NEET PG Social & Preventive Medicine Sample Paper-8

Duration: 20 Minutes **Maximum Marks: 100**

Instructions

- This paper contains **25** Multiple Choice Questions.
- Each correct answer carries **+4** mark. Incorrect answer: **−1** marks. Only **one** correct option.
- Unattempted questions carry **0** marks.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.

Q1. A newly introduced screening test for an aggressive variant of carcinoma is evaluated in a cohort of 1,000 individuals. The test yields a positive result in 180 out of 200 confirmed patients, and a negative result in 720 out of 800 healthy controls. If the prevalence of this carcinoma suddenly triples in a specific high-risk subpopulation, which of the following performance characteristics of the screening test will remain completely unchanged?

(A) Positive predictive value and Negative predictive value

(B) Sensitivity and Specificity

(C) True positive rate and False negative rate only

(D) Positive predictive value and Sensitivity

Q2. An investigator studies the relationship between severe vitamin D deficiency and early-onset osteoarthritis using a classic case-control design. The investigator finds that the odds ratio is 3.5. To assess the precision of this estimate, a 95% confidence interval is calculated as (0.85, 7.24). Which of the following is the most accurate statistical interpretation of these findings?

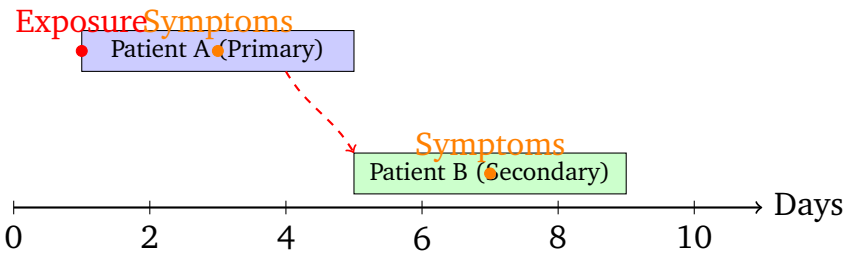
(A) The association is highly statistically significant because the odds ratio is well above 1.0.

(B) There is a 95% probability that the true population odds ratio lies exactly between 0.85 and 7.24, confirming a causal link.

(C) The association is not statistically significant at the 5% level because the confidence interval includes the value of no effect (1.0).

(D) The sample size was too large, causing the confidence interval to widen excessively and obscure the true effect.

Q3. A public health team is analyzing the impact of a recent respiratory virus outbreak in an industrial township. They construct a diagram to understand the progression and transmission timelines.



Based on the timeline shown above, the period between day 3 (onset of symptoms in Patient A) and day 7 (onset of symptoms in Patient B) represents which epidemiological metric?

(A) Incubation period

(B) Serial interval

(C) Generation time

(D) Latent period

Q4. Under the current guidelines of the National Tuberculosis Elimination Program (NTEP) in India, a 45-year-old male weighing 55 kg is diagnosed with microbiologically confirmed drug-susceptible pulmonary tuberculosis. Which of the following options correctly describes the composition and duration of the intensive phase medication regimen for this patient?

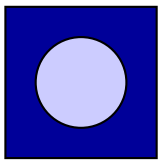
(A) 2 months of daily Isoniazid, Rifampicin, Pyrazinamide, and Ethambutol

(B) 3 months of intermittent (thrice weekly) Isoniazid, Rifampicin, and Pyrazinamide

(C) 2 months of daily Isoniazid, Rifampicin, and Streptomycin

(D) 4 months of daily Isoniazid, Rifampicin, and Ethambutol

Q5. During a routine inspection of a primary health centre cold chain system, the medical officer examines the Vaccine Vial Monitor (VVM) on a batch of Oral Polio Vaccines. The visual appearance of the VVM is represented below:



The inner square (represented here as a circle for schematic view) is distinctly lighter than the outer surrounding circle. Which of the following actions should the medical officer execute immediately regarding this vaccine batch?

(A) Discard the entire batch immediately as it has been exposed to excessive heat.

(B) Utilize the vaccine batch immediately, prioritizing it over batches with a completely white inner square.

(C) The vaccine can be safely used; however, older batches with intact VVMs should be used first according to standard EEFO principles.

(D) Return the batch to the district vaccine store for immediate potency re-testing.

