outcomes. Additionally, we will factor occupational status into risk indices (such as KDRI and LDRI) to assess whether this SDOH improves the prediction of the models. Due to the statistically significant findings in this study, we hypothesize that occupational status will improve the calibration and discrimination of models in predicting organ quality.

While the use of occupational status to predict organ quality may prove to be a useful tool in the deceased donor organ evaluation process, the factors leading to these health disparities in the lives of donors should not be forgotten. Increased visibility of the SDOH as a parameter in the organ evaluation process will provide a tangible benchmark for the impact of disparities in healthcare. The stark presence of health disparities among deceased donors highlights the work needed to mitigate these differences by providing

upstream interventions to address the root causes and conditions contributing to these gaps, such as more equitable and accessible healthcare in the U.S., independent of social factors such as occupational status.

As with all observational studies, there are important limitations to be discussed. Most critical is the inability to determine causality or establish pathways in which occupational status leads to health outcomes in the deceased donor population—or vice versa. For example, we cannot confirm with this study design if a lower skill level occupation causes the outcomes we evaluated, such as intravenous drug use, or if intravenous drug use causes employment in a lower skill level occupation. However, the characterization of occupational status and understanding its relationship with factors that contribute to organ quality serves as an initial step in exploring occupational status as an additional tool for organ evaluation.

The specificity of this population introduces an additional limitation. As previously outlined in the description of the study population, this study focuses on a unique population of deceased organ donors whose organs were evaluated and procured for transplantation. Therefore, we cannot apply knowledge of the general population to this population without recognizing the selection bias introduced by the evaluation of specific characteristics for a deceased organ donor to be selected for procurement and transplantation.

An additional limitation is the use of occupational status and other social variables reported by next-of-kin which carries the potential of several response related biases, such as recall bias and social desirability bias. These response biases may have led to an

underestimation of deceased donors who fell into populations more associated with behavioral risk factors, such as low skill level and unemployed groups. This underestimation is alluded to in the comparison of deceased donors with missing data to the overall deceased donor population (Supplemental Table 2), as those with missing data for one or more variables were statistically significantly younger and more commonly unemployed than the deceased donor population with no missing data; however, this would likely lead to a bias towards the null hypothesis. Additionally, these data (including missing data, as well as data provided by next-of-kin on even more sensitive topics [e.g., sexual history, substance abuse history, incarceration history]) are routinely used in practice by transplant clinicians when evaluating deceased donor organs, reflecting real-world practice.

A final limitation of this study relates to stratification of the deceased donors into groups by occupational status. The grouping of the donors was completed using keywords from the collection of raw nominal data on occupational status as written in medical and social history forms. The transformations of occupational status into classifications may introduce the possibility of human error and allocation bias. To avoid this, researchers were blinded to any additional variables collected on the deceased donors while classifying donors by occupational status, but possibilities for error and bias persist.

Despite the stated limitations of the study, several strengths exist. Our study included every single deceased organ donor in the U.S. during the study period from 2014 through 2015. To our knowledge, this study was the first to conduct abstractions on

the medical and social history forms of deceased donors producing novel data which was then linked to a robust administrative database housing an abundance of clinical data. Additionally, this study is the first to begin to uncover associations between occupational status and outcomes of deceased donors along with building foundational knowledge to suggest the use of occupational status in organ evaluation. The novel findings of this study have demonstrated an occupational status-associated variability in outcomes such as behavioral risk factors, comorbidities, and premature mortality in the deceased organ donor population, with unemployed and low skill level groups being most heavily associated with a burden of behavioral risk factors, adverse health conditions, and premature mortality. The relationships between occupational status and factors utilized in organ evaluation, along with the context in which the SDOH have been used to holistically evaluate and serve the general population, support the value occupational status can provide if incorporated into the organ evaluation process.

In conclusion, occupational status is strongly associated with many factors used to evaluate deceased organ donors. Given the documented influence of occupational status on health outcomes in previous literature and in this study, we hypothesize that occupational status will add to the predictive ability of organ risk indices, improving the calibration and discrimination of prediction models. The hypothesized association between occupational status and transplant outcomes may be leveraged to improve existing organ quality scoring systems to assist in the complex decision-making of whether to accept an organ for transplant. We hypothesize that the establishment of occupational status as an added factor for evaluation of organ viability will improve the

prediction of allograft outcomes, aid in decision-making for transplant physicians, and bring visibility to SDOH in deceased donor organ evaluation.

TABLES

TABLE 1. DISTRIBUTION OF DEMOGRAPHICS, COMORBIDITIES, AND BEHAVIORAL RISK FACTORS BY OCCUPATIONAL STATUS ABSTRACTED FROM DONORNET IN THE U.S. DECEASED DONOR POPULATION (2014-2015)

	Unemployed[a,b] (n=1287)	Disabled[a,c] (n=812)	Not in Labor Force[a,d] (n=1320)	High Skill Level[a] (n=2919)	Medium Skill Level[a] (n=5810)	Low Skill Level[a] (n=1890)	Total (n=14038)	P-value
Age of Death, mean (SD)	36.3 (13.5)	45.1 (12.3)	40.3 (19.1)	48.2 (13.8)	43.7 (14.5)	40.4 (14.3)	43.3 (15.0)	<0.001
Female Sex, n (%)	542 (42.1)	405 (49.9)	850 (64.4)	1353 (46.4)	2103 (36.2)	368 (19.5)	5621 (40.0)	<0.001
Race or Ethnicity, n (%)								<0.001
Non-Hispanic White	813 (62.2)	568 (68.7)	856 (64.3)	2184 (74.4)	4033 (68.8)	1081 (56.6)	9434 (67.2)	
Black or African American	302 (23.1)	160 (19.4)	205 (15.4)	365 (12.4)	873 (14.9)	362 (19.0)	2243 (16.0)	
Hispanic or Latinx	152 (11.6)	81 (9.8)	208 (15.6)	236 (8.0)	794 (13.5)	417 (21.8)	1873 (13.3)	
Asian	22 (1.7)	10 (1.2)	49 (3.7)	136 (4.6)	125 (2.1)	34 (1.8)	375 (2.7)	
American Indian or Alaska Native	12 (0.9)	7 (0.9)	8 (0.6)	8 (0.3)	30 (0.5)	9 (0.5)	74 (0.5)	
Native Hawaiian or Other Pacific Islander	7 (0.5)	1 (0.1)	6 (0.5)	7 (0.2)	10 (0.2)	8 (0.4)	39 (0.3)	
BMI (KG/M2) , mean (SD)	27.5 (7.2)	29.9 (8.4)	28.1 (7.4)	29.2 (6.8)	28.8 (6.8)	27.7 (6.2)	28.6 (7.0)	<0.001
Hypertension, n (%)								<0.001
Yes	379 (29.5)	398 (49.0)	446 (33.8)	1219 (41.8)	2241 (39.0)	616 (32.6)	5299 (37.8)	
No	904 (70.2)	414 (51.0)	872 (66.1)	1692 (58.0)	3353 (61.2)	1270 (67.2)	8814 (62.0)	
Unknown	4 (0.3)	0 (0)	2 (0.2)	8 (0.3)	16 (0.3)	4 (0.2)	34 (0.2)	
Diabetes, n (%)								<0.001
Yes	152 (11.8)	197 (24.3)	167 (12.7)	354 (12.1)	733 (12.6)	198 (10.5)	1801 (12.8)	
No	1132 (88.0)	615 (75.7)	1151 (87.2)	2562 (87.8)	5065 (87.2)	1690 (89.4)	12215 (87.0)	
Unknown	3 (0.2)	0 (0)	2 (0.2)	3 (0.1)	12 (0.2)	2 (0.1)	22 (0.2)	
Myocardial Infarction, n (%)								<0.001
Yes	31 (2.4)	46 (5.7)	53 (4.0)	125 (4.3)	204 (3.5)	54 (2.9)	513 (3.7)	
No	1250 (97.1)	759 (93.5)	1263 (95.7)	2782 (95.3)	5578 (96.0)	1829 (96.8)	13461 (95.9)	
Unknown	6 (0.5)	7 (0.9)	4 (0.3)	12 (0.4)	28 (0.5)	7 (0.4)	64 (0.5)	
Peak Serum Creatinine (mg/dL), mean (SD)	2.1 (1.9)	2.4 (2.9)	1.8 (1.8)	1.9 (1.8)	2.0 (1.8)	2.0 (1.8)	2.0 (1.9)	<0.001
Terminal Serum Creatinine (mg/dL), mean (SD)	1.6 (1.8)	1.8 (2.1)	1.4 (1.4)	1.5 (1.5)	1.6 (1.6)	1.6 (1.7)	1.6 (1.6)	<0.001
HCV Status, n (%)								<0.001
Positive	149 (11.6)	66 (8.1)	59 (4.5)	64 (2.2)	324 (5.6)	154 (8.2)	816 (5.8)	
Negative	1138 (88.4)	746 (91.9)	1261 (95.5)	2855 (97.8)	5484 (94.4)	1736 (91.9)	13220 (94.2)	
Not Done	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.03)	0 (0)	2 (0.01)	
History of Heavy Alcohol Use[e], n (%)								<0.001
Yes	250 (19.4)	117 (14.4)	125 (9.5)	517 (17.7)	1262 (21.7)	465 (24.6)	2736 (19.5)	
No	995 (77.3)	681 (83.9)	1180 (89.4)	2383 (81.6)	4471 (77.0)	1391 (73.6)	11101 (79.1)	
Unknown	42 (3.3)	14 (1.7)	15 (1.1)	19 (0.7)	77 (1.3)	34 (1.8)	201 (1.4)	
History of Cigarette Use[f], n (%)								<0.001
Yes	290 (22.5)	267 (32.9)	244 (18.5)	519 (17.8)	1452 (25.0)	417 (22.1)	3189 (22.3)	
No	975 (75.8)	536 (66.0)	1066 (80.8)	2383 (81.6)	4272 (73.5)	1447 (76.6)	10679 (76.1)	
Unknown	22 (1.7)	9 (1.1)	10 (0.8)	17 (0.6)	86 (1.5)	26 (1.4)	170 (1.2)	
History of Intravenous Drug Use, n (%)								<0.001
Yes	298 (23.2)	64 (7.9)	90 (6.8)	125 (4.3)	600 (10.3)	259 (13.7)	1436 (10.2)	
CDC Increased Risk[g], n (%)								<0.001
Yes	551 (42.8)	175 (21.6)	195 (14.8)	355 (12.2)	1222 (21.0)	514 (27.2)	3012 (21.5)	
No	736 (57.2)	637 (78.5)	1123 (85.1)	2564 (87.8)	4587 (79.0)	1376 (72.8)	11023 (78.5)	
Unknown	0 (0)	0 (0)	2 (0.2)	0 (0)	1 (0.02)	0 (0)	3 (0.02)	

