

# Confidence intervals and replicability

8 October 2021

*Modern Research Methods*

# Feedback on Roderick's guest lecture

- Survey anonymous, voluntary, and confidential
- Administered by the Eberly Center
- Please complete by October 10

# Lab today

- Common errors from previous assignment
- Introduce Assignment 5 dataset
- Make class study guide for confidence intervals

## Exercise 5

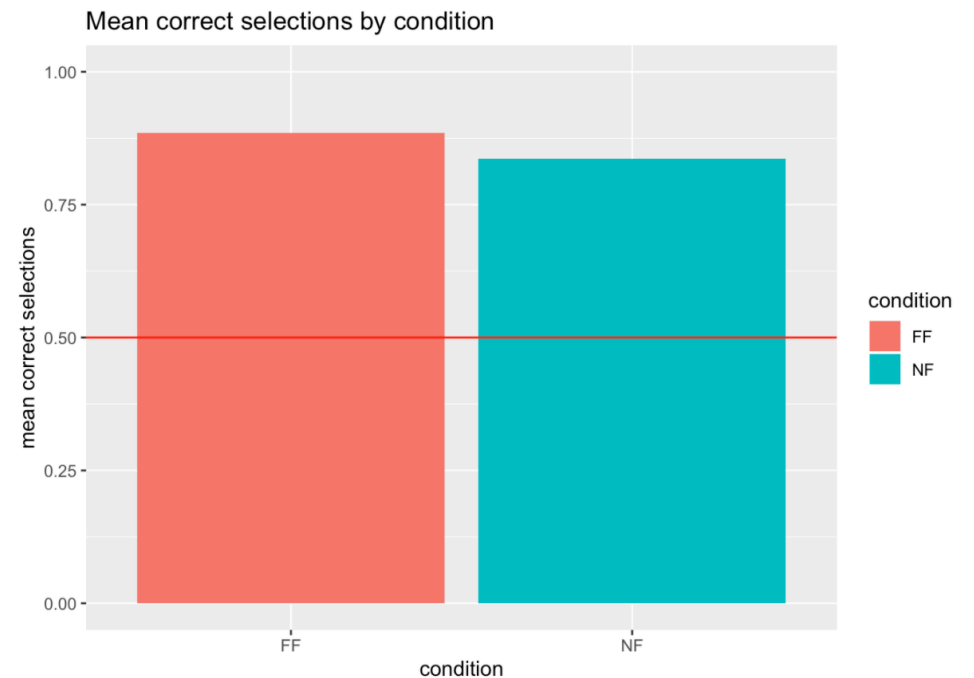
Use the `subject_means` data frame to calculate the mean correct by condition. Plot the result as a bar plot. Include the following things:

- a y-axis that scales from 0 to 1 (use `ylim`).
- each condition as a different fill
- an appropriate title
- appropriate x- and y-axis labels
- a red horizontal line indicating chance performance (use `geom_hline()`; `geom_hline` takes one parameter, `yintercept`).

Which condition are children better at?

```
overall_means <- subject_means %>%  
  group_by(condition) %>%  
  summarize(mean_correct = mean(prop_correct))
```

```
ggplot(overall_means, aes(x = condition, y = mean_correct, fill = condition)) +  
  ggtitle("Mean correct selections by condition") +  
  geom_bar(stat = "identity") +  
  ylab("mean correct selections") +  
  ylim(0,1) +  
  geom_hline(yintercept = .5, color = "red")
```



**Exercise 12**

Recreate the plot below, where each point corresponds to an individual child.

```
subject_means_with_years_months <- me_data %>%
  filter(condition == "FF") %>%
  group_by(sub_id, age_months, vocabulary_score) %>%
  summarize(prop_correct = sum(correct)/n())
```

## `summarise()` has grouped output by 'sub\_id', 'age\_months'. You can override this.

```
data_for_faceting <- pivot_longer(subject_means_with_years_months, cols = 2:4)

ggplot(data_for_faceting, aes(x=value, y = prop_correct)) +
  geom_point() +
  geom_smooth(method = "lm") +
  facet_wrap(~name, scales = "free") +
  labs(title = "Mean proportion correct on familiar-familiar trials",
       subtitle = "Predicted by age (left) and vocabulary score (right)")
```