Q6. An epidemiological investigation is conducted to determine the source of an acute gastroenteritis outbreak following a community feast. The investigators compute the attack rates among those who consumed various food items. The food item with the highest non-exposure attack rate is fried rice, while the attack rate among those who ate vanilla ice cream was 85% compared to 5% among those who did not eat it. Which of the following statistical metrics is most appropriate to identify the primary culprit food item?

(A) Population attributable risk fraction

(B) Relative risk or Attributable risk

(C) Proportional mortality ratio

(D) Odds ratio from a retrospective cohort index

Q7. A longitudinal cohort study tracks 5,000 middle-aged individuals over a period of 10 years to determine the risk of developing type 2 diabetes mellitus associated with sugar-sweetened beverage consumption. Over the decade, 400 individuals are lost to follow-up at various intervals, and 350 individuals develop diabetes. Which of the following denominators must be utilized to calculate the true incidence rate (person-time incidence) of diabetes in this cohort?

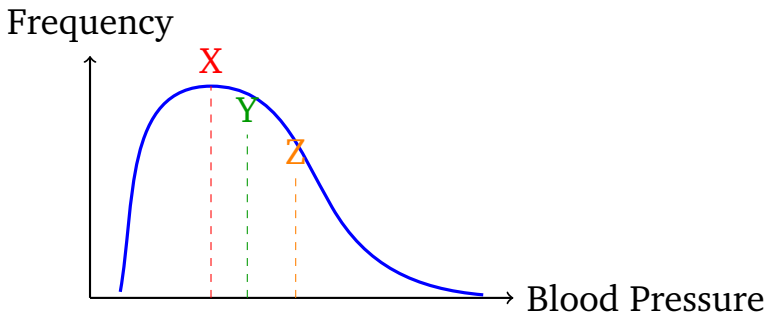
(A) Total number of individuals healthy at the end of the study (4,250)

(B) Total number of individuals initially recruited (5,000)

(C) Total sum of the exact periods of time during which each individual remained free of disease and under active observation

(D) Average of the initial population and the final disease-free population

Q8. A national health survey collects data on systolic blood pressure across a large state population. The data are plotted to analyze their distribution pattern as shown below:



Which of the following options correctly identifies the labels X, Y, and Z indicating the measures of central tendency for this positively skewed distribution?

(A) X = Mean, Y = Median, Z = Mode

(B) X = Mode, Y = Median, Z = Mean

(C) X = Median, Y = Mode, Z = Mean

(D) X = Mode, Y = Mean, Z = Median

Q9. The National Reproductive and Child Health (RCH) program emphasizes the active management of third stage of labor to prevent Postpartum Hemorrhage (PPH). According to the current operational definitions under the National Health Mission, PPH following a standard vaginal delivery is defined as blood loss exceeding which threshold?

(A) $\geq$ 200 mL

(B) $\geq$ 500 mL

(C) $\geq$ 1000 mL

(D) $\geq$ 750 mL

Q10. A 2-month-old infant is brought to the immunization clinic at a primary health centre for routine vaccination under the Universal Immunization Programme (UIP) in India. The mother states that the child missed the scheduled vaccines at 6 weeks of age. Which of the following vaccine combinations should be administered to this infant on the current visit?

(A) Pentavalent (1st dose), Oral Polio Vaccine (1st dose), Fractional IPV (1st dose), Rotavirus Vaccine (1st dose), Pneumococcal Conjugate Vaccine (1st dose)

(B) Pentavalent (2nd dose), Oral Polio Vaccine (2nd dose), Rotavirus Vaccine (2nd dose)

(C) BCG, Hepatitis B birth dose, Oral Polio Vaccine (0 dose)

(D) Pentavalent (1st dose), Whole-cell Pertussis vaccine, Measles-Rubella (1st dose)

Q11. A public health official is evaluating the efficacy of the National Vector Borne Disease Control Programme (NVBDCP) in a district endemic for Plasmodium falciparum malaria. The official calculates the Annual Parasite Index (API) for the district. The formula used to compute API involves which of the following parameters?

