

# PRESENTING AT A JOURNAL CLUB

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PLEXUS  
SURGERY APP 

# PRELIMS - THE JOURNAL

- Which Journal?
- Who is the Editor-in-Chief? Affiliations?
- Publishers?
- Paid/Open Access?
- Impact factor of the Journal? Try Scimago Journal & Country Rank
- Readership
  - Regional
  - National
  - International

# INTRODUCTIONS

- Clinical question that prompted your interest?
- Who wrote the paper and their affiliations? (Well known authors/Institutions)
  - Any outstanding feature?
  - First of its kind.
  - Controversial or contentious issues.

# HYPOTHESIS

- What is the research Question?
- Does it observe the four basic components of a good and sound research question?
- **PICO**
  - **P**opulation studied?
  - **I**ntervention – what was the intervention tested?
  - **C**ontrol -what was the alternative that the intervention was compared to?
  - **O**utcome – what was the nature of the outcome measured?

# ASSESS THE EVIDENCE

- What are the key references and related papers?
  - What is already known on the subject?
  - Is this correctly presented?
  - Is the hypothesis correct?
  - Is the question relevant and important in the context of the existing literature?
  - What does the study contribute to the existing literature?
- The introduction will usually contain a statement validating the content of the article by placing it in the context of the wider literature.

# STUDY DESIGN

- Study Type?
  - randomized controlled trial, case control, meta-analysis, cross-sectional, descriptive.
- The study population?
  - Can the results of the study be translated to the general population? Is the patient group representative of the normal population? If not, is this addressed in the text?
- Randomization?
  - How are the participants allocated into the groups?

# STUDY DESIGN

- **Bias?**
  - This refers to a flaw in impartiality that introduces systematic error into the methodology and results of a study.
  - Is the research method exposed to bias?
  - Has randomization been used to reduce experimenter bias?
  - What form of blinding or masking has been used to reduce experimental or observational bias?
- **Inclusion and exclusion criteria?**
  - Are these appropriate and clearly stated? Can you identify any oversights that may affect the validity of the study?

# METHODS

- Ensure that the method is not flawed?
- Was the method and approach to the study appropriately diligent?  
Were processes consistent?
- Was follow up complete and consistent in each group?
- What outcome measures were used and were they appropriate?

# METHODS

- Have the authors made a power statement (Table )?
- What significance level has been used (P value)?
- Has the power of the study been stated, does it exceed 80%?
- Was a power analysis carried out?
- Was this before the study or post-hoc?
- Is the study sufficiently powered to eliminate errors?
- Do the data exhibit low variability?
- What is the effect size?

## Statistical power explanations

<i>P</i> value	A measure of the strength of evidence against the null hypothesis (usually $P < 0.05$ , indicating that the result obtained would only be reproduced 5 times out of 100 if there truly was no difference between the two groups tested)
Type 1 ( $\alpha$ ) error	Incorrectly rejecting the null hypothesis, i.e. a false positive result; decreased by lowering the acceptable <i>P</i> value
Type 2 ( $\beta$ ) error	When we incorrectly do not reject the null hypothesis, i.e. a false negative result; usually a result of a small sample size and can be eliminated by performing a power analysis
Power	Assuming there is a true underlying difference, how certain do you want to be of detecting this – usually set at $\geq 80\%$ (i.e. the probability of rejecting the null hypothesis when it is false)
Power analysis	A statistical method of determining the number of subjects needed in a study in order to have a reasonable chance of showing a difference if one exists
Effect size	The value of the response or the outcome variable that reflects the comparison of interest, or a standardized measure of this, e.g. the difference in two population means

adapted from Petrie (2010)

# RESULTS

- Are the results clearly stated?
- Have any results been ignored and why?
- Is the result statistically significant, i.e. is the P value less than 0.05 (is the null hypothesis rejected)?

# NULL HYPOTHESIS

- In statistical hypothesis testing, the null hypothesis ( $H_0$ ) and alternative hypothesis ( $H_1$  or  $H_a$ ) are used to make predictions about whether there is a relationship or effect between variables:
- Null hypothesis
  - The statement that there is no effect or relationship between variables, or that there is no difference in the populations being tested. This is the hypothesis that is being tested to be rejected.
- Alternative hypothesis
  - The statement that there is an effect or relationship between variables, or that there is a difference in the populations being tested. This is the hypothesis that is being tried to be proven.

# EXAMPLE

- You wish to test the concept that prolonged use of antibiotics after routine surgery does not reduce instances of SSI.
- How would you set up the question?
- The NULL hypothesis ( $H_0$ ) should then be,
  - “Use of prolonged post-op antibiotics reduces incidences of SSIs”.
- The ALTERNATIVE hypothesis ( $H_1$  or  $H_a$ ) should then be –
  - “Prolonged use of antibiotics has no effect on the incidence of SSIs”.

