BSTA 660: Design of Observational Studies

Fall 2018 (second half of semester)
Tuesdays and Thursdays 1:30 – 2:50
Blockley Hall 418

Course Director
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Course Description
The objective of this course is to prepare students to design and analyze medical research studies using observational data. Through a combination of lectures and hands-on assignments, students will learn to identify an appropriate study design to answer a given research question, identify possible sources of bias, conduct an analysis appropriate to a given study design and interpret results, and conduct sensitivity analyses to evaluate robustness of results to common sources of bias and error. Topics for the course will include epidemiologic study designs, issues of confounding and hidden bias, matching methods, propensity score methods, sensitivity analysis, and instrumental variables. Case studies in biomedical research will be presented as illustrations. (0.5 course unit)

Prerequisites: permission of instructor

Course Requirements and Grading

- Three homework assignments (20% each)
- Class participation (10%)
- Final project (30%)

Recommended Texts:

Material from the textbook will be supplemented with readings from the statistical and epidemiologic literature.

**Class Web Page**

This course will use Canvas to share materials including lecture notes and readings, to submit homework assignments, and to interact outside of the classroom via the discussion board. Lecture notes and readings from sources other than the textbook will be made available prior to class each week. Students should check Canvas regularly for information.

**Expectations**

Students are expected to:

- Complete all assigned readings prior to class.
- Participate in class discussions and activities.
- Complete all homework assignments by the due date. No credit will be given for late assignments except in extraordinary circumstances.
- Comply with the University of Pennsylvania’s Code of Academic Integrity policy on plagiarism. Students may work together on homework assignments, but the final submitted document should be prepared by each individual student. No credit will be given for work that is plagiarized, either from another student, the internet, or any other source.
<table>
<thead>
<tr>
<th>Class session</th>
<th>Date</th>
<th>Topic</th>
<th>Readings (details pending)</th>
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<tr>
<td>1</td>
<td>10/23/18</td>
<td>Overview of observational studies: classic examples</td>
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<td>2</td>
<td>10/25/18</td>
<td>Cross-sectional studies</td>
<td>Weiss pgs. 77-78, Harding 2015, Hubbard 2016 (optional), Simon 1980 (optional)</td>
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<td>3</td>
<td>10/30/18</td>
<td>Cohort studies</td>
<td>Weiss pgs. 82-85, 320-339, Laurson 2008</td>
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<td>4</td>
<td>11/6/18</td>
<td>Case-control studies</td>
<td>Weiss pgs. 385-387, 340-352, Abrahamsen 2010, Dell 2012</td>
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<td>6</td>
<td>11/13/18</td>
<td>Nested case-control and case-cohort designs</td>
<td>Wacholder 1992, O’Connor 2014, Barlow 1999 (optional)</td>
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<td>7</td>
<td>11/15/18</td>
<td>Potential outcomes framework and confounding</td>
<td>Selected articles</td>
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<td>8</td>
<td>11/20/18</td>
<td>Matching for different epidemiologic study designs</td>
<td>Selected articles</td>
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<td>9</td>
<td>11/22/18</td>
<td>THANKSGIVING BREAK</td>
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<td>10</td>
<td>11/27/18</td>
<td>Full, optimal, and caliper matching</td>
<td>Hansen</td>
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<td>11</td>
<td>11/29/18</td>
<td>Propensity scores: matching, stratification, inverse probability of treatment weighting</td>
<td>Rosenbaum and Rubin etc.</td>
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<td>12</td>
<td>12/04/18</td>
<td>Sensitivity analysis</td>
<td>Mitra</td>
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<td>13</td>
<td>12/05/18</td>
<td>Instrumental variables</td>
<td>Small</td>
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