

MPHIS-604.101 Statistical Reasoning in Public Health

Time - 3 Hours

MM-50

This question paper contains 3 printed pages.

Section A

Q1. Choose the most appropriate option for the following questions (i-ix) : (1x10=10)

- i. Which of the following variable is ordinal?
 - a. Area of residence (rural, semi-urban and urban)
 - b. Blood type (A, B, AB, and O)
 - c. Severity of pain (mild, moderate and severe)
 - d. Type of carcinoma (breast, lung, cervix, etc.)
- ii. Compute the median for total cholesterol levels obtained in a study on 9 selected children 2 to 6 years of age: 185, 225, 240, 196, 175, 180, 194, 147, 223
 - a. 195
 - b. 194
 - c. 196
 - d. 189.5
- iii. Which of the following does not follow a Poisson distribution?
 - a. Number of children in a family
 - b. Number of hospital infections in a week
 - c. Number of deaths due to electric accidents
 - d. Number of triplet births in a hospital over a month
- iv. In a class of 134 medical students, the mean systolic blood pressure was found to be 126 mm Hg with a standard deviation of 6 mm Hg. If the blood pressures in this sample are normally distributed, what portion of the medical students will have systolic blood pressures above 132 mm Hg
 - a. 2.5%
 - b. 5%
 - c. 16%
 - d. 32%
- v. Confidence intervals are preferred to p -values because
 - a. They are more precise
 - b. p -values are not easily interpretable
 - c. Along with the significance, the variability and the limits of the estimate is known in the confidence intervals
 - d. Confidence intervals can be computed more readily, whereas p -values involve complex calculation
 - e. They are more accurate in large studies

- vi. Serum cholesterol levels for two groups of Americans were recorded in 1989. The mean cholesterol levels of the two groups were compared. To determine whether the measurements were significantly different or not, the most appropriate statistical test would be:
- Independent samples 't'-test
 - One sample 't'-test
 - Paired 't'-test
 - Test for difference in proportions
 - One sample proportions test
- vii. The data on birth weights of children in a hospital are to be presented in a graph. This is best done by a
- Bar chart
 - Line diagram
 - Scatter diagram
 - Histogram
- viii. If we accept null hypothesis, when it is false in the population, it is known as –
- Type I error
 - Type II error
 - Power
 - Specificity
- ix. The proportion of subjects with impaired glucose tolerance is significantly higher ($p = 0.02$) among the new diabetic cases as compared with the controls. This may be interpreted as
- There is a 2% difference between the two proportions
 - There is 2% chance that the difference is significant
 - If there truly exists no difference between the groups, there is 2% likelihood that the proportions in the two samples are different by chance alone
 - If there exists a true difference between the groups, there is a 2% chance that this difference is not detected from the two samples
 - The chance of detecting the difference between the groups is 2%
- x. The correlation between two continuous variables (r , Pearson correlation coefficient) measures
- The extend to which they are clustered
 - The strength of the linear relationship
 - The nonlinear relationship
 - How causally related
 - How mutually exclusive

Section B

(4x5=20)

Answer the following questions. Q2 is compulsory. There is a choice between Q3 & Q4, Q5 & Q6 and Q7 & Q8. Each question carries 5 marks.

Q2. Why concepts of biostatistics are important in answering questions which concerns us in the field of public health? Give your answer by providing suitable example.

Q3. Write a short note on measurement of scale and give examples.

OR

Q4. Give a brief description of any three graphical methods of data presentation.

Q5. Write about the normal distribution and explain its properties.

OR

Q6. Define standard error and explain why it is important to link random samples with the populations.

Q7. Discuss the two types of errors (type I and type II errors) in hypothesis testing through examples.

OR

Q8. Outline the steps involved in testing of statistical hypothesis.

Section C

(2x10=20)

Answer the following. There is a choice between Q9 & Q10 and Q11 & Q12. Each question carries 10 marks.

Q9. A clinical trial is conducted to compare an experimental medication to placebo to estimate the difference in mean BMI. Two hundred participants are enrolled in the study and randomized to receive either the experimental medication or placebo. The mean BMI in experimental and placebo groups were 24.7 and 25.1, respectively. The standard deviation of BMI in experimental and placebo groups were 2.7 and 2.4, respectively. Generate a 95% confidence interval for the difference in mean BMI in participants assigned to the experimental versus the placebo groups.

OR

Q10. A clinical trial is conducted to compare an experimental medication to placebo to reduce the symptoms of asthma. Two hundred participants are enrolled in the study and randomized to receive either the experimental medication or placebo. The primary outcome is a self-reported reduction of symptoms. Among 100 participants who receive the experimental medication, 38 report a reduction of symptoms as compared to 21 participants of 100 assigned to the placebo. Generate a 95% confidence interval for the difference in proportions of participants reporting a reduction of symptoms between the experimental and placebo groups.

Q11. A clinical trial is planned to compare an experimental medication designed to lower blood pressure to a placebo. Before starting the trial, a pilot study is conducted involving seven participants. The objective of the study is to assess how systolic blood pressures change over time if left untreated. Systolic blood pressures are measured at baseline and again 4 weeks later. Is there a statistically significant difference in blood pressures over time? Run the test at a 5% level of significance.

Subject	1	2	3	4	5	6	7
Baseline:	120	145	130	160	152	143	126
4 Weeks:	122	142	135	158	155	140	130

OR

Q12. In a study on cardiovascular risk factors among young adults from Vellore Birth Cohort study, the proportion of overweight in men and women are shown in the table below. The overweight is defined as body mass index (BMI) ≥ 23 and the normal weight as BMI < 23 . Do the proportion of overweight in men and women differ significantly at a 5% level of significance?

Weight	Men	Women	Total
Overweight	285	299	584
Normal	873	753	1626
Total	1158	1052	2210