

# Statistics with Recitation: TA Session

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# Today's agenda

- 1 Hypothesis Testing: t-test
  - One-Sample t-test
  - Paired Sample t-test
  - Two Independent Sample t-test

# Today's Dataset

- Please download the three datasets from the OpenIntro website.
  - `china.csv`: Weekly time spent on child care in China.
  - `textbooks.csv`: Prices of textbooks for various courses at UCLA Bookstore and Amazon.com.
  - `ncbirths.csv`: A 2004 dataset from North Carolina on births, including mothers' habits and practices, with 1,000 cases.
- After that, import the data

```
china <- read.csv("data/china.csv")  
book <- read.csv("data/textbooks.csv")  
birth <- read.csv("data/ncbirths.csv")
```

# One-Sample t-test: `t.test()`

- **Syntax:**

```
t.test(data$variable, mu,  
       alternative, conf.level)
```

- **Example 1:**

```
china_male <- china %>% filter(gender == 1)  
t.test(china_male$child_care,  
       mu = 25,  
       conf.level = 0.95)
```

- Default value for parameter `alternative` is `"two.sided"`
  - Use `"less"` or `"greater"` for one-sided tests.

# One-Sample t-test: `t.test()`

- **Output:**

One Sample `t`-test

```
data: china_male$child_care
```

```
t = -13.232, df = 434, p-value < 2.2e-16
```

```
alternative hypothesis: true mean is not equal to 25
```

```
95 percent confidence interval:
```

```
-9.429757 -0.524266
```

```
sample estimates:
```

```
mean of x
```

```
-4.977011
```

# One-Sample t-test: `t.test()`

- **Example 2:**

```
t.test(china$child_care,  
       mu = 25,  
       alternative = "less",  
       conf.level = 0.95)
```

# One-Sample t-test: `t.test()`

- **Output:**

```
One Sample t-test

data:  china$child_care
t = -14.697, df = 1238, p-value < 2.2e-16

alternative hypothesis: true mean is less than 25

95 percent confidence interval:
 -Inf 5.249741

sample estimates:
mean of x
 2.758676
```

# Paired Sample t-test: `t.test()`

- **Syntax:**

```
t.test(data$var1, data$var2,  
       paired = TRUE, conf.level)
```

- **Example 1:**

```
t.test(book$ucla_new,  
       book$amaz_new,  
       paired = TRUE,  
       coef.level = 0.95)
```



# Paired Sample t-test: `t.test()`

- **Output:**

Paired t-test

data: book\$ucla\_new and book\$amaz\_new

t = 7.6488, df = 72, p-value = 6.928e-11

alternative hypothesis: true mean difference is not equal to 0

95 percent confidence interval:

9.435636 16.087652

sample estimates:

mean difference

12.76164

# Two Independent Sample t-test: `t.test()`

- **Syntax:**

```
t.test(data$ValueVar ~ data$GroupVar,  
       conf.level)
```

- **Example 1:**

```
t.test(birth$weight ~ birth$habit,  
       conf.level = 0.95)
```

# Two Independent Sample t-test: `t.test()`

- **Output:**

Welch Two Sample t-test

```
data:  birth$weight by birth$habit
```

```
t = 2.359, df = 171.32, p-value = 0.01945
```

alternative hypothesis: true difference in means between  
group nonsmoker and group smoker is not equal to 0

95 percent confidence interval:

0.05151165 0.57957328

sample estimates:

mean in group nonsmoker  
7.144273

mean in group smoker  
6.828730