SISCER Module 12
Causal Inference with Observational Data: Common Designs and Statistical Methods

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University of Washington & University of Cambridge

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Welcome to SISCER Module 12

Welcome!

▶ Causal Inference with Observational Data: Common Designs and Statistical Methods

More on the scope and content in a few slides ...

About Ting

Ting Ye, PhD (she/her); I am an Assistant Professor in Biostatistics at UW
- ▶ Research: causal inference (observational studies and clinical trials)
  - ▶ I develop new methods and apply causal inference methods to answer scientific questions
- ▶ Background
  - ▶ PhD in Statistics, University of Wisconsin-Madison
  - ▶ Postdoc in Statistics, UPenn

About Qingyuan

Qingyuan Zhao, PhD (he/his); I am an Assistant Professor in the Statistical Laboratory at the University of Cambridge.

I am interested in improving the general quality and appraisal of statistical research, including

▶ New methodology and better understanding of causal inference;

▶ Novel study designs;

▶ Sensitivity analysis;

▶ Multiple testing;

▶ Selective inference.

Our fabulous TA

Yinxiang Wu, MS (he/his); third year PhD student in Biostatistics at UW

- ▶ Research: causal inference, high-dimensional data and statistical learning
- ▶ MS in Statistics, at Columbia University

Who are you?

We have a wonderful diverse set of background here

- ▶ Biostatistics, Psychiatry, Epidemiology, Environmental Health Science, Medicine, Nursing, *definitely others...*
- ▶ Academic, government, biopharmaceutical company

Learning goal and learning process

The objective is to study methods for **designing and analyzing** observational studies to make them **provide more reliable evidence**.

To achieve this goal, we will
- ► Learn common designs of observational studies and how to analyze them
- ► Gain experience from practicing with real data

You are highly encouraged to apply the methods to your own data!

What are we going to learn?

6 lectures over 3 days

- ▶ Lecture 1: Randomization inference
- ▶ Lecture 2: Matching for cohort studies
- ▶ Lecture 3: Sensitivity analysis, Weighting methods
- ▶ Lecture 4: Case-control studies
- ▶ Lecture 5: Instrumental variables, Mendelian randomization
- ▶ Lecture 6: Negative control, Difference-in-differences

Achieving our goals

Each day will be structured as follows (with two 15 mins breaks)

▶ Two (roughly) 1-hour lectures
▶ 45 minutes practical data analysis with R
  * We will use breakout rooms so you can work in small groups
▶ 15 minutes discussion of exercises

We will assume basic background in statistical inference and some knowledge of R.

Please note: the 3 day course moves quickly. So, **please ask questions!** – as "chat" or "raise hand" in Zoom calls, or on our Slack channel.