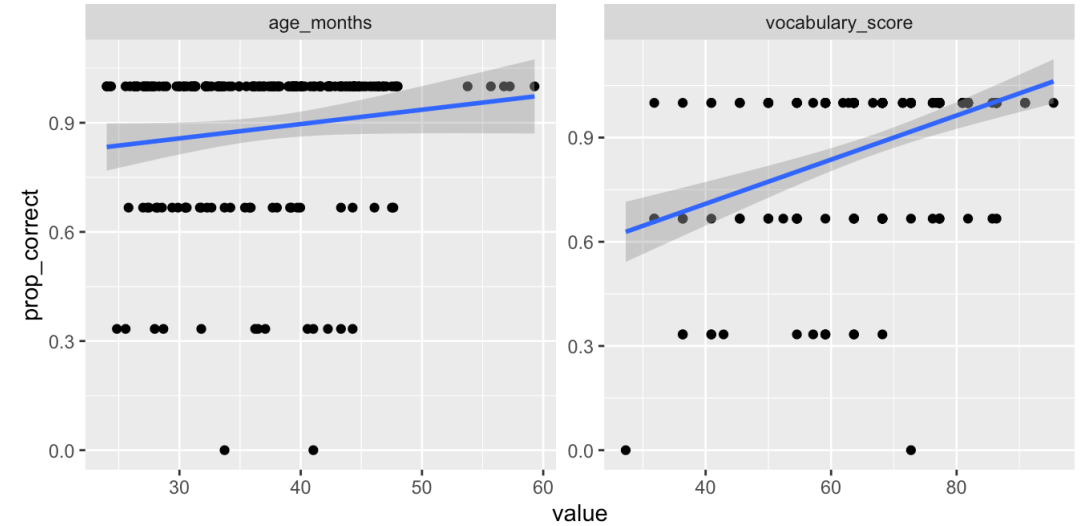
```
head(subject_means_with_years_months)
```

```
## # A tibble: 6 × 4
## # Groups:   sub_id, age_months [6]
##   sub_id age_months vocabulary_score prop_correct
##   <dbl>   <dbl>         <dbl>         <dbl>
## 1     1     47.0           72.7           1
## 2     2     30.4           59.1           1
## 3     3     41.6           77.3           1
## 4     4     41.5           72.7           1
## 5     5     42.4           68.2           1
## 6     6     32.3           63.6           0.667
```

```
head(data_for_faceting)
```

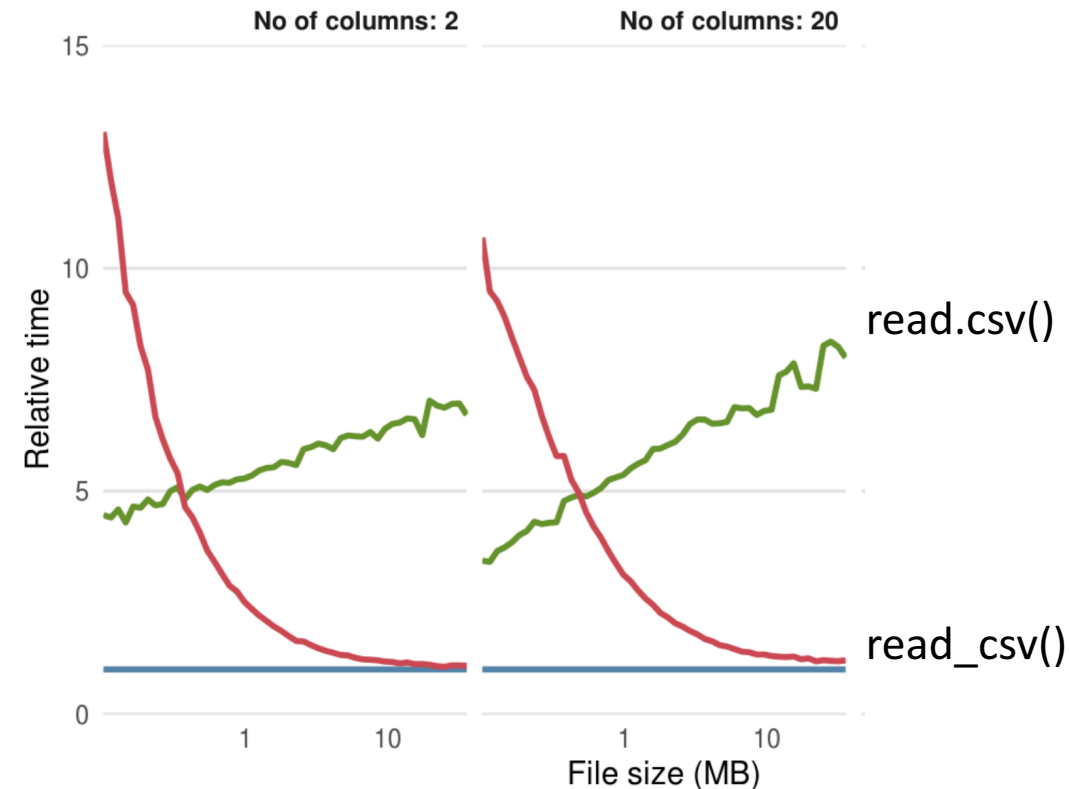
```
## # A tibble: 6 × 4
## # Groups:   sub_id [3]
##   sub_id prop_correct name          value
##   <dbl>     <dbl> <chr>         <dbl>
## 1     1         1     1 age_months    47.0
## 2     1         1     1 vocabulary_score 72.7
## 3     2         1     1 age_months    30.4
## 4     2         1     1 vocabulary_score 59.1
## 5     3         1     1 age_months    41.6
## 6     3         1     1 vocabulary_score 77.3
```

