
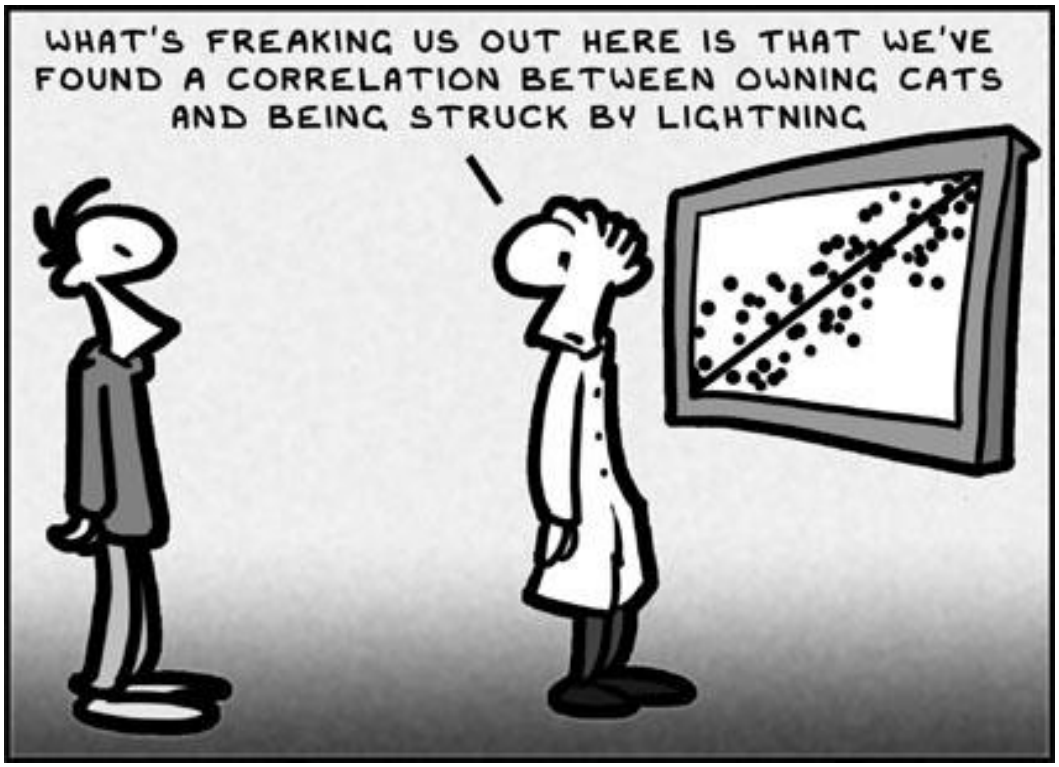


# Introduction to Statistics!

# Why do we use statistical tests?

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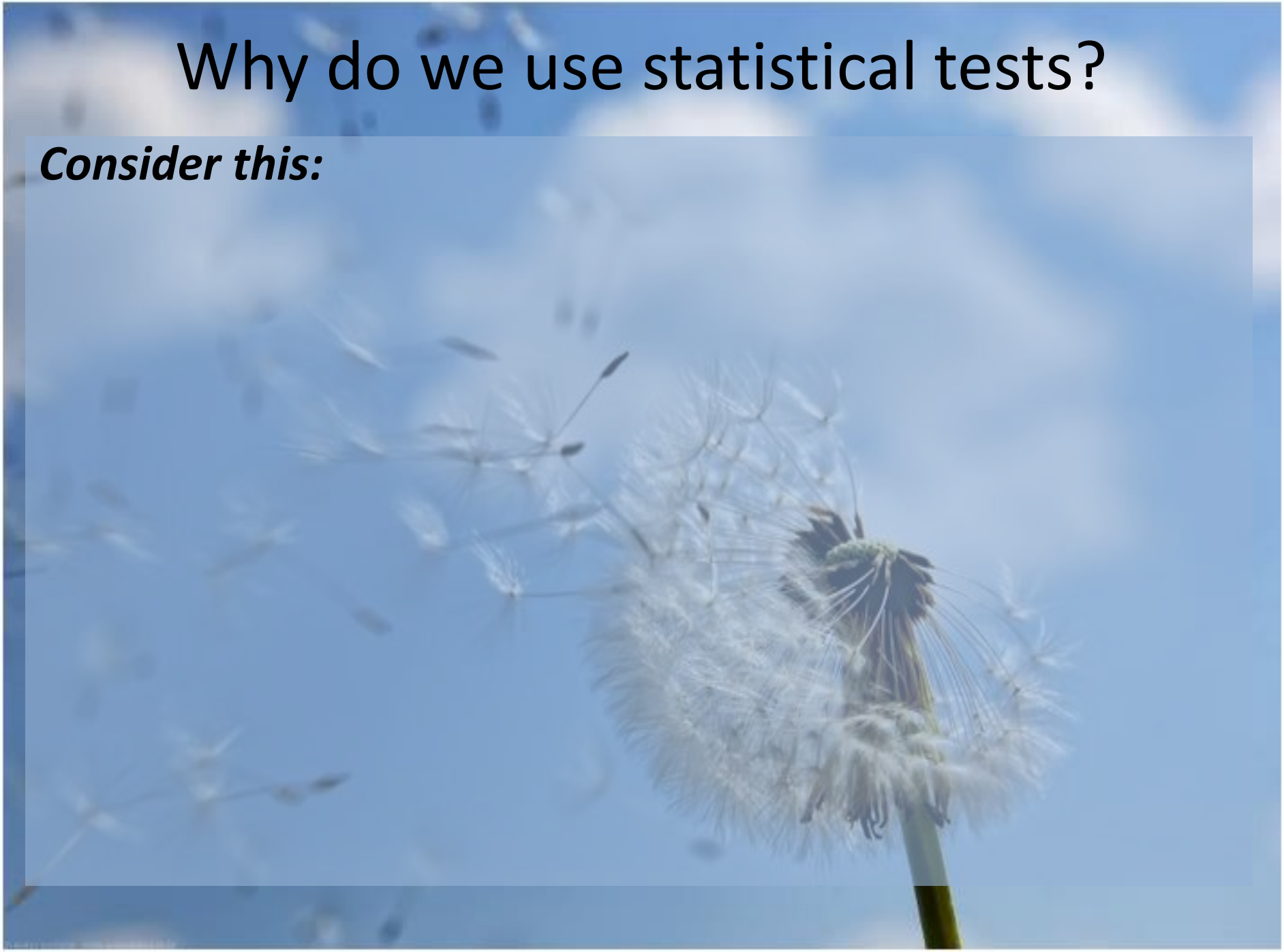

