

# Summarizing Your Design

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## Learning Objectives

Introduce **GLIMMPSE** software.

Illustrate how to use GLIMMPSE to summarize a study design.

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## This course provides instruction in the use of **GLIMMPSE** for power and sample size calculation

Recall, GLIMMPSE is a free, point-and-click open-source software package that enables power and sample size calculation for multilevel and longitudinal studies.

Kreidler et al., 2013  
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**GLIMMPSE is available in a variety of formats**

Available via standard web browsers and mobile devices at

**GLIMMPSE. SampleSizeShop.org**

Kreidler et al., 2013

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**USING GLIMMPSE**

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**First, visit the GLIMMPSE home page and select 'Guided Study Design'**

**GLIMMPSE. SampleSizeShop.org**



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**From the 'Start' menu, indicate what you are interested in calculating**

Calculate

Start

Solving For

Desired Power

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**You may calculate the power that can be achieved given known limitations on recruitment**

Power

Sample Size

Remember, power and sample size calculations must be done before a study is conducted.

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**Alternatively, you may calculate the sample size required to attain a desired level of power**

Power

Sample Size

This option is useful in planning studies with few restrictions on recruitment.

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**GLIMMPSE will then require specifying five characteristics of the study design**

1. Clustering
2. Predictors
3. Is there a covariate?
4. Response variables
5. Repeated measures

Model	
Clustering	✓
Predictors and Groups	✓
Covariate	✓
Response Variables	✓
Repeated Measures	✓
Group Sizes	✓

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**1. Clustering**

Indicate whether the units of observation in your study are grouped into clusters.

What term would you like to use for a participant in the study? (For example, student.)

participant

Add Clustering Level Remove Clustering Level Remove Clustering

Clustering level 1 name

Enter a name

Number of participants in each CL1

Enter a number

Intraclass correlation

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**2. Predictors**

Type in the category values of each predictor variable.  
For example:

Predictors

Enter predictor name

Treatment ✕

Values for 'Treatment'

Enter value for 'Treatment'

SensoryFocus ✕

StandardOfCare ✕

Press Enter.

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### 2. Predictors

Indicate whether the groups assigned to each level of the predictor variable are of equal size.

**Model**

Clustering

Predictors and Groups

Covariate

Response Variables

Repeated Measures

**Group Sizes**

**Example:**

Treatment	Relative Group Size
SensoryFocus	1
StandardOfCare	1

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### 2. Predictors

If solving for **power**, indicate the number of participants or groups of participants that will be recruited in the smallest subgroup.

**Smallest Group Size**

Enter a sample size value

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### 3. Is there a covariate?

Under the 'Model' menu, indicate if you would like to control for a single normally distributed covariate.

**Model**

Clustering

Predictors and Groups

**Covariate**

Control for a single, normally distributed predictor.

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### 3. A covariate

GLIMMPSE cannot currently calculate power for many normally or any non-normally distributed covariates.

Glueck and Muller (2003) described an approximate method of adjustment.

Ignoring useful covariates gives conservative power.

Control for a single, normally distributed predictor.

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### 4. Response variables

GLIMMPSE can accommodate multiple response variables in a single analysis

Response Variable Name

Response Variable 4

Response Variable 1 x

Response Variable 2 x

Response Variable 3 x

You may prefer multiple univariate analyses.

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### 5. Repeated measures

Specify up to three levels of repeated measures.

Dimension (Repeated Measure 1)

HalfYear

Add Repeated Measure Remove Repeated Measure Clear All

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**5. Repeated measures**

Classify the repeated measures (label) type.

Type	Example
Numeric	BMI over time
Ordinal	Hardness of cement
Categorical	Right arm, left arm

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**5. Repeated measures**

**Why do we care about the type?**

The type of repeated measures affects what type of hypothesis is appropriate and appealing to test.

For example:

- Trends test for continuous type.
- MANOVA for categorical type.

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**5. Repeated measures**

Indicate number and spacing of repeated measurements.

Example:

Three measurements at months 3, 6, and 9.

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**PRACTICE**

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**For practice, we will summarize the designs of our example studies**

Single level  
 Longitudinal  
 Multilevel  
 Multilevel longitudinal

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**For each study, we will identify the following characteristics required by GLIMMSE**

- 1. Clustering**
- 2. Predictors**
- 3. Is there a covariate?**
- 4. Response variables**
- 5. Repeated measures**

Model	
Clustering	✎
Predictors and Groups	✔
Covariate	✔
Response Variables	✔
Repeated Measures	✔
Group Sizes	✔

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## PRACTICE: SINGLE LEVEL STUDY

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### Vignette

A single level study examined the efficacy of a workplace training program to reduce alcohol consumption. Researchers randomized workplaces to two treatment groups. The first treatment included a workplace training program and the second treatment included no training. Post-treatment drinking rate for each worker was measured as the outcome of interest.