[a] Donors in the labor force occupation and skill levels were classified utilizing the International Standard Classification of Occupations (ISCO-08). Donors without an occupation were classified utilizing the January 2015 U.S. Bureau of Labor Statistics Employment Report.

[b] Persons who are unemployed and persons who currently want a job excluding persons with a disability who are unemployed

[c] Persons with a disability who are unemployed and persons with a disability who are not in the labor force

[d] Persons not in the labor force (retirees, homemakers, students, and veterans) minus persons who currently want a job excluding persons with a disability not in the labor force

[e] Defined as a pattern of >2 alcoholic drinks per day ever

[f] Defined as ≥20 pack years ever

[g] CDC Increased Risk Donor, as defined in the 2013 Public Health Service (PHS) Guideline for Reducing Human Immunodeficiency Virus, Hepatitis B Virus, and Hepatitis C Virus Transmission Through Organ Transplantation, includes donors with the following risk factors: people who have had sex with a person known or suspected to have HIV, HBV, or HCV infections in the preceding 12 months; men who have had sex with men (MSM) in the preceding 12 months; women who have had sex with men with a history of MSM behavior in the preceding 12 months; people who have had sex in exchange for money or drugs in the preceding 12 months; people who have had sex with people who have had sex in exchange for money or drugs in the preceding 12 months; people who have or who have had sex with a person that has injected drugs by intravenous, intramuscular, or subcutaneous route for nonmedical reasons in the preceding 12 months; people who have been in lockup, jail, prison, or a juvenile correctional facility for more than 72 hours in the preceding 12 months; people who have been newly diagnosed with or have been treated for syphilis, gonorrhea, Chlamydia, or genital ulcers in the preceding 12 months; and people who have been on hemodialysis in the preceding 12 months.

TABLE 2. AGE OF DEATH LINEAR REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

	Age of Death			
Variable	Crude Beta (SE)	P-value	Adjusted Beta (SE)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	-4.54 (0.34)	<0.001	-3.59 (0.28)	<0.001
Low Skill Level Occupation	-7.84 (0.44)	<0.001	-4.82 (0.37)	<0.001
Unemployed	-11.73 (0.50)	<0.001	-8.20 (0.43)	<0.001
Disabled	-3.24 (0.59)	<0.001	-5.04 (0.49)	<0.001
Not in Labor Force	-7.94 (0.49)	<0.001	-7.13 (0.41)	<0.001

Adjusted for: sex, race/ethnicity, BMI, history of hypertension, history of diabetes, history of myocardial infarction, HCV status, history of cigarette use, history of heavy alcohol use, history of intravenous drug use, and history of incarceration

TABLE 3. BMI LINEAR REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

BMI (kg/m^2)

Variable	Crude Beta (SE)	P-value	Adjusted Beta (SE)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	-0.44 (0.16)	0.01	-0.19 (0.16)	0.23
Low Skill Level Occupation	-1.50 (0.21)	<0.001	-0.96 (0.21)	<0.001
Unemployed	-1.63 (0.24)	<0.001	-1.12 (0.24)	<0.001
Disabled	0.70 (0.28)	0.01	0.70 (0.28)	0.01
Not in Labor Force	-1.16 (0.23)	<0.001	-0.98 (0.23)	<0.001

Adjusted for: age, sex, and race/ethnicity

TABLE 4. HISTORY OF HYPETERTENSION LOGISTIC REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

History of Hypertension

Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	0.87 (0.79-0.95)	0.003	1.10 (0.98-1.23)	0.10
Low Skill Level Occupation	0.67 (0.59-0.76)	<0.001	1.04 (0.89-1.21)	0.64
Unemployed	0.60 (0.52-0.70)	<0.001	1.15 (0.96-1.38)	0.12
Disabled	1.30 (1.11-1.52)	0.001	1.31 (1.08-1.58)	0.01
Not in Labor Force	0.71 (0.62-0.82)	<0.001	0.97 (0.81-1.16)	0.72

Adjusted for: age, sex, race/ethnicity, BMI, history of diabetes, and history of cigarette use

TABLE 5. HISTORY OF DIABETES LOGISTIC REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

	History of Diabetes			
Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	1.03 (0.90-1.18)	0.70	1.16 (1.00-1.35)	0.05
Low Skill Level Occupation	0.83 (0.70-1.00)	0.05	1.07 (0.87-1.32)	0.52
Unemployed	0.97 (0.79-1.19)	0.78	1.73 (1.37-2.18)	<0.001
Disabled	2.21 (1.81-2.70)	<0.001	2.48 (1.99-3.09)	<0.001
Not in Labor Force	1.06 (0.87-1.29)	0.58	1.32 (1.06-1.65)	0.01

