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Background

Data and research are key pillars of the global economy and society today. We need rigorous approaches to collecting and analysing both the statistics that can tell us 'how much' and if there are observable relationships between phenomena; and the information gives us a nuanced understanding of cultural contexts and human dynamics. Quantitative skills enable us to explore and measure socio-economic activities and processes at large scales, while qualitative skills enable understanding of social, cultural, and political contexts and diverse lived experiences. Rather than being in opposition, qualitative and quantitative research can complement one another in the investigation of today's pressing research questions.

To these ends, this course will help you develop your quantitative (statistical) and qualitative skills, as critical tools. This course will help you understand what quantitative statistical and qualitative approaches researchers use, and to develop a set of research techniques that you will use in your field classes and dissertations. The course will also help you to investigate problems and make better decisions about how to fix them in both your future employment and more widely – to enable us to make evidence-based, more informed decisions so we can use our research to have a positive impact.

Module Learning Outcomes

By the end of the module, students should be able to:

- Demonstrate an understanding in the application and interpretation of both commonly used qualitative and quantitative research methods.
- Demonstrate an understanding of how to work with empirical geographical data to address real-world research questions.
- Communicate key findings in a professionally written way to inform decision making.

Achievement of these outcomes will be assessed through two pieces of coursework.

Module materials will be posted to Canvas. There will be discussion boards for student queries about course content and assessments. These will be checked regularly, but please **do not** expect instantaneous responses, especially close to assessment deadlines.

Quantitative Block (Weeks 7-12)

The Quantitative block (Weeks 1-6) runs as follows:
Week 1, 2, 4, 6 Tuesday @ Central Teaching Hub PCTC
- Lecture (10 - 11 am).
- Practical PC session (11 am – 1 pm).
- Week One will also include an introduction to the module and assessments.

Week 3
- Lecture (3 – 4 pm) Thursday @ Central Teaching Hub – Lect. Theatre C.

- Practical PC session (9 – 11 am) Friday @ Central Teaching Hub PCTC.

Week 5
- Lecture (3 – 4 pm) Thursday @ Central Teaching Hub – Lect. Theatre C.
- Practical PC session (10 – 12 am) Friday @ Central Teaching Hub PCTC.

Lectures will introduce and explain the fundamentals of quantitative methods. You will then have the chance to apply what you have learned straight away in computer practical sessions, working with real-world data. Support and training in R will also be provided through these sessions. Weekly sessions will be driven by empirical research questions.

This block will culminate students producing an original research report, analysing data using one of the regression techniques learned in the module. See 'Assessment' for further details.

Software

For quantitative training sessions, ensure you have installed and/or have access to RStudio.

To run the analysis and reproduce the code in R, you need the following software installed on your machine:
- R-4.2.2 or +
- RStudio 2022.12.0-353 or +

To install and update:
- R, download the appropriate version from The Comprehensive R Archive Network (CRAN)
- RStudio, download the appropriate version from here.

This software is already installed on University Machines. But you will need it to run the analysis on your personal devices.

Module Programme

Week	Topic	Staff
1	Introduction & Review *Lecture and Computer Lab Practical*	GF
2	Single & Multiple Linear Regression *Lecture and Computer Lab Practical*	GF
3	Multiple Linear Regression with Dummy Variables *Lecture and Computer Lab Practical*	ZY
4	Logistic Regression *Lecture and Computer Lab Practical*	ZY
5	Data Visualisation *Lecture and Computer Lab Practical*	GF

6	Summary and Assessment Support *Lecture and Computer Lab Practical*	ZY

Assessments

The module will be assessed via two summative assignments, each worth 50% of the overall module mark with a mandatory maximum word limit of 2000 words, excluding references. A detailed description for each assignment is provided below.

As per School Assessment Guidelines, over-length submissions will be penalised, assignments submitted after the deadlines will be penalised 5% per working day late, and assignments submitted more than five working days late will be awarded a mark of zero. **Extenuating Circumstances/Late Penalty Removal Forms:** requests must be submitted via the Student Support Office: Ground Floor, Roxby Building, contact: envsci@liverpool.ac.uk

Top Assessment Tips: incrementally work on assessments week by week; ask questions early/often on discussion boards; check discussion board before asking.

AI Policy

The inappropriate use of Generative Artificial Intelligence Tools in the preparation of this assignment is strictly prohibited. The School's current position is that inappropriate usage is:
- Using GAI to generate novel content that is subsequently used in a submission.
- Extensive translation of text from another language.
- Extensive and unacknowledged use of proof-reading tools (except where explicitly permitted under an SSIS).

This assignment should be prepared using your own words. All use of AI translation tools should be properly acknowledged. Extensive use of AI proof-reading tools is prohibited. Whilst you may use spelling/grammar checks typically found in word-processing packages, using AI tools to change words/sentence structure may incur an Academic Integrity penalty.

