Syllabus of teaching unit "Introduction to biostatistics"

Module	A Primer of Biostatistics
Coordinator	Nolwenn Le Meur, PhD EHESP, METIS department Nolwenn.LeMeur@ehesp.fr
Dates	September 2024: 16-18 ; 23-26 October 2024: 21-24 November 2024: 12-15 December 2024: 02-05 ; 09-12
Credits/ECTS	10,5 ECTS
Duration	Lectures, case studies, group work, field studies and readings = hours
Location	EHESP, 15 avenue du Professeur Léon Bernard – 35043 Rennes
Description	The main objective of this biostatistics program is to give primer biostatical concepts and methodological key to comprehend public health data analysis of a public problem whatever the topics. More precisely, this course covers the basic tools for the analysis and presentation of data. Each concept will be presented during a short lecture and followed by an application including exercises, cases study, articles/report discussion and data analysis on computers. Those applications cover different public health topics. The data analysis is carried out using Excel or R.
Prerequisites	None
Course learning objectives	Students who successfully complete this course will be able to (1) To conduct preliminary/simple discussion and criticism on reports and articles applying biostatistics to public health with a focus on epidemiology (2) To conduct preliminary/simple statistical analysis and discuss plans for more sophisticated statistical analyses (3) To work with scientific experts including biostatisticians, epidemiologists and public health professionals The learning objectives are: • Interpret graphical summaries and statistical tables • Criticize the statistics of simple public health studies • Describe a study population using the appropriate indicators • Formulate statistical hypothesis according to the objective aimed by a study • Measure the strength of the association between two quantitative or qualitative variables and interpret it • Apply statistical tests using the R software and interpret the results • Follow step-by-step procedure to obtain a linear regression model and interpret it • Follow step-by-step procedure to obtain a logistic regression model and interpret it • Assess the validity of a regression model • Summarize statistical results and write the material, methods, and result sections of a poster/report

Competences	**Competences:** 1) Designs and conducts qualitative and/or quantitative research that builds on existing evidence and adds to the evidence base for public health practice, involving relevant stakeholders in this process 2) Knows how to retrieve, analyze and appraise evidence from all data sources to support decision-making 3) Uses vital statistics and health indicators effectively to increase knowledge and generate evidence about population health, including within at-risk and vulnerable groups 4) Applies methods, (digital) technologies and good practices for managing, analyzing and storing data and health information **Teaching activities:** 1) Study cases will be used to illustrate the use of statistical summary and model on vital statistics, health measurements and health indicators to generate evidence about population health 2) Each student will conduct a preliminary study on survey data on a public health issue (Data analysis project). The student will have to define at least one hypothesis to investigate and test. The data management and data analysis will be done individually using statistical software such as R. Each student will summarize the results in a scientific poster like format. **Evaluations:** • Frequent multiple choices questions for assessment of theorical knowledges (competences 1-3) • A critical reading in groups with a restitution in the form of a debate (competences 2-3) • Reading and interpreting table and graphics extracted from papers (competences 2-3) • Poster type summary of a statistical analysis on survey data (competences 1-4)
Teaching unit structure (details of sessions title/speaker/approx. duration)	1) Descriptive statistics a. Central parameters, Nolwenn Le Meur 4h00 b. Dispersion parameters, Nolwenn Le Meur 4h00 c. Graphics, Nolwenn Le Meur, 4h00 d. Introduction to descriptive statistics in spatial analysis, Cindy Padilla 6h e. Inference and confidence intervals, Nolwenn Le Meur 6h 2) Inferential statistics a. Statistical tests: comparisons of frequencies, Nolwenn Le Meur 6h b. Tests: comparisons of means, Nolwenn Le Meur 6h c. Comparison of multiple means, Nolwenn Le Meur 3h 3) Introduction to regression model a. Introduction to linear regression, Juste Goungounga: 5.5h b. Introduction to logistic regression, Juste Goungounga: 5.5h 4) Introduction to planning and conducting a statistical analysis a. Sample design, sample size, and power analysis. Nolwenn Le Meur 6h b. Introduction to critical reading, Nolwenn Le Meur 9h c. Applied statistical analysis: compute summary tables and figures to create a scientific poster based on survey date - Nolwenn Le Meur (30h) 5) Module Debriefing. Nolwenn Le Meur: 1h30 6) Review session, N Le Meur 6h00 Time for evaluations are not included here (see time schedule or details) Time is estimated from face-to-face teaching. The possible use of online courses may modify the duration and sequencing of lectures.