Adjusted for: age, sex, race/ethnicity, BMI, and history of hypertension

TABLE 6. HISTORY OF MYOCARDIAL INFARCTION EVENTS LOGISTIC REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

History of Myocardial Infarction

Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	0.84 (0.66-1.05)	0.12	0.90 (0.71-1.15)	0.40
Low Skill Level Occupation	0.63 (0.45-0.88)	0.01	0.84 (0.59-1.19)	0.32
Unemployed	0.57 (0.38-0.85)	0.01	0.86 (0.56-1.31)	0.43
Disabled	1.37 (0.96-1.94)	0.08	1.28 (0.88-1.85)	0.20
Not in Labor Force	0.96 (0.69-1.34)	0.82	1.20 (0.85-1.70)	0.31

Adjusted for: age, sex, race/ethnicity, BMI, history of hypertension, history of diabetes, history of cigarette use, and history of intravenous drug use

TABLE 7. PEAK AND TERMINALCREATININE LINEAR REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

	Peak Creatinine (mg/dL)				Terminal Creatinine (mg/dL)			
Variable	Crude Beta (SE)	P-value	Adjusted Beta (SE)	P-value	Crude Beta (SE)	P-value	Adjusted Beta (SE)	P-value
Occupational Status								
High Skill Level Occupation	ref		ref		ref		ref	
Medium Skill Level Occupation	0.09 (0.04)	0.038	-0.008 (0.04)	0.86	0.05 (0.04)	0.1505	-0.009 (0.04)	0.81
Low Skill Level Occupation	0.12 (0.06)	0.0373	-0.08 (0.06)	0.17	0.08 (0.05)	0.0996	-0.04 (0.05)	0.37
Unemployed	0.18 (0.06)	0.0048	-0.03 (0.06)	0.63	0.11 (0.05)	0.0436	-0.007 (0.06)	0.90
Disabled	0.54 (0.08)	<0.001	0.28 (0.07)	<0.001	0.33 (0.07)	<0.001	0.12 (0.06)	0.05
Not in Labor Force	-0.05 (0.06)	0.4392	-0.06 (0.06)	0.33	-0.08 (0.05)	0.1367	-0.05 (0.05)	0.36

Adjusted for: age, sex, race/ethnicity, BMI, history of hypertension, history of diabetes, cause of death, and history of cigarette use

TABLE 8. PRESENCE OF HCV ANTIBODIES LOGISTIC REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

	HCV Antibody Positive			
Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	2.63 (1.99-3.48)	<0.001	1.60 (1.18-2.17)	0.003
Low Skill Level Occupation	3.96 (2.92-5.37)	<0.001	2.23 (1.58-3.14)	<0.001
Unemployed	5.81 (4.26-7.91)	<0.001	2.00 (1.40-2.85)	<0.001
Disabled	3.88 (2.69-5.58)	<0.001	3.05 (2.03-4.59)	<0.001
Not in Labor Force	2.13 (1.47-3.07)	<0.001	1.83 (1.22-2.75)	0.004

Adjusted for: age, sex, race/ethnicity, history of cigarette use, history of heavy alcohol use, history of intravenous drug use, and history of incarceration

TABLE 9. HISTORY OF HEAVY ALCOHOL USE LOGISTIC REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

	History of Heavy Alcohol Use[a]			
Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	1.31 (1.17-1.47)	<0.001	1.18 (1.04-1.33)	0.01
Low Skill Level Occupation	1.54 (1.33-1.78)	<0.001	1.38 (1.18-1.61)	<0.001
Unemployed	1.18 (0.997-1.40)	0.054	1.20 (1.00-1.44)	0.05
Disabled	0.79 (0.64-0.99)	0.04	0.70 (0.56-0.88)	0.002
Not in Labor Force	0.50 (0.41-0.62)	<0.001	0.60 (0.48-0.74)	<0.001

[a] Defined as a pattern of >2 alcoholic drinks per day ever

Adjusted for: age, sex, race/ethnicity, history of cigarette use, and history of intravenous drug use

TABLE 10. HISTORY OF CIGARETTE USE LOGISTIC REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

	History of Cigarette Use[a]			
Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	1.55 (1.38-1.74)	<0.001	2.08 (1.84-2.35)	<0.001
Low Skill Level Occupation	1.32 (1.14-1.52)	<0.001	2.26 (1.92-2.66)	<0.001
Unemployed	1.39 (1.18-1.63)	<0.001	2.64 (2.20-3.18)	<0.001
Disabled	2.24 (1.88-2.67)	<0.001	3.26 (2.69-3.95)	<0.001
Not in Labor Force	1.05 (0.89-1.25)	<0.001	1.63 (1.35-1.98)	<0.001

[a] Defined as ≥20 pack years ever

Adjusted for: age, sex, race/ethnicity, history of heavy alcohol use, and history of intravenous drug use

TABLE 11. HISTORY OF INTRAVENOUS DRUG USE LOGISTIC REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

History of Intravenous Drug Use

Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	2.62 (2.14-3.20)	<0.001	1.97 (1.60-2.42)	<0.001
Low Skill Level Occupation	3.54 (2.82-4.44)	<0.001	2.61 (2.05-3.31)	<0.001
Unemployed	6.74 (5.38-8.45)	<0.001	4.25 (3.35-5.41)	<0.001
Disabled	1.91 (1.39-2.63)	<0.001	1.59 (1.14-2.21)	0.01
Not in Labor Force	1.64 (1.24-2.18)	<0.001	0.97 (0.72-1.30)	0.82

Adjusted for: age, sex, race/ethnicity, history of cigarette use, and history of heavy alcohol use

TABLE 12. IDENTIFIED AS A CDC INCREASED RISK DONOR LOGISTIC REGRESSION MODEL WITH CRUDE AND ADJUSTED ESTIMATES

	CDC Increased Risk Donor[a]			
Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Occupational Status				
High Skill Level Occupation	ref		ref	
Medium Skill Level Occupation	1.92 (1.68-2.18)	<0.001	1.53 (1.34-1.75)	<0.001
Low Skill Level Occupation	2.64 (2.27-3.08)	<0.001	1.86 (1.58-2.19)	<0.001
Unemployed	5.24 (4.46-6.14)	<0.001	3.37 (2.84-3.98)	<0.001
Disabled	1.98 (1.62-2.43)	<0.001	1.76 (1.42-2.17)	<0.001
Not in Labor Force	1.25 (1.03-1.51)	0.02	0.87 (0.71-1.07)	0.18

[a] CDC Increased Risk Donor, as defined in the 2013 Public Health Service (PHS) Guideline for Reducing Human Immunodeficiency Virus, Hepatitis B Virus, and Hepatitis C Virus Transmission Through Organ Transplantation, includes donors with the following risk factors: people who have had sex with a person known or suspected to have HIV, HBV, or HCV infections in the preceding 12 months; men who have had sex with men (MSM) in the preceding 12 months; women who have had sex with men with a history of MSM behavior in the preceding 12 months; people who have had sex in exchange for money or drugs in the preceding 12 months; people who have had sex with people who have had sex in exchange for money or drugs in the preceding 12 months; people who have or who have had sex with a person that has injected drugs by intravenous, intramuscular, or subcutaneous route for nonmedical reasons in the preceding 12 months; people who have been in lockup, jail, prison, or a juvenile correctional facility for more than 72 hours in the preceding 12 months; people who have been newly diagnosed with or have been treated for syphilis, gonorrhea, Chlamydia, or genital ulcers in the preceding 12 months; and people who have been on hemodialysis in the preceding 12 months.