# EXAMPLE

- Test statistics and p values
- Every statistical test produces:
  - A test statistics that indicates how closely your data match the null hypothesis.
  - A corresponding p value that tells you the probability of obtaining this result if the null hypothesis is true.
- The  $p$  value determines statistical significance.
- An extremely low p value indicates high statistical significance, while a high p value means low or no statistical significance.

# EXAMPLE

- What is a significance level?
- The significance level, or alpha ( $\alpha$ ), is a value that the researcher sets in advance as the threshold for statistical significance. It is the maximum risk of making a false positive conclusion (Type I error) that you are willing to accept.
- In a hypothesis test, the  $p$  value is compared to the significance level to decide whether to reject the null hypothesis.
  - If the  $p$  value is higher than the significance level, the null hypothesis is not refuted, and the results are not statistically significant.
  - If the  $p$  value is lower than the significance level, the results are interpreted as refuting the null hypothesis and reported as statistically significant.
- Usually, the significance level is set to 0.05 or 5%. That means your results must have a 5% or lower chance of occurring under the null hypothesis to be considered statistically significant.

# EXAMPLE

- The significance level can be lowered for a more conservative test. That means an effect has to be larger to be considered statistically significant.
- The significance level may also be set higher for significance testing in non-academic marketing or business contexts. This makes the study less rigorous and increases the probability of finding a statistically significant result.

# EXAMPLE

- As best practice, you should set a significance level before you begin your study. Otherwise, you can easily manipulate your results to match your research predictions.
- It's important to note that hypothesis testing can only show you whether or not to reject the null hypothesis in favor of the alternative hypothesis.
- It can never “prove” the null hypothesis, because the lack of a statistically significant effect doesn't mean that absolutely no effect exists.



# EXAMPLE

- When reporting statistical significance, include relevant descriptive statistics about your data (e.g., means and standard deviations) as well as the test statistic and  $p$  value.



# PERCENTAGES

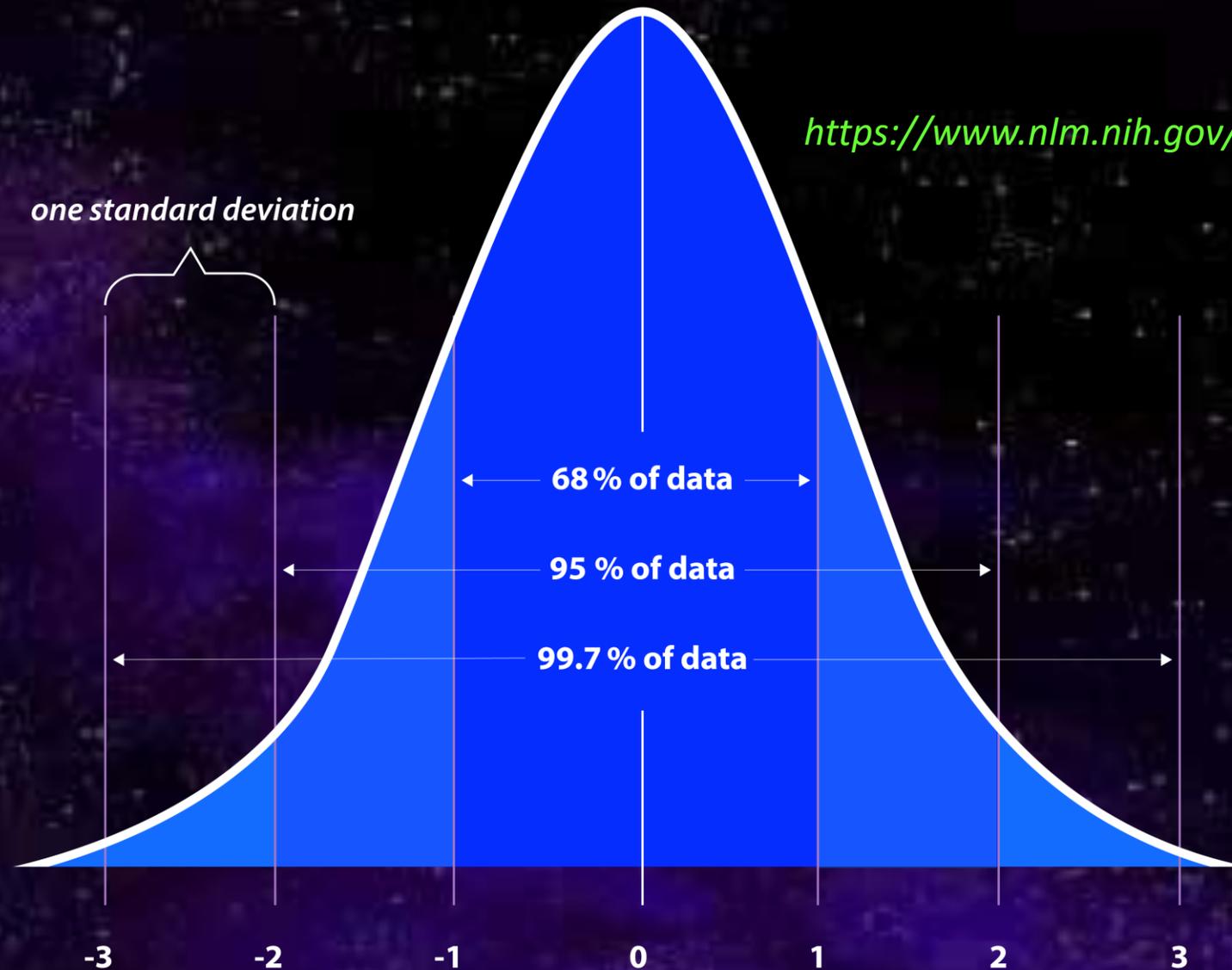
- Percentages are mainly used in the tabulation of data in order to give the reader a scale on which to assess or compare the data.
- To calculate a percentage, divide the number of items or patients in the category by the total number in the group and multiply by 100.
- Authors can use percentages to hide the true size of the data. To say that 50% of a sample has a certain condition when there are only four people in the sample is clearly not providing the same level of information as 50% of a sample based on 400 people. So, percentages should be used as an additional help for the reader rather than replacing the actual data.