Mean proportion correct on familiar-familiar trials  
Predicted by age (left) and vocabulary score (right)



# Some other points of confusion

1. Use `read_csv()` rather than `read.csv()`
2. Headers
  - Space after `#` to correct format
  - Need blank line before so doesn't show up next to plot
  - Good 10 minute tutorial for markdown: <https://www.markdowntutorial.com/>
3. `Geom_histogram`, `binwidth`, `no`  
`stat= "identity"`

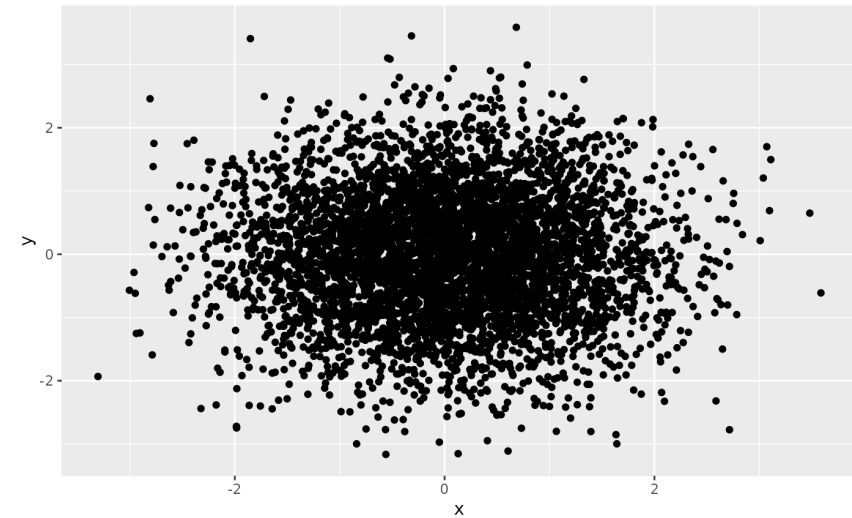


# Assignment 5

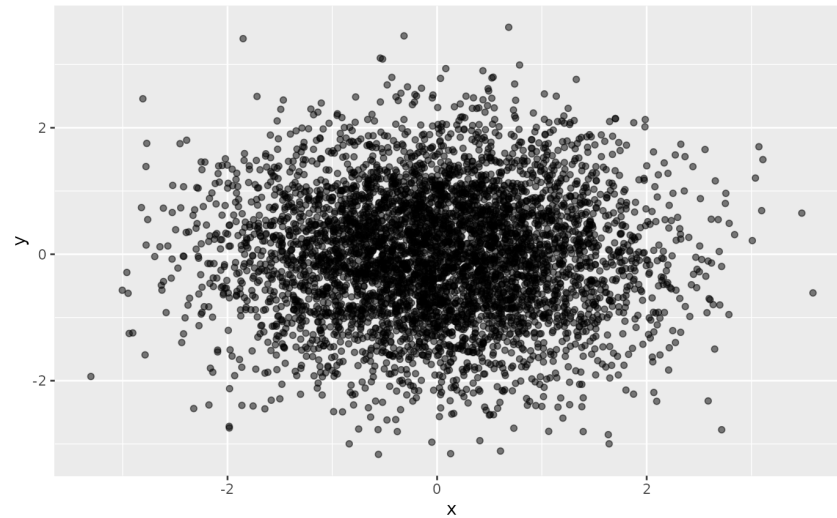
- Last assignment before midterm
- Focuses on estimating means from experimental data and quantifying uncertainty

