European Master in Public Health
EUROPUBHEALTH+

Specialization:
Advanced Biostatistics and Epidemiology

2017-2021

EHESP School of Public Health

TEACHING PROGRAMME

European Master in Public Health (Europubhealth+)
SPECIALIZATION: Advanced Biostatistics and Epidemiology

The present document details the content of the second year specialisation of the **Europubhealth+** programme delivered in Paris by the EHESP School of Public Health. For the first year of the Europubhealth+ programme, a foundation course with the core competences in public health is delivered at the School of Health and Related Research - University of Sheffield (United Kingdom) in English or at the Andalusian School of Public Health - University of Granada (Spain) in Spanish.

I. PRESENTATION

The specialization course lasts two semesters and students get 30 ECTS for mandatory modules and 27 ECTS for the dissertation work and related placement. A mandatory integration module worth 3 ECTS is organized by the EHESP School of Public Health in Rennes (France) at the end of the academic year.

The specialisation provides students and young professionals wishing to design their career in public health with high level of qualification which enhances intellectual approach to the subject. Its offers basic and advanced schemes of study involving knowledge, skills and techniques which can variously be applied to different public health issues and in the context of health services agencies or health & environmental organizations in the public or private sector, in developed or developing countries. The specialisaiton is both a professional qualification and a contributor to generic skills in research. It provides traditional core courses and options with an innovative approach to developing public health agendas in different contexts including crisis situations.

The international teaching staff comprises outstanding lecturers from European & North American universities and from research institutions. Thanks to a privileged partnership between EHESP & Mailman School of Public Health (SPH) in the City of New York, MPH students can benefit from a concentration in epidemiology run by the department of epidemiology at the Mailman SPH.

II. QUALIFICATIONS OF THE GRADUATE

The goal of the specialisation is to train young professionals to identify the health problems of a population, analyze the resources needed to preserve and improve population health, and progressively become a new generation of decision makers in health. To achieve this, the EHESP pedagogy stresses an inter-disciplinary approach, consisting in placing students in realistic problem contexts from which they utilize various professional skills and methodologies. The MPH encourages a degree of specialisation according to the students' career objectives.

Epidemiology is one of the pillars of public health. Epidemiologists study the distribution and determinants of disease in human populations; they also develop and test ways to prevent and control disease. The discipline covers the full range of disease occurrence, including genetic and environmental causes for both infectious and noninfectious diseases. Increasingly, epidemiologists view causation in the broadest sense, as extending from molecular factors at the one extreme, to social and cultural determinants at the other. This course introduces students to the theory, methods, and body of knowledge of epidemiology and provides an integrated approach to the disciplines of Epidemiology.

If not all MPH students decide to become "biostatisticians", knowledge of biostatistics is required in almost every field of public health and its applications. Therefore, all students have to develop solid knowledge base in biostatistics.This course will present the most fundamental methods used in biostatistics including applied leaning exercises by means of computer-based live examples with STATA software® during all lectures, exercises within small working groups as well as project-based learning.

III. REQUIREMENTS FOR GRADUATION AND OBTAINING PROFESSIONAL TITLE

In order to graduate, students must get an overall average of at least 10/20 to obtain all mandatory credits of the second year specialization. Students must also pass all mandatory credits during the first year of the programme in the partner university (Sheffield or Granada) as well as both integration modules organized at EHESP in Rennes.

IV. PRACTICAL PLACEMENT

A 4-month practical placement is mandatory and linked to the Master dissertation work.

STUDY PLAN

Specialization: Advanced Biostatistics and Epidemiology

Option 1: Concentration in Epidemiology

I^st^ semester

No	Name of the subject	Class form	M/F	Credit form (Mark or Pass/Fail)	Number of teaching hours	ECTS
1	Upgrading Biostatistics	Seminar	M	Mark	-	Not credited
2	Advanced Core module Epidemiology	Seminar	M	Mark	30	3
3	Advanced Core curriculum Information sciences and biostatistics	Seminar	M	Mark	30	3
4	Advanced Core curriculum – Environmental and occupational health sciences	Seminar	M	Mark	30	3
5	2 electives to be chosen among:	Seminar	M	Mark	60	6
	Infectious Disease Epidemiology					
	Chronic Disease Epidemiology					
	Perinatal and Pediatric Epidemiology					
6	Biostats Data Mining	Seminar	M	Mark	30	3
7	Multi-level Analysis	Seminar	M	Mark	30	3