(A) (Total confirmed malaria cases during the year / Total slide examinations) × 100

(B) (Total positive slides during the year / Total population under surveillance) × 1000

(C) (Total falciparum cases during the year / Total population under surveillance) × 100

(D) (Total slide examinations / Total population under surveillance) × 100

Q12. A medical research team conducts a study comparing the mean reduction in serum cholesterol levels achieved by two novel lipid-lowering compounds. The data are found to be normally distributed with equal variances. Which of the following statistical tests is most appropriate to determine if the observed difference between the two independent sample means is statistically significant?

(A) Paired Student's t-test

(B) Unpaired (Independent) Student's t-test

(C) Chi-square test of independence

(D) Fisher's exact test

Q13. A clinical trial evaluates a new drug designed to reduce mortality in patients suffering from acute septic shock. The investigators report that the new drug decreases mortality from 30% in the standard control group to 20% in the treatment group. What is the Number Needed to Treat (NNT) to prevent one additional death from septic shock?

(A) 5

(B) 10

(C) 50

(D) 100

Q14. A cluster of acute flaccid paralysis (AFP) cases is reported from a remote block of a northern state in India. Under the guidelines of the National Polio

Surveillance Project, what are the criteria for collection of adequate stool samples from a suspected AFP case to isolate the wild poliovirus?

(A) One sample collected within 7 days of the onset of paralysis

(B) Two samples collected at least 24 hours apart, within 14 days of the onset of paralysis

(C) Two samples collected simultaneously within 28 days of the onset of paralysis

(D) Three samples collected 12 hours apart within 48 hours of the onset of paralysis

Q15. In a major metropolitan city, public health authorities are monitoring air quality parameters. The Environmental Protection Agency uses the Air Quality Index (AQI) to communicate the health hazards of ambient air pollution. Which of the following atmospheric pollutants is NOT routinely factored into the calculation of the standard National Air Quality Index in India?

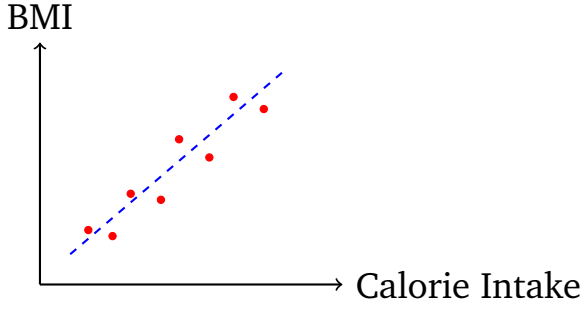
(A) Particulate Matter 2.5 ($PM_{2.5}$)

(B) Sulfur Dioxide (SO_2)

(C) Carbon Dioxide (CO_2)

(D) Ammonia (NH_3)

Q16. The relationship between daily calorie consumption and body mass index (BMI) is evaluated in a cross-sectional study of 500 young adults. The investigator calculates a Pearson correlation coefficient (r) of +0.82. The scatter plot of this association can be conceptualized using the following basic trend configuration:



What does the coefficient value of +0.82 imply regarding the linear relationship and its corresponding coefficient of determination (R^2)?

(A) There is a weak positive relationship; approximately 82% of the variation in BMI is explained by calorie intake.

(B) There is a strong positive linear relationship; approximately 67% of the variance in BMI is explained by calorie intake.

(C) There is a perfect linear relationship; 100% of the variation is explained by calorie intake.

(D) The relationship is inverse and non-linear, as R^2 cannot be evaluated from positive correlations.

Q17. An epidemiologist tracks a major cholera outbreak in a coastal region. The investigation reveals that the index case was identified on October 1st, followed by a sudden exponential surge in cases peaking on October 5th, and terminating abruptly by October 10th. All affected individuals shared a single contaminated water source during a festival on September 30th. This epidemiological pattern is characteristic of which type of epidemic curve?

(A) Continuous common-source epidemic

(B) Point-source (single exposure) common-source epidemic

(C) Propagated epidemic with person-to-person transmission

(D) Mixed-mode cyclical epidemic

Q18. A 24-year-old medical student sustains a deep percutaneous needle-stick injury while drawing blood from a patient known to be a chronic carrier of Hepatitis B virus (HBsAg positive, HBeAg positive). The student's immunization records indicate that they completed the full 3-dose Hepatitis B vaccination series 2 years ago, but their post-vaccination anti-HBs titer was never documented. What is the immediate correct management protocol for this student?

(A) Administer one dose of Hepatitis B Immune Globulin (HBIG) and restart the 3-dose vaccine series immediately.