# New aesthetic: alpha

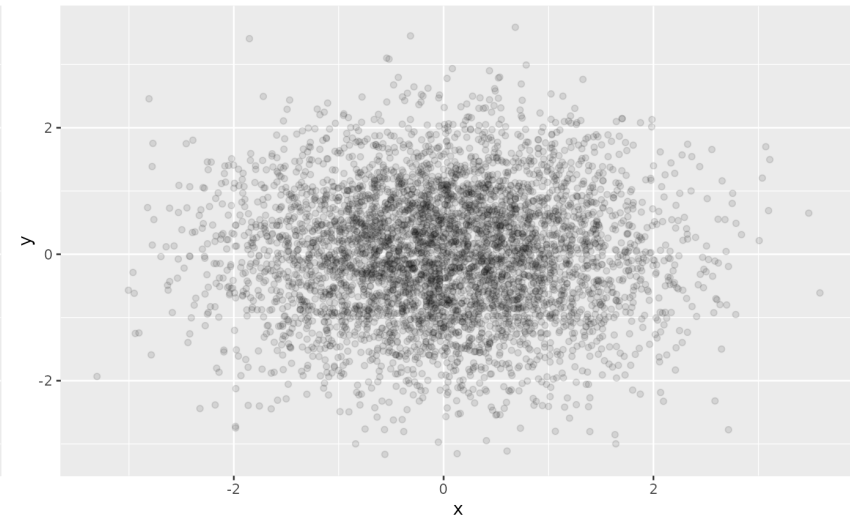
- Geom opacity
- Range from 0 to 1, with lower values corresponding to more transparent colors



`geom_point()`



`geom_point(alpha = .5)`



`geom_point(alpha = .1)`



	Original	Reproduction	Replication
Population			
Question			
Hypothesis			
Exp. Design			
Experimenter			
Data	01100 10110 11110	01100 10110 11110	01100 10110 11110
Analyst			
Code			
Estimate			
Claim			

## Original:

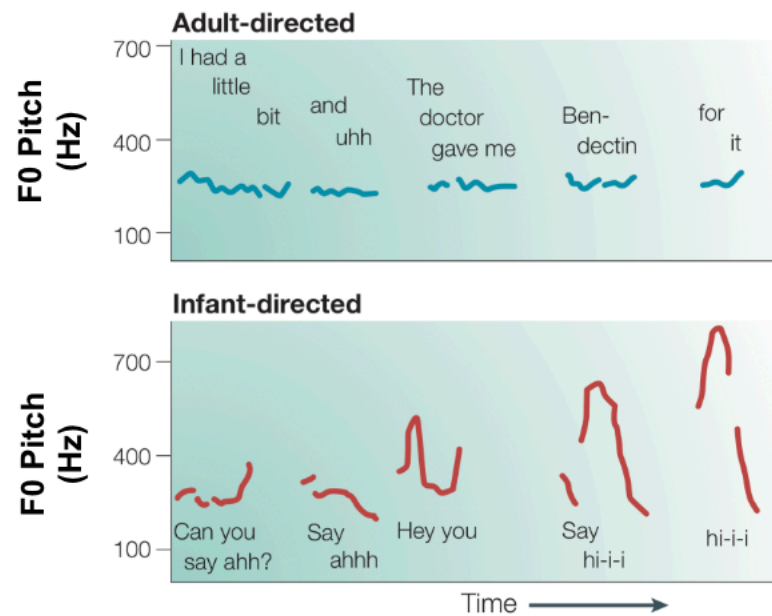
### Preference for Infant-directed Speech in the First Month after Birth