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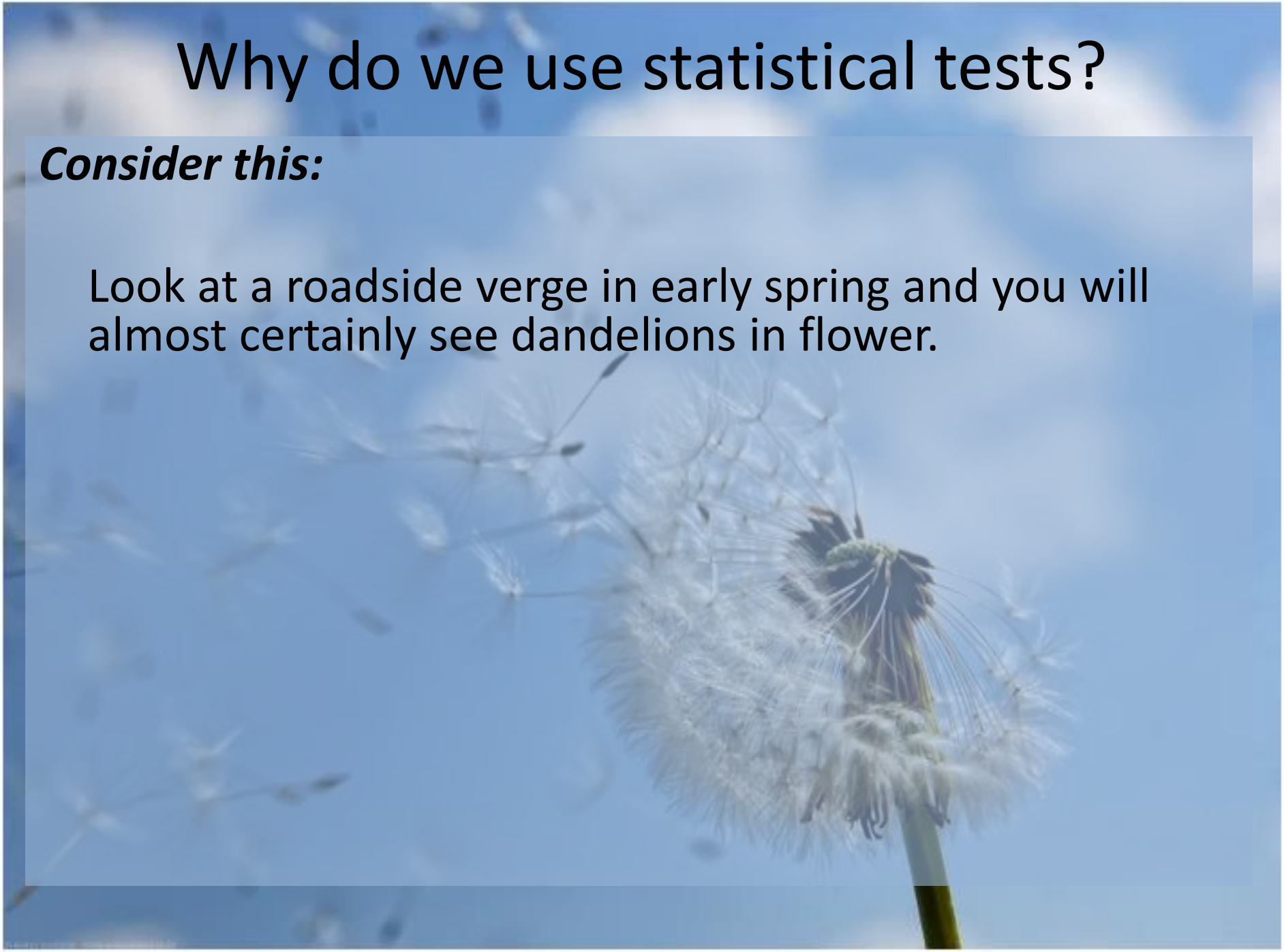
Look at a roadside verge in early spring and you will almost certainly see dandelions in flower.



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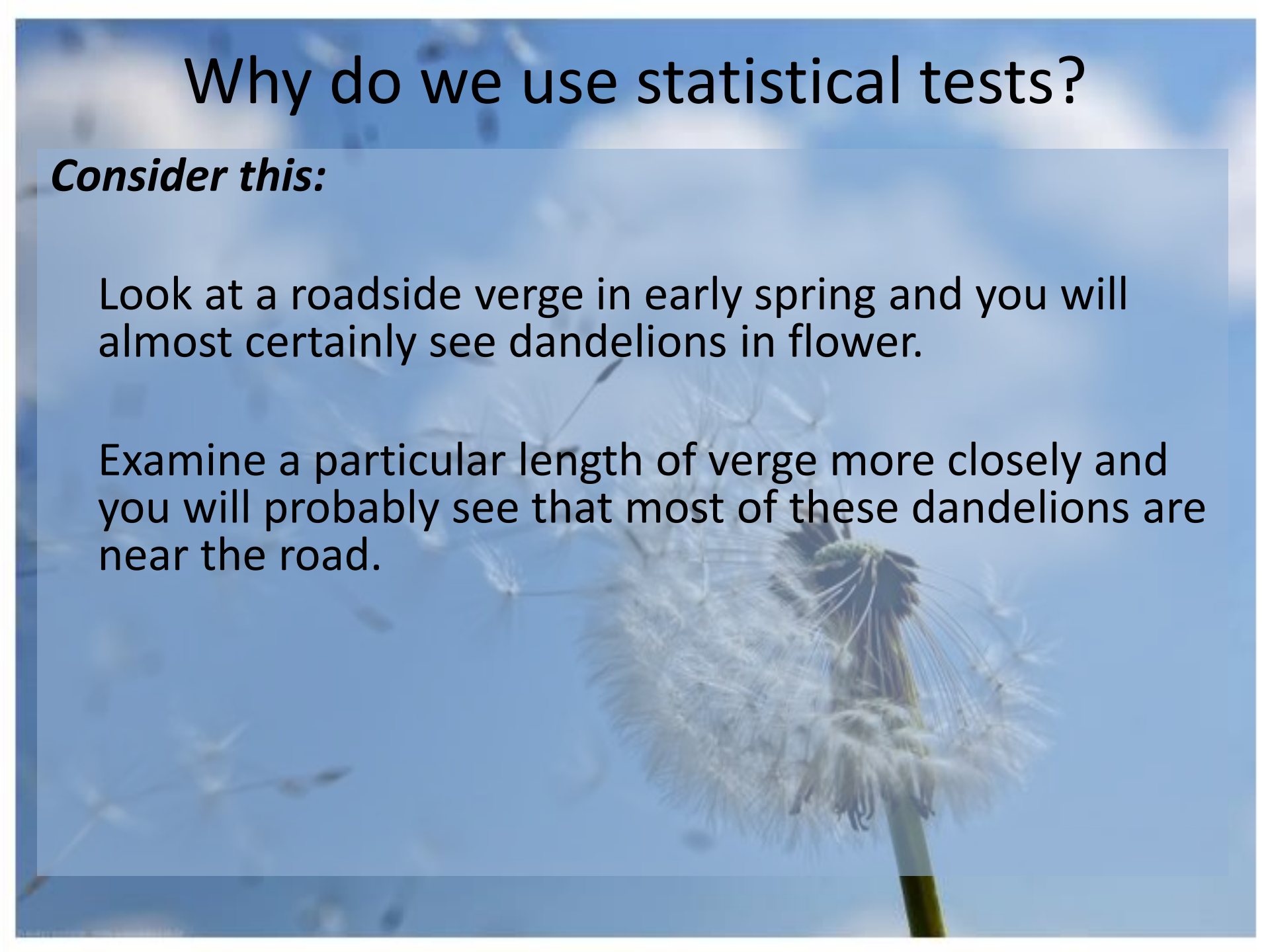

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Farther away, dandelions are less common and other species of plant are more numerous.