# MEAN

- It is used when the spread of the data is fairly similar on each side of the mid point, for example when the data are “normally distributed”.
- The “normal distribution” is referred to a lot in statistics. It’s the symmetrical, bell-shaped distribution of data shown in next figure.

<https://www.nlm.nih.gov/oet/ed/stats/02-800.html>



**Normal distribution Curve & Standard Deviation**

# EXERCISE

- Two groups of patients are up for study of lipid lowering agents.
  - I. 52, 55, 56, 58 and 59 years & also
  - II. 52, 55, 56, 58, 59 and 92 years
- Which modality would you use to find the midpoint and how?
-



Five women in a study on lipid-lowering agents are aged 52, 55, 56, 58 and 59 years.

Add these ages together:  $52 + 55 + 56 + 58 + 59 = 280$

Now divide by the number of women:  $280 / 5 = 56$

So the mean age is 56 years.

### **Drawback:**

- If a value (or a number of values) is a lot smaller or larger than the others, “skewing” the data, the mean will then not give a good picture of the typical value.
- For example, if there is a sixth patient aged 92 in the study then the mean age would be 62, even though only one woman is over 60 years old. In this case, the “median” may be a more suitable mid-point to use.

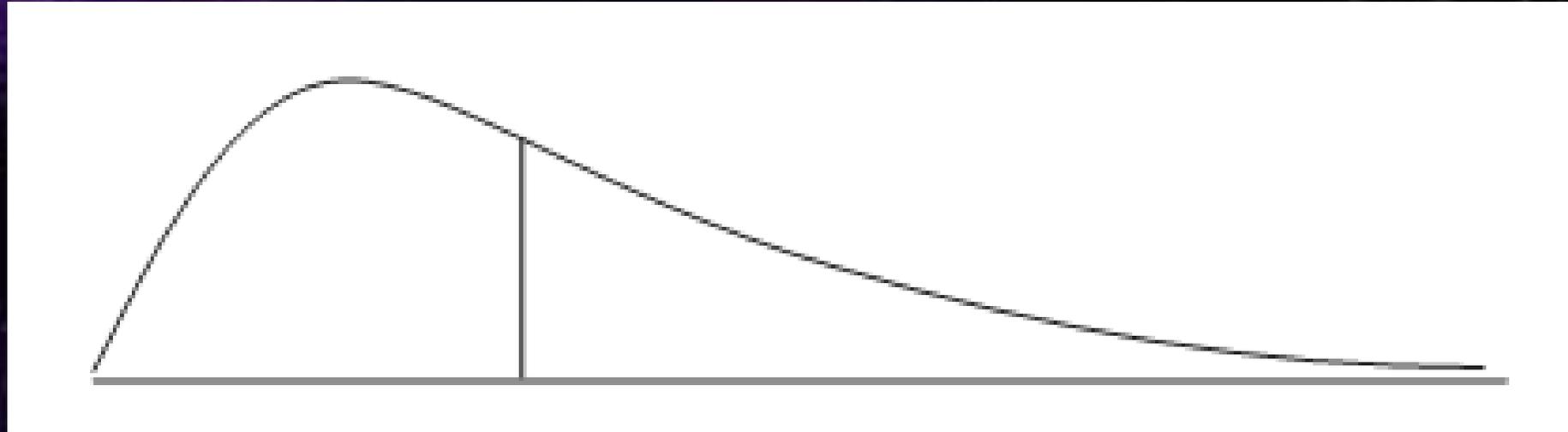


# MEDIAN

- Sometimes known as the mid-point.
- It is the point which has half the values above, and half below.
- It is used to represent the average when the data are not symmetrical, for instance the “skewed” distribution in next figure.