(B) Test the student immediately for anti-HBs titers; if $\geq$ 10 mIU/mL, no further prophylaxis is required.

(C) Administer standard interferon alfa-2b therapy for 4 weeks as post-exposure prophylaxis.

(D) Give a double dose of the Hepatitis B vaccine immediately without testing the titers.

Q19. The Ministry of Health and Family Welfare, Government of India, has implemented the Pradhan Mantri Jan Arogya Yojana (PM-JAY) under Ayushman Bharat. Which of the following options correctly specifies the secondary and tertiary healthcare hospitalization benefit limit provided per family per year under this flagship scheme?

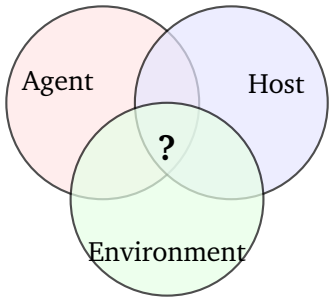
(A) INR 1 Lakh

(B) INR 2 Lakhs

(C) INR 3 Lakhs

(D) INR 5 Lakhs

Q20. A public health researcher creates a multi-layered Venn diagram to conceptualize the interactions necessary for the occurrence of infectious diseases in populations. This model is known as the Epidemiological Triad:



According to the basic tenets of advanced public health theory, what dynamic element occupies the overlapping central node marked with a question mark (?) when considering vector-borne zoonotic diseases?

(A) The baseline herd immunity threshold of the community

(B) The vector or transmission vehicle bridging the factors

(C) The specific clinical incubation matrix

(D) The absolute attributable risk fraction

Q21. A screening program for diabetic retinopathy is launched in a rural community. Out of 400 individuals who actually have diabetic retinopathy, the new screening tool correctly flags 360. Out of 1,600 individuals who do not have the condition, the tool incorrectly flags 160 as positive. What is the specificity of this new screening tool?

(A) 90%

(B) 80%

(C) 69%

(D) 75%

Q22. A corporate health officer records the absenteeism rates across different manufacturing departments due to psychological stress. The data are strictly qualitative and ranked into ordered categories: "Low Stress", "Moderate Stress", and "Severe Stress". Which of the following scale types is represented by this variable?

(A) Nominal scale

(B) Ordinal scale

(C) Interval scale

(D) Ratio scale

Q23. Under the National Non-Communicable Disease (NCD) screening guidelines embedded within the Health and Wellness Centres (Ayushman Arogya Mandirs) framework, population-based screening is carried out for specific chronic conditions. Which of the following sets of diseases is routinely covered under this mandatory screening program for all individuals aged 30 years and above?

(A) Hypertension, Diabetes Mellitus, Oral Cancer, Breast Cancer, Cervical Cancer

(B) Hypertension, Chronic Obstructive Pulmonary Disease, Lung Cancer, Prostate Cancer

(C) Diabetes Mellitus, Coronary Artery Disease, Stroke, Chronic Kidney Disease

(D) Obesity, Dyslipidemia, Cataract, Glaucoma, Colorectal Cancer

Q24. An urban primary health centre experiences a surge in canine bite cases. A 35-year-old female presents to the emergency room 3 hours after a stray dog bite on her right calf muscle. Examination reveals multiple deep transdermal tears with active oozing of blood. The animal cannot be traced. According to the WHO guidelines for rabies post-exposure prophylaxis, which categorization applies to this injury and what is the mandatory immediate management?

(A) Category II bite; immediate local wound cleaning and administration of anti-rabies vaccine only.

(B) Category III bite; immediate wound cleaning, administration of modern cell-culture anti-rabies vaccine, and infiltration of rabies immunoglobulin into and around the wound.

(C) Category III bite; immediate suturing of the wound under antibiotic cover followed by vaccine schedule on Day 3.

(D) Category I bite; routine observation of the patient for 10 days without active immunization.

Q25. A public health intervention is designed to reduce the child mortality rate in a low-resource district. According to standard demographic definitions, the Under-Five Mortality Rate (U5MR) is expressed mathematically using which of the following calculated frameworks?