***How can we explain this observation?***

# There are a number of possible biological explanations

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- Perhaps the road was treated with salt during the winter and dandelions can tolerate high salt concentrations better than other plants.
- Perhaps they can tolerate frequent mowing or trampling.
- Perhaps the wind generated by moving vehicles aids seed dispersal.

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- There is another possible explanation, which has very little to do with biology.
- Maybe it's all due to **chance**.
- It could be that we just happened to pick an area where there were more dandelions growing closer to the road.


# Null hypotheses

All of the statistical tests in the A2 Biology course are based on a null hypothesis.

Students should be able to state a null hypothesis clearly and concisely. It must be related to the investigation concerned.

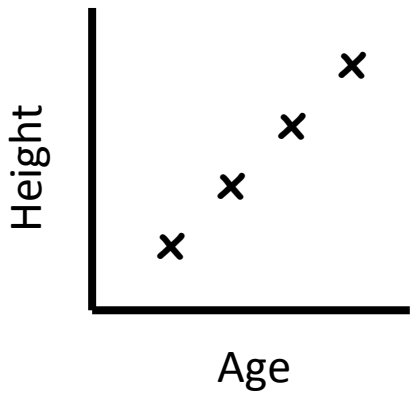
It is strongly recommended that it is worded in terms of:

**There is no significant difference between . . . and . .**
**There is no significant association between . . . and . .**
**There is no significant correlation between . . and . .**

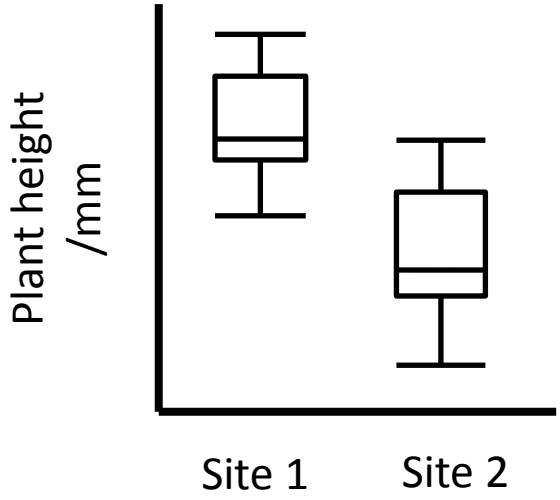
# Which statistical test do you use?

## What are you looking for?

### Relationship




### Difference



# Spearman’s Rank Coefficient of Correlation

BACK

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Looks for the strength of a relationship / correlation between two data sets

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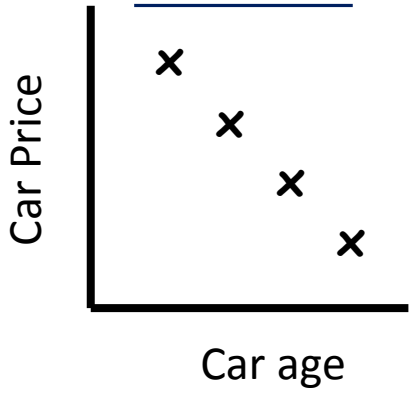
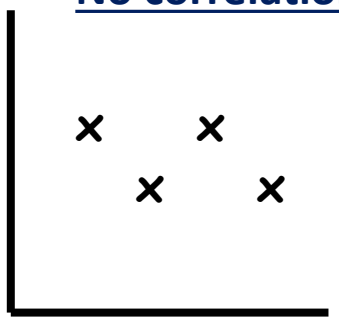
Looks for the strength of a relationship / correlation between two data sets

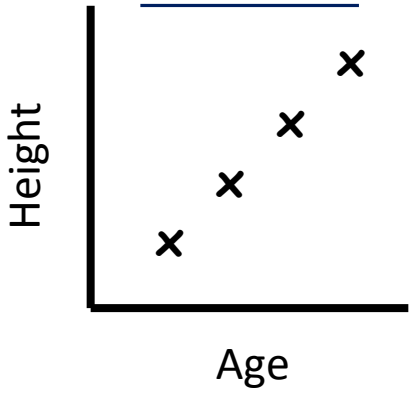
**Negative correlation**




**No correlation**



**Positive correlation**

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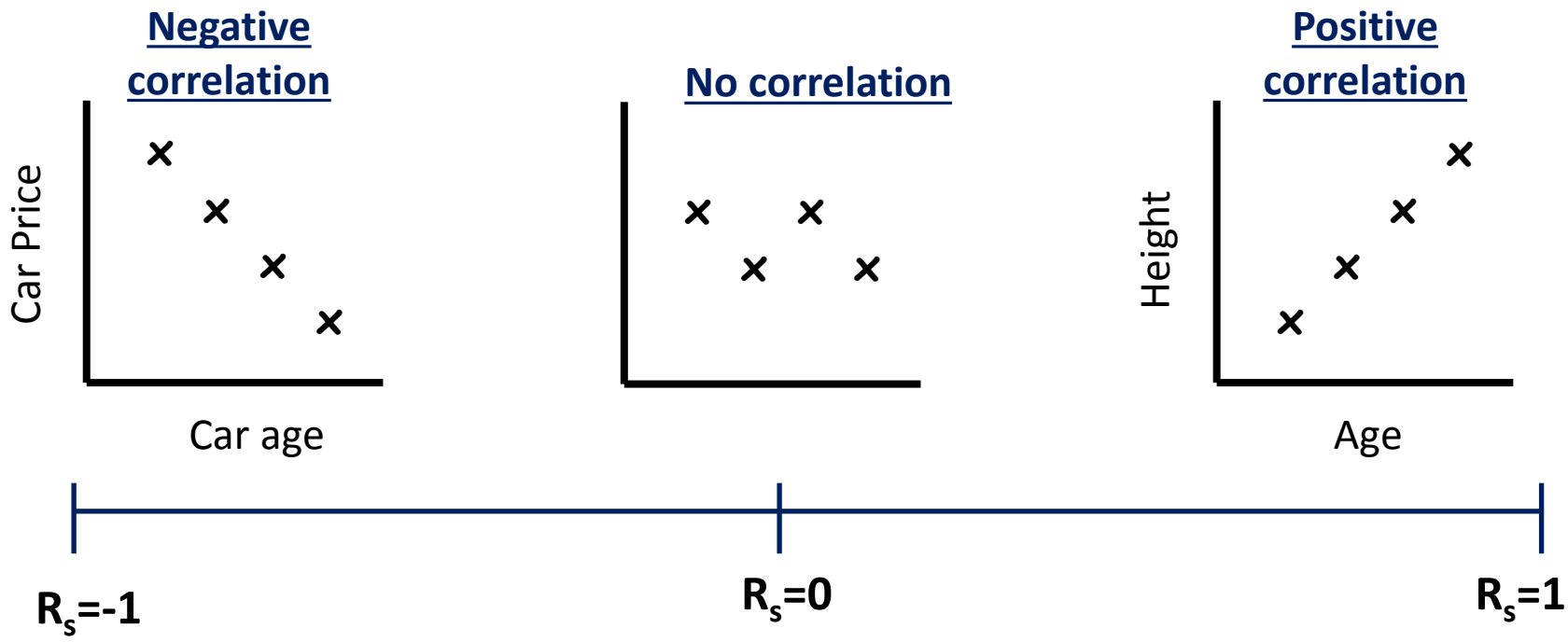