# SKEWED DISTRIBUTION



**A Skewed Distribution Curve.**

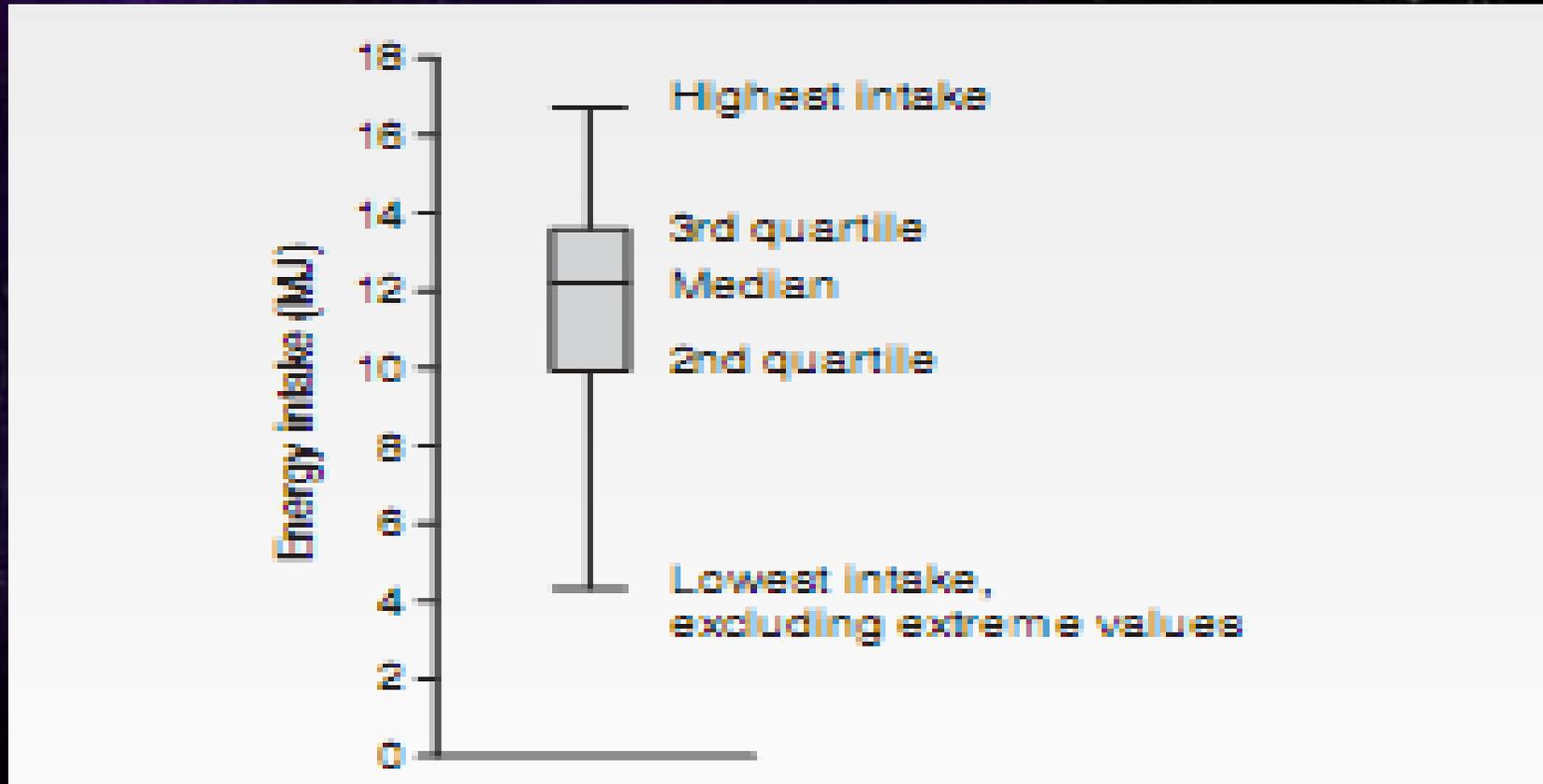
**The Central line is the Median.**



- Using the previous example from mean of five patients aged 52, 55, 56, 58 and 59, the median age is 56, the same as the mean – half the women are older, half are younger.
- However, in the second example with six patients aged 52, 55, 56, 58, 59 and 92 years, there are two “middle” ages, 56 and 58. The median is half-way between these, i.e. 57 years. This gives a better idea of the mid-point of this skewed data than the mean of 62.
- The median may be given with its inter-quartile range (IQR). The 1<sup>st</sup> quartile point has the 1/4 of the data below it, the 3<sup>rd</sup> quartile has the 3/4 of the sample below it, so the IQR contains the middle 1/2 of the sample. This can be shown in a “box and whisker” plot.