(A) Number of deaths of children under 5 years of age per 1,000 live births during a specified year

(B) Number of deaths of children under 5 years of age per 1,000 children enrolled in primary schools

(C) Number of deaths of children between 1 and 5 years of age per 10,000 total population

(D) Number of neonatal deaths per 1,000 total child survivors at the end of the fiscal year

Detailed Solutions

Q1.

Solution

Concept: Screening test performance parameters vary in their dependence on disease prevalence. Sensitivity and specificity are intrinsic properties of a test determined by its biological and technical cut-offs. Conversely, predictive values change radically when the underlying disease prevalence shifts within the screened cohort.

Solution:

(a) Sensitivity represents the proportion of true clinical cases correctly identified by the diagnostic marker ($180/200 = 90\%$). Specificity measures the test's ability to correctly identify healthy controls ($720/800 = 90\%$). Both parameters rely purely on internal true positive/negative ratios.

(b) Predictive values dynamically fluctuate with baseline disease prevalence. Positive Predictive Value (PPV) drops as prevalence drops and climbs as prevalence spikes. This occurs because prevalence alters the mathematical ratio of true positives to false positives within the total positive test pool.

(c) When the disease prevalence triples in a high-risk group, the absolute pool of true positives expands disproportionately. Consequently, the PPV will increase significantly while the Negative Predictive Value (NPV) drops, because a negative result becomes less reassuring in a high-prevalence setting.

(d) Since sensitivity and specificity evaluate test performance within isolated, predetermined diseased and healthy populations respectively, they are mathematically insulated from demographic shifts in population prevalence.

(e) Thus, performance metrics calculating intrinsic accuracy (Sensitivity and Specificity) remain completely constant regardless of changes in the epidemiological scenario.

Final Answer: Sensitivity and Specificity

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept: An odds ratio (OR) estimates the strength of association between an exposure and an outcome, while its 95% confidence interval (CI) communicates both the precision of that estimate and its statistical significance at the standard $\alpha = 0.05$ threshold.

Solution:

(a) The calculated odds ratio of 3.5 implies that the odds of having early-onset osteoarthritis are 3.5 times higher in individuals with severe vitamin D deficiency than in individuals without the deficiency.

(b) To determine if this point estimate is statistically significant, the lower and upper bounds of the 95% confidence interval must be scrutinized. The null value for a relative measure of association like an odds ratio or relative risk is exactly 1.0 (indicating equal odds).

(c) The calculated 95% confidence interval ranges from 0.85 to 7.24. Because this interval spans across the value 1.0, it indicates that the data are entirely compatible with the null hypothesis of no association.

(d) Statistically, if a 95% confidence interval includes the value 1.0, the corresponding p-value must be greater than 0.05. Therefore, the observed association fails to achieve standard statistical significance.

(e) Broad confidence intervals typically suggest a smaller sample size leading to lower statistical precision, rather than an excessively large sample size.

Final Answer: The association is not statistically significant at the 5% level because the confidence interval includes the value of no effect (1.0).

Answer: (C)

Go Back to Question 2

Q3.

Solution

Concept: Epidemiological timelines track infectious disease spread via specific chronological intervals. Differentiating between clinical metrics (symptom expression) and biological metrics (transmission and shedding) is essential for mapping outbreak dynamics.

Solution:

(a) The serial interval is explicitly defined as the chronological gap between the onset of clinical symptoms in the primary case (index patient) and the onset of clinical symptoms in the secondary case infected by them.

(b) In this timeline, Patient A develops visible symptoms on day 3, and Patient B develops symptoms on day 7. The 4-day interval between these two clinical endpoints represents the serial interval.

(c) In contrast, the incubation period defines the timeline for a single individual, spanning from the exact moment of pathogen exposure to the initial manifestation of clinical symptoms (which is 2 days for Patient A).

(d) Generation time measures a biological vector, defining the time elapsed from the point of infection in the primary host to the point of maximum infectivity or actual transmission to the secondary host.

(e) Latent period reflects internal viral kinetics, defining the time window from initial exposure until the host becomes infectious, which often precedes clinical symptom onset.

Final Answer: Serial interval

Answer: (B)

Go Back to Question 3

Q4.

Solution

Concept: The National Tuberculosis Elimination Program ($NTEP$) implements standard treatment protocols aligned with international guidelines. Management of drug-susceptible pulmonary tuberculosis features a standardized intensive phase and a continuation phase using fixed-dose combinations ($FDCs$) administered daily.

