

Graduate program
Digital Public Health / université de BORDEAUX



PREREQUISITES YOU SHOULD COMPLETE

MSc PUBLIC HEALTH DATA SCIENCE



This document is a compendium of resources about prerequisite concepts you should be familiar with before beginning the Master program in Public Health Data Science. We encourage you to read and/or train with the materials listed below.

BIOSTATISTICS

- **General statistical theory concepts**

Read through the 6 chapters of this interactive online book: <http://students.brown.edu/seeing-theory/>

- **Introductory statistics & basics of R programming**

Following <http://swirlstats.com/students.html> instructions, install *Rstudio*, *R* and the *swirl* package, and complete the following courses in the given order:

1. *R Programming*
2. *Exploratory Data Analysis*
3. *Getting and Cleaning Data*
4. *Statistical Inference*
5. *Regression Models*
6. *Statistical Inference*

- **Deepen R capabilities**

« R for data-science » book (free online version): <https://r4ds.had.co.nz/>

- ✓ Practical solutions from the book (in case you experience some difficulties going through the book): <https://jrnold.github.io/r4ds-exercise-solutions/>

An additional resource on *statistical hypothesis testing* can be found on the *Statistics in Action with R* website: <http://sia.webpopix.org/statisticalTests1.html>. Read through it, then play around with the Shiny application at <http://shiny.webpopix.org/sia/testMean/>.

- **Basic ideas about causality**

The article “Confounding in health research” from Greenland, S. and H. Morgenstern (in *Annual review of public health*, 2001 22(1): 189-212) gives a good overview of the fundamental concepts of causality and confounding in health science. You can read it here: <https://www.ncbi.nlm.nih.gov/pubmed/11274518>.

- **Deepen statistical prerequisites**

- Follow the « Statistical Inference » class from Johns Hopkins University on Coursera: <https://www.coursera.org/learn/statistical-inference>. The online book from Lauren Cappiello « Introduction statistics » <https://bookdown.org/lgpcappiello/IntroStats/random-variables.html> is also a very useful resource blending key statistical theoretical concepts with R without too much complexity and a lot of explanations.

EPIDEMIOLOGY

- Basic concepts

- Epidemiological concepts compulsory in **basic tools**:
 - Introduction the most common types of epidemiological study designs (experimental, cross-sectional, cohort, case-control).
 - Introduction to bias (selection, information, confounding) and effect modification.
 - Differences between measures of health status (prevalence, incidence, risk) and association (risk ratio, rate ratio, odds ratio).
- Fundamentals of Epidemiology
 - **ActivEpi Web** is a multimedia electronic free book, created by David Kleinbaum (doctor and professor of epidemiology) that provides an interactive resource to learn the fundamentals of epidemiology, biostatistics, and an introduction to mathematical modeling.
 - <http://www.activepi.com/>
 - Log In access: <https://activepi.herokuapp.com/>

- Recommended readings

- For students with no background in epidemiology: **Rothman KJ. Epidemiology. An introduction. Oxford: Oxford University Press; 2012.**
- For students with intermediate background in epidemiology: **Szklo M, Nieto FJ. Epidemiology: beyond the basics. Burlington: Jones & Bartlett Publishers; 2014.**
- For students with advanced background in epidemiology: **Rothman KJ, Greenland S, Lash TL. Modern epidemiology (Vol. 3). Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2008.**

MEDICAL INFORMATICS

- Notions of relational database design and implementation

Normalisation

First, Second and Third Normal Forms

Entity-relationship modelling

Relational modelling

SQL language

You can follow this course: <https://www.coursera.org/learn/database-management> or this one: <https://www.udemy.com/relational-database-design/>

- **Object-oriented programming**

Data structure and algorithm

Object-oriented design: classes and objects, inheritance, polymorphism, encapsulation

Basics of Python programming: basic instructions, introduction to Object Oriented programming with Python.

Enroll in the following udemy course(until OOP in Python section):

<https://www.udemy.com/python-masterclass-for-beginners/>

It could be completed by the following course on OpenClassRoom

<https://openclassrooms.com/fr/courses/2304731-learn-python-basics-for-data-analysis>

CONTACT

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