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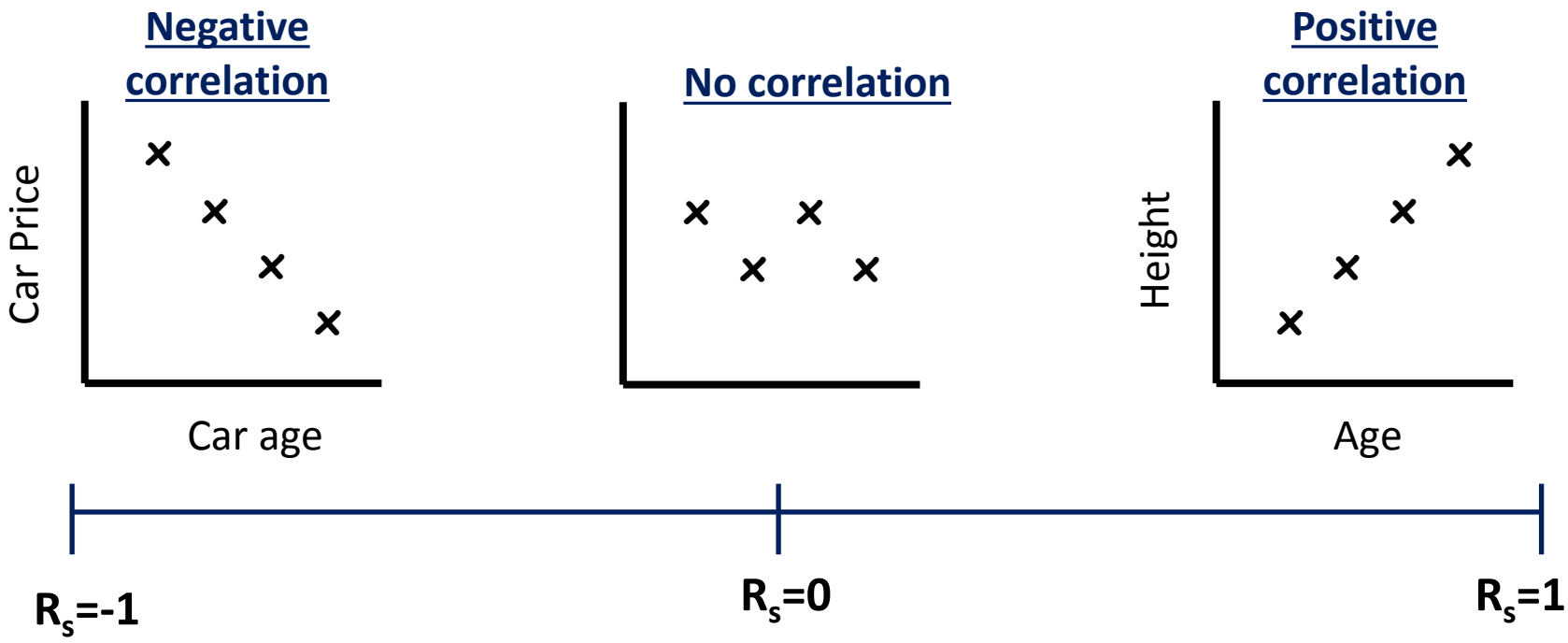


Requires a minimum of 10 sets of data (and a maximum of 30)

BACK

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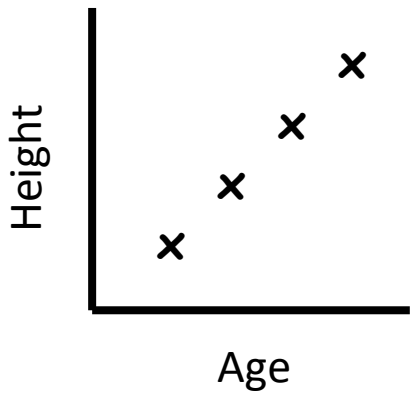


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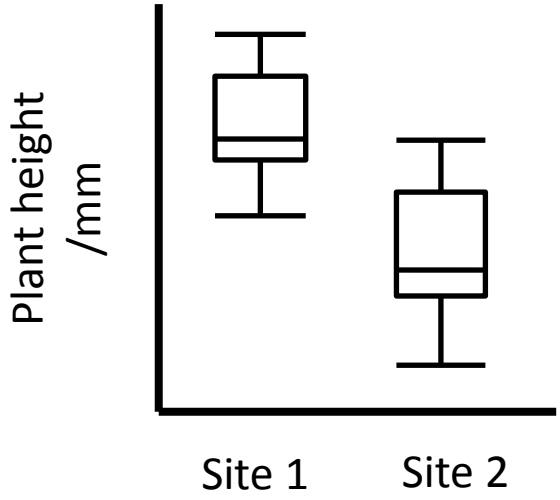

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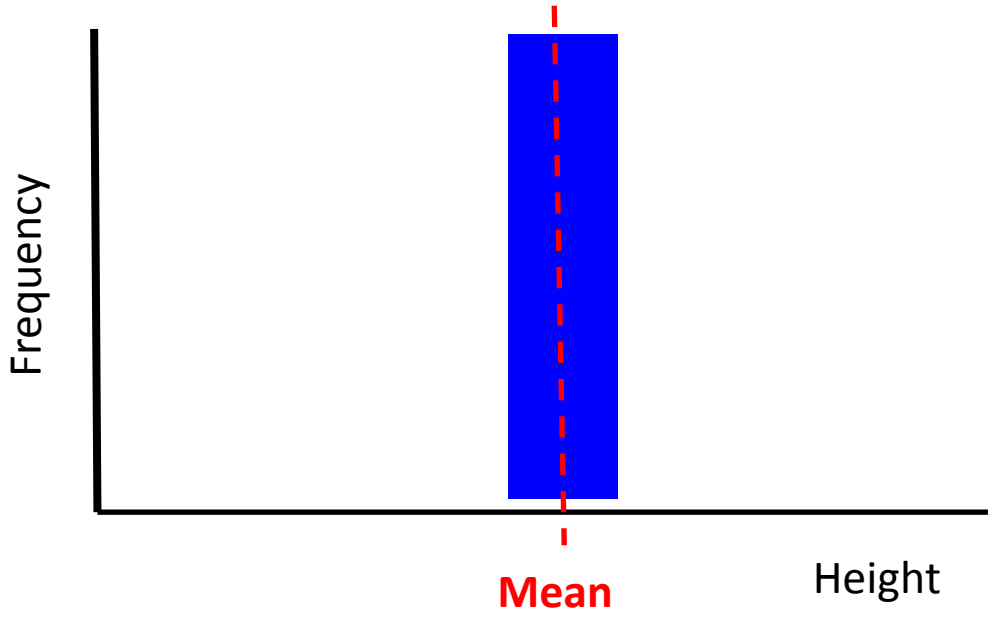