Solution:

(a) For a newly diagnosed, microbiologically confirmed case of drug-susceptible pulmonary tuberculosis, the standard therapeutic strategy dictates a total treatment duration of 6 months, split into two separate operational blocks.

(b) The intensive phase comprises a 2-month regimen utilizing four core first-line anti-tuberculosis medications: Isoniazid (H), Rifampicin (R), Pyrazinamide (Z), and Ethambutol (E).

(c) $NTEP$ shifted completely from intermittent, thrice-weekly regimens to a daily schedule of weight-band-based fixed-dose combinations to suppress mutant selection and reduce treatment default rates.

(d) The continuation phase immediately follows the intensive phase and lasts for 4 months, utilizing three drugs: Isoniazid, Rifampicin, and Ethambutol (HRE), with Pyrazinamide omitted.

(e) Injectable agents like Streptomycin are strictly restricted from first-line regimens for drug-susceptible cases under current protocols to minimize toxicity and avoid unnecessary injection burdens.

Final Answer: 2 months of daily Isoniazid, Rifampicin, Pyrazinamide, and Ethambutol

Answer: (A)

Go Back to Question 4

Q5.

Solution

Concept: Vaccine Vial Monitors ($VVMs$) are specialized heat-sensitive labels placed on vaccine vials to track cumulative thermal exposure over time, helping health workers determine whether a vaccine has degraded past safe limits.

Solution:

(a) A standard VVM consists of an inner square enclosed within a darker outer circle. The chemical indicator inside the inner square gradually darkens as it absorbs ambient heat over time.

(b) The monitor features four distinct operational stages. In Stage 1, the inner square is completely white or significantly lighter than the outer circle. This indicates no significant heat exposure, making the vaccine fully potent and safe to administer.

(c) In Stage 2, the inner square has darkened slightly but remains visibly lighter than the surrounding circle. The vaccine remains potent and usable but should be prioritized for distribution ahead of Stage 1 vials.

(d) Once the inner square matches the shade of the outer circle (Stage 3) or becomes darker than the outer circle (Stage 4), the discard point has been reached, indicating the vaccine is no longer safe to use.

(e) Since the scenario describes an inner square that is distinctly lighter than the outer circle, the vaccine is safe to use. According to standard cold chain inventory rules, it should be utilized promptly.

Final Answer: The vaccine can be safely used; however, older batches with intact VVMs should be used first according to standard EEFO principles.

Answer: (C)

Go Back to Question 5

Q6.

Solution

Concept: In food-borne disease outbreaks, investigators evaluate food-specific attack rates to determine which exposure is responsible for the illness. Comparing attack rates among exposed and unexposed cohorts helps isolate the primary source of infection.

Solution:

(a) The primary culprit food item in an outbreak is identified by calculating the relative risk (RR) or attributable risk (AR) for each item consumed, looking for the maximum statistical divergence between exposed and unexposed groups.

(b) The unexposed attack rate represents the baseline incidence of illness among people who did not eat a specific item. A high unexposed attack rate for fried rice suggests it was likely a secondary, coincidental exposure.

(c) For vanilla ice cream, the attack rate was 85% among those who consumed it, compared to a baseline of just 5% among those who did not. This represents an exceptionally high relative risk ($85/5 = 17$).

(d) Attributable risk calculates the absolute excess incidence directly linked to an exposure ($85\% - 5\% = 80\%$). A large difference confirms that vanilla ice cream is the primary exposure driving the outbreak.

(e) Population attributable risk fraction measures the potential disease reduction across the entire community if an exposure were removed, which is useful for long-term policy rather than immediate source identification.

Final Answer: Relative risk or Attributable risk

Answer: (B)

Go Back to Question 6

Q7.

Solution

Concept: Incidence can be calculated as cumulative incidence or as an incidence rate (person-time incidence). The incidence rate provides a more accurate measure in dynamic cohorts where individuals are monitored for varying lengths of time.

Solution:

(a) The incidence rate uses a denominator that sums the total person-time at risk contributed by each cohort member, accounting for individuals who drop out or develop the disease at different points during the study.

(b) An individual remains at risk only as long as they are free of the disease and actively monitored under the study's observation protocol.

(c) Once a participant develops type 2 diabetes, they are no longer at risk and stop contributing person-time to the denominator from that exact date forward.

