

SISCER Module 15
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 15

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 the Genentech Endowed 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

Marlena Bannick, MS (she/her); third year PhD student in Biostatistics at UW

- ▶ Research: design and analysis of clinical trials, statistical learning, and population health
- ▶ BS in public health, MS in Biostatistics, at UW



Who are you?

We have a wonderful diverse set of background here

- ▶ Biostatistics, Psychiatry, Clinical Epidemiology, Violence Prevention, Infectious Disease, Population Health, Global Health, Medicine, *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
- ▶ 1 hour practical data analysis with R
 - * We will use poll from time to time to monitor progress and pause several times to answer common questions.

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.