

### Part 5.3: Comparison Between Two Independent Groups

The third type of claim we look at is where we are given a claim comparing numbers from two independent groups. This could be something like “a greater percentage of boys have an iPhone than girls.”

The “rule of thumb” formula for the comparison between two independent groups 95% margin of error is

$$\text{MoE1} = \frac{1}{\sqrt{n_1}} \quad \text{MoE2} = \frac{1}{\sqrt{n_2}} \quad \text{Overall MoE} = \text{Average MoE} \times 1.5$$

Or

$$1.5 \times \frac{1}{2} \left( \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} \right)$$

where  $n_1$  is the sample size of the first group and  $n_2$  is the sample size of the second group.

This formula only works where **both** the percentages you are comparing are between **30% and 70%**. Outside of this range the margin of error is **smaller**. You cannot use this formula if **either** of the percentages are outside this range.

If you want to play around with seeing where this formula comes from see the simulator used in the videos here: <https://www.mathsnz.com/resources/files/3.12/moe>  
 And change the type to “Comparison between two independent groups”.

Let's look at an example for when we are making a claim with a comparison inside a group: “a greater percentage of boys have an iPhone than girls.”

We are given some more information as well:

- The survey questioned 540 males and 430 females
- 43 percent of males said they owned an iPhone
- 36 percent of females said they owned an iPhone

Looking at this we can see the number of males who said they owned an iPhone was 7 percentage points higher than females. We need to see if the 7 percentage points difference from the sample is actually enough for us to conclude that there is a difference back in the population.

There are four things we need to do now.

- **Find the margin of error:**  $1.5 \times \frac{1}{2} \left( \frac{1}{\sqrt{540}} + \frac{1}{\sqrt{430}} \right) = 0.0684$  (3sf) = 6.84%.
- **Construct the confidence interval:** 0.16% (7-6.84) to 13.84% (7+6.84).
- **Interpret what this means:** It is a fairly safe bet that the percentage of male kiwi students who own an iPhone is somewhere between 0.16 percentage points higher and 13.84 percentage points higher than the percentage of female kiwi students who own an iPhone.
- **Make a judgement:** This confidence interval does support the claim that a higher percentage of male kiwi students own iPhones than female students because the confidence interval is entirely positive.

It is **really important** that you keep these last as two separate sentences, as that is something the markers have specifically said, as often when people combine them into one sentence they end up mixing up the two.

There three types of judgement we can make are the same as in the last section.