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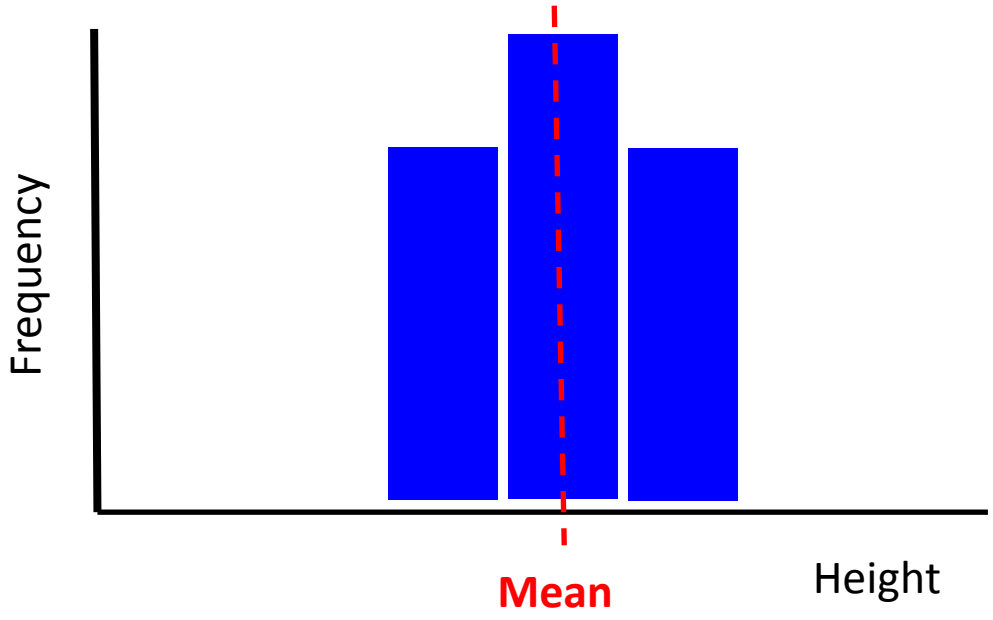

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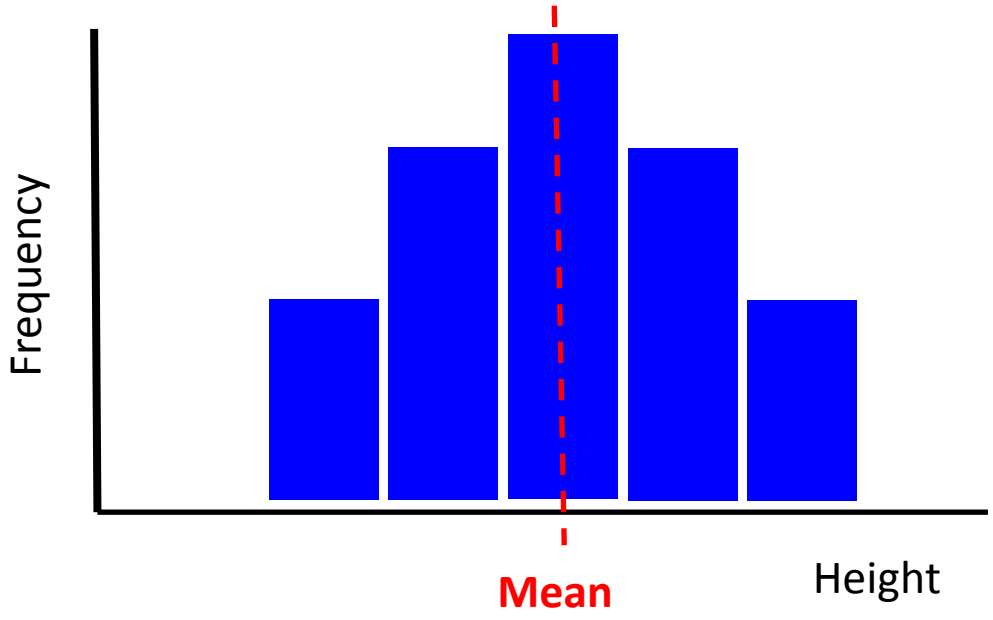

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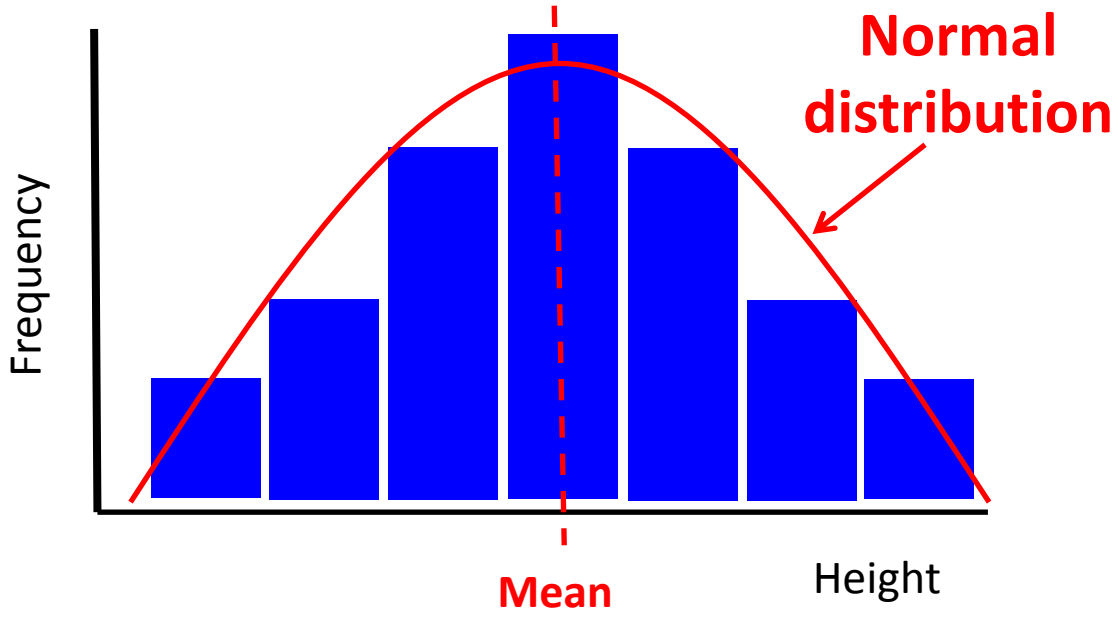