IInd semester

1	Cross-disciplinary Module: Global and International Health	Seminar	M	Mark	30	3
2	1 elective to be chosen among:	Seminar	M	Mark	30	3
	Analysis in Epidemiology (II)					
	Analysis in Epidemiology (I) SAS Software					
3	Design, Concept and Methods in Epidemiology	Seminar	M	Mark	30	3
4	SUPRA OPTIONAL Intro to R: computing, graphics and statistics, Biostats Modelling of infectious diseases, Biostats Spatial statistical analysis	Seminar	F	Pass/Fail	-	Not credited
4	Dissertation and placement	-	M	Mark	-	27
5	Integration Module (at EHESP in Rennes – France)	Seminar	M	Mark	30	3

F – facultative, M – mandatory to graduate

Total number of teaching hours: 300
Total number of ECTS: 60

Option 2: Concentration in Biostatistics

Ist semester

No	Name of the subject	Class form	M/F	Credit form (Mark or Pass/Fail)	Number of teaching hours	ECTS
1	Upgrading Biostatistics	Seminar	M	Mark	-	Not credited
2	Advanced Core module Epidemiology	Seminar	M	Mark	30	3
3	Advanced Core curriculum Information sciences and biostatistics	Seminar	M	Mark	30	3
4	Advanced Core curriculum – Environmental and occupational health sciences	Seminar	M	Mark	30	3
5	2 electives to be chosen among:	Seminar	M	Mark	60	6
	Biostats Modelling of infectious diseases					
	Biostats Multi-level Analysis					
	Biostats Spatial statistical analysis					
6	Design, Concept and Methods in Epidemiology	Seminar	M	Mark	30	3
7	Intro to R: computing, graphics and statistics	Seminar	M	Mark	30	3

IInd semester

1	Cross-disciplinary Module: Global and International Health	Seminar	M	Mark	30	3
2	1 elective to be chosen among:	Seminar	M	Mark	30	3
	Infectious Disease Epidemiology					
	Chronic Disease Epidemiology					
	Perinatal and Pediatric Epidemiology					
3	Biostats Data Mining	Seminar	M	Mark	30	3
4	SUPRA OPTIONAL Analysis in Epidemiology (II), Analysis in Epidemiology (I) SAS Software	Seminar	M	Pass/Fail	-	Not credited
4	Dissertation and placement	-	M	Mark	-	27
5	Integration Module (at EHESP in Rennes – France)	Seminar	M	Mark	30	3

Total number of teaching hours: 300
Total number of ECTS: 60

Module title	**Advanced Core module – Epidemiology**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	Epidemiology is one of the pillars of public health. Epidemiologists study the distribution and determinants of disease in human populations; they also develop and test ways to prevent and control disease. The discipline covers the full range of disease occurrence, including genetic and environmental causes for both infectious and noninfectious diseases. Increasingly, epidemiologists view causation in the broadest sense, as extending from molecular factors at the one extreme, to social and cultural determinants at the other. This course introduces students to the theory, methods, and body of knowledge of epidemiology and provides an integrated approach to the disciplines of Epidemiology. The primary objective of the course is to teach the basic principles and applications of epidemiology and introduce students to the theory, methods, and body of knowledge of epidemiology. This course will cover fundamental concepts of epidemiology, causal inference, study design, confounding and bias, ethics, sample size calculation and data collection methods. If Public Health is not a simple, reactive, "take the pill three times a day" solution, but a purposeful approach to preventing disease and promoting health, then being able to document, measure and understand all the consequences becomes imperative. The methods introduced in this course begin to provide some of the tools necessary to help estimate the relationships between the smaller pieces that comprise the complex and dynamic web of systems in Public Health.
Learning outcomes	Students who successfully complete this course will be able to: • Discuss the role of epidemiology within the broader field of public health • Discuss the principles of disease prevention within populations • List and describe key terms used in the epidemiology and prevention of infectious disease • Calculate and interpret basic population measures of health and disease occurrence including incidence and prevalence • Make appropriate comparisons of disease rates within and between populations • Distinguish between basic measures of association, including rate ratio, risk ratio, incidence density ratio, odds ratio, attributable risk, and population attributable risk • Select and apply fundamental epidemiologic study designs including randomized clinical trial, cohort, case-control, and ecologic for the purpose of investigating public health problems • Identify the role of bias and confounding in epidemiologic research and apply methods appropriate to assessment of confounding and various types of bias • Differentiate between various epidemiologic study designs and compare their respective strengths and weaknesses • Critique published epidemiological studies and identify their strengths and weaknesses
Assessment methods	Student grades will be based on: 1. Readings and Class Participation (20 % of grade or points) 2. Homework Assignments (30% of grade or points) 3. Final Exam (50 % of grade or points)
Classes / Workload	5 days of 6 hours = 30 hours
Number of ECTS	**3**

