Summer Course
Introduction to Epidemiology & Biostatistics

Part 1: June 17 – 21, 2019

Part 2: June 24 – 28, 2019

1. Course aims

The course provides postgraduate researchers (such as PhD's, doctoral students and residents) with a basic understanding of bio-statistical and epidemiological concepts and their applications in research and day-to-day activities in clinical research and (veterinary) medicine. The R statistical program will be used in the course.

At the end of the course, participants are expected to understand and critically evaluate literature relating to the topic of applied (veterinary) epidemiological research, and to design and analyse simple clinical and epidemiological studies of their own.

The course is intended to be problem-based and will involve active participation of the students and assignment of exercises in both statistical data analysis, clinical and epidemiological study design, and critical evaluation.

Learning objectives

At the end of the course, the students will be able to:
1. Learn about the key concepts in epidemiology: disease, prevalence, incidence, geography, population, sample, uncertainty, variability, descriptive epidemiology, and analytical epidemiology
2. Know the most common descriptive and analytical study designs, be able to choose and implement an appropriate study design to answer a specific research question. The study designs covered in this course are case reports, cross sectional, case-control, prospective and retrospective cohort studies, ecological, clinical trials, and systematic reviews.
3. Identify the different bias that can affect a research study at different stages
4. Perform basic data handling, description and visualization with R
5. Design a questionnaire for a specific research question
6. Be able to define the characteristics of a diagnostic test and name different phases in diagnostic test studies
7. Be able to explain and calculate sensitivity, specificity, predictive vales, likelihood ratios, apparent and true prevalence
8. Be able to assess test agreement with kappa
9. Be able to explain and generate a ROC curve

10. Choose and calculate an appropriate sample size according to a specific research question, study design and statistical test
11. Define the concepts of causality, inference, type 1 and type 2 error, power and p-value and formulate hypothesis
12. Know the basic statistical tests, their advantages and disadvantage, and where they should be used. Choose the appropriate statistical test based on the study design, the characteristics of the outcome and exposure variables (continuous, categorical, etc), and the association being tested.
13. Know the common measures of associations, their strengths and weakness, where they are used and how to test their statistical significance using R
14. Define a linear model, and how to test its assumptions using R, explain and check for association and collinearity in linear models
15. Implement univariable linear models (i.e., t-test, one-way Anova, regression), and interpret their outputs using R
16. Know logistic regression models, how to implement them in R and interpret the corresponding output
17. Understand multivariable modelling and what are the different methods and criteria to select the best final model
18. Describe infectious disease model types and when they are used (SIR ,agent-based, network models)
19. Define are R0 and herd immunity and explain their relations with diseases spread
20. Define the concept of Evidence Based Medicine and identify different types of knowledge synthesis
21. Recognize and being able to implement the different steps of a systematic review
22. Critically review a scientific paper

2. Organisation

Structure of course

This is a two-week course with morning and afternoon lectures in two blocks of 5 days. The first block includes an introduction to basic epidemiological and statistical concepts, the design and analysis of clinical studies, and questionnaire design. The second block addresses specific topics in veterinary epidemiology and statistics such as diagnostic test evaluation, systematic reviews and meta analyses, an introduction to infectious disease modelling, and an introduction (with several group exercises) to critical literature review.

Proposed topics for 2019 (order of modules might change slightly)

Week 1
- Introduction to epidemiological principles and study design (2 days)
- Statistical principles in R (1 day)
- Diagnostic test evaluation (1 day)
- Questionnaire design (0.5 day)
- Modelling of infectious diseases (0.5 day)

Week 2
- Statistical principles in R (3 days)

- Sample size considerations (0.5 day)
- Study design – clinical trials (0.5 day)
- Reporting guidelines, systematic literature review and meta-analysis, critical reading of papers (1 day)

Participants can either register for week 1 or weeks 1 & 2. Registration for week 2 is <u>only</u> possible after approval by the course coordinator when sufficient previous training in the respective week 1 topics can be documented.

Location and language

Course location: Anatomy Building (Anatomie-Hörsaal), Vetsuisse Faculty, University of Bern, Länggassstrasse 120, 3012, Bern

Course language: English (questions might be asked in other languages, depending on the instructor)

Course fees

Due to environmental concerns, we are trying to reduce the amount of paper copies we print. You have the chance to decide whether you want to have the course materials in a digital format or both in a digital format and paper. Those who decide to have the course materials solely in a digital format will have a discount of 25 CHF per week.

The following course fees are charged to the participants:

	Course material in digital and paper formats	Course material in a digital format only
Students currently enrolled in the Graduate School for Cellular and Biomedical Sciences, Univ. Bern (CH) AND participants working under the supervision of one of the course lecturers or directly affiliated with the VPHI	No fees	No fees
Undergraduate and graduate students (including vet. master, Dr. med. vet., MSc, PhD), interns and residents (with proof of status)	150 EUR / week 150 CHF / week	125 EUR / week 125 CHF / week
Other participants	250 EUR / week 250 CHF / week	225 EUR / week 225 CHF / week

If you are not sure which category you belong to please inquire with the course organizers.

Once participants register for the course they will be invoiced and required to pay the above mentioned fees. All course materials are included.

Travel, accommodation and meals are the responsibility of participants.

3. Prerequisites

Participants are expected to have a basic understanding of bio-statistical and epidemiological principles comparable of what is taught during medical or veterinary school. The review of bio-statistical and epidemiological principles including examples & exercises with statistical output from various software packages is an integral part of the course.

Pre-course requirements

Before the course, the students should be able to:
- Define the concept of distribution (mostly Normal/Gaussian and binomial).
- describe numerical variables (central tendency and measures of dispersion)
- Identify outcome and explanatory variables
- Distinguish whether variables are categorical or continuous

(NB: Materials explaining these different concepts will be provided to the students in advance)

4. Signup, Attendance and Credits / Certificate

Registration deadline is **Friday 17th May 2019.** Please access the link below, enter your name and email address, and the specific link to a web registration form will be emailed to you.

http://www.vphibern.ch/limesurvey/index.php/457782?lang=en

The maximum number of participants is 30. Registration is on a first come-first served basis , but priority is given to students currently enrolled in one of the Graduate Schools of the University of Bern (confirmation through Graduate School Secretariat) and current ECVPH, ECBHM and ECPHM residents (confirmation through the respective College secretariat).

Participants are expected to attend all half-day modules. A certificate of attendance listing the respective modules will be distributed to all participants. Those in need of formal ECTS credits should indicate this to the course leader in order to arrange for the oral examination procedure (literature review & oral presentation) which typically is scheduled within 2-3 months after the course.

For further questions, please contact the course coordinators directly!

5. Coordinators

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For more information on the course content and registration, please contact Charlotte Warembourg: charlotte.warembourg@vetsuisse.unibe.ch