|  |  |  |
| --- | --- | --- |
|  | **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 |

\*When analyzing market, make sure to include deceased donor kidney supply, making sure to estimate the different valuation receivers would have for deceased donor kidneys. That is, account for deceased donor kidneys being an (inferior) substitute good for living donor kidneys.

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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.