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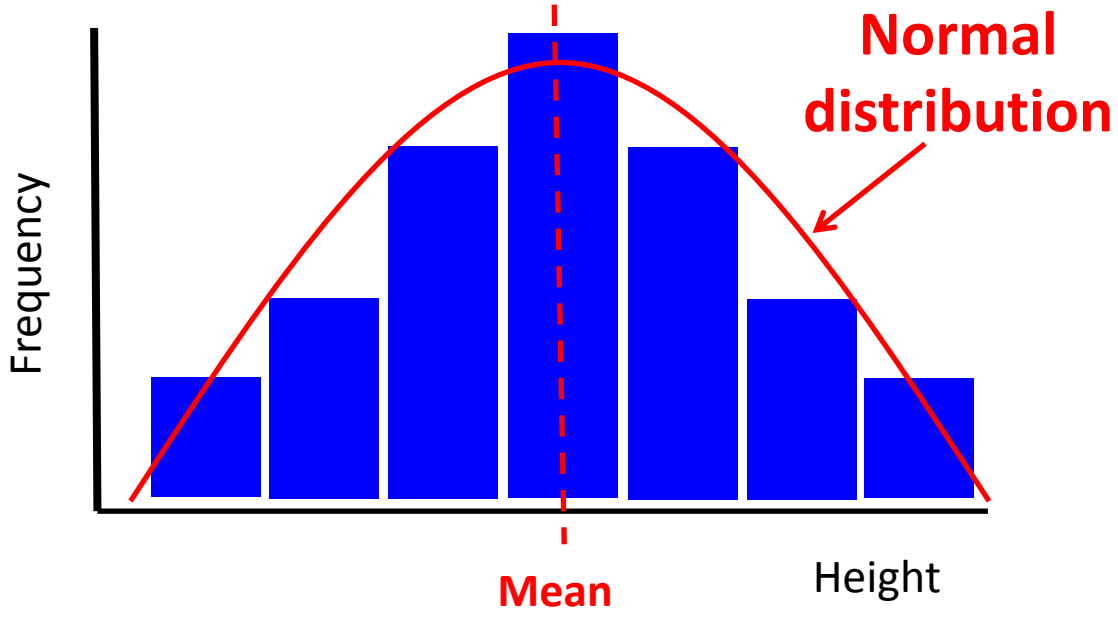


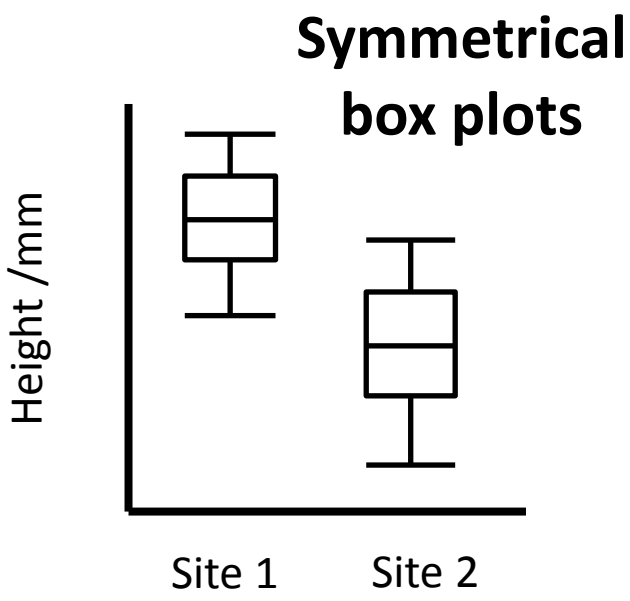

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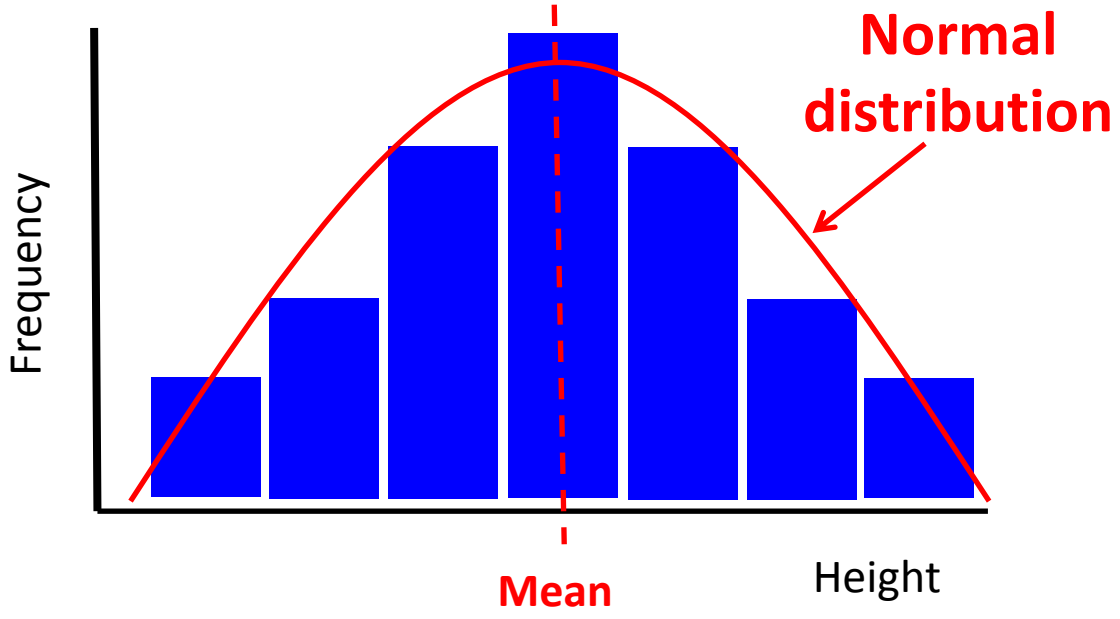


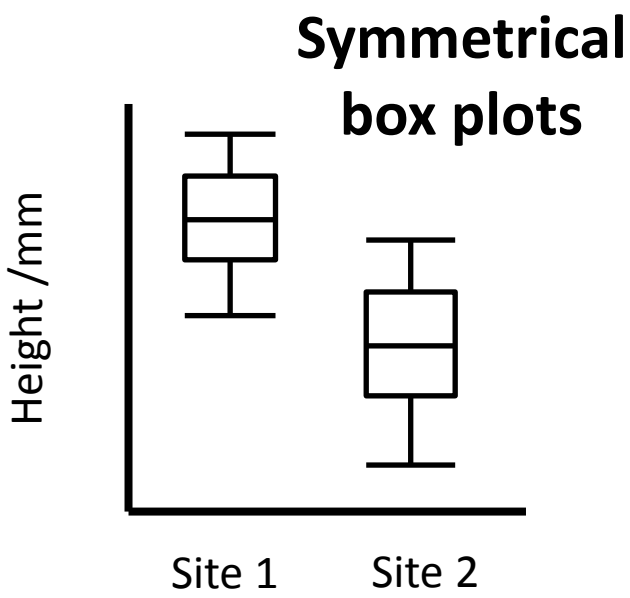


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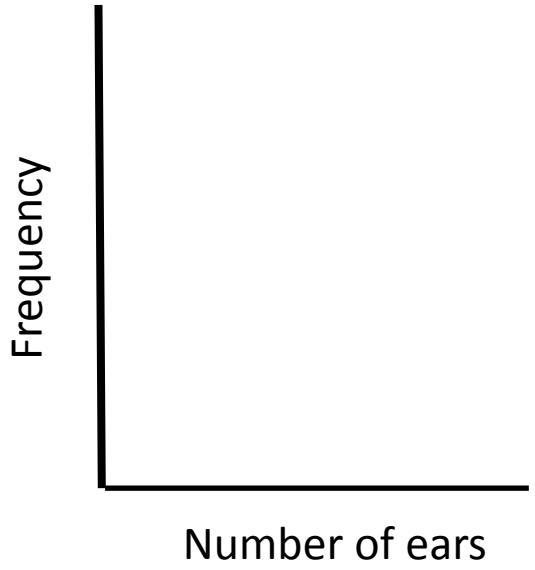


