

## Conducting a 1-sample t-test using RStudio

These instructions assume that you've already installed the necessary package and that you've imported and attached your data file.

To conduct a 1-sample t-test in Rstudio, you will use the following R command:

**`t.test(data, mu=?)`**

Where *data* is the name of the data set you are exploring and mu is the proposed population mean value to which the null hypothesis is compared.

Let's suppose that you have the following 10 observations in your sample of the lengths of Fiddlehead Ferns:

Fiddlehead Fern Lengths (cm)
4.3
5.2
4.8
5.1
4.7
5.3
4.9
5.0
5.2
5.1

Your research question is as follows:

*Is the mean length of Fiddlehead Ferns equal to 5?*

The following will be your hypotheses:

*Ho: The mean length of Fiddlehead Ferns is not equal to 5.*

*Ha: The mean length of Fiddlehead Ferns is equal to 5.*

Symbolically, this would be represented as follows:

$H_0: \mu \neq 5$

$H_a: \mu = 5$

Here's how you might input this array of data into R if it wasn't in a spreadsheet.

```
x <- c(4.3, 5.2, 4.8, 5.1, 4.7, 5.3, 4.9, 5.0, 5.2, 5.1)
```

Now we are ready to perform our 1-sample test to determine whether or not we should reject or fail to reject the null hypothesis. Input the following command into R:

```
t.test(x, mu = 5)
```

Upon executing the above command, you will see the following output:

#### **One Sample t-test**

```
data: x
t = -0.42321, df = 9, p-value = 0.6821
alternative hypothesis: true mean is not equal to 5
95 percent confidence interval:
 4.746189 5.173811
sample estimates:
mean of x
 4.96
```

Note that the p-value is 0.6821 which is greater than our alpha of .05. As such, we will fail to reject the null hypothesis meaning that there is not sufficient evidence to support our alternative hypothesis that the true mean is 5. Additionally, notice that the output also provides you with a t value, degrees of freedom (df), and the 95% confidence interval. Unless otherwise specified, the default will be a 95% confidence interval.

Let's now test to see if the true mean is less than 5.

$H_0: \mu \geq 5$

$H_a: \mu < 5$

Here's our new command for R:

```
t.test(x, alternative="less", mu = 5)
```

This will be the output from this t-test:

### **One Sample t-test**

```
data: x
t = -0.42321, df = 9, p-value = 0.341
alternative hypothesis: true mean is less than 5
95 percent confidence interval:
  -Inf 5.133259
sample estimates:
mean of x
  4.96
```

If we wanted to test whether or not the true mean is greater than 5, we would use the following:

```
t.test(x, alternative="greate", mu = 5)
```

Here's the corresponding output:

### **One Sample t-test**

```
data: x
t = -0.42321, df = 9, p-value = 0.659
alternative hypothesis: true mean is greater than 5
95 percent confidence interval:
  4.786741   Inf
sample estimates:
mean of x
  4.96
```