Board Review Course

STATISTICS REVIEW

March 2023

STATISTIC 1

- In a clinical practice, a screening test was done to detect carcinoma of the bladder by using dip stick haematuria, referring any positive results for urological investigations
- They screened 459 men, only twelve had a positive test, but only four were confirmed later to have the bladder cancer. The test failed to detect one case, which was proved to have a bladder cancer afterwards.

- Draw the 2 x 2 table
- Calculate the sensitivity, specificity and positive predictive value of this test.

ANSWER STATISTIC 1:

	DISEASE STATUS		
	Cancer bladder	No cancer	
Dip stick positive	**4**	**8**	**12**
Dip stick negative	**1**	**446**	**447**
	5	**454**	**459**

- Sensitivity= a/a+c =4/4+1 =80%
- Specificity =d/b+d =98%
- Positive predictive value +a/a+b = 4/4+8 = 33%

Statistic 2:

- In a pilot study done to calculate the power of new urine strips to detect glucose, it was found positive in 18 cases among them 11 patients were truly diabetics, 20 were tested negative although 7were truly diabetics.

Calculate the followings:

- Sensitivity and specificity.
- (Positive, and negative) predictive value.
- The likelihood ratios of test results.

Answer Statistic 2:

- Construct 2x2 table:

	DM	NO DM	Total
Positive	11(a)	7(b)	18
Negative	7(c)	13 (d)	20
Total	18	20	38

- Sensitivity= a/a+c= 11/18= 61.1%
- Specificity= d/ b+d= 13/20= 65%
- +ve predictive value= a/a+b=11/18= 61.1%
- -ve predictive value= d/c+d=13/20= 65%
- The likelihood ratio= (a/a+c)/(b/b+d)= 61%/35%= 1.7

Statistic 3:

The prevalence of tuberculosis in a 100,000 population to be screened is approximately 4%. The tuberculin skin test is used for screening. The sensitivity and specificity associated with this screening are 40.8% and 99.2% respectively.

- **What is the probability for a person with positive skin test to have TB in this population?**
- **Calculate the percentage of false (+ve) and (-ve) test results.**

- Construct 2x2 table

	TB	No TB	Total
Positive	1632 (a)	768 (b)	2400
Negative	2368(c)	95232(d)	97600
Total	4000	96000	100,000

- Sensitivity 40.8%= a / 4000
  a = 1632
- Specificity 99.2% = d /96000
  d = 95232
- percentage of false positive =
  false+ve / total +ve = 768/2400 =32%
- percentage of false negative =
  false –ve / total –ve =2368/97600= 2.4%
- Probability(+ve PV)= a/a+b=1632/2400= 68%

STATISTIC 4:

In a prospective study done to study the relation between development of hypertension and use of oral contraceptive beyond 40 years age.
A total of 600 females at age of 40 years were divided to two equal groups, group A used the OCP, group B used the condom as a method for contraception, were followed up for 5 years, it was found that 60 females developed hypertension by the end of the study, 45 of them were on OCP.

Statistic 4:

- **Draw the 2x2 table and calculate:**
- **The incidence of hypertension due to OCP.**
- **Odds ratio.**
- **Relative Risk.**

Answer statistic 4:

	hypertension	No hypertension	Total
OCP	45	255	300
Condom	15	285	300
Total	60	540	600

Incidence = 45/300 =15%

Odds ratio = (a x d)/(c x b)

Relative risk =(a/a+b)/ (c/c+d) =15%/ 5%= 3

Statistic 5:

The test used to indicate myocardial damage is serum creatinine kinase level (CK) , 240 patients were admitted to ICU with provisional diagnosis of myocardial infarction & positive test, 20 were found not to have myocardial infarction, At the same time out of the 160 patients admitted to the ICU with negative test 15 were found to have myocardial infarction .

- Calculate:
- The sensitivity, specificity, negative and positive predictive value.

Answer statistic 5:

	MI	No MI	Total
Positive CK	220 (a)	20 (b)	240 (a+b)
Negative CK	15 (c)	145 (d)	160 (c+d)
Total	235 (a+c)	165 (b+d)	400

Sensitivity = a /(a+c)= 220 / 235= 93.6%

Specificity =d /(b+d)= 145 /165= 87.8 %

Positive predictive value= a / (a+b)= 220 / 240= 91.6%

Negative predictive value= d / (c+d)= 145 /160= 90.6%

Statistic 6:

- The patients involved in the study are not aware of the treatment group they are in and whether they are receiving the current medication or the new treatment. However, the clinician treating the patients is aware of which group each of the patients is in.

Which of the following is correct?

- Case-control
- Double-blind
- Placebo-controlled
- Single-blind
- Unblinded

Answer statistic 6:

A. Case-control
B. Double-blind
C. Placebo-controlled
D. Single-blind **
E. Unblinded

Statistic 7:

A recent study of patients with stage 2 chronic kidney disease (CKD) found that a new drug reduced the progression to end-stage (stage 5) CKD from 37/1,000 placebo-treated cases to 12/1,000 new drug-treated cases over a five-year period.

Which of the following is the number needed to treat in order to obtain a single favorable outcome?

