What is Statistics?

It's both descriptive and it's inferential

stats ≠ math



Descriptive statistic of measured eggs

Prediction for descriptive parameter of all eggs



Inferential statistics

Statistical tests

Pose a question about the parameters of one or more populations

> Decide on probable answer to question

Calculate probabilities of seeing sample statistics if answer to question is yes/no

Measure some sample values

from the population(s)

Calculate appropriate

sample statistics

Inferential statistics

HYPOTHESIS

TESTING FREQUENTIST Make decisions based

on probability of seeing sample data

BAYESIAN STATS

Calculate probability of something, update with more data and assumptions

LIKELIHOOD STATS

Calculate likelihood of something, use values to support arguments (less yes/no)

AIC APPROACH

Compare some predictive models, then choose the best one (balance the accuracy # of parameters) Advanced

Descriptive statistics

Summarizing a larger set of numbers

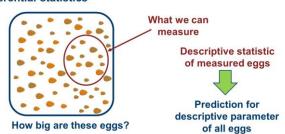
How big are these eggs?

What's the size of an average egg?

How variable are the egg sizes?

More complicated things ...

Inferential statistics



Inferential statistics

Statistical tests

Are the average sizes of eggs from these two populations the same?

- populations are probably different Probability not low:

Probability low:

- lack evidence that populations differ

different as we do, if the population averages are the same

Inferential statistics

Sample data will also appear to have differences or patterns

Question - is there evidence for a non-random pattern

Calculate probability of sample data if things are random

Probability low

Patterns probably non-random so we decide that differences/pattern are real

Measure some eggs

from populations

Calculate sample

averages

Calculate probability

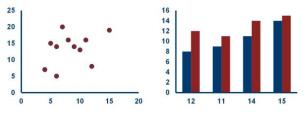
of seeing averages as

Probability not low:

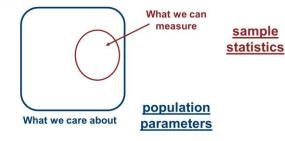
Patterns could be random so we lack evidence to decide that differences/pattern are real

Descriptive statistics

Purpose is to describe or summarize a set of data values



Inferential statistics



Inferential statistics

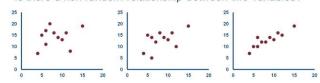
Tests are used for many questions:

Do populations have the same average?

Inferential statistics

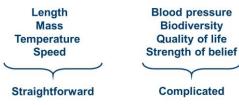
Tests are used for many questions:

Is there a non-random relationship between two variables?



Descriptive statistics

Choosing appropriate metrics



Descriptive statistics

Choosing appropriate metrics

Integers **Decimals Proportions** Behave nicely

most of the time

Fractions Ratios

Some bad Mathematical properties

Inferential statistics

Tests are used for many questions:

Do populations have the same variability?





Inferential statistics

Tests are used for many questions:

Is the proportion of some trait the same in populations?



Stats Examples.com