**Robin Panneton Cooper**

*Virginia Polytechnic Institute and State University*

**Richard N. Aslin**

*University of Rochester*

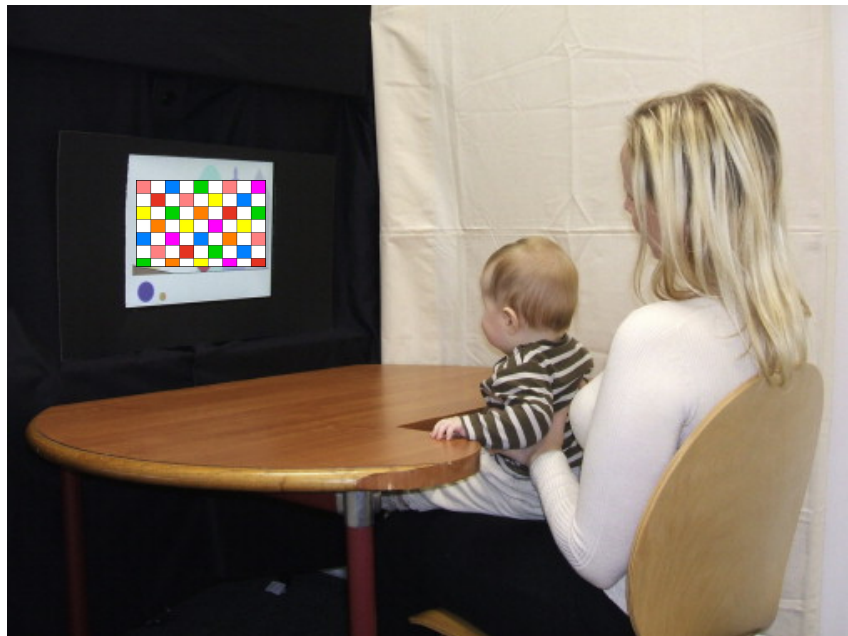
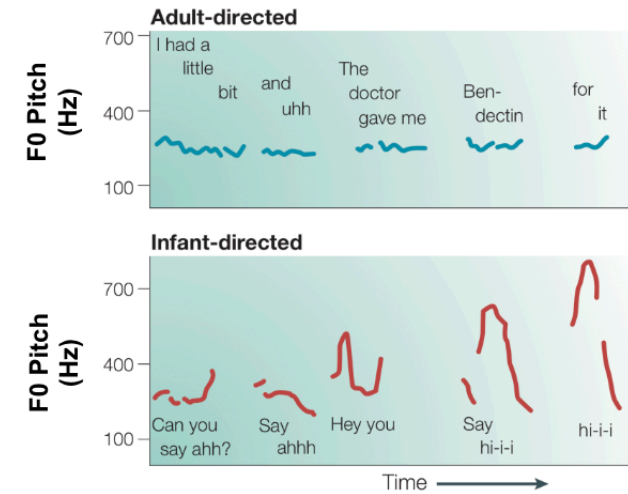


Shorter utterances,  
Higher, varied pitch,  
Longer pauses



# Cooper & Aslin (1990)

Do infants prefer IDS to ADS?