Ressources	My Little e-books:
	- Biostat class ressources https://nolwenn.github.io/ebook-M1-biostat/
	- Computer lab ressources https://nolwenn.github.io/software-M1-biostat/ with R and STATA examples
	Reference books for Statistics (available at George Sand's library or online)
	- B. Burt Gerstman Basic Biostatistics: Statistics for Public Health Pratice 2nd Edition 2015. ISBN-13: 978-1284036015
	- Harvey Motulsky - Essential Biostatistics a nonmathematical approach. Edition 2015
	- W.W Daniel and C.L. Cross Biostatistics A foundation for Analysis in the Health Sciences-10th edition https://msph1blog.files.wordpress.com/2016/10/biostatistics-_daniel-10th1.pdf
	- Sharpe, De Veaux, Velleman. Business Statistics. 2nd Edition 2012.
	R Reference books and course:
	- R for Statistics Pierre-Andre Cornillon, Arnaud Guyader, Francois Husson, Nicolas Jegou, Julie Josse, Maela Kloareg, Eric Matzner-Lober, Laurent Rouvière. March 21, 2012 by Chapman and Hall/CRC. ISBN 9781439881453 (available at George Sand's library – exists also in French)
	- R in Action Data analysis and graphics with R. Robert I. Kabacoof. Manning Publications Co. 2011
	- Introduction to statistics with R – Free interactive datacamp - https://www.datacamp.com/community/blog/new-courses-introduction-to-statistics#gs.0QV9hVM
Course requirement	Students are expected to read lectures before courses and work between classes. Students are expected to transmit their assessment work on time.
Grading and assessment	**The final grade results from group work, homework, individual MCQs, and a final sitting exam (2-hour table assignment).**
	Details assignments:

n°	Assignment topic	% final grade	Format
1	Final exam	50%	Individual
2	Descriptive statistics & Inferential statistics (MCQ)	5%	Individual
3	Statistical tests and regression model (MCQ)	5%	Individual
4	Critical reading	10%	Group work
5	Applied statistical analysis (Data analysis project with homeworks)	30%	Individual

Note on group work:
students will complete a questionnaire that assesses their own and their teammates' contributions to group work. All team members will receive the same grade except if it is clear that a student has not participated effectively (attended and contributed to meetings; made timely, helpful contributions; been constructive, etc.). In that case, the student's grade will be lowered accordingly.

Note on homework: Homework not returned in due time will be graded zero.

	Note on retake: in case a final grade below 10 out of 20, the student will have to retake an examination. It will take the form of an oral presentation of the results of a given exercise. The student will have 30 min to prepare the exercise and 30 min to present the results in from of a jury.
Course policy	**Attendance & punctuality** In class, regular and punctual class attendance is a prerequisite for receiving credit in a course. Students are expected to attend each class. Attendance will be taken at each class. The obligations of attendance and punctuality cover every aspect of the course: - lectures, conferences, group projects, assessments, examinations, as described in EHESP Academic Regulations http://mph.ehesp.fr EHESP Academic Regulation Article. 3). If students are not able to make it to class, they are required to send an email to the instructor and to the MPH program coordinating team explaining their absence prior to the scheduled class date. All supporting documents are provided to the end-of-year panel. . Students who miss class are responsible for content. Any student who misses a class has the responsibility for obtaining copies of notes, handouts and assignments. If additional assistance is still necessary, an appointment should be scheduled with the instructor. Class time is not to be used to go over material with students who have missed class. **Lateness**: Students who are more than 10 minutes late may be denied access to a class. Repeated late arrivals may be counted as absences (See http://mph.ehesp.fr EHESP Academic Regulation Article. 3 Attendance & Punctuality) **Maximum absences authorized & penalty otherwise** Above 20% of absences will be designated a fail for a given class. The students will be entitled to be reassessed in any failed component(s). If they undertake a reassessment or they retake a module this means that they cannot normally obtain more than the minimum pass mark (i.e. 10 out of 20) **Exceptional circumstances** Absence from any examination or test, or late submission of assignments due to illness, psychological problems, or exceptional personal reasons must be justified; otherwise, students will be penalized, as above mentioned. Students must directly notify their professor or the MPH academic secretariat before the exam or before the assignment deadline. Before accepting the student's justification, the professor or the MPH academic secretariat has the right to request either a certificate from the attending physician or from a psychologist, or from any other relevant person (See http://mph.ehesp.fr EHESP Academic Regulation Article 4 Examinations). **Courtesy**: All cell phones/pages MUST be turned off during class time. Students are required to conduct themselves according to professional standards, eating during class time is not permitted during class time, such as course or group work.
Valuing diversity	Diversity enriches learning. It requires an atmosphere of inclusion and tolerance, which oftentimes challenges our own closely held ideas, as well as our personal comfort zones. The results, however, create a sense of community and promote excellence in the learning environment. This class will follow principles of inclusion, respect, tolerance, and acceptance that support the values of diversity. Diversity includes consideration of: (1) life experiences, including type, variety, uniqueness, duration, personal values, political viewpoints, and intensity; and (2) factors related to "diversity of presence," including, among others, age, economic circumstances, ethnic identification, family educational attainment, disability, gender, geographic origin, maturity, race, religion, sexual orientation, and social position.

Course evaluation	EHESP requests that you complete a course evaluation at the end of the school year. Your responses will be anonymous, with feedback provided in the aggregate. Open-ended comments will be shared with instructors, but not identified with individual students. Your participation in course evaluation is an expectation, since providing constructive feedback is a professional obligation. Feedback is critical, moreover, to improving the quality of our courses, as well as for instructor assessment.