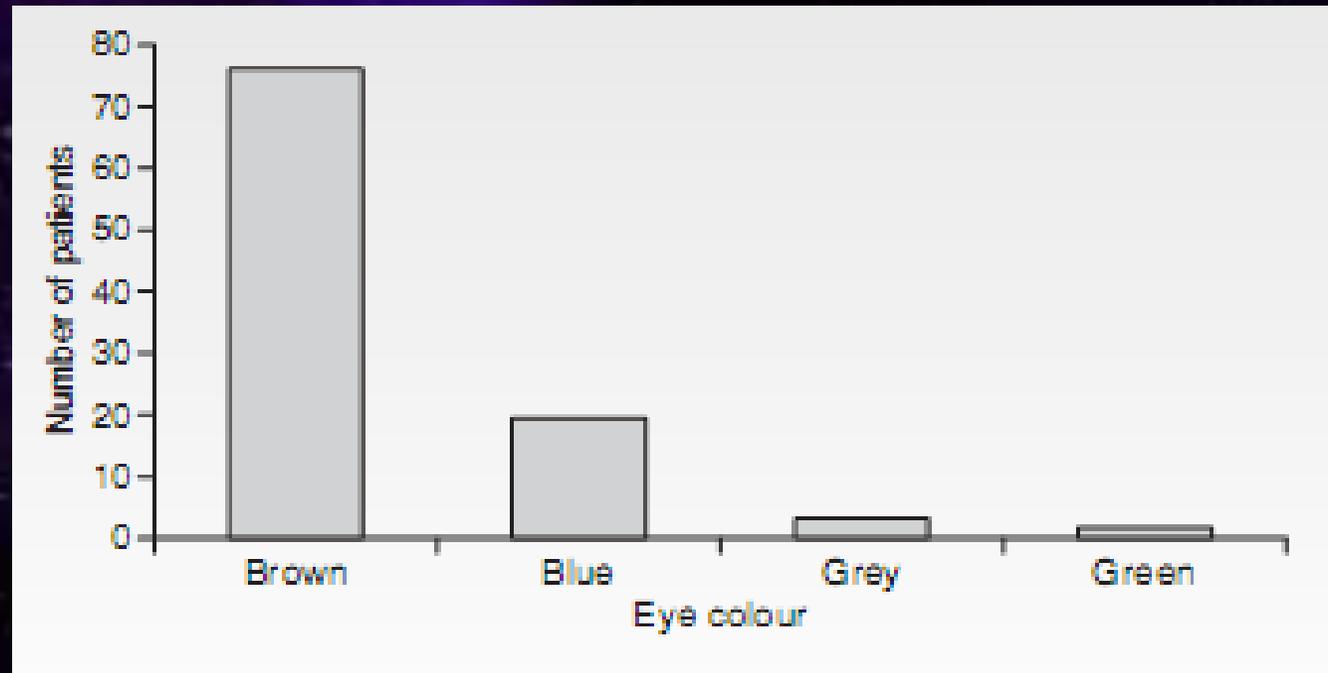
A dietician measured the energy intake over 24hrs of 50 pts on a variety of wards. One ward had 2 pts that were NPO. The median was 12.2 mj. One Interquartile - 9.9 to 13.6. The lowest intake was 0, the highest was 16.7. This distribution is represented by the BOX and WHISKER plot. The ends the whiskers represent the max and minimum values, excluding extreme results.