Adjusted for: age, sex, race/ethnicity, history of cigarette use, and history of heavy alcohol use

FIGURES

FIGURE 1. DIRECTED ACYCLIC GRAPH ESTABLISHING THE FRAMEWORK OF OCCUPATIONAL STATUS RELATED ASSOCIATIONS ON OUTCOMES OF INTEREST

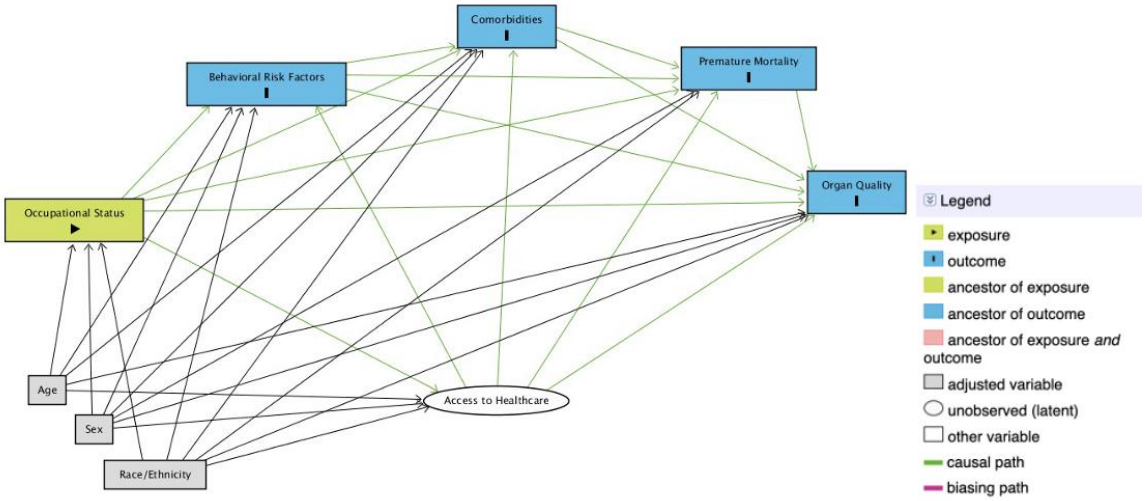
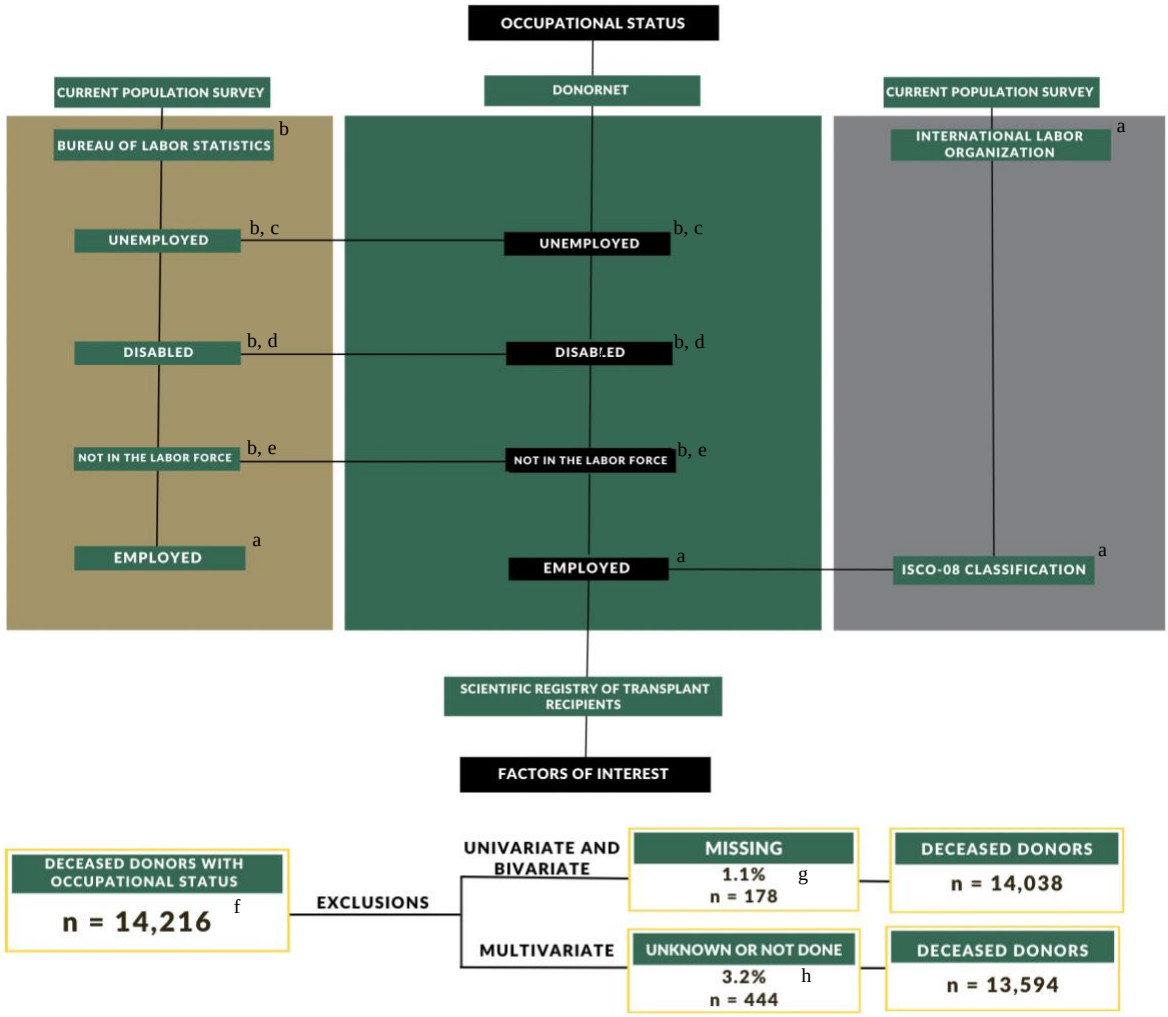
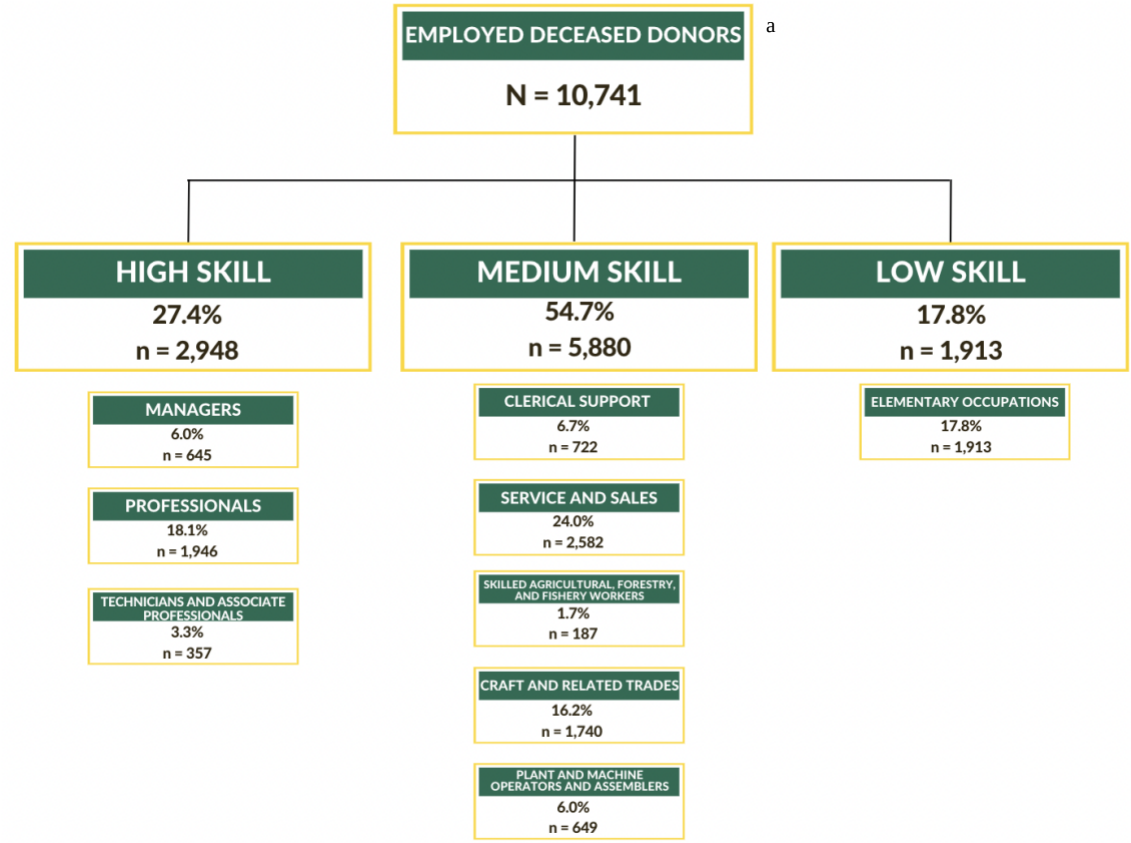