Teaching & learning methods	Lectures: Attendance at lectures is an essential and mandatory part of the course for which there is no suitable substitute. A list of the topics and lecturers is found below. Weekly lectures are the foundation upon which the course is based. Material is covered which may not necessarily be presented elsewhere and an invaluable opportunity for questioning and interacting with expert practitioners is provided. Reading assignments should be done prior to lectures. Homework: The homework assignments are interactive exercises on the Epiville training site (epiville.ccnmtl.columbia.edu), an online learning tool developed by Columbia University faculty and students. Epiville can be entered through the course website. After completing the online exercises, students are asked to submit answers to the first discussion question listed at the end of each exercise.
Course topics	Session 1. Introduction, Fundamental Concepts of Epidemiology Session 2 Clinical trials Session 3. Measurement, validity and reliability Session 4. Study Design Session 5. Confounding and bias

Module title	**Advanced Core curriculum – Information sciences and biostatistics**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	If not all MPH students decide to become "biostatisticians", knowledge of biostatistics is required in almost every field of public health and its applications. Therefore, all students have to develop solid knowledge base in biostatistics. This course will present the most fundamental methods used in biostatistics including applied leaning exercises by means of computer-based live examples with STATA software® during all lectures, exercises within small working groups as well as project-based learning.
Learning outcomes	At the end of the module, the students should be able to: ○ Investigate a public health issue through quantitative data ○ Make comparisons through basic and multivariate statistical analysis from STATA software ® ○ Interpret and summarize statistical results, with a focus on logistic regression
Assessment methods	Group work (continuous) and Individual exam (2 hours)
Classes / Workload	5 days of 6 hours = 30 hours
Number of ECTS	**3**
Teaching & learning methods	All students will be asked to practice and become familiar with the use of the statistical package. Various statistical analyses with different sets of data will be conducted, from basic to advanced applications, the latter targeting students who wish to develop an in-depth knowledge of biostatistics and continuing biostatistics in further classes or internships. In all cases, public health field examples will highlight that course material is connected to real-life situations.
Course topics	Day 1: Introduction to logistic regression – Computer lab Day 2: Sample size and power calculation – Computer lab Day 3: Collinearity, interaction – Computer lab Day 4: Goodness-of-fit, choice of final model – Computer lab Day 5: Sensitivity analysis, Presentation and interpretation of results - Computer lab

