COMMON SENSE POLICY GROUP

Northumbria University NEWCASTLE

Course Guide

Understanding and addressing social challenges through applied statistical methods, data science and creative microsimulation

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Teaching team

All course staff are drawn from within the Common Sense Policy Group in the Department of Social Work, Education and Community Wellbeing, Northumbria University:

Dr Elliott Johnson, Vice Chancellor's Fellow in Public Policy, (elliott.johnson@northumbria.ac.uk)

Dr Graham Stark, Senior Research Fellow in Public Policy (graham.stark@northumbria.ac.uk)

Prof Howard Reed, Senior Research Fellow in Public Policy, (howard.reed@northumbria.ac.uk)

Anna Thew, Senior Research Assistant in Public Policy, (anna.thew@northumbria.ac.uk)

Professor Daniel Nettle, Professor in Community Wellbeing, (daniel.nettle@northumbria.ac.uk)

Professor Matthew Johnson, Professor of Public Policy, (matthew7.johnson@northumbria.ac.uk)

Please direct all queries to the Course Leader, Elliott Johnson, at Elliott.johnson@northumbria.ac.uk

Summary

This course provides unique, cutting-edge training in applied statistical methods and data science. It builds on examples of online delivery elsewhere, along with models and methods developed within the course teaching team to provide you with unique experience in using statistical evidence to inform policymaking. This applied element is particularly important given the abstract and highly theoretical nature of much teaching in quantitative methods. The course will be of relevance to students across a range of social scientific subject areas, including economics, sociology, social policy, politics, international relations, geography, criminology, education, law, environmental planning, management, psychology and sports and society. Formative assessment will enable you to develop a 3,000-word report on a chosen policy area with complementary code and microsimulation output to be uploaded to an osf.io repository following feedback from the course teaching team.

Objectives

You will develop the capacity to:

a) understand and explain statistical methods.
b) conduct basic coding.
c) deploy applied data science.
d) microsimulate policy interventions.
e) create coherent and effective outputs for use in policymaking.

Should I take this course?

While there are no formal entry requirements and while we welcome doctoral and non-doctoral students alike, this course will benefit you if you:

- have an interest in advanced quantitative methods and data science.
- want to be able to code and microsimulate as part of your work.
- wish to develop the capacity to engage in applied analysis of policy.

It is not suitable for you if you have no prior knowledge of quantitative methods or interest in policy analysis.

Registration and fees

Full course information is available on the Northumbria course page. The course will run between 12th-16th May 2025.

If you are a NINE student, you are eligible to take the course **at no cost** as part of your training programme. Please register via this **link**. You will need to select NINE DTP when you create an account.

If you are **not** a NINE student, please register here. The fee for the full training programme **for non-NINE** students is £850.

We particularly encourage you to attend if you are a student from other Doctoral Training Programmes (e.g. North West Social Science Doctoral Training Partnership) or an academic at a UK and or non UK university and if you work in the public sector (Local Authorities, Civil Service, government, etc.) or third sector (think tanks, charities, unions, etc.).

Please register via this by 30th April 2025.

Location

Teaching will take place in A block at Northumbria University Coach Lane Campus. If you cannot travel to attend the course, please contact Elliott Johnson (elliott.johnson@northumbria.ac.uk) to discuss the possibility of remote delivery.

Structure

There will be five day-long units delivered over five consecutive days between 12th-16th May. Each unit will contain a mixture of lectures, supervised practice sessions, group discussions and independent report development.

Unit 1: Key concepts: an introduction to statistics and data science

Location
A105

Lead
Daniel Nettle

Summary
This unit enables students with some prior knowledge of quantitative methods to understand the key concepts around which to conduct statistical analysis and to engage in relevant forms of data science, specifically with regard to coding. In order to prepare you for the rest of the course and assessment, you will work with recent data on income and health, to understand the relationships as well as how we go about quantitative data science.

Unit structure
- What are statistics, how can we use them and what does modelling do?
- Basic statistical procedures: summarising data, model fit, sample weighting, bootstrapping
- Principles of coding for statistical computation
- Applying those principles to tax-benefit analysis
- What are the key concepts for this course? Poverty, inequality and budgetary constraint
- Analysing incomes and health data

Resources
Producing and Using Data in Cognitive Science: https://bookdown.org/danielnettle2/bookdown/ Chapters 1; 3; 4; 5; 8; 22. While we will not use R to analyse data, the course explains underpinning assumptions regarding quantitative research methods.

Reading
Khandker, S.R., Koolwal, G.B., Samad, H.A. (2009) *Handbook on impact evaluation: quantitative methods and practices* (English). Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/650951468335456749/Handbook-on-impact-evaluation-quantitative-methods-and-practices.

Paál, T., Carpenter, T. & Nettle, D. (2015) Childhood Socioeconomic Deprivation, but Not Current Mood, Is Associated with Behavioural Disinhibition in Adults. *PeerJ*, 3 (May): e964. https://doi.org/10.7717/peerj.964.

Nettle, D., Chevalier, C., de Courson, B., Johnson, E.A., Johnson, M.T. & Pickett, K.E. (2023) 'Short-term changes in financial situation have immediate psychological consequences: The Changing Cost of Living Study', *Social Policy and Administration*. https://doi.org/10.1111/spol.13065.

Unit 2: Understanding coding

Location
A105

Lead
Graham Stark

Summary
This unit introduces basic data scientific principles and coding through a series of practical examples. You will explore general principles of coding using any platform, before working through a series of practical examples to understand the nature of analyses produced.

Unit structure
- Introducing our environment: Python & Jupyter notebooks
- Making a first notebook
- Using tabular data and graphics: DataFrames, filtering, joining, sampling
- Simple data filtering and selection on a live dataset
- Plotting statistics: line, scatter and algebra
- Reconstructing a Households Below Average Income (HBAI) diagram

Resources
Individuals, Families and Households: https://stb.virtual-worlds.scot/households.html.

Reading
Haughton, J. & Khandker, S.R. (2009) *Handbook on poverty and inequality*. Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/488081468157174849/Handbook-on-poverty-and-inequality.

VanderPlas, J. (2022) *Python data science handbook: essential tools for working with data*. Second edition. O'Reilly. (Use online trial at: https://www.oreilly.com/library/view/python-data-science/9781098121211/).

Unit 3: Building your own tax-transfer model

Location
A207

Lead
Graham Stark

Summary
This unit enables you to develop you own tax-transfer model. This forms the basis for the analysis within the end of course report. You will use Python to create your own model and populate it with a dataset that will be provided in advance of the course's start date. You will then begin to work through basic impacts from changes in taxes and benefits with a view to understanding and illustrating their impacts on poverty.

Unit structure
- How to build a simple tax-transfer model
- Build your own model
- A slightly more complicated model
- Building a simple test suite and adding visual outputs to your model
- More summary measures: poverty, inequality, marginal/average tax rates
- Experimenting with poverty and inequality measures: adding marginal rates to your model

Resources
Microsimulation Training: https://github.com/grahamstark/microtraining.
Tax Benefit Models and Microsimulation: https://stb.virtual-worlds.scot/intro.html.

Reading
O'Donoghue, D. (2021) Practical Microsimulation Modelling. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198852872.001.0001.

Stark, G., Johnson, E.A., Reed, H., Nettle, D. & Johnson, M.T. (2024 in press) The Public Policy Preference Calculator (TriplePC): Developing a comprehensive welfare policy microsimulation. *International Journal of Microsimulation*. https://triplepc.northumbria.ac.uk.

Unit 4: Understanding advanced models

Location

A202

Leads

Howard Reed and Graham Stark

Summary

This unit uses the cutting-edge Landman Tax-Transfer Model to understand and explore complex forms of economic microsimulation and to assess the strengths and weaknesses of different survey datasets. You will learn how to model specific impacts accurately and understand the economic context for analysis of innovative policies to address poverty and inequality.

Unit structure

- Introduction to Landman Tax-Transfer 2 to frame analysis
- Modelling specific impacts accurately
- Using different datasets for modelling: Understanding Society (UKHLS) and Living Costs and Food Survey datasets
- Designing a package of revenue-neutral reforms
- Complex impacts on poverty and inequality
- Applying a Basic Income to your model

Resources

Understanding Society (UK Household Longitudinal Study (UKHLS)): https://www.understandingsociety.ac.uk/.

Living Costs and Food Survey: https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/methodologies/livingcostsandfoodsurvey.

Reading

Reed, H.R. (2024) *Microsimulation of the impacts of tax, social security and public spending changes on living standards, the income distribution, poverty and health: methodological advances and an application to basic income policies*. PhD Thesis. Northumbria University, pp. 6-29. https://researchportal.northumbria.ac.uk/en/studentTheses/microsimulation-of-the-impacts-of-tax-social-security-and-public-.

Reed, H.R., Johnson, M.T., Lansley, S., Johnson, E.A., Stark, G. & Pickett, K.E. (2023) Universal Basic Income is affordable and feasible: evidence from UK economic microsimulation modelling. *Journal of Poverty and Social Justice*. 31(1): 146–162. https://doi.org/10.1332/175982721X16702368352393.

Reed, H., Johnson, E.A., Stark, G., Nettle, D., Pickett, K.E. & Johnson, M.T. (2024) Estimating the effects of Basic Income schemes on mental and physical health among 18+ adults in the UK: a microsimulation study. *PLOS Mental Health*. https://doi.org/10.1371/journal.pmen.0000206.

Unit 5: Persuading the politicians: how to deploy evidence to influence policy

Location
A105

Leads
Elliott Johnson and Matthew Johnson

Summary
This unit sets out the putative commitment to evidence-based policy and unpicks the way in which specific forms of evidence seem to matter in different contexts. You will work through a series of examples of evidence regarding economic, health and electoral outcomes to frame the evidence produced in your own microsimulation to persuade relevant stakeholders. You will explore ways of presenting evidence for different stakeholders, such as civil servants, third sector bodies and academics.

Unit structure
- What is responsible economic policy?
- Report development: identifying the intended outcomes of your policy.
- What evidence matters? Affordability, feasibility and popularity.
- Report development: framing evidence within report.
- Conclusion: how to engage with different stakeholders.
- Report development: final checks on data.

Resources
Act Now dataset:
https://triplepc.northumbria.ac.uk/actnow/all_results_by_policy.html.

Reading
Johnson, E.A., Hardill, I., Johnson, M.T. & Nettle, D. (2023) 'Breaking the Overton Window: on the need for adversarial co-production', *Evidence & Policy*, 20:3, 393-405. https://doi.org/10.1332/17442648Y2023D000000005.

Johnson, M.T., Johnson, E.A., Reed, H. & Nettle, D. (2022) 'Can the downward spiral be stopped? Balancing transformative policy with feasibility in red wall constituencies', *British Journal of Politics & International Relations*, 26:1, 131-148. https://doi.org/10.1177/13691481221146886.

Johnson, E., Reed, H., Nettle, D., Stark, G., Chrisp, J., Howard, N., Gregory, G., Goodman, C., Smith, M., Coates, J., Robson, I., Parra-Mujica, F., Pickett, K.E. & Johnson, M. (2023) *Treating causes not symptoms: Basic Income as a public health measure*. https://autonomy.work/portfolio/treating-causes/.

Common Sense Policy Group (2024) *Spend to Save Britain: A Common Sense approach to the Budget*, Newcastle: Northumbria University. https://doi.org/10.17605/OSF.IO/3N524.

Assessment

You will receive continuous formative assessment throughout the course via supervised independent and group exercises as well as daily drop-in sessions at the beginning of each day.

You will receive feedback on a 3,000-word report on a chosen policy approach to addressing poverty and inequality using the code and microsimulation output and analysis developed within units 3, 4 and 5 of the course. This will take the form of a research report, including the following sections (word counts including in-text citations):

i) Introduction (250 words)
ii) Literature review (500 words)
iii) Methods (250 words)
iv) Results (750 words)
v) Discussion (1,000 words)
vi) Conclusion (250 words)
vii) Bibliography
viii) Appendix: Code and dataset

You will submit the report 1 week after completion of the course. You will receive feedback within a further week. You will then have two weeks in which to revise your report in response to feedback before uploading your report to your Pure account (if you have one) and Open Science Framework repository. This will provide you with a CV-enhancing reference point for future work in data science.

Reading

The course will benefit from unique datasets, simulations and readings, including a bespoke text written by the course staff that will be available on the course homepage. This will be expanded into a full text outlining activities and assessments that will be hosted Open Access within the Common Sense Policy Group website.

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