



Population Health Management Fall course: Responsible Data Analysis

16 – 20 October 2017

Short description content

PHM requires evidence, which is often based on analysis of empirical, population-based data. Solid analysis based on various public health statistics and clinical indicators need to be carried out. This requires a thorough understanding of epidemiological and statistical concepts. In this course students will learn the pros and cons of various statistical methods. We will focus on choosing the appropriate methods, corresponding to the research questions, discuss how these methods can be carried out and the interpretation of the results. This week will be a mixture of theory and applications.

After course students

- Know various statistical and epidemiological concepts needed for PHM
- Know the pros and cons of various statistical methods,
- Can choose the appropriate methods in commonly PHM research situations.

- Know the basics of cost-effectiveness analysis
- Are able to discuss the interpretation of the statistical results in the context of PHM
- Are able to formulate recommendations based on statistical outcomes
- Have developed a constructive critical attitude towards various statistical interpretations

Embedding in total PHM curriculum

This course is the 2nd course in data-analysis track. It is recommended that students have followed the courses “Fundamentals of Population Health Management: Moving from Volume to Value” and “Study Design and Risk Parameters”. The current course will be followed by a third course on “Predictive Modeling”.

Faculty

Mar Rodriguez-Gironde PhD (Medical Statistics, LUMC)
Marta Fiocco PhD (Medical Statistics, LUMC)
Prof Jelle Goeman (Medical Statistics, LUMC)
Prof Saskia Le Cessie PhD (Clinical Epidemiology, LUMC)
Wilbert van den Hout PhD (Medical Decision Making, LUMC)

Coordinators

Prof Ewout Steyerberg PhD (Medical Statistics & Medical Decision Making, LUMC)
Prof Marc Bruijnzeels PhD (Public Health & Primary Care, LUMC)





PROGRAMM Population Health Management Fall course: Responsible Data Analysis

Day 1: Monday 16 October 2017
Room 318

Topic: Introduction to biostatistics
Lecturer: M Rodríguez-Girondo

Population versus sample. Summary measures (mean, median); measures of confidence (standard deviation, standard errors, confidence intervals). Hypothesis testing versus estimation. Types I and II errors. P-values. Commonly used statistical tests. Problems with interpretation of p-values. Publication bias. Sample size and power versus bias. How to adapt study designs to remove confounding and bias. Limitations of observational studies. Specific problems of big health care data: measurement error, selective registration, missing data, informative drop-out.

Learning objectives of the day

After this day, students:

- Are able to formulate statistical hypothesis from their research questions.
- Understand the concept of Type I and II errors.
- Are able to critically evaluate appropriateness of basic biostatistical research methodologies
- Are able to identify the consequences of chosen study design in the interpretation of presented research results.
- Are able to interpret the results of biostatistical analyses carried out on real data



Monday 16 October 2017

Room 318

09.00 – 10.45

Introduction to Biostatistics. Basic review

The aim of this lecture is to make the participants acquainted with basic statistical ideas and methods. We will skip mathematic formalism of the methods. Examples from population health and medical research will be emphasized. Present overview of common statistical tests used in medical research.

M. Rodríguez-Girondo

Literature

- Practical statistics for medical research . Altman DG, Chapman and Hall/CRC, 1990
- Medical Statistics at a Glance. Petrie A and Sabin C, Blackwell Science, 2000

10.45 – 11.00

Coffee break

Location: second floor, behind the restaurant

11.00 – 12.30

Introduction to Multiple Testing

There is an increasing concern that many of the current published research findings are false. In this lecture we will focus on the problem of optimism bias. Several statistical aspects related to it will be covered, with special emphasis in multiple testing procedures.

M. Rodríguez-Girondo

Literature

- Why most research findings are false. John P.A. Ioannidis. PLOS Medicine 2005

12.30 – 13.30

Lunch break

Location: second floor, behind the restaurant

13.30 – 15.30

Group assignments: SPSS practical

15.30 – 15.45

Tea break

Location: second floor, behind the restaurant

15.45 – 17.15

Reflection: Paper discussion. JAC Sterne and GD Smith. (2001). Sifting the evidence—what's wrong with significance tests? BMJ

17.15 – 18.00

Dinner

Location: second floor, behind the restaurant

18.00 – 19.30

Capita Selecta

“Biological Ageing is a personal process. What to expect from biomarkers.”