FIGURE 2. DATA SOURCES AND EXCLUSIONS



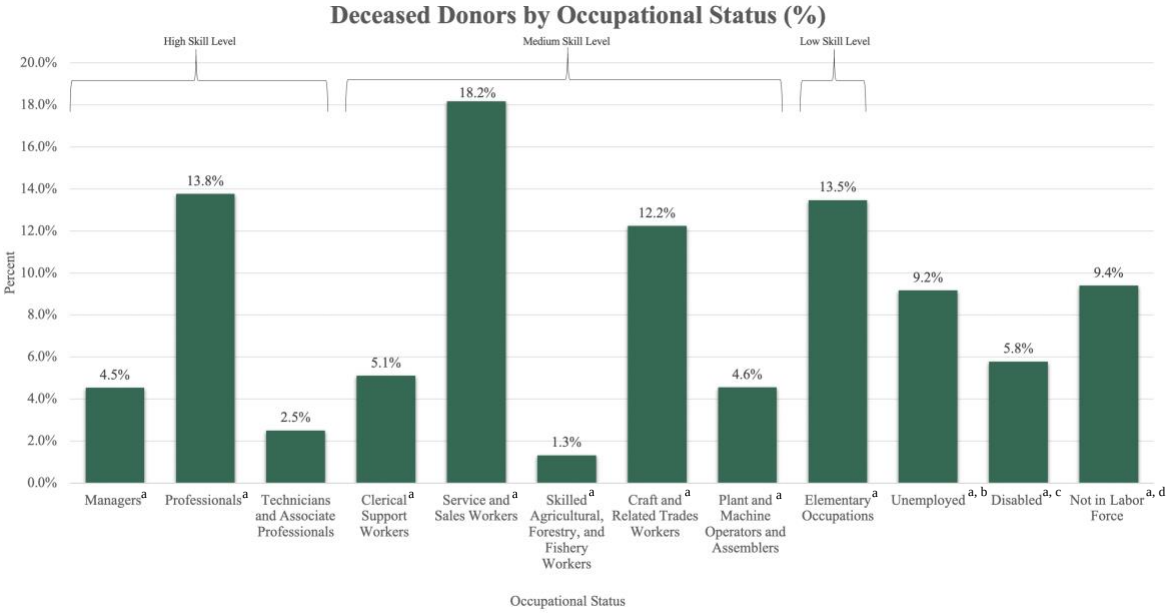
[a] Donor occupations and skill levels were classified utilizing the 2008 International Standard Classification of Occupations (ISCO-08)
[b] Donors without an occupation were classified utilizing the January 2015 U.S. Bureau of Labor Statistics Employment Report
[c] Persons who are unemployed and persons who currently want a job excluding persons with a disability who are unemployed
[d] Persons with a disability who are unemployed and persons with a disability who are not in labor force
[e] Persons not in the labor force (retirees, homemakers, students, and veterans) minus persons who currently want a job excluding persons with a disability not in the labor force
[f] Adult (≥18 years of age) deceased organ donors evaluated for heart, lung, liver, kidney, pancreas, and/or small bowel transplant donation from January 1, 2014 through December 31, 2015 in the U.S. with a documented occupational status
[g] Excluded due to missing outcome variables
[h] Excluded due to unknown or not done outcome variables

FIGURE 3. ISCO-08 CLASSIFICATIONS OF OCCUPATION SKILL LEVELS AND MAJOR GROUPS AMONG EMPLOYED DECEASED DONORS IN THE U.S. DECEASED DONOR POPULATION (2014-2015)



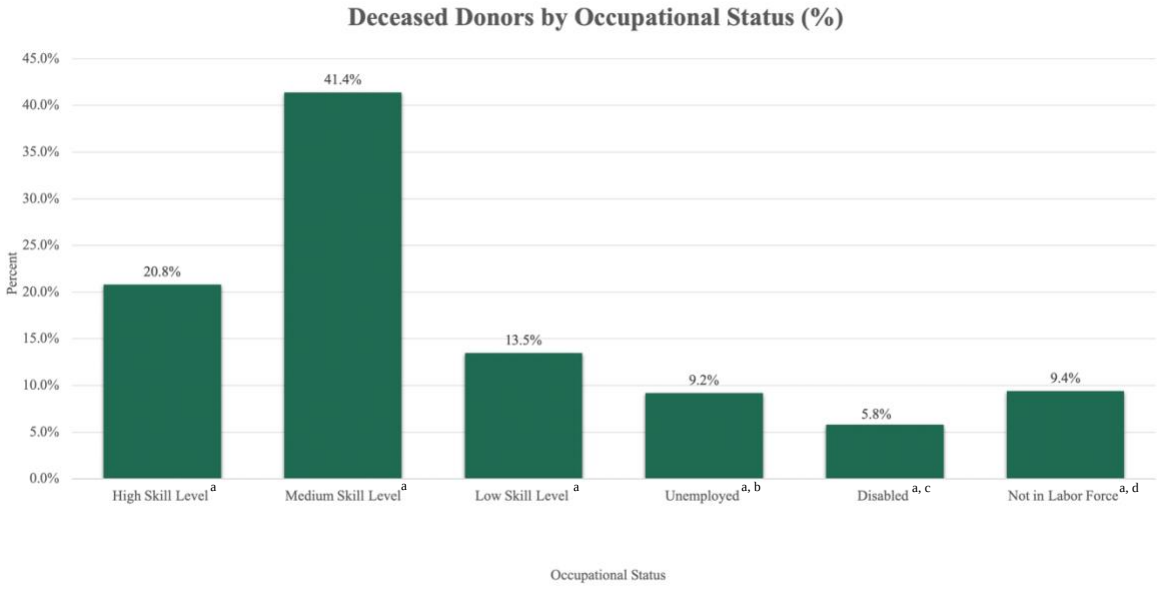
[a] Employed deceased donor occupations and skill levels were classified utilizing the 2008 International Standard Classification of Occupations (ISCO-08) from the International Labor Organization (ILO)

FIGURE 4. THE U.S. DECEASED DONOR POPULATION (2014-2015) BY OCCUPATIONAL STATUS



[a] Donor occupations and skill levels were classified utilizing the 2008 International Standard Classification of Occupations (ISCO-08) and donors without an occupation were classified utilizing the January 2015 U.S. Bureau of Labor Statistics Employment Report
[b] Persons who are unemployed and persons who currently want a job excluding persons with a disability who are unemployed
[c] Persons with a disability who are unemployed and persons with a disability who are not in labor force
[d] Persons not in the labor force (retirees, homemakers, students, and veterans) minus persons who currently want a job excluding persons with a disability not in the labor force