(d) Similarly, when a participant is lost to follow-up, their subsequent risk profile cannot be verified. Their person-time contribution is censored at the date of their last documented clinical visit.

(e) Using the total initial population (5,000) as the denominator yields cumulative incidence rather than an incidence rate, failing to account for variations in individual observation times.

Final Answer: Total sum of the exact periods of time during which each individual remained free of disease and under active observation

Answer: (C)

Go Back to Question 7

Q8.

Solution

Concept: Asymmetric data distributions alter the relative positions of the mean, median, and mode. In a skewed distribution, these three measures of central tendency split and follow a predictable mathematical sequence.

Solution:

(a) A positive skew occurs when an asymmetrical distribution has an elongated tail extending toward higher values on the right side of the horizontal axis.

(b) The mode represents the value that appears most frequently in the dataset, corresponding directly to the highest peak on the frequency curve (labeled as line X).

(c) The mean is highly sensitive to extreme outliers. In a positive skew, high-value outliers pull the mean toward the elongated right tail, positioning it furthest to the right (labeled as line Z).

(d) The median represents the middle value of the ordered dataset, dividing the area under the curve into two equal halves. It sits between the mode and the mean (labeled as line Y).

(e) Therefore, moving left to right along the horizontal axis in a positively skewed distribution, the metrics always appear in the following order: Mode (X), Median (Y), and Mean (Z).

Final Answer: X = Mode, Y = Median, Z = Mean

Answer: (B)

Go Back to Question 8

Q9.

Solution

Concept: Postpartum Hemorrhage (PPH) remains a leading cause of maternal mortality globally. National guidelines establish clear blood loss thresholds to help healthcare providers recognize PPH early and initiate life-saving interventions.

Solution:

(a) Under the National Health Mission guidelines, postpartum hemorrhage is defined as any volume of blood loss from the genital tract that threatens the hemodynamic stability of the mother after delivery.

(b) For operational clarity during clinical management, PPH following a standard, uncomplicated vaginal delivery is defined as a measured or estimated blood loss of 500 mL or greater.

(c) For a cesarean section delivery, the diagnostic threshold for postpartum hemorrhage is higher, set at a blood loss volume of 1,000 mL or greater.

(d) Active Management of the Third Stage of Labor ($AMTSL$) is routinely performed for all deliveries to reduce blood loss and prevent progression past these volume thresholds.

(e) Waiting for blood loss to reach 1,000 mL after a vaginal delivery before diagnosing PPH delays critical interventions like uterine massage and uterotonic administration, jeopardizing patient safety.

Final Answer: $\geq$ 500 mL

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept: The Universal Immunization Programme (UIP) in India follows a structured immunization schedule. When an infant misses a scheduled vaccination visit, catch-up immunization guidelines dictate administering all age-appropriate missed doses at the earliest opportunity.

Solution:

(a) At 6 weeks of age, the national immunization schedule mandates the administration of the first doses of Pentavalent, Oral Polio Vaccine (OPV), Fractional Inactivated Polio Vaccine ($fIPV$), Rotavirus Vaccine (RVV), and Pneumococcal Conjugate Vaccine (PCV).

(b) This 2-month-old infant missed the 6-week schedule completely and has received no vaccinations beyond their birth doses. This visit marks their first opportunity to receive these primary series vaccines.

(c) Catch-up guidelines state that the infant must receive the initial doses of all scheduled vaccines on this current visit to establish protective antibody titers without further delay.

(d) The infant cannot skip directly to the second doses of these vaccines without first receiving the primary priming doses to stimulate the immune system.

(e) Therefore, the medical officer must administer the first doses of Pentavalent, OPV, $fIPV$, RVV, and PCV during this visit, documenting the revised timeline for subsequent doses.

Final Answer: Pentavalent (1st dose), Oral Polio Vaccine (1st dose), Fractional IPV (1st dose), Rotavirus Vaccine (1st dose), Pneumococcal Conjugate Vaccine (1st dose)

Answer: (A)

Go Back to Question 10

Q11.

Solution

Concept: The Annual Parasite Index (API) is a core epidemiological metric utilized under the National Vector Borne Disease Control Programme to measure the operational load and endemicity of malaria within a defined geographical community or district over a fiscal year.
Solution:

(a) The API functions as a key tracking mechanism to assess the true incidence of malaria cases confirmed through active and passive surveillance operations within a specific administrative boundary.

