

Summer Institute of Advanced Epidemiology and Preventive Medicine

Summer 2014

Case-Control Studies: Design and Methods - Course Syllabus

Course number: 0158.1157

2 Academic Credits

July 6th – July 10th, 2014, 08:30-13:00

Room 215, Sackler Medical Faculty Building, Tel Aviv University

Instructor: Moyses Szklo, MD, DrPH, MPH

Professor of Epidemiology and Medicine

Johns Hopkins University

Editor-in-Chief, American Journal of Epidemiology

Course Assistants: Mrs. Miriam Lutski - miri77@gmail.com

Mr. Michael Brik - michael.brik@gmail.com

I. Course Description:

This course will cover key principles, designs and methods of case-control studies. It is aimed at students who have already taken an introductory epidemiology course. Topics will include selection of cases and controls, main case-control designs, measures of association, evaluation of confounding and interaction, and the most often used methods of adjustment of case-control data and their assumptions. The course's is the notion of the case-control design as a special way to examine cohort data. The course will consist of lectures and small group discussions of exercises.

II. Course required prerequisites:

- Basic course in Epidemiology
- Basic course in Biostatistics

III. Course location and schedule:

All classes will take place at the [Sackler Medical Faculty building](#) - room 215.

Some of the exercises will be also conducted in room 123.

	Sunday July 6, 2014	Monday July 7, 2014	Tuesday July 8, 2014	Wednesday July 9, 2014	Thursday July 10, 2014
8:30-10:00	Introduction- I	Measures of association - II	Bias	Interaction	Confounding and adjustment: (1) Stratified Methods (2) Multiple Regression
10:00-10:30	Break	Break	Break	Break	Break
10:30-12:00	Introduction – II	Exercise No. 1: Measures of association	Exercise No. 2: Bias	Exercise No. 3: Interaction	Exercise No. 4: Adjustment
12:00-12:15	Break	Discussion of exercise No. 1*	Break	Discussion of exercise No. 3*	Break
12:15-13:00	Measures of association - I		Discussion of exercise No. 2		Discussion of exercise No. 4

* On Monday (July 7th) and Wednesday (July 9th) the classes will end at 12:30 in favor of 2 seminars on medical writing conducted by Moyses Szklo (Editor in Chief, American Journal of Epidemiology) and Philip Greenland (Senior Editor, JAMA). The seminars will be conducted in room 201 between 13:00 and 15:00 hours.

IV. Course Topics:

1. Introduction

- a. Definition of a case-based case-control study
- b. Hypothesis-testing vs. exploratory studies
- c. Advantages of case-based case-control studies vis-à-vis concurrent cohort studies
- d. Cross-sectional case-control studies
- e. Identification and selection of cases in case-based case-control studies
- f. Selection of controls:

- Principles of comparability
 - What is a control group?
 - Types of control groups
 - Multiple control groups
- g. Matching: advantages and disadvantages
- h. Measurement of exposure
- i. Case-crossover study

2. Measures of association in case-control studies

- a. Odds and odds ratios
- b. Odds ratio of exposure and odds ratio of disease
- c. The prospective inference when estimating the odds ratio
- d. Calculation of the odds ratio when there are more than two exposure categories
- e. Parameter estimated by the exposure odds ratio as a function of the type of control group
- f. Case-control studies within a defined cohort
 - Case-cohort studies
 - Nested case-control studies
- g. Attributable risk calculation in case-control studies

3. Bias in case-control studies

- a. Definition
- b. Selection bias: compensated and uncompensated bias; external validity of a rate vs. external validity of an association measure
- c. Information bias: non-differential and differential misclassification; regression dilution bias
- d. Mixed bias: prevalence-incidence and temporal biases

4. Interaction evaluation in case-control studies

- a. Definition and models (additive and multiplicative)
- b. Strategies for evaluation of interaction: (1) effect modification and (2) comparison of observed with expected odds ratios/relative risks
- c. Quantitative vs. qualitative interaction

- d. Reciprocity of interaction
- e. The primacy of the additive model for public health and medicine
- f. Biologic interaction (“synergy”)
- g. Statistical interaction (not causal)
- h. Interaction as a confounding factor
- i. A practical algorithm to evaluate interaction
- j. What should be reported (when there is/there is not confounding or interaction)

5. **Confounding in case-control studies**

- a. Definition
- b. Stratified methods for control of confounding
 - Stratification
 - Direct adjustment: what it really means
 - Mantel-Haenszel method for adjustment of odds ratios
 - Matching; its relationship to the Mantel-Haenszel method
 - Limitations of the stratified methods
- c. Positive and negative confounding
- d. Residual confounding
- e. Statistical significance and confounding
- f. Is confounding a bias?
- g. Interaction is not confounding

6. **Multiple regression in case-control studies**

- a. Generalized linear regression methods
- b. Logistic regression; odds ratio of exposure and odds ratio of “caseness”
- c. Main assumption when using a single analytic unit
- d. Main assumption when estimating a “main effect”
- e. Unconditional and conditional logistic regression
- f. “Dummy” variables when the function is not linear

V. **Course Textbook:**

Epidemiology: Beyond the Basics (2nd Ed).

Moyses Szklo and F Javier Nieto. Jones & Bartlett Publishers, 2006.

VI. Final exam

Course participants, who wish to receive academic credits for the course, must pass the final exam with a grade of at least 60 (D-).

Participants who will chose not take the exam or will receive grade below 60 (F) will receive a participation diploma only

**The final exam will take place on Friday, July 11th, at 09:00-11:00, room 215.
An additional date for the exam will be scheduled if required.**