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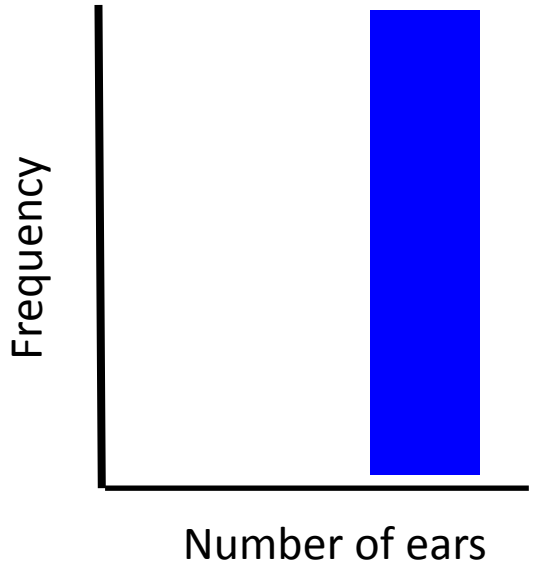


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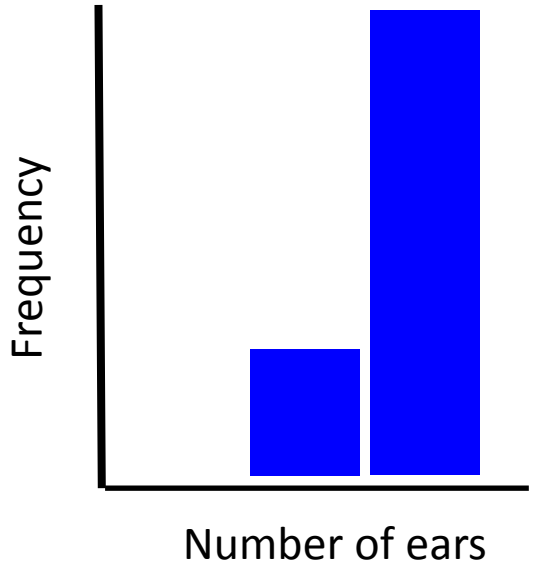


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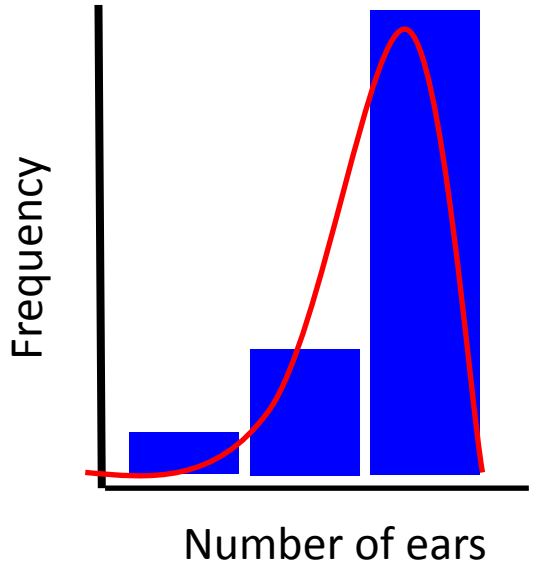


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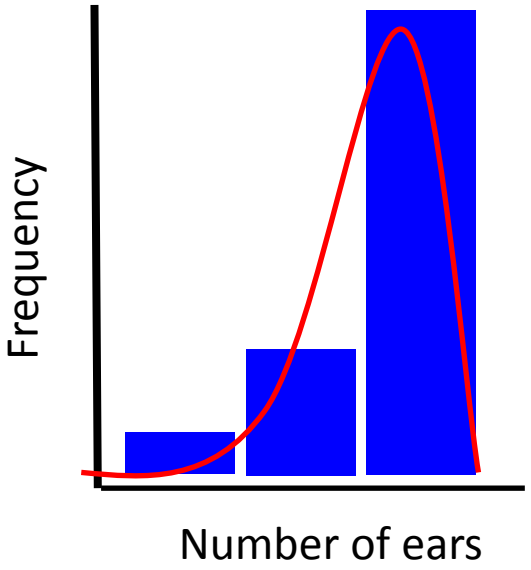


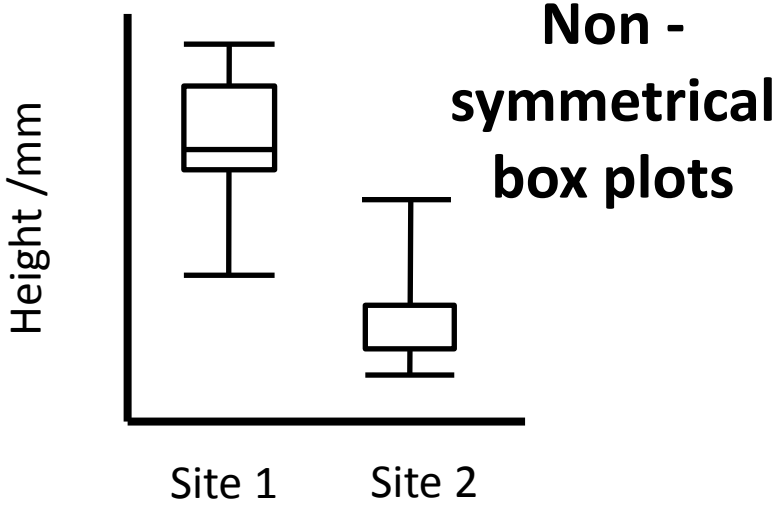


**Non - symmetrical box plots**

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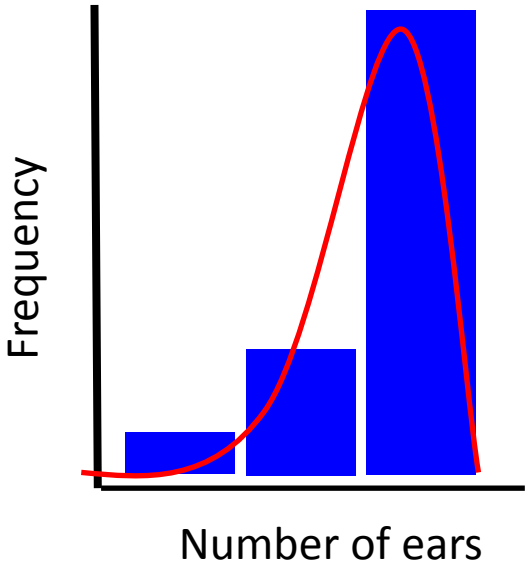