If your assessment is referred for an Academic Integrity Investigation, you may be asked to demonstrate that the work you have submitted is your own. Therefore, it is advised that you keep hold of earlier files, drafts, notes and other relevant preparatory materials that you have used.

Assessment 2

Data analysis and exploration (50%)

Deadline**: 2pm - Monday 3rd November 2025**

Word limit: 2000 words

This assignment consists of writing a research report using one of the regression techniques learned during the module. The report should have the following sections: an introduction, a brief literature review,

methods and data, results and/or discussion, and discussion or/and conclusion. The Section 2 below in this document provides detail on the required content for each of these sections. The literature review should be kept very brief, one or two paragraphs. The core of the assignment should be the results/discussion sections.

The basic idea is to put in practice the methods learned during the quantitative component of the module. You are required to apply a linear or logistic regression model to the data provided for the module. To this end, you will need to identify a relevant research question to be addressed. Based on the chosen question, you will need to identify a dependent or outcome variable which you want to explain, and at least three relevant independent variables that can use to explain your chosen outcome variable. The selection of variables should be informed by the literature and empirical evidence.

Once variables have been chosen, you will need to describe the data and type of regression to be used for the analysis. You need to explain any transformation done to the original data source, such as reclassifying variables, or changing variables from continuous to nominal scales. You also need to briefly describe the data use: source of data, year of data collection, indicate the number of records used, state if you are using individual records or geographical units, explain if you are selecting a sample, and any relevant details. You also need to identify type of regression to be used and why. You need to describe the model(s) to be estimated. It is good practice to write down the model equation to be estimated. Each of the model components should be clearly identified and described.

You need to provide two types of analyses. First, you need to provide a descriptive analysis of the data. Here you could use tables and/or plots reporting relevant descriptive statistics, such as the mean, median and standard deviation; variable distributions using histograms; and relationships between variables using correlation matrices or scatter plots. Second, you need to present an estimated regression model or models and the interpretation of the estimated coefficients. You need a careful and critical analysis of the regression estimates. You should think that you intend to use your regression models to advice your boss who is expecting to make some decisions based on the information you will provide. As part of this process, you need to discuss the model assessment results for the overall model and regression coefficients. Remember to substantiate your arguments using relevant literature and evidence, and present results clearly in tables and graphs.

Suggested Report Structure

1. *Introduction*
   - Aim.
   - Why is the topic relevant or worth being investigated?
   - Knowledge gap & one (1) or two Research Questions (RQs). Avoid Yes/No Research questions.
   - Brief structure of the article.

2. *Literature review*
   - What do we already know about this subject?
   - Rationale for including certain predictor variables in the model.
   - What knowledge gap remains that this article will address? (includes 'not studied before in this area / year'). *Note: there is no expectation on totally original research. The focus is on a clean, sensible, data analysis situated in existing ideas.*

3. *Methodology*
   - A *brief* introduction to the dataset being analysed (who collected it? When? How many responses? etc.).
   - A description of any transformation made to the original data i.e. Turn a continuous variable of income into intervals or reducing the number of age groups from 11 to 3.
   - A *brief* description and justification of the statistical techniques in the subsequent analysis.

4. *Results and Discussion*
- Results and interpretation, including relevance to existing literature.
- Selective illustrations (graphs and tables) to make your findings as clear as possible.

5. *Conclusion*
- Summary of main findings
- Limitations of study (self-critique)
- Implications of the findings of the study for others

Additional Tips

1. Make sure you use the type of correlation and regression that matches the types of dependent and independent variables chosen for your analyses i.e. categorical or continuous.

2. Structure your write-up as much like a journal article as possible (see suggested structure above), subject to the following caveats:
- Explicitly address all the points above in your write up.
- There is no need for an extensive literature review – the focus of this assignment is on demonstrating mastery of data analysis exploration, regression, visualisation and interpretation – but a good/very good answer would include a few citations to relevant ideas/theories at relevant points, based upon a *quick* google.
- Because the emphasis of the assignment is on mastery of technique, more extensive (but still not exhaustive!) coverage of data preparation and model diagnostics than that found in a conventional academic article would be appropriate.

3. The guideline word count for this assignment is up to c. 2000 words, excluding bibliography.

4. Marking criteria: standard school 'report' marking criteria apply, but with less emphasis on evidence of reading, and a strong emphasis on the use of regression models, critical interpretation of results and presentation standards.

Feedback

Verbal feedback on understandings of all module material will be provided during lectures and computer session labs if requested. Formative feedback will be provided within three working weeks of the intermediate assessment submission deadline (beginning of week 10).