FIGURE 5. THE U.S. DECEASED DONOR POPULATION (2014-2015) BY OCCUPATIONAL STATUS GROUPED BY SKILL LEVEL



[a] Donor occupations and skill levels were classified utilizing the 2008 International Standard Classification of Occupations (ISCO-08) and donors without an occupation were classified utilizing the January 2015 U.S. Bureau of Labor Statistics Employment Report
[b] Persons who are unemployed and persons who currently want a job excluding persons with a disability who are unemployed
[c] Persons with a disability who are unemployed and persons with a disability who are not in labor force
[d] Persons not in the labor force (retirees, homemakers, students, and veterans) minus persons who currently want a job excluding persons with a disability not in the labor force

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APPENDIX A: SUPPLEMENTAL TABLES

SUPPLEMENTAL TABLE 1. COMPARISON OF DECEASED DONORS WITH A DOCUMENTED OCCUPATIONAL STATUS VERSUS DECEASED DONORS WITH NO DOCUMENTED OCCUPATIONAL STATUS

Variable	Exposure Missing[a] (n=1,547)	Exclude Exposure Missing[b] (n=14,348)	P-value
Age of Death, mean (SD)	43.9 (15.0)	43.2 (15.0)	0.08
Female Sex, n (%)	656 (42.4)	5708 (40.0)	0.046*
Race or Ethnicity, n (%)			
White	1070 (69.3)	9620 (67.2)	0.09
Black or African American	277 (17.9)	2292 (16.0)	0.054
Hispanic or Latinx	158 (10.2)	1901 (13.3)	<0.001*
Asian	30 (1.9)	379 (2.7)	0.06
American Indian or Alaska Native	7 (0.5)	75 (0.5)	1.0
Native Hawaiian or Other Pacific Islander	3 (0.2)	42 (0.3)	0.49
BMI (kg/m^2), mean (SD)	28.5 (7.1)	28.6 (6.9)	0.59
History of Hypertension, n (%)			
Yes	582 (37.7)	5398 (37.6)	0.94
No	888 (57.4)	8905 (62.1)	<0.001*
Unknown	76 (4.9)	45 (0.3)	<0.001*
History of Diabetes, n (%)			
Yes	246 (15.9)	1838 (12.8)	<0.001*
No	1224 (79.2)	12475 (87.0)	<0.001*
Unknown	76 (4.9)	35 (0.2)	<0.001*
History of Myocardial Infarction, n (%)			
Yes	67 (4.4)	523 (3.7)	0.17
No	1391 (90.3)	13754 (95.9)	<0.001*
Unknown	83 (5.4)	71 (0.5)	<0.001*
Peak Serum Creatinine (mg/dL), mean (SD)	2.1 (2.2)	2.0 (1.9)	0.053
Final Serum Creatinine (mg/dL), mean (SD)	1.7 (1.7)	1.6 (1.6)	0.02*
HCV Status, n (%)			
Positive	124 (8.0)	842 (5.9)	0.001*
Negative	1419 (91.7)	13504 (94.1)	<0.001*
Not Done	3 (0.2)	2 (0.01)	<0.001*
History of Heavy Alcohol Use[c], n (%)			
Yes	297 (19.2)	2806 (19.6)	0.71
No	1144 (74.1)	11321 (78.9)	<0.001*
Unknown	103 (6.7)	221 (1.5)	<0.001*
History of Cigarette Use[d], n (%)			
Yes	373 (24.1)	3263 (22.7)	0.21
No	1066 (69.0)	10900 (76.0)	<0.001*
Unknown	107 (6.9)	185 (1.3)	<0.001*
History of Intravenous Drug Use, n (%)			
Yes	173 (12.1)	1450 (10.2)	0.02*
CDC Increased Risk[e], n (%)			
Yes	429 (27.8)	3166 (22.1)	<0.001*
No	1112 (71.9)	11177 (77.9)	<0.001*
Unknown	5 (0.3)	5 (0.03)	<0.001*

[*]Indicates a statistically significant value
[a] Deceased donors with missing occupational status
[b] Deceased donors excluding those with missing occupational status
[c] Defined as a pattern of >2 alcoholic drinks per day ever
[d] Defined as ≥20 pack years ever
[e] CDC Increased Risk Donor, as defined in the 2013 Public Health Service (PHS) Guideline for Reducing Human Immunodeficiency Virus, Hepatitis B Virus, and Hepatitis C Virus Transmission Through Organ Transplantation, includes donors with the following risk factors: people who have had sex with a person known or suspected to have HIV, HBV, or HCV infections in the preceding 12 months; men who have had sex with men (MSM) in the preceding 12 months; women who have had sex with men with a history of MSM behavior in the preceding 12 months; people who have had sex in exchange for money or drugs in the preceding 12 months; people who have had sex with people who have had sex in exchange for money or drugs in the preceding 12 months; people who have or who have had sex with a person that has injected drugs by intravenous, intramuscular, or subcutaneous route for nonmedical reasons in the preceding 12 months; people who have been in lockup, jail, prison, or a juvenile correctional facility for more than 72 hours in the preceding 12 months; people who have been newly diagnosed with or have been treated for syphilis, gonorrhea, Chlamydia, or genital ulcers in the preceding 12 months; and people who have been on hemodialysis in the preceding 12 months.

SUPPLEMENTAL TABLE 2. COMPARISON OF DECEASED DONORS WITH ONE OR MORE MISSING OUTCOME VARIABLES VERSUS DECEASED DONORS WITHOUT MISSING OUTCOME VARIABLES

Variable	Outcome Missing[a] (n=178)	Outcome Exclude Missing[b] (n=14,038)	P-value
Occupational Status, n (%)			
Low Skill Level Occupation	23 (12.9)	1890 (13.5)	0.82
Medium Skill Level Occupation	70 (39.3)	5810 (41.4)	0.57
High Skill Level Occupation	29 (16.3)	2919 (20.8)	0.14
Unemployed	26 (14.6)	1287 (9.2)	0.01*
Disabled	16 (9.0)	812 (5.8)	0.07
Not in Labor Force	14 (7.9)	1320 (9.4)	0.50
Age of Death, mean (SD)	40.4 (13.6)	43.3 (15.0)	0.01*
Female Sex, n (%)	63 (35.4)	5621 (40.0)	0.21
Race or Ethnicity, n (%)			
Non-Hispanic White	101 (71.6)	9434 (67.2)	0.27
Black or African American	24 (17.0)	2243 (16.0)	0.75
Hispanic or Latinx	15 (10.6)	1873 (13.3)	0.35
Asian	1 (0.71)	375 (2.7)	0.15
American Indian or Alaska Native	0 (0)	74 (0.5)	0.40
Native Hawaiian or Other Pacific Islander	0 (0)	39 (0.3)	0.51
BMI (kg/m^2), mean (SD)	27.4 (6.6)	28.6 (7.0)	0.02*
History of Hypertension, n (%)			
Yes	59 (33.2)	5299 (37.8)	0.21
No	109 (61.2)	8814 (62.0)	0.83
Unknown	10 (5.6)	34 (0.2)	<0.001*
History of Diabetes, n (%)			
Yes	25 (14.0)	1801 (12.8)	0.63
No	144 (80.9)	12215 (87.0)	0.02*
Unknown	9 (5.1)	22 (0.2)	<0.001*
History of Myocardial Infarction, n (%)			
Yes	5 (2.8)	513 (3.7)	0.53
No	168 (94.4)	13461 (95.9)	0.32
Unknown	5 (2.8)	64 (0.5)	<0.001*
Peak Serum Creatinine (mg/dL), mean (SD)	2.4 (2.2)	2.0 (1.9)	0.01*
Terminal Serum Creatinine (mg/dL), mean (SD)	1.8 (1.9)	1.6 (1.6)	0.10
HCV Status, n (%)			
Positive	12 (6.74)	816 (5.8)	0.59
Negative	166 (93.3)	13220 (94.2)	0.61
Not Done	0 (0)	2 (0.01)	0.89
History of Heavy Alcohol Use[c]			
Yes	47 (26.4)	2736 (19.5)	0.02*
No	118 (66.3)	11101 (79.1)	<0.001*
Unknown	13 (7.3)	201 (1.4)	<0.001*
History of Cigarette Use[d], n (%)			
Yes	47 (26.4)	3189 (22.3)	0.19
No	119 (66.9)	10679 (76.1)	0.004*
Unknown	12 (6.7)	170 (1.2)	<0.001*
History of Intravenous Drug Use, n (%)			
Yes	4 (10.5)	1436 (10.2)	0.95
CDC Increased Risk[e], n (%)			
Yes	102 (57.3)	3012 (21.5)	<0.001*
No	74 (41.6)	11023 (78.5)	<0.001*
Unknown	2 (1.1)	3 (0.02)	<0.001*

