

Bias in Observational Studies

Epi-on-the-Island

23 August – 3 September 2021

This course covers 2 topics essential for producing valid results from observational data:

- bias (and quantitative bias analysis)
- use of Bayesian methods to incorporate bias correction into the study analyses

In the first section, we will review the three fundamental types of bias (confounding, selection bias, and information bias) including causes of the bias, approaches to preventing the bias and an evaluation of the potential impact these biases could have on study results. Given that not all biases can be prevented, it is important to know how to deal with biases which may affect a study. Two general approaches will be presented. Probabilistic quantitative bias analysis is a post-hoc approach which allows an investigator to apply knowledge about factors which may have biased a study in order to adjust observed estimates of effects (eg odds ratios) to remove the bias effects. While it does allow for adjustment for multiple biases and for uncertainty in bias parameters estimates, probabilistic quantitative bias analysis is usually applied to models that can be summarized by a 2x2 table.

Bayesian methods allow for incorporation of bias parameters directly during the analysis phase and, consequently, can be applied to more complex models. For instance multivariable logistic regression model (ie models with more than one predictor, including continuous predictors), mixed models (ie models with random effects), etc can be run with these. Using the Bayesian methods allows an investigator to compute unadjusted and bias-adjusted point estimate and 95% CI that will, hopefully, be closer to the true counterfactual effect. At the very least, it would allow for estimating the biases direction and magnitude.

Instructors:

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Software:

Software used will be a combination of spreadsheets (provided) and R programs. Participants will need to have some proficiency in R (primarily for the Bayesian analyses). Guidance in developing this proficiency will be provided.

Tentative schedule

This course will be offered on-line with an in-person option for people in Charlottetown (and potentially) in Montreal.

The following is a tentative schedule showing the main topics covered. A more detailed schedule with exact times of all sessions will be provided prior to the course.

Day	Contents
Mon. 23 Aug.	Introduction to the course, to causal thinking and to confounding
Tues.24 Aug.	Selection bias
Wed.25 Aug.	Information bias and introduction to quantitative bias analysis (QBA)
Thurs.26 Aug.	Simple QBA for selection and information bias
Fri.27 Aug.	QBA – Obtaining estimates of bias parameters, probabilistic QBA, case studies
Mon.30 Aug.	Introduction to Bayesian methods
Tues.31 Aug.	Bayesian adjustment for unmeasured confounder and selection bias
Wed.1 Sept.	Bayesian adjustment for non-differential and differential outcome misclassification
Thurs.2 Sept	Bayesian adjustment for exposure misclassification and multiple biases
Fri.3 Sept	Assistance for participants working on their own data and participant presentations