Source: Moll & Tomasello, 2010

**Dependent measure:**  
Looking time to checkerboard

**Independent variable:** ADS vs. IDS played in pairs of trials within subjects

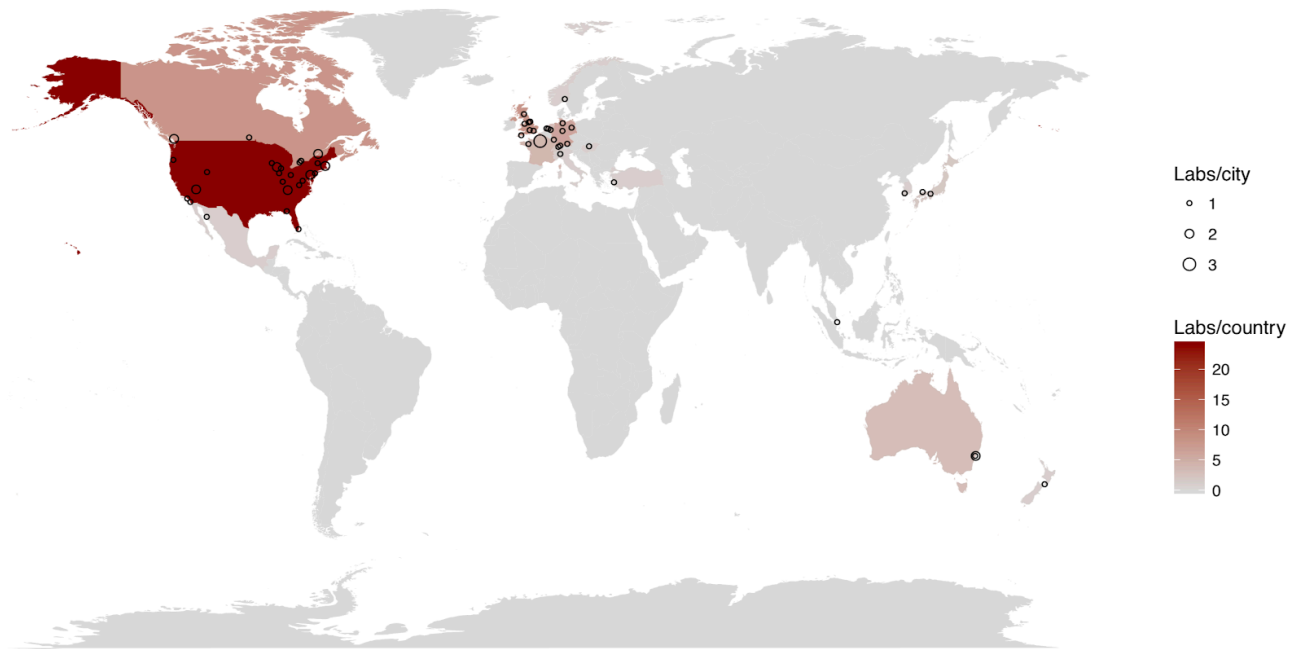


FIG. 2.—Mean looking times (in sec) of 1-month-old subjects from Experiment 1 (including standard errors); ID = infant-directed and AD = adult-directed.

# ManyBabies (2017)

- Multi-lab effort to replicate this effect ([paper](#))
- Each lab conducted their own replication of Cooper & Aslin (1990), with standardization of the paradigm across labs

