Selecting a Valid Sample Size for Longitudinal and Multilevel Studies in Cancer Research: Software and Methods

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Outline

• Introduction
• Multilevel and longitudinal studies in cancer research
• GLIMMPSE power and sample size calculation
• Questions
Funding and Licensing

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SampleSizeShop Website

https://samplesizeshop.org
SampleSizeShop Resources

- Power and sample size software
- Power and sample size short course materials
- Webinars
- Tutorials
- Talks
- Type I error lookup table for cluster-randomized trials
- Cancer screening study bias correction software
- Related publications
GLIMMPSE

Start Your Study Design

Welcome to GLIMMPSE. The GLIMMPSE software calculates power and sample size for study designs with normally distributed outcomes. Select one of the options below to begin your power or sample size calculation.

- **Guided Study Design**: Build common study designs including ANOVA, ANCOVA, and regression with guidance from the study design wizard. This mode is designed for applied researchers including physicians, nurses, and other investigators.

- **Matrix Study Design**: Directly enter the matrices for the general linear model. This mode is designed for users with advanced statistical training.

- **Upload a Study Design**: If you have previously saved a study design from GLIMMPSE, you may upload it here. Click 'Upload a Study Design' to select your study design file.
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Longitudinal Studies

A longitudinal study evaluates a research question by analyzing two or more measurements on the same independent sampling unit over time.
Longitudinal Study Design

Start → Randomize Participant → Garden
   Month 0 Data → Month 6 Data → Month 12 Data
   Control
   Month 0 Data → Month 6 Data → Month 12 Data

Stop
Studies of Groups or Clusters

Levels of correlation:

Patients within clinics are correlated.
Cluster Randomized Study Design

Start

Randomize workplaces

Workplace program

Controls

Post treatment drinking rate

Stop
Multilevel Designs

Levels of correlation:
1. Clinics within hospitals.
2. Patients within clinics.

- Hospitals
  - Independent sampling unit
- Clinics
  - Level 1
- Patients
  - Level 2
Multilevel Study Design

Start → Randomize hospitals → Smoking cessation program → Post treatment cessation rate

Controls → Post treatment cessation rate

Stop
Multilevel and Longitudinal Designs

- Longitudinal features induce correlations across time.
- Multilevel features induce correlations within levels, also known as groups or clusters.
Multilevel Feature

Randomize
Schools

School 1
Classroom 1
Student 1

Classroom n₁
Student n₁

School 61
Classroom 1
Student 1

Classroom n₆₁
Student kₙ₆₁
Longitudinal Feature

Start

Randomize School

Treatment

Control

6th Grade Data

7th Grade Data

8th Grade Data

Stop
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Create a Study Design

Start Your Study Design

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Main Application Screen

Introduction

The GLIMMPSE wizard will guide you through several steps to design your study.

Click on each item in the left navigation bar to describe each component of your study. We will ask you to specify:

- Whether you wish to calculate power or sample size
- The model for your design, including predictor and response variables
- The primary study hypothesis of interest
- Choices for group means
- Choices for standard deviations and correlations for study outcomes

Tools for saving your work, uploading an existing design, or clearing your design appear at the upper right of the screen. The help manual is can be accessed under the "Help" menu on the top navigation bar.

Select the "Start" menu to begin.
Repeated Measures

- Dimension (Repeated Measure 1)
  - month

- Type
  - Numeric

- Number of measurements
  - 3

- Spacing
  - 18
  - 27
  - 39

Buttons:
- Add Repeated Measure
- Remove Repeated Measure
- Clear All
Accounting for Uncertainty

![Power vs Mean Difference Graph]

- **Power**
- **Mean Difference**

- **0.90**

- Variance x 0.5
- Variance x 1
- Variance x 2
## GLIMMPSE Results

### Power Results

<table>
<thead>
<tr>
<th>Power</th>
<th>Total Sample Size</th>
<th>Means Scale Factor</th>
<th>Variability Scale Factor</th>
<th>Test</th>
<th>Type I Error Rate</th>
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Publications

Link to Publications
Questions?