Module title	**Advanced Core curriculum – Environmental and occupational health sciences**
Faculty	-
Conducting unit	Department of environmental and occupational health and sanitary engineering
Teaching Language	English
Aim of the course	The introductory module focuses on three methodological domains and on their applications to environmental and occupational health issues, so as to strengthen and expand the acquisitions of the first year: (i), epidemiological methods developed for the investigation of health problems resulting from air pollution in outdoor or occupational settings; (ii) various developments in the field of human exposure assessment, their respective strengths and limitations; (iii) finally, experimental models and state of knowledge in the field of carcinogenesis, neurotoxicity, respiratory and reproductive toxicology in relation with environmental and occupational exposures.
Learning outcomes	Consolidate the competencies acquired in environmental health sciences in M1 • Apply analysis skills and techniques to assess and understand an environmental or occupational health problem • Discuss the basic biological concepts that allow to evaluate the exposure-response relationships • Describe the principles of exposure and risk assessment for nuisances and hazards related to the environment or to occupational settings
Assessment methods	Group work & presentation (30%) of the final grade On table test of 2 hours (70%) of the final grade Scientific paper reading and answers to a set of questions (critical analysis of the study design, of exposure assessment, writing of the hidden summary…). Final Grade on 20 at least equal to 10 (requirement).
Classes / Workload	5 days of 6 hours face to face, and personal or group work (estimation 15h)
Number of ECTS	**3**
Teaching & learning methods	A group assignment whereby students will prepare and expose critical analyses of a set of papers from the scientific literature in a variety of domains will force them to draw from the different disciplinary areas in an integrative way.
Course topics	• Epidemiology (1): Methodology in occupational health • Epidemiology (2) : methods in occupational epidemiology • Risk Assessment: An introduction, rationale, methods & application, • Exposure (1): Biomarkers; strength, limitations and applications. • Exposure (2): Construction and validation of job-exposure matrices. Examples. • Toxicology (1): Evaluation of self-training acquisition, • Toxicology (2): an introduction. • Toxicology (3): Respiratory toxicology. • Conference : Is Fertility impaired by Environmental Contaminants, • Toxicology (4): Carcinogenesis. • Toxicology (5): Neurotoxicology. • Paper analysis in environmental health (1) • Paper analysis (2): Group presentations (and exam preparation).

Module title	**Infectious disease epidemiology**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health

Teaching Language	English
Aim of the course	Infectious disease epidemiology studies the occurrence of infectious diseases; factors leading to infection by an organism; factors affecting transmission of an organism; and factors associated with clinically recognizable disease among those who are infected. It requires the use of traditional epidemiologic methods as well as methods unique to infectious disease epidemiology, such as mathematical modeling. In addition to knowing epidemiologic methods, infectious disease epidemiologists need to be familiar with the biological features and clinical manifestations of important pathogens as well as laboratory techniques for the identification and quantification of infectious organisms. This course is designed to provide an introduction to infectious disease epidemiology. It will focus on the tools and methods used in identifying, preventing, and controlling infectious diseases to improve public health. Case studies based on the literature and the work of faculty members will be used to illustrate the real-world application of these tools and methods to address public health problems.
Learning outcomes	Students who successfully complete this course will be able to: • Discuss the key concepts of infectious disease transmission and control, and the differences with non-infectious diseases • Apply biological principles to development and implementation of disease prevention, control or management programs • Specify the role of the immune system in population health • Apply epidemiologic tools and methodologies to understand the transmission dynamics and control of infectious diseases • Critically appraise and interpret the findings of infectious disease epidemiology papers
Assessment methods	100% Final written examination
Classes / Workload	5 days
Number of ECTS	3
Teaching & learning methods	Specific leaning objectives are noted for each session. At the end of each session, students should know and be able to accomplish the session's learning objectives.
Course topics	• Session 1. Introduction to Infectious Disease Epidemiology • Session 2. Evaluation of Diagnostic Tests and Treating Latent Infection as a Control Strategy: Tuberculosis • Session 3. Causal Inference, Mathematical Modeling, and the Development of Public Health Policy: Voluntary Medical Male Circumcision to Prevent HIV Transmission • Session 4: Epidemiologic Methods for Measuring Transmission and Control of Respiratory Infections: Influenza • Session 5. Mathematical Modeling: Introduction to Concepts in Transmission and Dynamics • Session 6. Epidemiologic Methods in Vaccinology • Session 7. Choosing Biologic Outcomes and Developing Immunization Policy: The Human Papillomavirus Vaccine to Prevent Cervical Cancer • Session 8. Epidemiologic Methods for Measuring Transmission and Control of Viral Hepatitis • Session 9. Surveillance and control of healthcare-associated infections • Session 10. Epidemiology and Control of Malaria