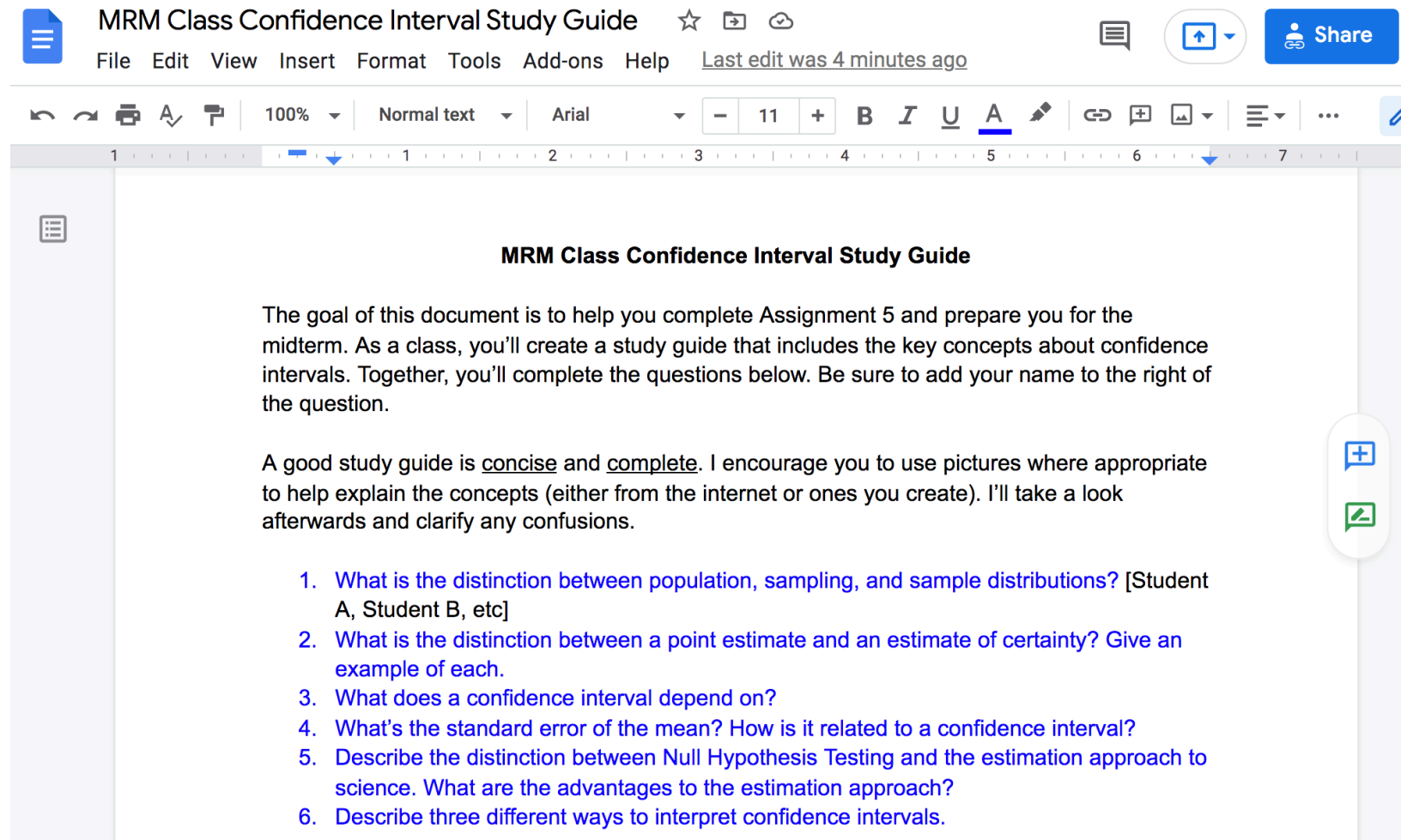
Geography of ManyBabies1 Labs



68 labs, 2773  
babies!

Assignment 5 includes data  
from 6 labs.

# Class CI study guide



The screenshot shows a Google Docs interface. At the top, the document title is "MRM Class Confidence Interval Study Guide". Below the title is a menu bar with options: File, Edit, View, Insert, Format, Tools, Add-ons, Help. To the right of the menu bar are icons for comments, a share button, and a "Share" button. Below the menu bar is a toolbar with various editing tools like undo, redo, bold, italic, underline, text color, background color, link, insert, and a pencil icon. The main content area of the document is visible, showing the title "MRM Class Confidence Interval Study Guide" centered. Below the title is a paragraph of text, followed by another paragraph, and then a numbered list of six questions. The questions are: 1. What is the distinction between population, sampling, and sample distributions? [Student A, Student B, etc] 2. What is the distinction between a point estimate and an estimate of certainty? Give an example of each. 3. What does a confidence interval depend on? 4. What's the standard error of the mean? How is it related to a confidence interval? 5. Describe the distinction between Null Hypothesis Testing and the estimation approach to science. What are the advantages to the estimation approach? 6. Describe three different ways to interpret confidence intervals.

**MRM Class Confidence Interval Study Guide**

The goal of this document is to help you complete Assignment 5 and prepare you for the midterm. As a class, you'll create a study guide that includes the key concepts about confidence intervals. Together, you'll complete the questions below. Be sure to add your name to the right of the question.

A good study guide is concise and complete. I encourage you to use pictures where appropriate to help explain the concepts (either from the internet or ones you create). I'll take a look afterwards and clarify any confusions.

1. What is the distinction between population, sampling, and sample distributions? [Student A, Student B, etc]
2. What is the distinction between a point estimate and an estimate of certainty? Give an example of each.
3. What does a confidence interval depend on?
4. What's the standard error of the mean? How is it related to a confidence interval?
5. Describe the distinction between Null Hypothesis Testing and the estimation approach to science. What are the advantages to the estimation approach?
6. Describe three different ways to interpret confidence intervals.