

Quantitative Research Methods with Replication

Course Level	Undergraduate
Subject	Research Methods or Statistics
Duration	7 weeks (2 sessions per week, 2 hours each session)
Replication Focus	A well-documented original study utilizing both OLS regression, and logistic regression.

Objectives

- Understand the concept of replication and its significance in scientific research.
- Analyze prepared data using ANOVA, OLS regression, and logistic regression.
- Critically evaluate outcomes and implications of their findings.
- Present and discuss the findings in the context of the original study.

Materials Needed

- Access to the prepared dataset (provided by the instructor).
- Computers or tablets with data analysis software (e.g., SPSS, R, STATA).
- Access to the original study's article for reference.

WEEK 1

Introduction to Replication and Study Overview

Session 1 · Understanding Replication

1

Lecture

- Define replication in research and explain its importance.
- Discuss the replication crisis and notable examples in various fields.

2

Group Discussion

- Discuss why some studies fail to replicate and the implications for scientific credibility.
- Explore the importance of methodological rigor in research.

Session 2 · Workshop on the Selected Study

1

Introduction to the Original Study

- Guide groups to discuss the selected study, including its theoretical argument(s), hypothesis, methodology, and key findings.

2

Data Overview

- Introduce the prepared dataset, explaining its structure and variables relevant to the original study.
- Discuss how data preparation supports the replication process.

3

Group Activity: Formulating Research Questions

- In small groups, students formulate specific research questions based on the original study and the prepared dataset.

Session 3 · Data Collection and Preparation

- 1 Tutorial: Data Collection Principles
 - Discuss the principles of data collection, including sampling methods, reliability, and validity.
- 2 Hands-On Activity: Data Preparation
 - Provide students with a tutorial on cleaning and preparing data for analysis (e.g., handling missing values, outlier detection).
 - Use the prepared dataset to demonstrate data cleaning techniques.
 - Allow students to practice these techniques in their small groups, applying what they learned to the prepared dataset.

Session 4 · Analyzing the Dataset with Descriptive Statistics

- 3 Introduction to Descriptive Statistics
 - Briefly review the purpose of descriptive statistics in data analysis.
 - Discuss key measures: mean, median, mode, standard deviation, and range.
 - Explain how these statistics provide a summary of the data and insight into its distribution.
- 4 Hands-On Activity: Conducting Descriptive Analysis
 - Group Work: In their assigned groups, students will perform the following:
 - Load the prepared dataset into their chosen statistical software (e.g., SPSS, R, STATA).
 - Calculate key descriptive statistics: mean, median, standard deviation, range (continuous); frequency tables and percentages (categorical).
 - Create visualizations such as histograms and bar charts.
 - Support: Provide guidance on how to execute these analyses in the statistical software and assist with any technical questions.
- 5 Wrap-Up Discussion: Insights from Descriptive Analysis (30 min)
 - Each group shares their findings, focusing on key statistics, notable trends, and comparisons with expectations based on the original study.
 - Discuss how descriptive statistics inform the understanding of the dataset and set the stage for subsequent inferential analyses (ANOVA, OLS, logistic regression).
 - Discuss how proper data preparation impacts the quality of the analysis and the validity of the results.

WEEK 3

OLS Regression Analysis

Session 5 · Introduction to OLS Regression

- 1 Lecture: OLS Regression Fundamentals
 - Introduce the fundamentals of OLS regression, including model assumptions and interpretation of coefficients.
- 2 Guided Practice: Checking Assumptions
 - Walk students through checking assumptions of OLS regression (e.g., linearity, normality of residuals).
- 3 Group Work: Preparing for OLS Analysis
 - Groups prepare to conduct OLS regression by defining the dependent and independent variables based on the original study.
- 4 Wrap-Up Discussion (10 min)
 - Discuss how OLS regression complements the ANOVA findings.

Session 6 · Conducting OLS Regression

- 1 Group Activity: Performing OLS Regression
 - Groups conduct OLS regression analysis on the dataset, focusing on relationships between the identified variables.
 - Support students in interpreting the regression output, including coefficients, R-squared, and p-values.
- 2 Discussion: Comparing Findings
 - Groups present their OLS regression findings and compare them with the original study's conclusions.
- 3 Assignment: OLS Results Summary
 - Groups submit a brief report summarizing their OLS regression results and interpretations.

WEEK 4

Logistic Regression Analysis

Session 7 · Introduction to Logistic Regression

- 1 Lecture: Understanding Logistic Regression
 - Explain the purpose of logistic regression for binary outcomes and the interpretation of odds ratios.
- 2 Group Discussion: Formulating Logistic Hypotheses
 - Groups formulate hypotheses related to the binary outcome of interest from the original study.
- 3 Logistic Regression Preparation
 - Guide students in preparing for logistic regression analysis, including identifying predictor variables.
- 4 Wrap-Up Discussion
 - Discuss how logistic regression expands their understanding of the study outcomes.

Session 8 · Conducting Logistic Regression

- 1 Group Activity: Performing Logistic Regression
 - Groups conduct logistic regression analysis on the dataset, focusing on predicting the binary outcome.
 - Provide support in interpreting results, including odds ratios and model fit statistics.
- 2 Discussion: Findings Reflection
 - Each group presents their logistic regression findings and discusses any significant insights gained.
- 3 Assignment: Logistic Regression Summary
 - Groups submit a report summarizing their logistic regression findings and interpretations.

