Advanced course in *Epidemiology* arranged by the National Institute of Epidemiology in India (https://www.nie.gov.in) in collaboration with the EpiCap initiative of the Centre for Intervention Science in maternal and Child Health (https://www.uib.no/en/cismac) at the University of Bergen, Norway

Time: 16-24 January 2024
Place: In or close to Chennai, India. Exact venue to be announced soon at NIE and EpiCap webpages.

Advanced Epidemiology

EpiCap is an initiative to strengthen the capacity in analytic epidemiology and its teaching/learning at the University of Bergen (UiB), in collaborating institutions in India and Sub-Saharan Africa and at the Norwegian Institute of Public Health and Innlandet Hospital Trust in Norway.

The course "Advanced Epidemiology" will be given by Professor Matthew Fox and supported by EpiCap co-facilitators who will lead its hands-on analysis exercises.

Faculty
Matthew Fox, DSc, MPH, (https://www.bu.edu/sph/profile/matthew-fox) is a Professor in the Departments of Epidemiology and Global Health at Boston University. Prof. Fox is a graduate of the Boston University School of Public Health with a master's degree in epidemiology and biostatistics and a doctorate in epidemiology. His research interests include treatment outcomes in HIV-treatment programs, infectious disease epidemiology (with specific interests in HIV and pneumonia), and epidemiologic methods. Prof. Fox works on ways to improve retention in HIV-care programs in South Africa. As part of this work, he is involved in analyses assessing the impact of changes in South Africa's National Treatment Guidelines for HIV. Prof. Fox is also an expert on quantitative bias analysis and co-authored a book on these methods, Applying Quantitative Bias Analysis to Epidemiologic Data. He co-chairs the Society for Epidemiologic Research's Committee for Podcasts in epidemiology, and is the Host for SERious EPI. He is also the host of a public health journal club podcast called Free Associations designed to help people stay current in the public health literature and think critically about the quality of research studies. He currently teaches a third-level epidemiologic methods class, Advanced Epidemiology, as well as two other doctoral level epidemiologic methods courses.

Target group for the course "Advanced Epidemiology" 16-24 January 2024 in Chennai: Postdoctoral researchers and advanced doctoral level students.

Course Content
Introductory and intermediate courses in epidemiological methods teach students the concepts needed to begin a career conducting valid epidemiological research; however, these courses typically only briefly cover the causal models that should underlie the design of valid epidemiological studies. We will use these models as a jumping-off point to begin rethinking what we have already learned and to go further in our understanding of basic concepts of measures of effect, confounding, selection and misclassification bias. From there, we will begin to address the implications of various sources of bias in our studies and we will work through novel methods and approaches for doing more than simply speculating about them We will then explore the basic statistics used in epidemiological research and correct misunderstandings about what they can tell us. The course will also encompass group work with

computer analysis exercises (using Stata® or R) that will enable the participants to apply the principles taught. It will also include discussions of conceptual and computational aspects of relevance to causal inference.

The course will address the core concepts of validity (lack of systematic error) and statistical precision (lack of random error), to foster a deeper understanding of these central concepts. Moreover, we will emphasize the learning of practical skills that doctoral level students in epidemiology should have.

At the end of the course, participants should be able to:

- Use the sufficient-component cause model, counterfactual susceptibility type model, and a causal graph to assist with the design and analysis of epidemiologic studies.
- Calculate adjusted measures of effect and select those that, when collapsible, correspond to the no-confounding condition. Use the adjusted measures of effect to estimate the direction and magnitude of confounding.
- Distinguish effect measure modification, interdependence, and statistical interaction from one another as separate - but related - concepts of interaction.
- Identify the likely magnitude and direction of bias due to misclassification of exposure, outcomes, confounders, and modifiers.
- Weigh the advantages and disadvantages of significance testing.
- Compare the advantages and disadvantages of frequentist and Bayesian approaches to analysis of a single study, to evidence, and to changing your mind.