[*]Indicates a statistically significant value
[a] Deceased donors with one or more missing outcome variables
[b] Deceased donors excluding those with one or more missing outcome variables
[c] Defined as a pattern of >2 alcoholic drinks per day ever
[d] Defined as ≥20 pack years ever
[e] CDC Increased Risk Donor, as defined in the 2013 Public Health Service (PHS) Guideline for Reducing Human Immunodeficiency Virus, Hepatitis B Virus, and Hepatitis C Virus Transmission Through Organ Transplantation, includes donors with the following risk factors: people who have had sex with a person known or suspected to have HIV, HBV, or HCV infections in the preceding 12 months; men who have had sex with men (MSM) in the preceding 12 months; women who have had sex with men with a history of MSM behavior in the preceding 12 months; people who have had sex in exchange for money or drugs in the preceding 12 months; people who have had sex with people who have had sex in exchange for money or drugs in the preceding 12 months; people who have or who have had sex with a person that has injected drugs by intravenous, intramuscular, or subcutaneous route for nonmedical reasons in the preceding 12 months; people who have been in lockup, jail, prison, or a juvenile correctional facility for more than 72 hours in the preceding 12 months; people who have been newly diagnosed with or have been treated for syphilis, gonorrhea, Chlamydia, or genital ulcers in the preceding 12 months; and people who have been on hemodialysis in the preceding 12 months.

SUPPLEMENTAL TABLE 3. COMPARISON OF DECEASED DONORS WITH ONE OR MORE MISSING OR UNKNOWN/NOT DONE OUTCOME VARIABLES VERSUS DECEASED DONORS WITHOUT MISSING OR UNKNOWN/NOT DONE OUTCOME VARIABLES

Variable	Outcome Missing and Unknown/Not Done[a] (n=622)	Exclude Outcome Missing and Unknown/Not Done[b] (n=13,594)	P-value
Occupational Status, n (%)			
Low Skill Level Occupation	85 (13.7)	1828 (13.5)	0.89
Medium Skill Level Occupation	271 (43.6)	5609 (41.3)	0.25
High Skill Level Occupation	85 (13.7)	2863 (21.1)	<0.001*
Unemployed	92 (14.8)	1221 (9.0)	<0.001*
Disabled	44 (7.1)	784 (5.8)	0.18
Not in Labor Force	45 (7.2)	1289 (9.5)	0.06
Age of Death, mean (SD)	44.2 (14.9)	43.2 (15.0)	0.1
Female Sex, n (%)	201 (32.3)	54833 (40.3)	<0.001*
Race or Ethnicity, n (%)			
Non-Hispanic White	381 (65.1)	9154 (67.3)	0.25
Black or African American	118 (20.2)	2149 (15.8)	0.003*
Hispanic or Latinx	73 (12.5)	1815 (13.4)	0.52
Asian	9 (1.5)	367 (2.7)	0.07
American Indian or Alaska Native	4 (0.7)	70 (0.5)	0.49
Native Hawaiian or Other Pacific Islander	0 (0)	39 (0.3)	0.17
BMI (kg/m^2), mean (SD)	28.6 (7.0)	28.6 (6.9)	1
Cause of Death, n (%)			
Anoxia	234 (37.6)	4647 (34.2)	0.08
Cerebrovascular/Stroke	178 (28.6)	4652 (34.2)	0.004*
Head Trauma	187 (30.1)	3891 (28.6)	0.42
CNS Tumor	1 (0.2)		
Other	22 (3.5)	404 (2.97)	0.45
History of Hypertension, n (%)			
Yes	237 (38.1)	5121 (37.7)	0.84
History of Diabetes, n (%)			
Yes	94 (15.1)	1732 (12.7)	0.08
History of Myocardial Infarction, n (%)			
Yes	17 (2.7)	501 (3.7)	0.19
Peak Serum Creatinine (mg/dL), mean (SD)	2.2 (2.1)	2.0 (1.9)	0.01*
Terminal Serum Creatinine (mg/dL), mean (SD)	1.8 (1.9)	1.6 (1.6)	0.003*
HCV Status, n (%)			
Positive	63 (10.1)	765 (5.6)	<0.001*
History of Heavy Alcohol Use[c], n (%)			
Yes	106 (17.0)	2677 (19.7)	0.10
History of Cigarette Use[d], n (%)			
Yes	122 (19.6)	3114 (22.9)	0.06
History of Intravenous Drug Use, n (%)			
Yes	63 (13.1)	1377 (10.1)	0.02*
CDC Increased Risk[e], n (%)			
Yes	257 (41.3)	2857 (21.0)	<0.001*

[*]Indicates a statistically significant value
[a] Deceased donors with one or more missing or unknown/not done outcome variables
[b] Deceased donors excluding those with one or more missing or unknown/not done outcome variables
[c] Defined as a pattern of >2 alcoholic drinks per day ever
[d] Defined as ≥20 pack years ever
[e] CDC Increased Risk Donor, as defined in the 2013 Public Health Service (PHS) Guideline for Reducing Human Immunodeficiency Virus, Hepatitis B Virus, and Hepatitis C Virus Transmission Through Organ Transplantation, includes donors with the following risk factors: people who have had sex with a person known or suspected to have HIV, HBV, or HCV infections in the preceding 12 months; men who have had sex with men (MSM) in the preceding 12 months; women who have had sex with men with a history of MSM behavior in the preceding 12 months; people who have had sex in exchange for money or drugs in the preceding 12 months; people who have had sex with people who have had sex in exchange for money or drugs in the preceding 12 months; people who have or who have had sex with a person that has injected drugs by intravenous, intramuscular, or subcutaneous route for nonmedical reasons in the preceding 12 months; people who have been in lockup, jail, prison, or a juvenile correctional facility for more than 72 hours in the preceding 12 months; people who have been newly diagnosed with or have been treated for syphilis, gonorrhea, Chlamydia, or genital ulcers in the preceding 12 months; and people who have been on hemodialysis in the preceding 12 months.

APPENDIX B: DISCLOSURES

The data reported here have been supplied by the Hennepin Healthcare Research Institute (HHRI) as the contractor for the Scientific Registry of Transplant Recipients (SRTR). The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy of or interpretation by the SRTR or the U.S. Government.

APPENDIX C: IRB APPROVAL

Record Number
IRB-161212003

Done Save

Transplant Outcome Assessment: The Role of Demographics, Comorbidities, and Disease Etiology on Waitlist Candidate, Donor, and Recipient Outcomes
Jayme E. Locke - Surgery - Transplantation (UAB DEPARTMENT)

Human Subjects Protocol
View Mode

Submissions (49) Linkages (1) Summaries ?