Adapted from Reynolds et al., 2015

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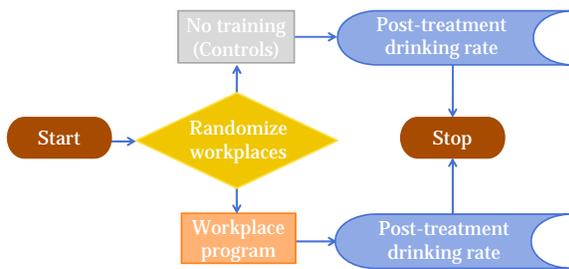
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### Single level study



Adapted from Reynolds et al., 2015

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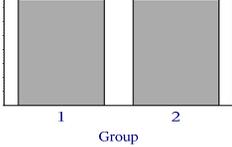
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**Single level study**

**Null hypothesis:**

There is **no difference** in post-treatment drinking rates between workers who receive no training and workers who receive the workplace program.



Adapted from Reynolds et al., 2015

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**Single level study**

**Independent sampling unit (ISU):** Workplace

**Between-independent sampling unit factor:** Intervention (standard of care or workplace drinking program)

**Within-independent sampling unit factor:** Worker within a workplace

Adapted from Reynolds et al., 2015

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**Single level study**

**Level(s):** One level consisting of workers in a workplace

**Unit of observation:** Drinking rate for each employee after treatment

Adapted from Reynolds et al., 2015

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**Statistical modeling terminology:  
Single level study**

**Clustering:** Workers within the workplace

**Predictors:** Exposure to workplace  
substance abuse prevention program

**Covariates:** None

Adapted from Reynolds et al., 2015

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**Statistical modeling terminology:  
Single level study**

**Response variable:** Rate of drinking  
alcohol

**Repeated Measures:** None

Adapted from Reynolds et al., 2015

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**LONGITUDINAL STUDY**

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**Vignette**

Researchers conducted a study to determine if dental patients who are instructed to use a sensory focus have a different pattern of long-term memory of pain than participants who did not. Participants were selected and randomly assigned to either intervention or no intervention.

Logan, Baron and Kohout, 1995

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**Vignette**

Those in the intervention group listened to automated audio instructions to pay close attention only to the physical sensations in their mouth. Patients in the no intervention group listened to automated audio instruction on a neutral topic to control for media and attention effects.

Logan, Baron and Kohout, 1995

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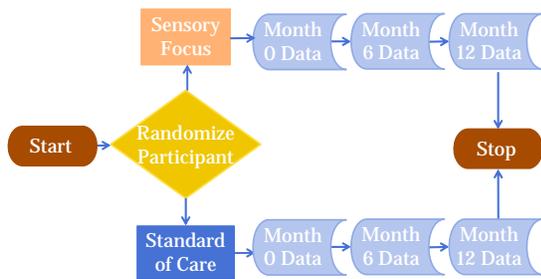
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**Longitudinal study**



Logan, Baron and Kohout, 1995

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**Longitudinal study**

**Null hypothesis:**

Participants receiving the sensory focus treatment experience the same pattern of pain over time as participants receiving the standard of care treatment.

Logan, Baron and Kohout, 1995

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**Longitudinal study**

**Independent sampling unit (ISU):** Patient

**Unit of observation:** Patient perceived pain at a specific time

**Within-ISU factor:** Time

**Between-ISU factor:** Treatment assignment to standard of care or sensory focus

Logan, Baron and Kohout, 1995

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**Statistical modeling terminology:  
Longitudinal study**

**Response variables:** Perceived pain

**Repeated measures:** Three equally spaced measurements at months 0, 6 and 12

Logan, Baron and Kohout, 1995

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**Statistical modeling terminology:  
Longitudinal study**

**Clustering:** None

**Predictors:** Treatment group (sensory focus or standard of care)

**Covariate:** None

Logan, Baron and Kohout, 1995

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**PRACTICE: MULTILEVEL  
STUDY**

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**Vignette**

Researchers conducted a trial to evaluate the effectiveness of a web-based literacy intervention called ABRACADABRA (ABRA). The study included 24 classrooms within 12 elementary schools within a single school district. Researchers assumed that schools within the district were under local control and were therefore independent.

Adapted from Piquette et al., 2014

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**Vignette**

Schools were randomized into the intervention group or the control group. Change in literacy was evaluated using pre- and post-tests to determine whether ABRA technology significantly improved literacy in elementary school children.