Prerequisites and pre-course studies

Prerequisites: A good understanding of:

- Medical statistics [e.g. S. J. Walters, M. J. Campbell, D. Machin. Medical Statistics: A Textbook for the Health Sciences (ISBN-13: 978-1119423645)].

and of

- Epidemiology [we strongly recommend to, before the course, carefully study: Kenneth J Rothman's/Krista F. Huybrechts, and Eleanor J. Murray's "Epidemiology- an introduction" (ISBN-13: 978-0197751541) or, alternatively, KJ Rothman's 2nd edition of the same book (ISBN-13: 978-0199754557]. Power point presentations and videos from CISMAC webinars held in 2021 and 2022 covering several topics from the textbook can be made available upon request to Ms. Iselin H. Kvamme (Iselin.Kvamme@uib.no).

A good command of English is required to benefit from the course. All participants must be well versed with analyzing epidemiologic data using either Stata® or R; the analysis workshop 22-24 January will use these programs (some participants/Co-facilitators will use R, others Stata®) but will not explain the use of these programs. Each participant must carry to the course his/her computer with Stata® (version 14 or higher) or R (with R studio) installed.

Participants

30 from India and up to 10 participants from other countries.

Course literature

To fully benefit from the course, we strongly recommend that each participant, before it starts, carefully studies the following 10 papers/book chapters:

Day	Reading
1	1. Ioannidis JP. Why most published research findings are false. *PLoS Med* 2005;2(8):e124. 2. Greenland S and Robins JM. Identifiability, exchangeability, and epidemiological confounding. *Int J Epidemiol* 1986;15:412–418
	3. Rothman, KJ. Causes *Am J Epidemiol* 1976; 104: 587–592.
2	4. Greenland S, Pearl J, and Robins JM. Causal diagrams for epidemiologic research. *Epidemiology* 1999;10:37–48. 5. Hernan MA, Brumback B, Robins JM. Marginal structural models to estimate the causal effect of zidovudine on the survival of HIV-positive men. *Epidemiology* 2000;11(5):561-570.
3	6. Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology*, 4th Edition. ISBN-13: 978-1-4511-9328-2. . Chapter 26 – Analysis of Interaction OR VanderWeele TJ. On the distinction between interaction and effect modification. Epidemiology. 2009 Nov;20(6):863-71 7. Jurek AM, Greenland S, Maldonado G et al. Proper interpretation of non-differential misclassification effects: expectations vs observations. *Int J Epidemiol* 2005;34(3):680-687.
4	8. Greenland S. Randomization, Statistics, and Causal Inference. *Epidemiology* 1990;1:421–429. 9. Goodman S N. Toward Evidence-Based Medical Statistics. 1: The *P* Value Fallacy. *Annals of Internal Medicine* 1999;130(12): 995-1004. Paper available at http://www.acponline.org. 10. Poole C. Low P-Values or Narrow Confidence Intervals: Which Are More Durable? *Epidemiology* 2001;12(3): 291-294.

Course fee: None | **Travel support:** None

Credit points: The course does not provide credit points.

Application deadline: Before 15 November at 23:59 India time (19:29 CET). *Priority will be given to those who apply before 16 October 23:59 India time (19:29 CET).*

Application form: Please click here.

Course program/timetable:

	09h00 – 12h00	12h00 – 13h00	**13h00 – 16h00**
Thursday 16 Jan	INTROD TO MODERN EPI: Review of basic epi and intro to advanced epi concepts	Lunch	THE SUFFICIENT CAUSES MODEL: An introduction to causal models
Friday 17 Jan	POTENTIAL OUTCOMES MODEL: Confounded definitions of confounding	Lunch	STRUCTURAL APPROACHES TO BIAS: Directed Acyclic Graphs and potential harms of statistical adjustment
Saturday 18 Jan	NOVEL CONFOUNDING APPROACHES: Propensity Scores and Marginal Structural Models	Lunch	BEYOND "NON-DIFFERENTIAL MISCLASSIFICATION BIASES TOWARD THE NULL": Information bias
Sunday 19 Jan	Time off		
Monday 20 Jan	INTERACTION: Important distinctions in approaches	Lunch	RANDOM ERROR I: What's in a p-value?
Tuesday 21 Jan	RANDOM ERROR II: A show of confidence	Lunch	Presentation and discussion of group work
Wednesday 22 Jan	Group work: Analyzing epidemiologic data	Lunch	Group work: Analyzing epidemiologic data
Thursday 23 Jan	Group work: Analyzing epidemiologic data	Lunch	Group work: Analyzing epidemiologic data
Friday 24 Jan	Group work: Analyzing epidemiologic data	Lunch	Group work: Analyzing epidemiologic data