Statistic 7:

A. 2.5
B. 10
C. 25
D. 40
E. 100

Answer Statistic 7:

A. 2.5
B. 10
C. 25
D. **40 ****
E. 100

Explanation:

The number needed to treat (NNT) provides an estimate of the effectiveness of a treatment or intervention.

This can be calculated as the reciprocal of the absolute risk reduction (ARR).

In this case, the ARR is 2.5% (37/1,000 or 3.7% in the placebo group - 12/1,000 or 1.2 % in the treatment group = 2.5%). The number needed to treat can then be calculated by dividing 1 by 2.5% (1 / 0.025), or 40.

In an ideal world, the number needed to treat would be 1 and would benefit all treated patients. Many clinicians feel that the NNT is more practical and better in estimating an intervention's benefit than the ARR, relative risk reduction, or odds ratio.

Statistic 8:

- A study randomizes 2 groups of 200 patients with melanoma into a clinical trial. The study will compare treatment outcomes with a new medication, Mirabelle, against the standard treatment. Patients in Group A receive Mirabelle, and 192 patients in this group go into remission. Patients in Group B receive standard treatment, and 160 patients in this group go into remission.

- What is the odds ratio?

Answer *Statistic 8:*

The odds ratio is:

$(A \times D)/(B \times C) = (A/C)/(B/D) = (A/B)/(C/D)$

	+ remission	-remission
+ New Drug	192	8
- New Drug	160	40

The odds ratio is: (192/8)/160/40 = 6. The other choices are incorrect

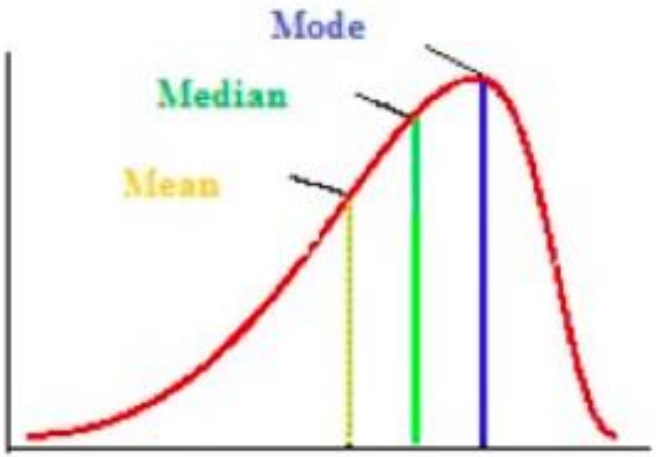
Answer *Statistic 8:*

- What is the odds ratio?
  - A. 0.17
  - B. 4.17
  - C. 0.36
  - D. 5.0
  - E. **6.0****

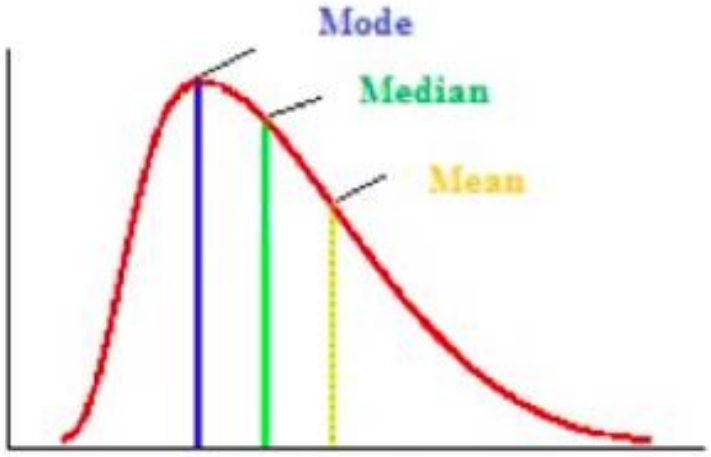
Statistic 9:

- The results of a study of blood pressure in a population are distributed in the curve shown below.

- Which of the following statements is true regarding the study's results?



Left-Skewed (Negative Skewness)



Right-Skewed (Positive Skewness)

Answer Statistic 9:

- A. The most appropriate measure of central tendency is the median.
- B. The most appropriate measure of central tendency is the mean.
- C. The mean is smaller than the median.
- D. The distribution is skewed negatively.
- E. This study demonstrates selection bias.

Answer Statistic 9:

- **A. The most appropriate measure of central tendency is the median.****
- B. The most appropriate measure of central tendency is the mean.
- C. The mean is smaller than the median.
- D. The distribution is skewed negatively.
- E. This study demonstrates selection bias.

Statistic 10:

- The following indicate the results of a study investigating Prostate specific antigen (PSA) as a screening test for prostate cancer.

	Prostate Cancer	No Cancer
PSA Positive	40	10
PSA negative	30	120

Statistic 10

- Which ONE of the following ratios gives you the predictive value of a positive test result?

A. 40/50
B. 40/70
C. 70/200
D. 120/130
E. 120/150

Answer Statistic 10

- Which ONE of the following ratios gives you the predictive value of a positive test result?

A. **40/50**
B. 40/70
C. 70/200
D. 120/130
E. 120/150

THANK YOU