Adapted from Piquette et al., 2014

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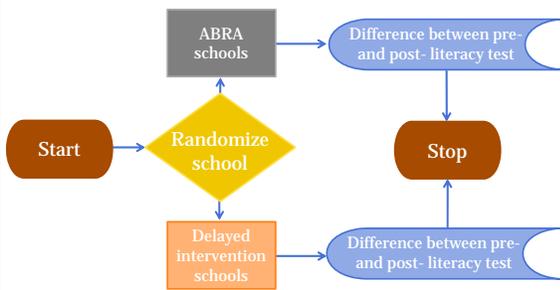
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**Multilevel study**



Adapted from Piquette et al., 2014

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**Multilevel study**

**Null hypothesis:**

There is no significant difference in literacy between elementary students in the intervention group and those in the control group.

Adapted from Piquette et al., 2014

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**Multilevel study**

**Levels of correlation:** Classrooms within each school, students within each classroom

**Independent sampling unit (ISU):** School

**Unit of observation:** Difference between pre- and post-test performance

Adapted from Piquette et al., 2014

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**Multilevel study**

**Between-ISU factor:** Randomization group

**Within-ISU factors:** Classroom, child

Adapted from Piquette et al., 2014

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**Statistical modeling terminology:  
Multilevel study**

**Clustering:** Classrooms within each school, students within each classroom

**Predictors:** Study condition (ABRACADABRA or delayed intervention)

**Covariates:** None

Adapted from Piquette et al., 2014

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**Statistical modeling terminology:**  
**Multilevel study**

**Response variable:** Difference between pre- and post-test scores

**Repeated measures:** None

Adapted from Piquette et al., 2014

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**PRACTICE: MULTILEVEL  
LONGITUDINAL STUDY**

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**Vignette**

Researchers conducted a group-randomized, multilevel longitudinal study to test the effectiveness of a preventive alcohol use intervention. The study focused on urban, low-income, and multi-ethnic populations.

Komro et al., (2008)

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**Vignette**

Sixty-one schools were recruited. Schools were randomized into an intervention or control group. Students were surveyed at the end of 6<sup>th</sup> grade, 7<sup>th</sup> grade, and 8<sup>th</sup> grade to measure alcohol use.

Komro et al., 2008  
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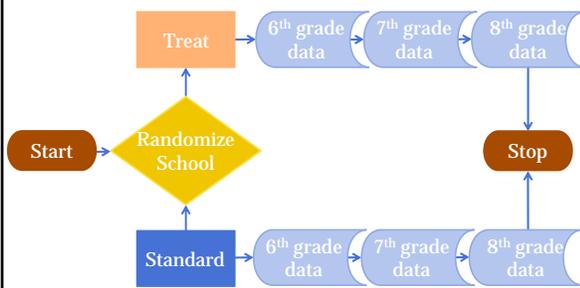
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**Clustering and longitudinal study**



Komro et al., (2008)  
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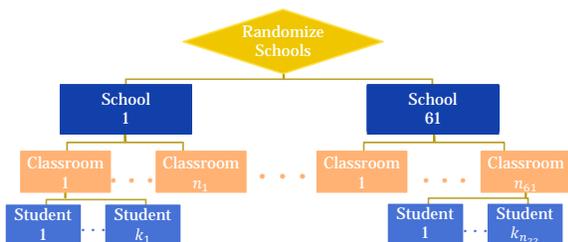
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**Multilevel longitudinal study**



Komro et al., 2008  
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**Multilevel longitudinal study**

**Null hypothesis:**

There is no significant difference in the pattern of alcohol use across time between schools that receive the standard of care and schools that receive the intervention.

Komro et al., (2008)

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**Multilevel longitudinal study**

**Independent sampling unit (ISU):** School

**Unit of observation:** Student alcohol use measured at one point in time

**Within-ISU factor:** Time

**Between-ISU factor:** Intervention group

Komro et al., (2008)

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**Statistical modeling terminology:  
Multilevel longitudinal study**

**Clustering:** Students within each classroom, classrooms within each school

**Predictor:** Study condition (intervention group or control group)

**Covariate:** None

Komro et al., (2008)

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**Statistical modeling terminology:**  
**Multilevel longitudinal study**

**Response variables:** Alcohol use scores

**Repeated measures:** Grade level (6<sup>th</sup> grade, 7<sup>th</sup> grade, 8<sup>th</sup> grade)

Komro et al., (2008)  
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**REVIEW OF LEARNING OBJECTIVES**

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**What five characteristics should be used to summarize a study design?**

- 1. Clustering**
- 2. Predictors**
- 3. Is there a covariate?**
- 4. Response variables**
- 5. Repeated measures**

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