Home Summaries Personnel

Summary
Devices
Drugs
Personnel

Research Personnel

Add

All Certifications and Training

PI	Name	COI	Start Date		End Date
◉	Jayme Locke - Surgery - Transplantation Role: PI	✔	12-Dec-2016	Retire	Remove
	Certifications and Training		Responsible Person ☑	CV Email	
○	Shara Andrews - Surgery - Transplantation Role: Other Personnel	✔	21-Jan-2021	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Tina Ayer - Med - Nephrology Role: Other Personnel	?	26-Jan-2017	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Robert Cannon - Surgery - Transplantation Role: Subinvestigator	⚠	21-Aug-2019	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Alexis Carter - Surgery - Transplantation Role: Other Personnel	✔	18-Feb-2021	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Tyler Colvin - Graduate Medical Education-Hospital Role: Other Personnel	✔	06-Dec-2021	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Jeffrey Curtis - Med - Immunology/Rheumatology Role: Other Personnel	⚠	31-Mar-2019	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Collin Darwish - Physician Scientist Development OFC Role: Other Personnel	✔	15-Jul-2021	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Kayla Frey - Graduate School Dean's Office Role: Other Personnel	✔	10-Dec-2019	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Marguerite Irvin - Epidemiology Role: Subinvestigator	✔	26-Jan-2017	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Mohammad Jajja - Surgery - Transplantation Role: Other Personnel	✔	14-Jan-2022	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Essence Jones - Surgery - Transplantation Role: Other Personnel	✔	06-Sep-2019	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	Alixandra Killian - Surgery Chair Office Role: Other Personnel	✔	16-Sep-2019	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	
○	John Killian - Graduate Medical Education-Hospital Role: Other Personnel	✔	26-Jan-2017	Retire	Remove
	Certifications and Training		Responsible Person ☐	CV Email	

PI	Name	COI	Start Date		End Date
○	Seokhoon Kim - Med - Preventive Medicine Role: Other Personnel Certifications and Training	?	04-Oct-2021 Responsible Person ☐	Retire CV Email	Remove
○	David Kloda - Surgery - Transplantation Role: Other Personnel Certifications and Training	✓	12-Aug-2019 Responsible Person ☐	Retire CV Email	Remove
○	Adley Knowles - Surgery - Transplantation Role: Other Personnel Certifications and Training	?	06-Sep-2019 Responsible Person ☐	Retire CV Email	Remove
○	Emily Levitan - Epidemiology Role: Other Personnel Certifications and Training	✓	11-Jan-2022 Responsible Person ☐	Retire CV Email	Remove
○	Nita Limdi - Neurology Chair Office Role: Subinvestigator Certifications and Training	✓	26-Jan-2017 Responsible Person ☐	Retire CV Email	Remove
○	Paul MacLennan - Surgery - Transplantation Role: Subinvestigator Certifications and Training	⚠	26-Jan-2017 Responsible Person ☐	Retire CV Email	Remove
○	Marshall Mcleod - Surgery - Transplantation Role: Other Personnel Certifications and Training	✓	07-Aug-2019 Responsible Person ☐	Retire CV Email	Remove
○	Ariann Nassel - Lister Hill Center for Health Policy Role: Other Personnel Certifications and Training	✓	06-Dec-2021 Responsible Person ☐	Retire CV Email	Remove
○	Anoma Nellore - Med - Infectious Diseases Role: Subinvestigator Certifications and Training	⚠	26-Jan-2017 Responsible Person ☐	Retire CV Email	Remove
○	Babak Orandi - Surgery - Transplantation Role: Subinvestigator Certifications and Training	✓	21-Aug-2019 Responsible Person ☐	Retire CV Email	Remove
○	Luz Padilla - Epidemiology Role: Subinvestigator Certifications and Training	✓	16-May-2018 Responsible Person ☐	Retire CV Email	Remove
○	Nicole Pelletier - Surgery - Transplantation Role: Other Personnel Certifications and Training	✓	24-Nov-2020 Responsible Person ☐	Retire CV Email	Remove
○	Joshua Purvis - Physician Scientist Development OFC Role: Other Personnel Certifications and Training	✓	12-Aug-2019 Responsible Person ☐	Retire CV Email	Remove
○	Haiyan Qu - Health Services Administration Chair Office Role: Subinvestigator Certifications and Training	✓	07-Aug-2018 Responsible Person ☐	Retire CV Email	Remove
○	Rhiannon Reed - Comprehensive Transplant Institute Role: Other Personnel Certifications and Training	✓	26-Jan-2017 Responsible Person ☐	Retire CV Email	Remove
○	Mohamed Shoreibah - Med - Gastroenterology Role: Other Personnel Certifications and Training	✓	14-Jan-2020 Responsible Person ☐	Retire CV Email	Remove
○	Burkely Smith - Medical Student Services Role: Other Personnel Certifications and Training	✓	26-Jan-2017 Responsible Person ☐	Retire CV Email	Remove
○	Danielle Sutzko - Surgery - Gen Surg Vascular Section Role: Other Personnel	✓	04-Oct-2019	Retire	Remove

PI	Name	COI	Start Date		End Date
	Certifications and Training	Responsible Person		CV Email	
	Jose Tallaj - Med - Cardiovascular Disease Role: Subinvestigator	✔	26-Jan-2017	Retire	Remove
	Certifications and Training	Responsible Person		CV Email	
	Abirami Thiyagarajan - Graduate Medical Education-Hospital Role: Other Personnel	?	14-Jan-2020	Retire	Remove
	Certifications and Training	Responsible Person		CV Email	
	Jeffery Walker - Criminal Justice Role: Other Personnel	✔	05-Jan-2022	Retire	Remove
	Certifications and Training	Responsible Person		CV Email	
	Eric Wallace - Med - Nephrology Role: Subinvestigator	⚠	26-Jan-2017	Retire	Remove
	Certifications and Training	Responsible Person		CV Email	
	Christopher Woods - Surgery - Transplantation Role: Other Personnel	✔	19-Nov-2021	Retire	Remove
	Certifications and Training	Responsible Person		CV Email	
	Rongbing Xie - Surgery - Cardiovascular/Thoracic Role: Other Personnel	✔	06-Aug-2019	Retire	Remove
	Certifications and Training	Responsible Person		CV Email	

Past Research Personnel

Name	Department	Start Date	End Date	
Justin Blackburn Email	Health Policy & Organization Certifications and Training	26-Jan-2017	20-Nov-2018	Remove
Robert Cannon Email	Surgery - Transplantation Certifications and Training	26-Jan-2017	20-Nov-2018	Remove
Tanya Correya Email	Science & Technology Honors Program Certifications and Training	29-May-2018	06-Aug-2019	Remove
Cole Crowson Email	Graduate School Dean's Office Certifications and Training	26-Jan-2017	20-Nov-2018	Remove
John Donnelly Email	Emerg Med-Research Certifications and Training	26-Jan-2017	20-Nov-2018	Remove
Swapna Kakani Email	Graduate School Dean's Office Certifications and Training	04-Oct-2019	17-Jan-2020	Remove
Meredith Kilgore Email	Health Policy & Organization Certifications and Training	26-Jan-2017	20-Nov-2018	Remove
Margaux Mustian Email	Surgery - Transplantation Certifications and Training	24-Jul-2017	16-Oct-2020	Remove
Babak Orandi Email	Future UAB Faculty/Staff Certifications and Training	16-Jul-2018	13-Aug-2019	Remove
Christopher Ray Email	Graduate School Dean's Office Certifications and Training	26-Jan-2017	20-Nov-2018	Remove
Joshua Richman Email	Surgery - Gen Surg Gastrointestinal Section Certifications and Training	26-Jan-2017	06-Nov-2020	Remove
Margaret Romine Email	Graduate Medical Education-Hospital Certifications and Training	26-May-2018	16-Oct-2020	Remove
Brittany Shelton Email	Comprehensive Transplant Institute Certifications and Training	26-Jan-2017	14-May-2022	Remove
Grant Smith Email	Surgery - Transplantation Certifications and Training	26-Jan-2017	06-Aug-2019	Remove
Haichang Xin Email	Health Policy & Organization Certifications and Training	06-Feb-2019	06-Aug-2019	Remove
Megan Yanik Email	Graduate Medical Education-Hospital Certifications and Training	26-Jan-2017	07-Aug-2019	Remove