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## Causal Inference in Observational Studies using Health Administrative Data

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### Abstract

Health services research generally relies on observational data to compare outcomes of patients receiving different therapies. Comparisons of patient groups in observational studies may be biased, in that outcomes differ due to both the effects of treatment and the effects of patient prognosis. In some cases, especially when data are collected on detailed clinical risk factors, these differences can be controlled for using statistical or epidemiological methods. In other cases, when unmeasured characteristics of the patient population affect both the decision to provide therapy and the outcome, these differences cannot be removed using standard techniques. Use of health administrative data requires particular cautions in undertaking observational studies since important clinical information does not exist. We discuss several statistical and epidemiological approaches to remove overt (measurable) and hidden (unmeasurable) bias in observational studies. These include regression model-based case-mix adjustment, propensity-based matching, redefining the exposure variable of interest, and the econometric technique of instrumental variable (IV) analysis. These methods are illustrated using examples from the medical literature including prediction of one-year mortality following heart attack; the return to health care spending in higher spending U.S. regions in terms of clinical and financial benefits; and the long-term survival benefits of invasive cardiac management of heart attack patients. It is possible to use health administrative data for observational studies provided careful attention is paid to addressing issues of reverse causation and unmeasured confounding.

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