Module title	**Chronic disease epidemiology**
Faculty	-

Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	This minor will provide a more detailed overview of design, method, substantive and analytical issues pertaining to chronic disease epidemiology
Learning outcomes	At the end of the module, the students should be able to: • Discuss the key concepts of chronic diseases and identify their related risk factors • Specify the role of the genetic approach for chronic diseases • Apply epidemiologic tools and methodologies for chronic diseases, such as cancers and CVD • Identify key steps for implementing meta analysis and systematic reviews • Apply pharmaco epidemiology tools to chronic conditions and treatment • Critically assess and interpret the findings of chronic disease epidemiology papers
Assessment methods	At the conclusion of the course, an examination will be assigned covering course content. The examination will be a combination of multiple choice, true/false and essay questions.
Classes / Workload	Number of days: 5 Number of hours : 30
Number of ECTS	**3**
Teaching & learning methods	
Course topics	Infectious causes versus chronic slow causes, Implications for causal thinking and analysis, Issues of time and the epidemiology of risk factors. Specific issues will also be covered, such as Epidemiology of cancer: breast cancer risk among women; computation of risk; population versus individual risk; cancers in the western world; cancers and diet; trends in cancer; risk factors for cancer; Epidemiology of Cardiovascular diseases (CVD); CVD trends ; CVD in the world; CVD and diet; risk factors.

Module title	**Perinatal and pediatric epidemiology**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	Perinatal and pediatric epidemiology's goal is to monitor pregnancy and children's health and to study determinants for poor outcomes in childhood. DIFFERENT FIELDS INVOLVED: This course is designed to provide an introduction to perinatal and pediatric epidemiology focusing on several areas important in this field: preterm birth, infectious diseases, developing countries, international comparisons of care and practices, birth defects, nutrition, childhood development and deficiencies. A broad overview of the field will be given discussing tools used during pregnancy and childhood. EMPHASIS ON METHODS: During this course, we will discuss epidemiologic methods. Different study designs will be studied and discussed during the week through seminars and articles. Epidemiological concepts will be reviewed with practical examples, including confounding, modification effect, multivariate analyses, study design, biases.

Learning outcomes	Students who complete this course will be able to: • Discuss the key concepts in perinatal and pediatric epidemiology • Apply epidemiologic tools and methodologies to understand determinants of perinatal and pediatric health • Critically appraise and interpret the findings of perinatal and pediatric epidemiology papers
Assessment methods	One or two students will present and discuss one article every day chosen by the invited speaker. The article will be sent one week in advance. Studying articles from and chosen by these invited speakers will present an opportunity to discuss articles directly with these experts. Students will also work on an assignment. They will present their assignment on the last day of the week. One hour will be dedicated to explain this assignment at the beginning of the week. Students will learn to come with their own scientific ideas and to present appropriately their proposal. An exam will be given also. Grading: 25% for the article presentation 25% for the assignment presented on Friday 50% for the exam at the end of November
Classes / Workload	4 days of 7.5 hours = 30 hours
Number of ECTS	**3**
Teaching & learning methods	
Course topics	Day 1: Introduction and seminar on environmental issues Day 2: Seminars on maternal mortality, and malaria in pregnancy Day 3: Lectures on twins, births defects and Barker's hypothesis, seminar on preterm Day 4: Seminar on Global Health and evaluation

Module title	**Modeling of infectious diseases**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	Mathematical models are conceptual tools that describe the functioning of systems of objects. In epidemiology, they contribute to the understanding of fundamental epidemiological processes or are used to predict disease spread at various spatial-temporal scales and its prevention and control. Alone or combined with economic cost-effectiveness studies, mathematical models and associated statistical techniques have become invaluable decision-making tools in public health in general and in planning

	mitigation strategies against any epidemic of a communicable disease in particular.
Learning outcomes	At the end of the module, the students should be able to: • Critically read and analyse research articles featuring modeling-based epidemiological studies; • Provide the general ideas for constructing and analysing simple models of epidemic spread and control; • Interpret models outputs as information that help guide public health decision making.
Assessment methods	Submission of an individual report and class participation Individual report: 30% Grade Final written exam: 70% Grade
Classes / Workload	5 days of 6 hours = 30 hours
Number of ECTS	**3**
Teaching & learning methods	The course will present the simplest models and methods used in infectious diseases modelling either conceptually or practically (through computer-based exercises and critical reading of scientific research articles) and will illustrate this methodology with several developed examples from public health field
Course topics	• Brief overview of the basic concepts and ideas of modelling: (i) presentation of main classes of epidemic models (population vs individual based, deterministic vs stochastic, spatial models), (ii) construction of SIR-like models and calculation of basic reproductive numbers (R0); • Mathematical modeling for the preparedness against unnaturally-born outbreaks: use of modeling, inclusion of parameters representing preventive and control measures, interventions evaluation. Example of the small-pox; • Overview of the parameters of epidemic models and their relevance for public health & Introduction to methods and issues surrounding their estimation; • Analysis of temporal patterns of the spread of an epidemic with dynamic models. Case study on the analysis of drug sales to model an epidemic of scabies. Network modeling, from theory to practice. Lab work on the GleamViz epidemic simulator to capture the spatial (i.e. worldwide) spreading of an epidemic; • Introduction to the use of modeling tools for assessing the economic value of vaccinations programs & Illustration through several applications related to vaccines developed at Sanofi Pasteur

