|  |  |  |
| --- | --- | --- |
|  | **Mortality over time**  Mortality rate for an agent over time  Model: [Gompertz–Makeham law of mortality](https://en.wikipedia.org/wiki/Gompertz%E2%80%93Makeham_law_of_mortality) requires two parameters (e.g. life expectancy and mortality rate at a given age) | **Income and wealth over time** |
| **Giver – Control (General)** | * [Overall mortality](https://esj-journals.onlinelibrary.wiley.com/doi/full/10.1007/s10144-018-0609-6) * Mortality by age, gender, race, education, smoking, exercise, alcohol, health status, marriage, height, weight. [Paper](https://onlinelibrary.wiley.com/doi/full/10.1002/oby.21318), [supplemental material](https://onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1002%2Foby.21318&file=oby21318-sup-0001-suppinfo1.pdf). Another [Paper](https://journals.lww.com/epidem/fulltext/2014/03000/association_among_socioeconomic_status,_health.4.aspx). | * Run a simple OLS regression on CPS and NHIS data. |
| **Giver – Treated (Donor)** | * No significant impact on long-term mortality for eligible donors. However, possibility of unmeasured impact on long-term mortality for non-eligible donors. * Impact of LKD on GFR/CrCl, and GFR/CrCl impact on ESRD risk: [Paper](https://journals.lww.com/Kidney360/fulltext/2021/09000/The_Evaluation_of_Kidney_Function_in_Living_Kidney.19.aspx). [Paper](https://academic.oup.com/ndt/article/33/6/1054/4903015). | * Insufficient data on how income is affected by giving a kidney. For example, OPTN does not track income data. Iranian data is unreliable due to numerous confounding variables such as occupation. * Employment rate pre vs. post-transplantation in OPTN follow-up data |
| **Receiver – Control (Dialysis)** | * Mortality rates by age, race, ethnicity: [Paper](https://journals.lww.com/cjasn/fulltext/2013/06000/the_relationship_of_age,_race,_and_ethnicity_with.11.aspx), [Paper](https://karger.com/ajn/article/39/3/183/325964/Impact-of-Age-Race-and-Ethnicity-on-Dialysis), [Paper](https://jamanetwork.com/journals/jama/article-abstract/1104204). | * Employment rate over time after starting dialysis: [Paper](https://journals.lww.com/cjasn/fulltext/2018/02000/Employment_among_Patients_Starting_Dialysis_in_the.13.aspx). |
| **Receiver – Treated (Graft)** | * Long-term survival rates for graft recipients in [annual OPTN report](https://www.sciencedirect.com/science/article/pii/S1600613522082958) sliced by characteristics. Another similar [paper](https://onlinelibrary.wiley.com/doi/full/10.1111/tri.12217). | * Employment rate pre vs. post-transplantation in OPTN follow-up data |

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| --- | --- | --- | --- |
|  | **Immediate (peri-operative) Mortality** | **Immediate Costs** | **Long-term Costs** |
| **Giver – Control (General)** | N/A | N/A | N/A |
| **Giver – Treated (Donor)** | * List of perioperative risks and incidence rates: [Paper](https://www.sciencedirect.com/science/article/pii/S1600613522010085), [Paper](https://academic.oup.com/ndt/article/22/11/3122/1835281). | * Lost wages * Transportation costs * Length and cost of hospital stay * Cost of surgery | * Number of annual hospitalizations (OPTN follow up data) compared to control. * Effects on insurance premiums and coverage |
| **Receiver – Control (Dialysis)** | N/A | N/A | N/A |
| **Receiver – Treated (Graft)** | * List of perioperative risks and incidence rates: [Paper](https://onlinelibrary.wiley.com/doi/full/10.1111/j.1525-139X.2005.00097.x). | * Lost wages * Transportation costs * Length and cost of hospital stay * Cost of surgery | * Immunosuppressive treatments. * Number of annual hospitalizations (OPTN follow up data) compared to control. * Effects on insurance premiums and coverage |

Variable pool:

|  |  |  |  |
| --- | --- | --- | --- |
|  | OPTN | NHIS | CPS |
| Age | X |  |  |
| Gender | X |  |  |
| Race/ethnicity | X |  |  |
| Height | X |  |  |
| Weight | X |  |  |
| Education | X |  |  |
| State of residency | X |  |  |
| Insurance | X |  |  |
| CrCl | X |  |  |
| GFR | X |  |  |
| ABO type | X |  |  |
| Diabetes | X |  |  |
| Prior donor | X |  |  |
| Prior recipient | X |  |  |
| Dialysis | X |  |  |
| Wait time | X |  |  |
| Death status | X |  |  |

# Further Research

* More complete, robust model of mortality over age on covariates based on NIH-AARP dataset that controls for location fixed effects.
* Model of patient outcomes that controls for facility fixed effects.
* Using Iranian data (which may have crucially different models for mortality and treatment effects) to test model.
* Collection of more socioeconomic factors such as income in transplant data.
* Account for donor-recipient histocompatibility and differential valuation of kidneys based on donor quality.
* Account for different methods of surgery (laparoscopic, etc.) and their associated costs and benefits.
* More studies on impacts on mortality rates and socioeconomic status of socioeconomic covariates based on OPTN data.
* Inclusion of impacts of COVID on valuations.
* Using USRDS data in addition to OPTN data, which contains more information on ESRD patients who didn’t get on the waitlist.
* Inclusion of deceased donor kidney supply as an (inferior) substitute good for living donor kidneys. Currently modelling deceased donor kidney supply as equivalent product with 0 valuation from donor.