Summer Course

Introduction to Epidemiology & Biostatistics

June 15 – 26, 2020

1. Course aims

The course provides postgraduate researchers (such as PhDs, doctoral students and residents) with a basic understanding of bio-statistical and epidemiological concepts, as well as their applications in research and day-to-day activities in health sciences. 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 disadvantages, 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 associations 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 R0 and herd immunity and explain their importance for disease spread
20. Define the concept of Evidence Based Medicine and identify different types of knowledge synthesis
21. Recognize and be 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, balancing between theoretical and practical sessions. The topics to be covered can be found below.

Proposed topics for 2020 (order of modules might change slightly)

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

Week 2
- Statistical principles in R (2 days)
- Diagnostic test evaluation (1 day)
- 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)
Registration for individual weeks is only possible after approval by the course coordinator. Please contact the course organizers to obtain further information on this topic.

**Location and language**

Course location: Hochschulzentrum vonRoll, University of Bern, Fabrikstrasse 8, 3012, Bern

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

**Course fees**

The following course fees are charged to the participants:

<table>
<thead>
<tr>
<th>Category</th>
<th>Fee</th>
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</thead>
<tbody>
<tr>
<td>Students currently enrolled in the Graduate School for Cellular and</td>
<td>No fees</td>
</tr>
<tr>
<td>Biomedical Sciences, Univ. Bern (CH) AND participants working under</td>
<td></td>
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<tr>
<td>the supervision of one of the course lecturers or directly affiliated</td>
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<td>with the VPHI</td>
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<tr>
<td>Undergraduate and graduate students (including vet. master, Dr. med.</td>
<td>300 EUR</td>
</tr>
<tr>
<td>vet., MSc, PhD), interns and residents (with proof of status)</td>
<td>300 CHF</td>
</tr>
<tr>
<td>Other participants</td>
<td>500 EUR</td>
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<td></td>
<td>500 CHF</td>
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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 (provided in digital format).

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 to what is taught during medical or veterinary school. The review of bio-statistical and epidemiological principles including examples and 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:

- Understand the concept of a 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 **Sunday 10th May 2020**. 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.


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).

In case you would like to cancel your registration, please contact the coordinators as soon as possible. Please note that cancellation is not possible within 10 days of the beginning of the course and the full payment of the registration fee is required.

Participants are expected to attend all half-day modules (with due justification, participants are allowed to miss a total of 2 half-day modules without losing the possibility of sitting the exam and obtaining the corresponding ECTS). 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

Dr. Luis Pedro Carmo & Dr. John Berezowski & Prof. Gertraud Schüpbach
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For more information on the course content and registration, please contact Francesco Galli: [francesco.galli@vetsuisse.unibe.ch](mailto:francesco.galli@vetsuisse.unibe.ch)