Eline Slagboom



Day 2: Tuesday 17 October 2017

Room 259


Regression models

M Rodríguez-Girondo

Simple and multiple linear regression. Types of research questions in multiple linear regression. Interpretation of regression effects. Interaction of effects. Assumptions of linear regression models. Model building and criticism for linear regression.

Transformations. Outliers, influence. Binary data as outcome. Relation between odds and probabilities. Measures of risk: absolute risk differences, relative risks and odds ratios. Logistic regression: fit and interpretation.

Learning objectives of the day

- Understand when and how to apply relative risks and odds ratios
 - Are able to critically validate the assumptions in a linear regression model
 - Know in which situations linear and logistic regression can be applied and the conditions that should be met to obtain reliable results using these techniques
 - Understand when and how to apply prediction models
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Tuesday 17 October 2017

Room 259

09.00 – 10.45

Introduction to regression models

The aim of this lecture is to make the participants acquainted with the basic concepts in regression modelling, namely linear and logistic. Specific contents covered will be the interpretation of summary statistics, different types of predictors and discussion of interaction effects. Examples from population health and medical research will be emphasized.

M. Rodríguez-Girondo

10.45 – 11.00

Coffee break

Location: second floor, behind the restaurant

11.00 – 12.30

Performing regression models: why and when

In this lecture we will discuss different reasons to perform regression, distinguishing between etiological and prediction models. We will also discuss about confounding, mediation and the difference between association and causation. We will further discuss regression model assumptions.

M. Rodríguez-Girondo

12.30 – 13.30

Lunch break

Location: second floor, behind the restaurant

13.30 – 15.30

Group assignments: SPSS Practical

15.30 – 15.45

Tea break

Location: second floor, behind the restaurant

15.45 – 17.15

Reflection: Topic of the day

17.15 – 18.00

Dinner

Location: second floor, behind the restaurant

18.00 – 19.30

Capita Selecta

eHealth for self-management support: challenges in data analysis

J.K. Sont



Day 3: Wednesday 18 October 2017


Room 316

Topic: Survival Analysis

Lecturer: Marta Fiocco

Basics of time-to-event data. Rate, risk and hazard. Right censoring and left truncation. The survival function and the Kaplan-Meier estimator. Informative censoring in health data. Competing risks. Immortal time bias. Adding covariates: the Cox proportional hazards model. Alternatives to the Cox model. Time-varying covariates /exposures.

Learning objectives of the day

- Identify characteristics of survival data and their implications for analysis
 - Interpret univariate analyses of survival data
 - Understand different types of censoring and truncation and are able to identify them in real population health situations.
 - Interpret results using Cox proportional hazards model
 - Assess of proportional hazards and other aspects of model adequacy
 - Interpret advanced survival analyses: time dependent covariates; parametric models
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Wednesday 18 October 2017

Room 316

09.00 – 10.45

Concepts in time-to-event data

The study of time-to-event or lifetime data is often encountered in biomedical research. In this lecture we will introduce the concepts behind time-to-event data, such as right censoring and left-truncation and we will discuss the data collection mechanisms which cause them.

M. Fiocco

10.45 – 11.00

Coffee break

Location: second floor, behind the restaurant

11.00 – 12.30

Hazard regression models

In this lecture we will look at the central concept behind time-to-event regression models: the hazard function. We will present parametric and non-parametric methods for estimating the survival function and the Cox proportional hazards model to determine covariate effects on time-to-event.