Module title	**Multi-Level Analysis**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	Multilevel analysis has emerged as a useful analytical technique in several fields, including public health and epidemiology. Multilevel analysis allows for clustered data that represents a hierarchical structure, and allows for measurements at each level and effect estimate or predicted values at each level. The techniques also apply equally to data nested within individuals, as in a longitudinal setting.

Learning outcomes	At the end of the module, the students should be able: • Apply and fit multilevel and clustered data regression models using the STATA software package • Develop methods for hierarchical data analysis • Obtain predicted values and interpret estimated coefficients as epidemiologic parameters • Specify marginal models or cluster-specific models as appropriate • Test different models with random effects, especially linear and logistic models for additive and multiplicative effect parameters • Discuss multilevel analysis applications for public health policies and programs
Assessment methods	Written in class exam
Classes / Workload	5 days of 6 hours = 30 hours
Number of ECTS	**3**
Teaching & learning methods	Students will practice exercises in Stata software during each afternoon lab session and will do additional homework practice.
Course topics	Review of Regression Modeling in Epidemiology, Mean Square Error and Bias/Variance Trade-Off, James-Stein and Empirical Bayes Shrinkage, Non-Collapsibility of the Odds Ratio, Marginal versus Conditional Estimators, Simpson's Paradox and Selection Bias , Hierarchical Data Models, Random Effects ANOVA, Fixed Versus Random Effects, Empirical Bayes Prediction, Parameter Estimation and Model Fitting, Intraclas Correlation Coefficient, Discussion of Merlo et al 2006, Random Intercept Models with Covariates, Between and within effects of Level-1 covariates, Cluster-level confounding, Hausman Test for Endogeneity, Random Coefficient Models, Review of Effect Heterogeneity, Discussion of Merlo et al 2006, Marginal Models, Models for Categorical Responses, Random Intercept Logistic Regression, Median Odds Ratio, Predicted Probabilities from Categorical Models, Multilevel Fixed Effects, Discussion of Schempf & Kaufman 2012 , Differences in Differences Models, Contextual, Ecologic and Within Effects in Neighborhood Studies, Random Effects Poisson Regression and Negative Binomial Models, Random Effects Random Effects Cox Proportional Hazards Model, Session 10. Practice and Final Exam 3h30, Drs. Kaufman & Benmarhnia

Module title	**Spatial statistical analysis**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	Mapping is a useful and powerful tool to represent information which varies on a territory. It is particularly true in public health issues where health determinants are multiples and may be related to individual behavior and also to neighborhood factors which are not equally distributed in the space. Detecting clusters grouping small areas at greater health risk tends to be a appropriate method to orientate public health action. An explanatory spatial analysis can then be applied assessing the relationship between the cluster and the neighborhood characteristics in order to reveal risk factors of the health event.
Learning outcomes	After completing this course, students will be able to: • map geographic data • create geographic datasets • conduct basic spatial analyses • apply GIS to several public health disciplines
Assessment methods	Mean between Presentation by groups and Individual QCM
Classes / Workload	5 days of 6 hours = 30 hours

Number of ECTS	**3**
Teaching & learning methods	
Course topics	Session 1: Introduction to spatial analysis and working with geographic data, Spatial analysis data maps and spatial tools – computer lab (ArcGIS) Session 2: Spatial statistics - computer lab (ArcGIS) and conference, Detection of a cluster - computer lab (ArcGIS and Satscan) Session3: Critical lecture of spatial article and exam

