Persnickety Percentages

Stat 365: Statistical Communication

> **i** Note
>
> Even well-educated people can get tripped up when writing about percentages. Some words/terms on this topic that require careful use include:
>
> - Proportion, percentage, probability, odds, relative frequency
> - Count, frequency, tally
> - Percentage change, percentage difference, percentage points
> - Rate

An article that appeared in the journal Lancet in May of 2021 (Datoo, et al.) described a study that **investigated a potential vaccine that might protect children against malaria**. Researchers recruited children between the ages of 5 and 17 months in Burkina Faso, a country in western Africa, as participants. The **children were randomly assigned into one of three groups: one group received a large dose of the potential vaccine, another group received a small dose, and a third group received a placebo.** Researchers observed the children for the next 18 months, keeping track of **whether or not the child developed malaria.** Researchers hoped, of course, that children who received a vaccine would be less likely to develop malaria than children who received a placebo.

Count of ID	Column Labels		
Row Labels	High Dose	Placebo	Grand Total
Developed Malaria	38	105	143
Did Not Develop Malaria	108	42	150
Grand Total	146	147	293

1. Write a sentence that interprets and compares the percentage of "success" – defined as "Did not develop Malaria".

2. Calculate the *difference* in the success rates between the two groups, using the `Placebo` group as the baseline; then write a sentence interpreting this value.

4. Explain what's wrong with this sentence: *"The difference in success rates between these two groups was about 45.4%."*

5. Describe two things that are lacking in this sentence: *"The difference in the success rates between the two groups was about 45.4 percentage points."*

> **i** Note
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> The **percentage difference** in success proportions between two groups, with group B as the baseline, is calculated as:
>
> $$\frac{(p_A - p_B)}{p_B} \times 100$$

6. Calculate the *percentage difference* in the success rates between the two groups, using the `Placebo` group as the baseline. Also show how to calculate this from the ratio in Question 3. Then write a sentence that interprets this value.

7. Is it correct to say that the success rate with the placebo group was 86% less than the success rate with the high dose group? Explain why or why not. If not, calculate the correct value to replace 86% in this statement.

> **ℹ Note**
>
> The *odds of success* are calculated as
>
> $$\frac{\# \text{ of successes}}{\# \text{ of failures}}.$$
>
> Similarly, the *odds against* an event are calculated as
>
> $$\frac{\# \text{ of failures}}{\# \text{ of successes}}.$$
>
> If the odds of success for an event are 1:3, does this mean that about 1/3 of all events would result in success? What if the odds of success were 1:2 or 1:1 or 2:1? About what proportion of events would result in success if the odds of success are 1:3?

8. Is it correct to say that the odds of success in the high dose group are about 0.179? Explain.

9

. Calculate the odds of successfully not developing Malaria for each group. Then calculate the odds ratio, using the `Placebo` group as the baseline. Then write a sentence interpreting the odds ratio.

10. Explain what's wrong with the following sentence and then revise the sentence in two different ways to correct the error: *"Successfully quitting smoking was about 2.05 times more likely with the nicotine lozenge than with the placebo lozenge."*

11. Calculate the odds of failing to quit smoking for each group. Then calculate the odds ratio, using the nicotine group as the baseline. How does this odds ratio compare to the previous one?

> **ⓘ Note**
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> Odds ratio is invariant to which outcome is labeled a success.

> **ⓘ Note**
>
> The *relative risk* are calculated as
>
> $$\frac{\text{\# of successes}}{\text{\# of failures}}.$$
>
> Similarly, the *odds against* an event are calculated as
>
> $$\frac{\text{\# of failures}}{\text{\# of successes}}.$$

> If the odds of success for an event are 1:3, does this mean that about 1/3 of all events would result in success? What if the odds of success were 1:2 or 1:1 or 2:1? About what proportion of events would result in success if the odds of success are 1:3?

relative risk

(a / (a+b)) / (c / (c+d))

3. Calculate the *ratio* of the success rates between the two groups, using the `Placebo` group as the baseline; then write a sentence interpreting this value.