QNRM: Introduction to Quantitative Research Methods (20-21)

Course Syllabus

Introduction to Quantitative Research Methods (I) and (II)

Credits	1 (mandatory; pass/fail)
Duration	8 weeks
Lecturers	Elina Brutschin

Aims, objectives and learning outcomes

The aim of this course is to prepare students to choose the most appropriate quantitative (statistical) method and effectively apply it to answer a research question. A framework will be provided for basic descriptive and inferential statistical techniques to show how the choice of data analysis methodology is determined by the question asked and the nature of data available/recorded. The objectives are: to learn about the main types of the basic descriptive and inferential statistical analyses applied in environmental research and their specific tasks; to appreciate assumptions and limitations of the analyses, to be able to run these analyses in Excel and R and to know how to interpret the outputs produced.

At the end of this unit a successful student should:

Knowledge and understanding	· Have practical knowledge and basic understanding of the scientific method, and the main types of basic descriptive and inferential statistics applied in environmental research.
Intellectual skills	· Be able to choose, or advise others to choose, the most appropriate quantitative method to address a research question. · Be able to read documents/papers that contain basic descriptive and inferential statistics knowledgeably.
Practical skills	· Be able to perform some basic descriptive and inferential data analyses using Excel and R, interpret the statistical result and translate that back into the words of an environmental research issue.
Transferable skills and personal qualities	· Learn to ask appropriate questions about the problem, to design experiments or sampling programmes optimally and effectively communicate environmental research results.

Educational activities, assessment and estimated workload

Learning outcomes	Assessment	Educational activities	Estimated workload
· Acquiring practical knowledge and basic understanding of the main types of basic descriptive and inferential analyses applied in environmental research.	pass/fail based on attendance in course and submission of outputs	Lecture	2
		Excel & R practicals	12
		Reading/Self -study	36
		TOTAL	**50**

Key topics

· Topic 1. Introduction to course, science & the scientific method; terminology and scales of measurement.

· Topic 2. Discussing different types of research design and the main sections of a research paper (see the main replication paper). Basic overview of different data sources for environmental research.

· Topic 3. General introduction into data “issues” (reliability vs. validity of different sources). Different data structures, levels of measurement.

· Topic 4. Survey data and sampling techniques.

· Topic 5. Measures of central tendency and variability (or basic descriptive statistics).

· Topic 6. Visualizing measures of central tendency and variability.

· Topic 7. Introductions to the basics of inferential statistics (difference between correlation and causation, distributions, central limit theorem).

· Topic 8. The main elements of hypothesis testing with a t-test.

· Topic 9. Practicing hypothesis testing.

· Topic 10. How to interpret the results of statistical tests?

· Topic 11. Different types of dependent variables and statistical tests overview.

· Topic 12. A closer look at linear regression.

· Topic 13. Practicing data wrangling in excel and R.

· Topic 14. Practicing and interpreting data visualization in R.

· Topic 15. Practicing and interpreting data analysis in R.

Readings:

Topic 1+2

Gary King, Robert O Keohane, and Sidney Verba. 1995. "The Importance of Research Design in Political Science." American Political Science Review, 89, Pp. 454–481. Copy at https://j.mp/2ovDYd8

https://gking.harvard.edu/files/gking/files/kkvresp.pdf

Gary King ***Publication, Publication,*** *PS: Political Science and Politics, Vol. XXXIX, No. 1 (January, 2006), 119-125 (Abstract: HTML | Article: PDF)*

https://gking.harvard.edu/files/gking/files/paperspub.pdf

For other lectures slides and handouts will be supplemented.