Module title	**Concepts, methods and design in Epidemiology**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	As a basic science of public health, epidemiology is responsible for the identification of causes of disease that can guide the development of rational public health policies. The accuracy of the information provided by epidemiologic studies is therefore of central concern. Epidemiologic methods are the tools we use to make valid causal arguments. The primary objective is to provide students with the basic tools necessary to design, carry out, and interpret the results from observational epidemiologic studies.
Learning outcomes	Students who successfully complete this course will be able to: • Develop testable research hypotheses • Write a principled argument supporting research hypotheses • Operationalize hypotheses into statistically testable statements • Articulate the principles of basic observational study designs • Choose study designs that can test research hypotheses • Recognize and explain the effects of confounding and bias • Conduct basic sample size and power calculations
Assessment methods	Each session will be accompanied by a lab exercise to reinforce the concepts discussed during the lecture. The grade for the course is based on a homework assignment and a final exam which covers all the material covered in the course.
Classes / Workload	30 hours
Number of ECTS	**3**
Teaching & learning methods	Students entering this course are assumed to be are able to: • Calculate basic measures of association between exposures and disease • Interpret data in 2 by 2 tables • Identify major epidemiologic study designs • Define confounding, selection bias and misclassification • Explain the concept of causality in epidemiology
Course topics	Sampling and power Consequences of measurement error Testing our causal hypotheses : causal identification through stratification Effect modification and Mediation Graphical Representation of Causal Effects- DAGs Confounding Designs : Case-control and cohort Designs : Experimental and Cohort Designs: Experimental, cohort, case-control, cross-sectional, ecologic : Introduction to design Developing principled arguments Causal inference in epidemiology and measures of effect

Module title	**Analysis in EPIDEMIOLOGY(I) & (II)**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	The course focuses on integrating study design methods with advanced statistical analyses. The lectures focus on methodological issues of study designs covering causal modeling and hypothesis development, variable construct and measurement issues, tabular and multivariable analyses. The purpose of this course is to provide both theoretical and practical experience in analyzing epidemiological data. The main textbooks used are Rothman's Modern Epidemiology and Hosmer and Lemeshow's Logistic and Survival Models. Lectures cover theoretical concepts from confounding, interaction, pseudo risks and rates, and generalized linear models. Computer laboratories use multiple data sets covering topics in linear, logistic (binary and polytomous), Cox Proportional Hazard, Poisson, and Quantile regression methods. Multivariable methods for testing for confounding, interaction, and mediation are taught both in lecture and laboratories.
Learning outcomes	Students who successfully complete this course will be able to: • Integrate study design methods and advanced statistical analysis • Apply multivariable analyses • Clarify methodological issues for modeling and measurement • Critically appraise and interpret the findings of epidemiology papers
Assessment methods	Homeworks You will be asked to perform certain steps of analysis (and interpret the outputs) on topics that were covered in the lecture session using the dataset(s) provided. Computer Assignments Laboratories are designed to provide more informal discussions of conceptual issues, and to provide technical assistance to students. Homework assignment: 40% Final exam: Grade 60%
Classes / Workload	4 days of 7,5 hours ; 5 days of 6 hours
Number of ECTS	**3**
Teaching & learning methods	Lectures, lab sessions
Course topics	The Multivariable Model Absolute versus Relative Measures of Effect Observational Epidemiology and Counterfactuals; OR, IR and RR Relationship, Measurement and Bias Overview of Precision versus Bias, Selection Bias, Information Bias Confounding; Reliability, Validity and Confoundin; Interaction Statistical Interaction Biological Interaction, Public Health Interaction; Case-control Analysis I Design, Categorical Analyses, Logistic Regression Modeling; Logistic Regression, Case-control Analysis II; Model building Interaction in case-control studies Polytomous modeling, Logistic Regression, Polytomous modeling; Polytomous Regression ; Cohort/Follow-up Analysis I; Tabular analysis; Basic survival analysis; Kaplan Meier Survival Analysis; Cohort/Follow-up Analysis II Poisson Models; Cox PH Modeling; Advanced topics; Conceptual, Tabular Analyses, Regression Models; Matched Analyses Modeling: