Course Outline

Applied Statistics for Public Policy Analysis

Inayat Ullah, PhD
Jinnah School of Public Policy and Leadership, NUST
Website: `https://inayatullahamin.github.io`

Course Description

Public policy decisions increasingly rely on evidence generated from statistical analysis. This course introduces graduate students to the concepts and tools of applied statistics, emphasizing their application to governance and policy problems in Pakistan and globally. The course blends theoretical foundations with hands-on exercises in data analysis using STATA. By the end, students will be equipped to critically interpret statistical results, design simple empirical studies, and conduct policy-relevant quantitative research.

Examples of guiding questions:

- How do conditional cash transfer programs (e.g., BISP) affect poverty and inequality outcomes?
- Do public health interventions (vaccinations, safe water access) reduce health inequalities across regions?
- What are the socio-economic determinants of school dropout rates in rural areas of Pakistan?

Course Objectives

1. Familiarize students with core statistical concepts and their applications in public policy.
2. Enable the use of statistical software (STATA) for data analysis and visualization.
3. Develop skills to evaluate policy interventions using descriptive and inferential statistics methods.
4. Prepare students to contribute to the evidence-based policy research in Pakistan

Prerequisites

The most important prerequisite is the willingness to work hard on possibly unfamiliar material. Quantitative methods are like a language, and it will take time and dedication to master its vocabulary. This presents a challenge for us as instructors to give you the best intuition and a challenge for you as a student to work hard to internalize that intuition.

Evaluation Criteria

Midterm Exam	20%
Final Exam	40%
Research Project (Report + Presentation)	20%
Quizzes (3)	15%
Class Participation	05%

Required Texts & References

- Kenneth J. Meier, Jeffrey L. Brudney, John Bohte (2014). *Applied Statistics for Public and Nonprofit Administration.*
- Nick Huntington-Klein (2022). *The Effect: An Introduction to Research Design and Causality.*
- William Trochim (2015). *Research Methods: The Essential Knowledge Base.*
- Supplementary articles, datasets, and case studies will be provided.

Weekly Lesson Plan

Part I: Descriptive Statistics (Weeks 1–7)

Week 1: Course Introduction & Policy Relevance of Statistics
Role of data in evidence-based governance; types and sources of data; overview of descriptive vs. inferential statistics.

Week 2: –3 **Measurement in Policy Research**
Concepts of validity, reliability, and measurement error; examples from governance and public health indicators; hands-on exercises in Excel/Stata.

Week 3: Descriptive Statistics & Visualization
Frequency distributions, histograms, bar charts; communicating findings effectively for policymakers.

Week 4: –5 **Central Tendency & Dispersion**
Mean, median, mode; variance, standard deviation; interpreting inequality and disparities in income, education, and health.

Week 5: Patterns in Data & Policy Implications
Cross-tabulations, percentages, and rates; comparing sub-groups (urban vs. rural, gender gaps); introduction to official datasets (PSLM, HIES, DHS).

Week 6: –7 **Probability Foundations for Policy Analysis**
Basic probability, normal distribution, z-scores; interpreting risks and probabilities in public health, environment, and education.

— Midterm Exam (end of Week 7) —

Part II: Inferential Statistics (Weeks 8–16)

Week 8: Introduction to Inferential Statistics
Sampling, estimation, confidence intervals; implications of sample size for survey-based policy research.

Week 9: Hypothesis Testing Basics
Null and alternative hypotheses; significance levels; one-sample and two-sample tests with public policy data.

Week 10: Comparing Groups in Policy Research
t-tests, chi-square tests; applications to program participation, health outcomes, and education performance.

Week 11: Correlation & Simple Regression
Relationships between variables; interpreting scatterplots; examples from governance datasets.

Week 12: Multiple Regression Analysis
Understanding coefficients, model fit, and assumptions; case studies (determinants of poverty, tax compliance).

Week 13: Model Assumptions & Diagnostics
Linearity, multicollinearity, heteroskedasticity; interpreting results cautiously for policy recommendations.

Week 14: Policy Evaluation Methods
Introduction to causal inference; Difference-in-Differences, Randomized Control Trials (RCTs) overview; application examples.

Week 15: Student Research Project Presentations
Students present findings from applied policy data analysis projects.

Week 16: Wrap-up & Final Exam Preparation

Research Project

Each student (or group) will conduct a small empirical research project using real-world data (e.g., PSLM, DHS, World Bank). The project should address a public policy question, apply statistical methods taught in class, and present findings in a professional research report (05 pages max) and class presentation.