Syllabus of teaching unit "Introduction to biostatistics"
(Modules 111,112,113)[1]

Module	A Primer of Biostatistics
Coordinator	Nolwenn Le Meur, PhD EHESP, METIS department Nolwenn.LeMeur@ehesp.fr
Dates	September 2019: 25 (111) October 2019: 02 (111) November 2019: 05, 06 (111) November 2019: 12, 13 (112) December 2019: 03, 04 (112) December 2019: 11, 18 (113) January 2020: 28 (113), 29 (112) February 2020: 05, 12 (113)
Credits/ECTS	10,5 ECTS
Duration	Lectures, case studies, group work, field studies and readings = 90 hours
Location	EHESP, 20 avenue George Sand – 93 210 La Plaine Saint-Denis
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, STATA or R.
Prerequisites	Attendance to all sessions of Computer labs (as Excel, Stata &/or R will be required to go through some assignments)
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 epidemiology (2) To conduct preliminary/simple statistical analysis and to plan more sophisticated future 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 epidemiological studies • Describe the study population using the appropriate indicators • Formulate statistical hypothesis according to the objective aimed by the study

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[1] The epidemiology and biostatistics modules are deliberately mixed over time

	• Apply the statistical test using the R or STATA software and to interpret the results • Measure the strength of the association between two quantitative or qualitative variables and interpret it • Summarize statistical results and to write the material, methods and result sections of a report/article • Follow the step by step procedure to obtain an informative linear model and interpret it • Assess the validity of a linear model • Discover other fields of bio-statistics

Teaching unit structure (details of sessions title/speaker/date/duration)	1) Descriptive statistics
	    a. An introductionnary case study, Nolwenn Le Meur: 4h00
	    b. Dispersion and graphics, Nolwenn Le Meur: 3h00
	    c. Introduction to descriptive statistics in spatial analysis, Cindy Padilla 3h
	    d. Inference and confidence intervals, Nolwenn Le Meur 6h
	2) Inferential statistics
	    a. Tests: comparisons of frequency, Pascal Crepey 3h
	    b. Tests: comparisons of means, Pascal Crepey 3h
	    c. Analysis of variance, Nolwenn Le Meur 3h
	3) Introduction to regression model
	    a. Simple linear regression, Nolwenn Le Meur: 3h
	    b. Residual analysis, Nolwenn Le Meur 3h
	    c. Multiple linear regression, Nolwenn Le Meur: 3h
	    d. Correlation and collinearity, Nolwenn Le Meur: 3h
	4) Introduction to planning and conducting a statistical analysis
	    a. Sample design and power analysis. Nolwenn Le Meur 6h
	    b. Introduction to critical reading, Nolwenn Le Meur 6h
	5) Field survey (shared with EPI)
	    a. Preparation & Conduct. Florence Bodeau-Livinec and Nolwenn Le Meur 12h in total (+complement in the ISB module for data analysis)
	    b. Results (group presentations). Florence Bodeau-Livinec and Nolwenn Le Meur 6h (shared with ISB)
	6) Module Debriefing. Florence Bodeau-Livinec & Nolwenn Le Meur: 1h30 (shared with ISB)
	7) Review session, N Le Meur 4h30
	
	Time for evaluations are not included here (see time schedule or details)

Ressources	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 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 homework on time.

Grading and assessment

The final grade results from two group works, 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 (MCQ)	5%	Individual
3	Inferential statistics (MCQ)	5%	Individual
4	Introduction to regression model (MCQ)	5%	Individual
5	Homework	5%	Individual
6	Critical reading	10%	Group work
7	Field survey presentation	20%	Group work

Note also that 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.

Course policy

Attendance & punctuality
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.
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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.

Module #	111
Title	**Descriptive statistics**
Speakers	N. Le Meur C. Padilla
Learning objectives	Understand and use fundamental statistical parameters (mean, median, standard deviation, confidence interval…) and tools (graphics, table) to describe a study population

Session Outline	Lecture and lab with exercises on papers and statistical software
	   o data type and data transformation
	   o location parameters
	   o dispersion parameters
	   o summarize data into table and graphics
	   o compute confidence intervals to summarize information location parameters of a population from a sample

Duration	20 hours Minimum of 7h personal work
Training methods	25/09/2019, 02/10/2018, 06/11/2018, 05/02/2020
Assignments	Quiz I (5%) Acquired competences will be needed for the case studies, field survey and final exam

Module #	112
Title	**Inferential statistics and introduction to modelling**
Speakers	N. Le Meur P. Crepey
Learning objectives	Formulate statistical hypothesis according to the objective aimed by the study to measure the strength of the association between two quantitative or qualitative variables and interpret it Follow the step by step procedure to obtain a informative linear model, assess its validity and interpret it

Session Outline	Lecture and lab with exercises on papers and statistical software
	1. Statistical test for
	   a. bivariate comparisons of frequencies or means,
	   b. Analysis of variance
	2. Introduction to regression model
	   a. Simple linear regression
	   b. Residual analysis
	   c. Multiple linear regression
	   d. Principles of health surveillance
	3. Introduction planning and conducting a statistical analysis
	   a. Sample design and power analysis
	   b. Correlation and Collinearity

Duration	30 hours Minimum of 14h personal and group works
Training methods	5/11/2019, 12/11/2019, 13/11/2019, 03/12/2019, 04/12/2019, 29/01/2020, 05/02/2020
Assignments	Quizz II (5%), Acquired competences will be needed for the case studies, field survey and final exam

Module #	113
Title	**Biostatistics in practice**
Speakers	N. Le Meur F. Bodeau-Livinec
Learning objectives	- Analyses data using a statistical software (STATA or R) - Analyses data following a step by step procedure to obtain descriptive summary of the data, test some statistical hypothesis and, a model the effects of co-variables on some outcome. - Present and criticized results using table and graphics
Session Outline	- Field survey (shared with EPI) - Preparation & Conduct. - Analysis field survey data - Results presentations in groups - Introduction to critical reading analysis
Duration	15 hours Minimum of 4h personal and group works
Training methods	10/12/2019, 11/12/2019, 18/12/2018, 28/12/2018, 05/02/2020
Assignments	Critical reading (10%) Field survey (20%) Acquired competences will be needed for the case studies, field survey and final exam