The Multi-Outcome Medical Deconfounder:
Assessing Treatment Effects on Multiple Renal Measures

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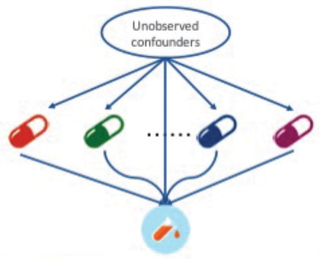
Background

- The **unobserved confounders** in observational data can **bias** treatment effect estimates.
- Classical causal inference assumes **ignorability**, that there is no unobserved confounder.
- The **medical deconfounder** adjusts for multi-cause unobserved confounders and produces closer-to-truth treatment effect estimates.



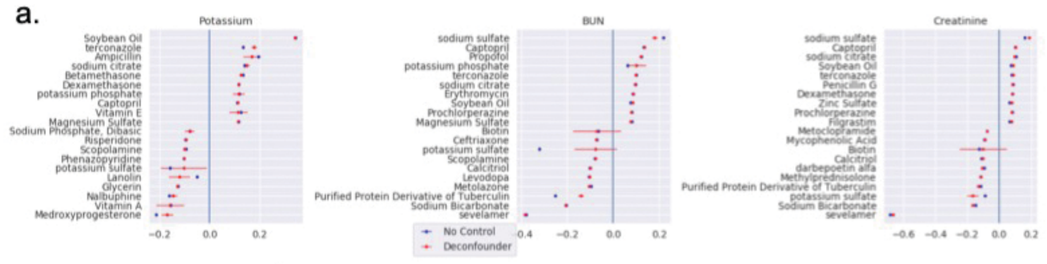
Conclusions

The multi-outcome medical deconfounder can estimate the causal effect of multiple treatments on multiple outcomes.

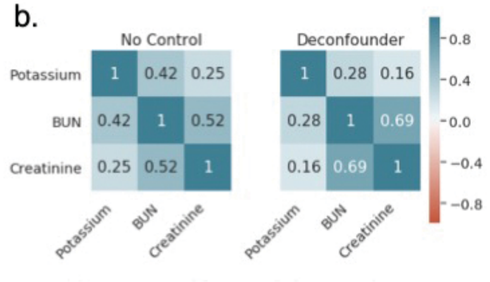
Results

- Adjusting for the substitute confounder can potentially reduce bias in treatment effect estimates.
- Drugs have more similar effect on BUN and creatinine after deconfounding.

a.



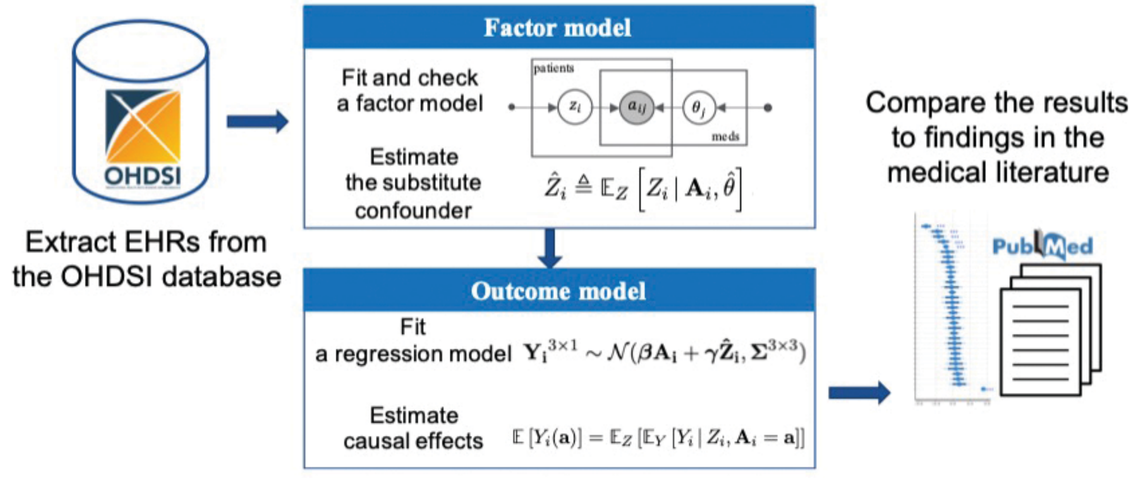
b.



Data and Cohort

- The study cohort is from Columbia University Medical Center database in the Observational Health Data Sciences and Informatics (OHDSI) OMOP common data model (CDM) format.
- We extracted medication records and 3 lab tests: potassium, urea nitrogen, and creatinine immediately before and after treatments.
- The cohort contains about 1.4 million patients, 313 drugs and 3 renal measures.

Methods



- The method works by fitting two models to the data.

1. a Poisson matrix factorization (PMF) model was fit to the drug matrix and its adequacy of fit was assessed by predictive model checking. The latent variable in PMF was inferred as a substitute for the unobserved confounder.
2. A multi-outcome Bayesian Ridge regression model to estimate treatment effects of all drugs on all outcomes.

- We improved the efficiency of estimation by inferring the covariance matrix of the outcomes.
- We compared the effect estimates from the model without adjusting for confounders (no control) and one adjusting for the PMF substitute confounders (deconfounder).