M. Fiocco

12.30 – 13.30

Lunch break

Location: second floor, behind the restaurant

13.30 – 15.30

Group assignments: SPSS Practical

15.30 – 15.45

Tea break

Location: second floor, behind the restaurant

15.45 – 17.15

Reflection: Good Statistical Practice. Summary and take-home messages

17.15 – 18.00

Dinner

Location: second floor, behind the restaurant

18.00 – 19.30

Capita Selecta

“ Patients with Staged Bilateral Total Joint Arthroplasty in Registries: Immortal Time Bias and Methodological Options.”

M. Fiocco



Day 4: Thursday 19 October 2017

Room 364

Topic: Causal Modelling

Lecturer: prof.dr. S. le Cessie

In the previous days you have learned the basic principles of statistics and prediction modelling. But in order to determine whether performing an intervention in public health would be effective, an estimate of the expected effect of the intervention in the target population(s) of interest is needed. Sometimes these effects can be estimated using the results of randomised trials, but often only observational data are available. Today you will learn how to formalize causal research questions, and how to derive the corresponding answers.

Learning objectives of the day

- Identify strengths and weaknesses of observational data as sources of evidence compared to RCTs
- Being able to formulate causal questions
- Understand various biases that may occur in observational data analysis
- Being able to draw directed acyclic graphs for different population health problems
- Understand different types of statistical models that aim to estimate causal effects, including regression models and propensity scores
- Interpret results from causal models



Thursday 19 October 2017

Room 364

09.00 – 10.45

Causal questions and epidemiological answers

In this lecture we focus on different types of causal questions and introduce a general approach to answer causal questions using potential outcomes. Furthermore we discuss the use of causal graphs to identify bias and confounding.

S. le Cessie

10.45 – 11.00

Coffee break

Location: second floor, behind the restaurant

11.00 – 12.30

Practical application of theory

There are several methods to deal with confounding, the most often used methods are regression methods and propensity scores. In this lecture an introduction to propensity score methods is given.

S. le Cessie

12.30 – 13.30

Lunch break

Location: second floor, behind the restaurant

13.30 – 15.30

Group assignments

15.30 – 15.45

Tea break

Location: second floor, behind the restaurant

15.45 – 17.15

Reflection: Topic of the day

17.15 – 18.00

Dinner

Location: second floor, behind the restaurant

18.00 – 19.30

Capita Selecta

“Causal modelling in practice: an example of influenza vaccination studies.”

Dr. R.H.H. Groenwold



Day 5: Friday 20 October 2017

Room 318

Topic: Cost-effectiveness analysis

Lecturer: dr. W.B. van den Hout

Medical treatment often also has economic consequences, either because of the costs of the treatment itself or because it affects other care or the productivity of the patient. Increasingly, costs are a factor in health care decision making. Cost-effectiveness research investigates how spending in the health sector relates to the need for healthcare and health.

Learning objectives of the day

- understand important health economic concepts, like utility, QALYs, cost-effectiveness analysis and pragmatic trial design;
- are able to perform simple cost-per-QALY calculations;
- understand the ethical concepts of utilitarianism and egalitarianism;
- understands how, in the Netherlands, cost-effectiveness is incorporated in policy making.



Friday 20 October 2017

Room 318

09.00 – 10.45

Healthcare costs and why they rise

Costs have been steadily rising over the past decades. Ageing is frequently blamed for these rising costs, but actually has only a limited impact. A number of alternative explanations is discussed and solutions that have been suggested to reduce healthcare costs.

W.B. van den Hout

10.45 – 11.00

Coffee break

Location: second floor, behind the restaurant

11.00 – 12.30

Costs-per-QALY and how they are used to support decision making

One way to reduce costs is to make sure healthcare provides good value for money. The cost-per-QALY framework is presented. The types of evidence needed in cost-effectiveness are discussed, as well as specific requirements for research to support decision making on reimbursement.

W.B. van den Hout

12.30 – 13.30

Lunch break

Location: second floor, behind the restaurant

13.30 – 16.00

Group assignment

Zorginstituut Nederland (ZiNL) advises the healthcare minister on whether specific types of healthcare should be included in the basic insurance package. In this assignment, a recent ZiNL reimbursement advice is studied and the validity of its results and conclusions are discussed.

16.00 – 17.00

Farewell drinks