**Generally useful symbols**

1. Single mean

* Population/true/underlying mean, *µ*
* Population/true/underlying standard deviation, *σ*
* Sample mean, 
* Sample standard deviation,  or  or *s*

2. Single proportion

* Population proportion, *p*
* Sample proportion, 

3. Difference between two means

* Difference in means – parameter: *µ*1 – *µ*2
* Difference in means – estimate: 

4. Difference between two proportions:

* Difference in proportions – parameter: *p*1 – *p*2
* Difference in proportions – estimate: 

**Useful stuff for *Normality-based Confidence Intervals* (Chapter 6)
AND
*Hypothesis Testing* (Chapter 7)**

Confidence interval: *estimate* ± *t* ×se(*estimate*)

* There are four different types of problem we will consider:

 1. Single mean 2. Single proportion 3. Difference between two means

 4. Difference between two proportions:

Situation (a) ***Proportions from two independent samples***

Situation (b) ***One sample of size n, several response categories***

Situation (c) ***One sample of size n, many yes/no items***

* The **estimate** is based on the **parameter** of interest we are investigating:

|  |  |
| --- | --- |
| **Parameter** | **Estimate** |
| 1. Single mean ***µ***: |  |
| 2. Single proportion ***p***: |  |
| 3. Difference between two means ***µ*1** **– *µ*2**:(independent samples) |  |
| 4. Difference between two proportions ***p*1 – *p*2** : |  |

* The ***t*-multiplier** is based on:
* Whether we are investigating means or proportions
* The desired level of confidence
* The degrees of freedom

|  |  |
| --- | --- |
| **Estimate**  | **Degrees of Freedom** |
| 1.  |  |
| 2.  | *df = ∞* |
| 3.  | *df = minimum*(*n*1 – 1, *n*2 – 1) |
| 4.  | *df = ∞* |

* The **standard error** is found from the *t*-procedures application:

|  |  |
| --- | --- |
| **Estimate** | **se(estimate)** |
| 1.  |  |
| 2.  |  |
| 3.  |  |
| 4.  |  |

**Useful stuff for *Hypothesis Testing* (Chapter 7)**

*t*-test statistic: 

State the **null hypothesis**, ***H*0**. **i.e.** *H*0: parameter = *hyp. val.*

State the **alternative hypothesis**, ***H*1**. **i.e.** *H*1: parameter ≠ *hyp. val.*

**OR** *H*1: parameter < *hyp. val.*

**OR** *H*1: parameter > *hyp. val.*

For example:

1. Single mean: 3. Difference in means:

*H*0: *µ* = ## *H*0: *µ*1 – *µ*2 = 0

*H*1: *µ* ≠ ## *H*1: *µ*1 – *µ*2 ≠ 0

2. Single proportion: 4. Difference in proportions:

*H*0: *p* = ## *H*0: *p*1 – *p*2 = 0

*H*1: *p* ≠ ## *H*1: *p*1 – *p*2 ≠ 0

where ## is some number from the story (i.e. it is context driven)

**Useful stuff for *Data on Numeric Variables* (Chapter 8)**

Hypotheses for:

* **Paired Data Comparisons**
(see Ch 8 lecture notes pages 6 & 7 and page 18;
Question 4 of Assignment 3):

*H*0: *µdiff* = 0

*H*1: *µdiff* ≠ 0

* **More Than Two Samples**
(see Ch 8 lecture notes pages 9-16 and pages 20 & 21;
Question 5 of Assignment 3):

*H*0: *µ*1 = *µ*2 = *µ*3 = *µ*4 = … = *µk* (i.e. all of the *µ*’s are the same)

*H*1: at least one of the *µ*’s is different from the rest