# MODE

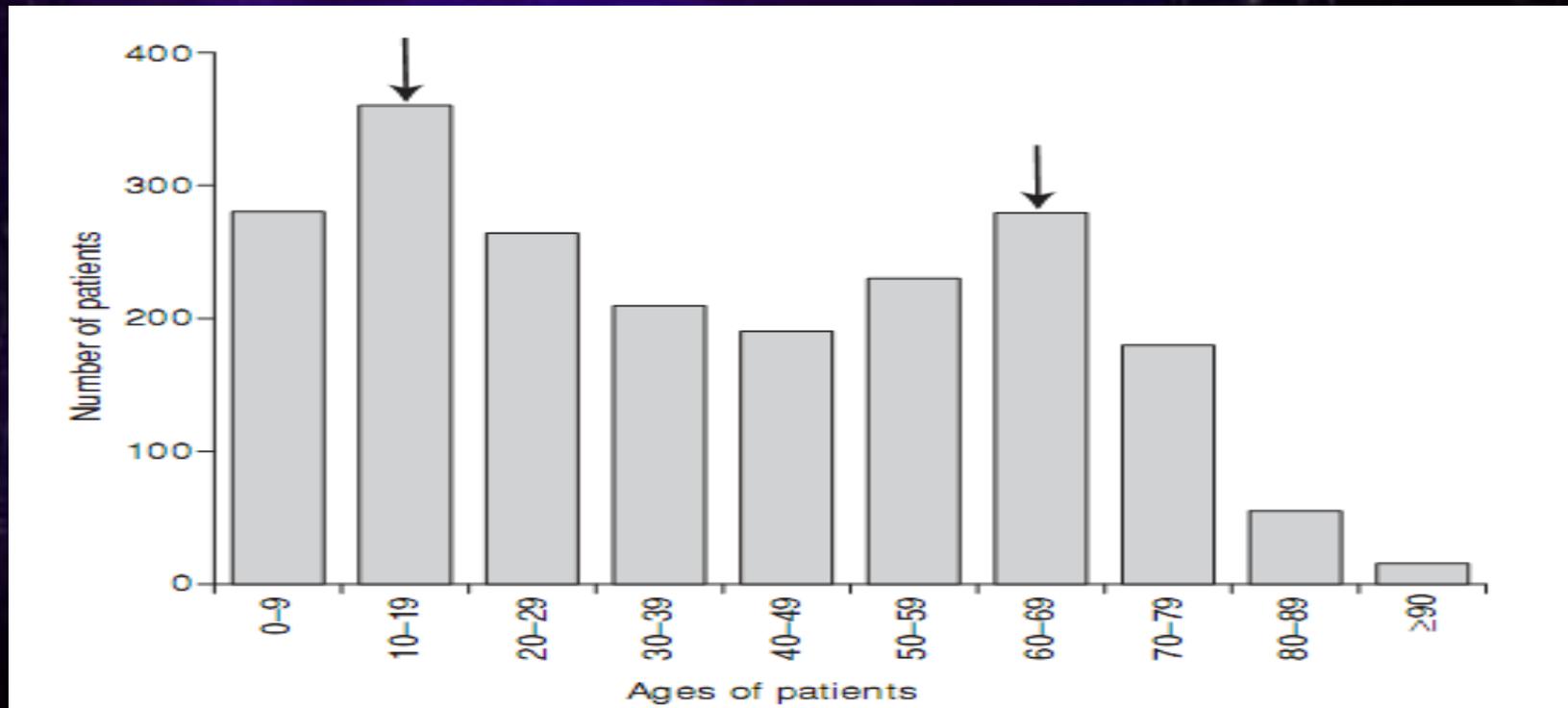


- The mode is the most common of a set of events.
- An eye clinic sister noted the eye color of 100 consecutive pts. The results are shown in figure given below.
- In this case the Mode is Brown, the commonest eye color.