Session 9 · Introduction to Robustness in Statistical Analysis

- 1 Lecture: Importance of Robustness Checks
 - Introduce robustness in the context of regression analysis. Explain why verifying results across different specifications and assumptions is essential.
- 2 Workshop: Robustness Checks for ANOVA and OLS
 - Guide students in conducting robustness checks on their ANOVA and OLS regression results, including alternative model specifications and sensitivity analyses (e.g., examining the impact of outliers).
- 3 Wrap-Up Discussion: Insights Gained
 - Groups discuss the implications of their robustness checks on the reliability of their findings.

Session 10 · Robustness for Logistic Regression

- 1 Discussion: Robustness in Logistic Regression
 - Discuss techniques for testing robustness in logistic regression, such as recalibrating the model with different variables.
- 2 Group Activity: Conducting Robustness Checks
 - Groups perform robustness checks on their logistic regression results, examining how these checks impact conclusions.
- 3 Discussion: Key Takeaways
 - Each group shares their findings from the robustness checks and reflects on the overall replication process.

Session 9 · Introduction to Robustness Checks Using ANOVA

- 1 Lecture: Theory and Application of ANOVA
 - Review the fundamentals of ANOVA, including types of ANOVA (one-way and two-way), assumptions (normality, homogeneity of variance), and interpretation of results (F-values, p-values).
 - Discuss how ANOVA relates to OLS regression analysis by assessing whether the means of different groups are significantly different.
- 2 Group Discussion: Identifying Relevant Variables
 - Have students discuss in groups which independent variables from their OLS regression could be tested using ANOVA, and how group differences could provide additional insights into their regression findings.
 - Each group prepares a brief summary of their proposed ANOVA analysis related to their OLS results.

Session 10 · Conducting ANOVA as a Robustness Check

- 1 Hands-On Activity: Setting Up ANOVA Analysis
 - Guide students in preparing for their ANOVA analysis: identifying the dependent and independent variables, and choosing the appropriate type of ANOVA (one-way or two-way) based on their research questions.
- 2 Conducting the ANOVA Analysis
 - In their groups, students load the prepared dataset into their statistical software, conduct the ANOVA analysis, and record the output, including F-values and p-values.
- 3 Interpreting ANOVA Results
 - Guide students through interpreting their ANOVA output: assessing statistical significance, discussing implications relative to OLS regression results, and identifying group differences that support or contradict initial OLS findings.
- 4 Wrap-Up Discussion: Insights and Implications
 - Each group presents their ANOVA findings, focusing on key results, new insights not evident in the regression analysis, and implications for their understanding of the original study and replication efforts.

WEEK 7

Preparing the Final Presentation

Session 11 · Presentation Workshop

- 1 **Drafting Presentations**
 - Groups draft a presentation summarizing their replication study, including background and rationale, methodology (ANOVA, OLS, logistic regression), key findings and robustness checks, and implications of their findings compared to the original study.
 - Provide guidelines on effective presentation techniques.
- 2 **Peer Feedback Session**
 - Groups present their drafts to another group for feedback, focusing on clarity, depth of understanding, and the presentation of statistical results.
- 3 **Wrap-Up Discussion: Addressing Feedback**
 - Allow groups time to address feedback received and refine their presentations.

Session 12 · Final Preparations and Q&A

- 1 **Instructor Q&A (30 min)**
 - Hold a session where groups can ask the instructor any final questions about their analyses or presentations.
- 2 **Final Rehearsals (60 min)**
 - Groups conduct a final rehearsal of their presentations, focusing on timing, clarity, and engagement.
- 3 **Assignment Reminder (30 min)**
 - Remind students of the final report submission and any last-minute preparations needed for their presentations.

Session 13 · Workshop on Final Replication Report

1 Introduction to Report Writing

- Discuss the key components of a replication report:
- Title Page – Title of the study, authors, and affiliations.
- Abstract – A brief summary of the study’s objectives, methods, results, and conclusions.
- Introduction – Background information, the significance of the study, and research questions.
- Methodology – Detailed description of the replication process, including the original study’s design, data collection, and analysis methods.
- Results – Presentation of descriptive statistics, ANOVA, OLS, and logistic regression findings, with tables and figures as needed.
- Discussion – Interpretation of results, comparison with the original study, implications, and limitations.
- Conclusion – Summary of findings and recommendations for future research.

2 Group Work: Outlining Their Reports

- In their groups, students create a detailed outline for their replication report based on the components discussed.
- Encourage them to assign sections to group members to streamline the writing process.
- Provide guidance on how to ensure clarity and coherence in their writing.

3 Peer Review Activity

- Students exchange their outlines with another group for feedback.
- Each group reviews the other’s outline, providing constructive feedback on clarity, completeness, and logical flow.
- Afterward, groups reconvene to discuss the feedback received and consider revisions to their outlines.

Session 14 · Reflection and Course Wrap-Up

1 Reflection Assignment

- Discuss with students their experiences throughout the course, focusing on the challenges faced during the replication process, key takeaways regarding data analysis, robustness, and scientific rigor, and their thoughts on the significance of replication in advancing scientific knowledge.

2 Feedback Session

- Facilitate a session for students to provide feedback on the course structure, content, and their learning experiences.