«Bias in Observational Studies» Workshop

Faculty of Veterinary Medicine, Université de Montréal

May 11-15, 2020

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.

Prerequisite: Participants should already have a good understanding of basic epidemiological concepts, such as measures of association (e.g., risk ratio, odds ratio), diagnostic test accuracy (e.g., sensitivity, specificity), etc. A good understanding of basic logistic regression will be needed for the Bayesian part. However, participants are not expected to have any prior knowledge of Bayesian methods or related software.

Tools used: An epi course would not be complete without learning a new cool software, right? For the first part of the course, participants will explore impact of biases using simple excel sheets. For quantitative bias analyses, Episensr (an R package) and Episensr-Shiny (a simplified web- or smartphone-interface that covers some QBA topics) will be used. OpenBUGS will be used for the Bayesian part of the course. Episensr, Episensr-shiny, and OpenBUGS are all free open source softwares.

Venue
Room 2950, Main building
Faculty of Veterinary Medicine, Université de Montréal
3200 rue Sicotte, St-Hyacinthe, QC, J2S 2M2

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GROUPE DE RECHERCHE EN ÉPIDÉMIOLOGIE DES ZOONOSES ET SANTÉ PUBLIQUE

GREZOSP 20 ans
Université de Montréal

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Tentative schedule

Lectures in bold

Day	Time	Contents
Monday	8:30-9:30	Introduction to Course, Assignments / Presentations
	9:30 - 10:00	**Causal thinking**
	10:00 - 10:30	Tea/Coffee
	10:30 - 12:00	**Confounding - brief review, DAGS, intervening variables, methods of control**
	12:00 – 1:00	**Lunch**
	1:00 - 2:00	Bias Exc. 1 – DAG, intervening variables, methods of control
	2:00 – 3:00	**Selection bias - brief review, types of sel. bias, general structure (Hernan's), magnitude**
	3:00 - 3:30	Tea/Coffee
	3:30 - 4:30	Bias Exc. 2 - selection bias - using VER non-response spreadsheet
	4:30 - 5:00	**Information bias - brief review, differential/non-diff., magnitude**
	5:00 - 6:00	Individual help
Tuesday	8:30 - 9:00	**Information bias - (cont)**
	9:00 - 10:00	Bias Exc. 3 - information bias - using VER misclassification spreadsheet
	10:00 - 10:30	Coffee
	10:30 - 12:00	**Quantitative Bias Analysis (QBA) - simple bias analysis (unmeasured confounder)**
	11:00 - 12:00	Bias Exc. 4 - simple bias analysis - using QBA spreadsheets and -episensr-
	12:00 - 1:00	Lunch
	1:00 - 2:00	**QBA - simple bias analysis (selection and misclassification)**
	2:00 - 3:00	Bias Exc. 5 - simple bias analysis - using QBA sel./info. bias spreadsheets and -episensr-
	3:00 - 3:30	Coffee
	3:30 - 4:30	**QBA - Where do we get estimates of bias parameters?**
	4:30 - 5:00	**QBA - What if I am uncertain of the bias parameter estimates?**
	5:00 - 6:00	Individual help
Wednesday	8:30 - 9:30	Bias Exc. 6 - multidimensional and probabilistic bias analysis - using QBA spreadsheets and -episensr- (cont.)
	9:30 - 10:00	**QBA - What if there are multiple sources of bias?**
	10:00 - 10:30	Coffee
	10:30 - 11:30	**Incorporating bias parameters into analyses**
	11:30 - 12:00	**Case Example – Fluorosis in Australian wildlife**
	12:00 - 1:00	Lunch
	1:00 - 2:00	Bias Exc. 7 - multiple bias analysis - using QBA spreadsheets and -episensr-

Day	Time	Contents
	2:00 - 3:00	**Introduction to Bayesian methods**
	3:00 - 3:30	Coffee
	3:30 - 5:00	Bayesian Exc. 8 - Running a logistic regression model using OpenBUGS
	5:00 - 6:00	Individual help
Thursday	8:30 - 9:00	**Bayesian adjustment for unmeasured confounder**
	9:00 - 10:00	Bayesian Exc. 9 – Unmeasured confounder
	10:00 -10:30	Coffee
	10:30 -11:00	**Bayesian adjustment for selection bias**
	11:00 -12:00	Bayesian Exc. 10 – Selection bias
	12:00 - 1:00	Lunch
	1:00 - 2:00	**Bayesian adjustment for outcome misclassification (non-differential and differential)**
	2:00 - 3:00	Bayesian Exc. 11 – Outcome misclassification – Non-differential and differential
	3:00 - 3:30	Coffee
	3:30 - 4:30	**Using internal data to adjust for outcome misclassification**
	4:30 - 5:00	Bayesian Exc. 11 – Outcome misclassification – Outcome misclassification using internal validation data
	5:00 - 6:00	Individual help
Friday	8:30 - 9:00	**Bayesian adjustment for exposure misclassification**
	9:00 - 10:00	Bayesian Exc. 12 – Exposure misclassification
	10:00 - 10:30	Coffee
	10:30 -11:00	**Bayesian adjustment for multiple biases**
	11:00 - 12:00	Bayesian Exc. 13 – Multiple bias analysis
	12:00 - 1:00	Lunch
	1:00 - 2:00	*work on own data*
	2:00 - 3:00	Presentations / Discussions of participants projects
	3:00 - 3:30	Coffee
	3:30 – 4:30	Presentations / Discussions of participants projects
	4:30 – 5:00	Course wrap-up

Registration numbers are limited and will be accepted on a first come, first served basis. Please register early to secure your place.

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Course Instructors

Ian R. Dohoo

Dr. Ian Dohoo is an internationally known veterinary teacher and researcher (loosely translated this means he has been at it a long time). He is a Professor Emeritus of epidemiology at the University of PEI and is the first author of the graduate level epidemiology texts "Veterinary Epidemiologic Research" and "Methods in epidemiologic Research". Numerous students around the world have participated in epidemiology courses he has taught. Most survived the experience. He has a particular interest in the advancement of epidemiologic methods, including those used in analyses of hierarchical data, survival analyses, and meta-analyses. He has served both as the Director of the Centre for Veterinary Epidemiologic Research (CVER at UPEI) and as an Associate Editor of Preventive Veterinary Medicine, (but don't blame him if your paper was rejected).

Simon Dufour

Dr. Simon Dufour completed a DVM degree at the Université de Montréal in 1998. Following 10 years of professional happiness as a dairy practitioner in Québec and British Columbia he finally saw the light and completed a PhD in epidemiology at UdeM. He is currently associate professor of epidemiology at UdeM and scientific director of the Mastitis Network, an organization responsible for mobilization of national and international scientific and financial resources to decrease the incidence of mastitis and maintain milk quality. Dr. Dufour's research program focuses, in part, on epidemiology of bovine infectious diseases, where he makes use of various observational study designs, and, on the other hand, on quantifying and controlling biases in observational studies.

For questions regarding the workshop, please contact Simon Dufour:
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