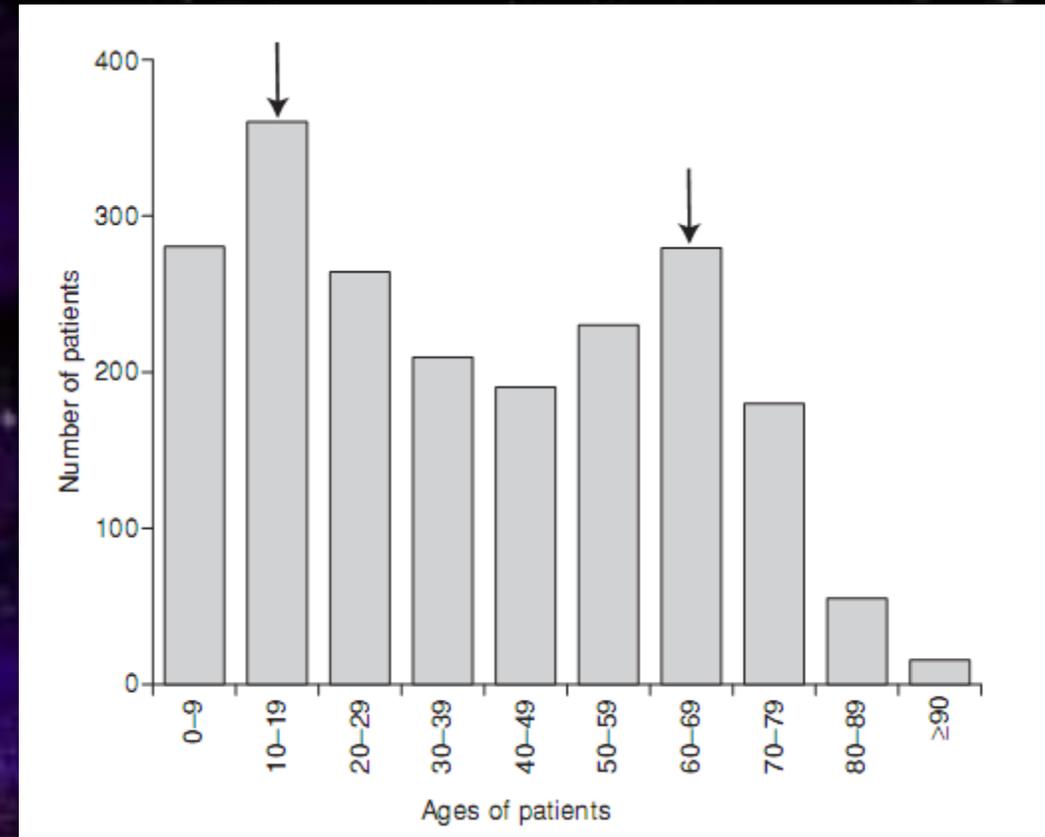


You may see reference to a “Bi-modal distribution”. Generally when this is mentioned in papers it is as a concept rather than from calculating the actual values, e.g. “The data appear to follow a bi-modal distribution”. See *Fig. for an example of where there are two “peaks” to the data, i.e. a bi-modal distribution.*





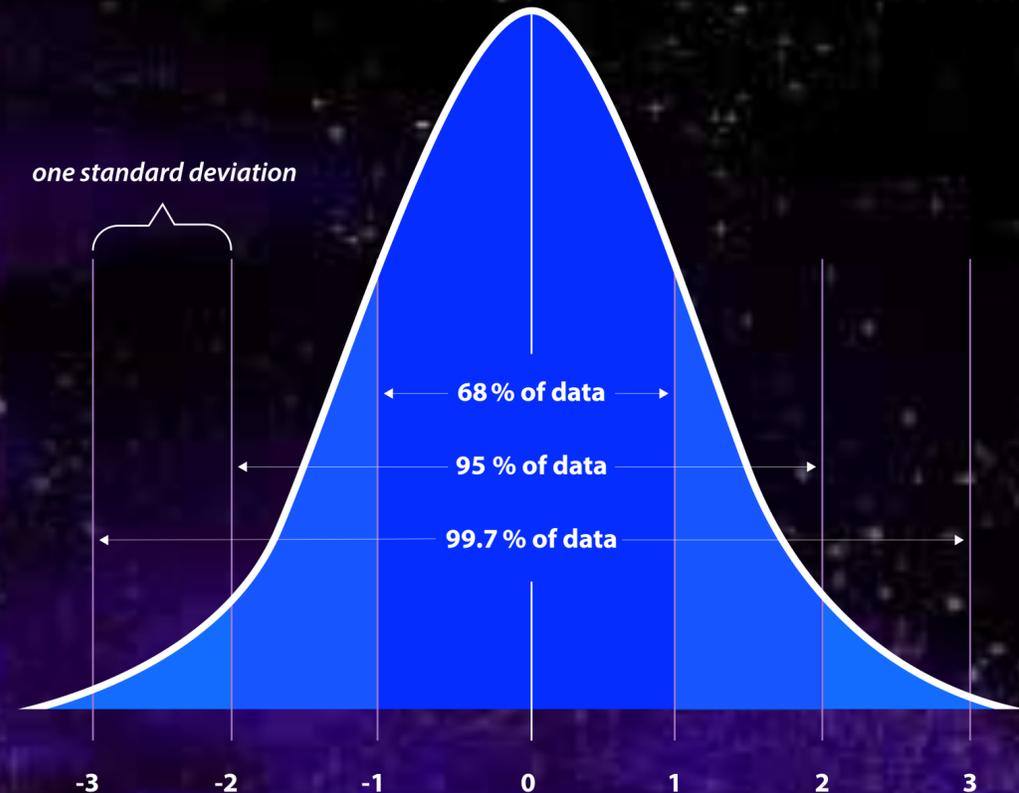
- The arrows point to the modes at ages 10–19 and 60–69.
- Bi-modal data may suggest that two populations are present that are mixed together, so an average is not a suitable measure for the distribution.





# STANDARD DEVIATION

- Standard deviation (SD) is used for data which are “normally distributed” to provide information on how much the data vary around their mean.
- SD indicates how much a set of values is spread around the average.
- A range of one SD above and below the mean (abbreviated to  $\pm 1$  SD) includes 68.2% of the values.
- $\pm 2$  SD includes 95.4% of the data.
- $\pm 3$  SD includes 99.7%.