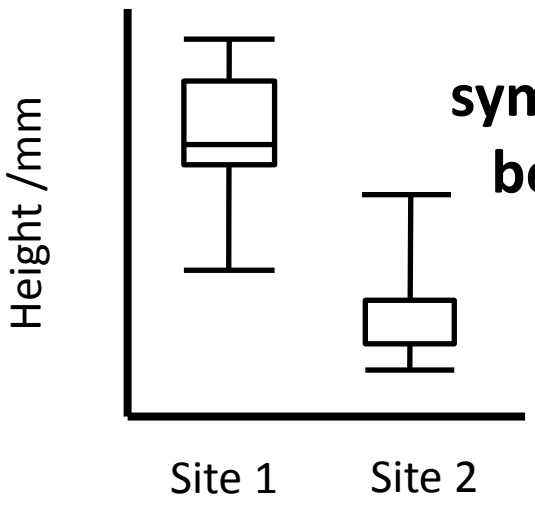


**Non - symmetrical box plots**

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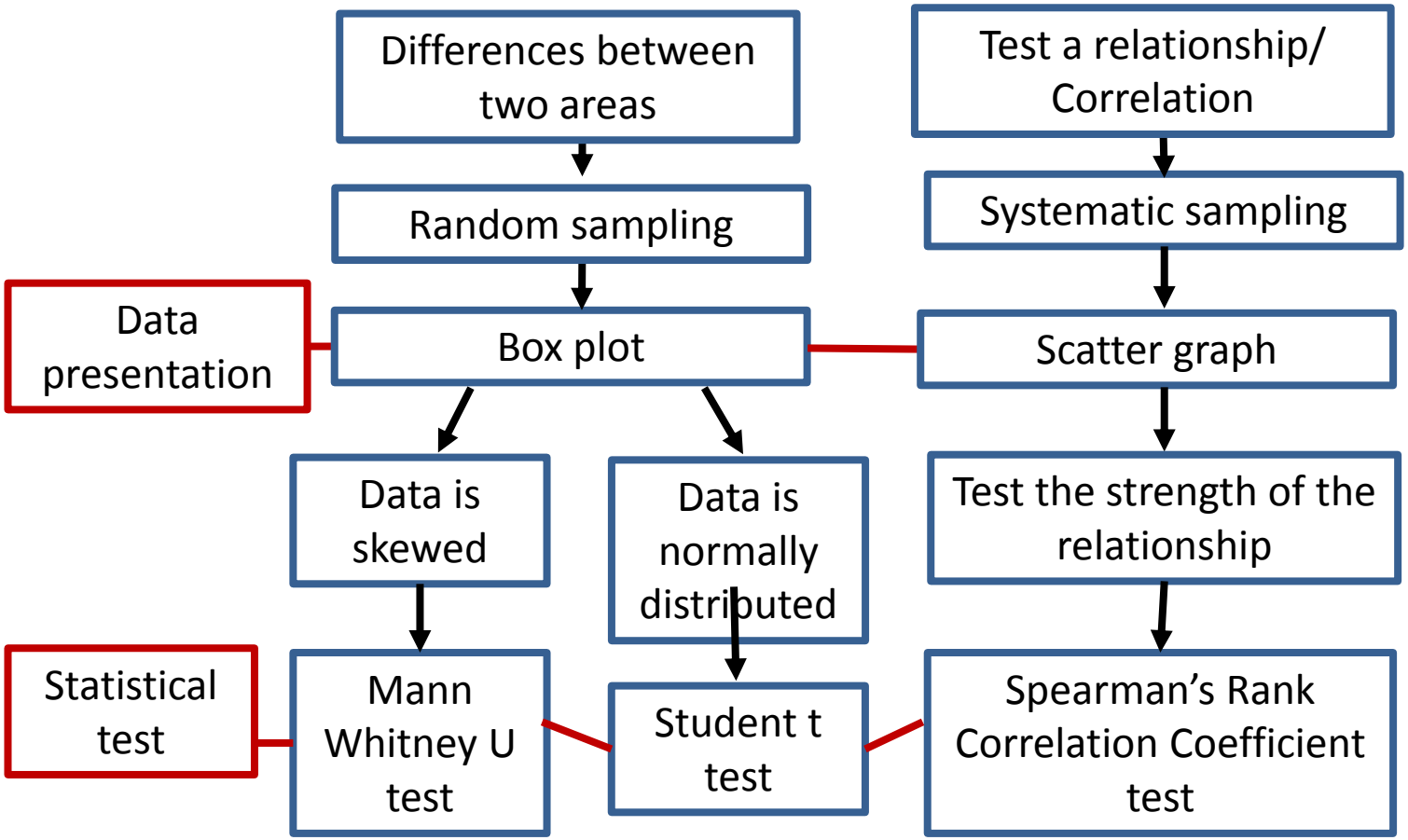
BACK

# Statistical tests

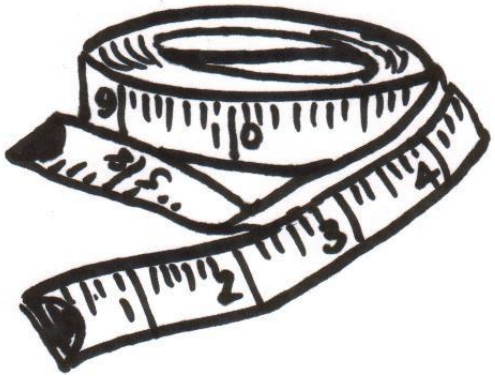
- Minimum sample size is at **least** 10 samples for a statistical test.
- How confident you are of the difference or relationship and whether it could just be down to chance



# Which statistical test do you use?

What sort of data will you obtain from your investigation?

## Measurements



## Frequencies

| | Sparrows | Robins |
|---|---|---|
| Friday | I | 𝍸 |
| Thursday | 𝍸 I | 𝍸 |
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| Monday | II | I |
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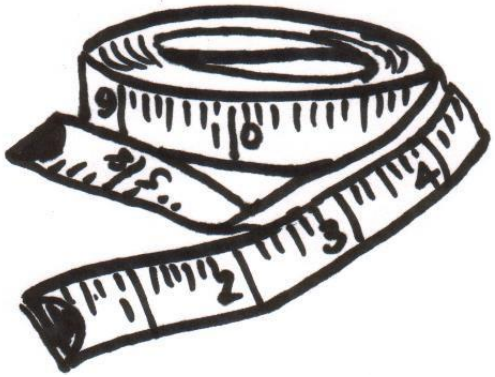

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# Chi-squared ($\chi^2$) Test

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Requires a minimum of 50 repeats

BACK