What do you mean by the terms?

Sensitivity  
Specificity

# SENSITIVITY & SPECIFICITY

- Imagine a blood test for gastric cancer, tried out on 100 patients admitted with haematemesis. The actual presence or absence of gastric cancers was diagnosed from endoscopic findings and biopsy.
- The results are shown in Table.

Blood result	Gastric cancer	
	Present	Absent
Positive	20 (TP)	30 (FP)
Negative	5 (FN)	45 (TN)

*Sensitivity-  $20/20+5=0.8$*

*Specificity-  $45/30+45=0.6$*

If there is gastric cancer there is a 80%(0.8) chance of the test also being positive – but a 20%(0.2) chance of a false negative result.

If there is no gastric cancer there is a 60% (0.6) chance of the test being negative – but 40% will have a false positive result.

# ODDS RATIO & RELATIVE RISK

- Measures of association are summary statistics that estimate the risk of an outcome or disease for a given exposure between two groups.
- Two frequently reported measures are the odds ratio (OR) and the relative risk (RR).
- The odds ratio (OR) is calculated from a case-control study where the participants were selected by their outcome and then studied to determine exposure.

# ODDS RATIO & RELATIVE RISK

$$OR = \frac{a \times d}{b \times c}$$

$$RR = \frac{a/a+b}{c/c+d}$$

- **OR = 1.4**
- **RR = 1.25**

Diagram of Observed Frequencies Extracted for Odds Ratio Example

		Syncope (mmHg)		Totals
		+	-	
High BP	+	337 (a)	586 (b)	923
N BP	-	206 (c)	500 (d)	706
Totals		543	1086	1629

BP = blood pressure

Data extracted and modified from Chen, et al, 2000 (23).

# WHAT IS CONFIDENCE INTERVAL?

- A confidence interval is the
  - mean of your estimate plus and
  - minus the variation in that estimate.
- This is the range of values you expect your estimate to fall between if you redo your test, within a certain level of confidence.

# WHAT IS CONFIDENCE INTERVAL?

- **WHEN?**
- **Data like:**
  - **Proportions**
  - **Population means**
  - **Differences between population means or proportions**
  - **Estimates of variation among groups**
- **These are all point estimates, and don't give any information about the variation around the number.**
- **Confidence intervals are useful for communicating the variation around a point estimate.**

# WHAT IS CONFIDENCE INTERVAL?

- **EXAMPLE**
- A survey 100 Brits and 100 Americans about their television-watching habits, and find that both groups watch an average of 35 hours of television per week.
- However, the British people surveyed had a wide variation in the number of hours watched, while the Americans all watched similar amounts.
- Even though both groups have the same point estimate (average number of hours watched), the British estimate will have a wider confidence interval than the American estimate because there is more variation in the data.

# CONFIDENCE INTERVAL FORMULA

- The confidence interval is based on the mean and standard deviation. Thus, the formula to find CI is
- $\bar{X} \pm Z_{\alpha/2} \times [ \sigma / \sqrt{n} ]$
- Where
  - $\bar{X}$  = Mean
  - $Z$  = Confidence coefficient
  - $\alpha$  = Confidence level
  - $\sigma$  = Standard deviation
  - $N$  = sample space
- The value after the  $\pm$  symbol is known as the margin of error.

# CONFIDENCE INTERVAL TABLE ( $Z_{\alpha/2}$ or $Z^*$ )

- Use a table to determine the Confidence Interval Co-efficient.



# DISCUSSION AND INTERPRETATION

- Discuss the strengths and weaknesses of the study.
- Do the results support the conclusions?
- Often the conclusions will exceed the scope of the evidence base in the preceding paper.
- Consider the statistical significance vs the clinical significance?
- Does the article acknowledge the relevant literature and other approaches?
- Before concluding, the authors will often include a discussion of the limitations of the study.
- Close attention should be paid to this to ensure a fair appraisal of the author's claims.
- Have the authors declared any conflicts of interest?

# ABSTRACT

- Now is the time to read the abstract.
- Assess whether any conflicting cclaims or hyperbole have been used.

# CLINICAL CONTEXT

- End your appraisal by assessing how the paper might change clinical practice.
- You might refer back to the clinical question that first drew you to the article.

# THE FINALE

- Having critically appraised and presented the article, consider whether your comments would be of interest to the publishing journal in the form of a letter to the editor.
- Particular points of merit, in addition to inconsistencies or statistical short fallings, are of interest to the journal, its readership and the author.
- Writing letters to the editor is a useful way to hone writing skills and, if accepted, are often published quickly and enhance a CV. Often, the article may suggest areas for further research.