(b) Mathematically, the index calculates the total number of microscopically confirmed or rapid diagnostic test-positive malaria cases detected over a single year divided by the total population under active surveillance.

(c) To yield a standardized, comparative metric across districts with varying demographic sizes, this calculated proportion is expressed per 1,000 population.

(d) Alternative metrics like the Slide Positivity Rate (SPR) instead measure the ratio of positive slides relative to the absolute number of blood smears examined, which reflects diagnostic yield rather than population incidence.

(e) Accurately monitoring the API allows public health planners to categorize regions into high or low endemicity zones, guiding the distribution of insecticide-treated bed nets and long-lasting indoor residual spraying.

Final Answer: (Total positive slides during the year / Total population under surveillance) × 1000

Answer: (B)

Go Back to Question 11

Q12.

Solution

Concept: When evaluating quantitative parameters across different clinical cohorts, selecting the appropriate parametric or non-parametric test is governed by data distribution, variance uniformity, and the baseline structure of the independent groups.

Solution:

(a) The study intends to evaluate a continuous variable, which is the mean reduction in serum cholesterol levels, measured across two distinct, non-overlapping cohorts receiving different lipid-lowering compounds.

(b) Preliminary diagnostic testing confirms that the dataset meets the standard prerequisites for parametric analysis, demonstrating a normal Gaussian distribution and equal homoscedastic variances across both treatment arms.

(c) Because the two groups are entirely independent and consist of different individuals rather than pre-test and post-test values obtained from a single cohort, a paired analysis is statistically invalid.

(d) The Unpaired Student's t-test is specifically designed to determine whether the observed statistical difference between two independent sample means occurs due to true therapeutic variation or random sampling chance.

(e) Categorical evaluations like the Chi-square test or Fisher's exact test are completely inappropriate here because the outcome metric is continuous rather than a discrete frequency count.

Final Answer: Unpaired (Independent) Student's t-test

Answer: (B)

Go Back to Question 12

Q13.

Solution

Concept: The Number Needed to Treat (NNT) is an epidemiological and clinical metric that quantifies the effectiveness of a novel therapeutic intervention by determining how many patients must receive the treatment to prevent one additional adverse outcome.

Solution:

(a) To compute the Number Needed to Treat, an investigator must first calculate the Absolute Risk Reduction (ARR), which defines the arithmetic difference in mortality rates between the unexposed control group and the treated group.

(b) In this clinical trial, the baseline mortality risk noted within the standard control cohort is 30% (0.30), whereas the mortality rate drops to 20% (0.20) among individuals receiving the new therapeutic compound.

(c) Subtracting the treatment group mortality from the control group mortality yields an Absolute Risk Reduction value of 10% ($0.30 - 0.20 = 0.10$), representing the absolute percentage of lives saved by the drug.

(d) The Number Needed to Treat is mathematically defined as the direct reciprocal of the Absolute Risk Reduction ($NNT = 1/ARR$).

(e) Substituting the values into the formula (1/0.10) yields an absolute integer of 10, meaning ten patients with acute septic shock must be treated with the new drug to prevent one death.

Final Answer: 10

Answer: (B)

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Q14.

Solution

Concept: The National Polio Surveillance Project enforces strict, high-quality stool collection criteria for all reported cases of Acute Flaccid Paralysis (AFP) to ensure accurate laboratory isolation of wild poliovirus variants and rule out vaccine-derived strains.

Solution:

(a) Surveillance protocols require rapid stool sampling because the shedding concentration of enteroviruses in human feces peaks immediately after the onset of clinical paralysis and drops significantly within a few weeks.

(b) For an AFP surveillance case to be classified as having adequate stool specimens, the field investigator must secure two separate stool samples from the affected individual.

(c) These two specimens must be collected with a chronological gap of at least 24 hours between them to maximize the probability of viable viral isolation and prevent false-negative diagnostic findings.

(d) Furthermore, both physical stool specimens must be obtained within a strict operational window of 14 days following the initial onset of acute flaccid motor weakness.

(e) Samples collected after this 14-day threshold are classified as inadequate, requiring additional complex clinical follow-up examinations at Day 60 to look for residual neurological deficits.

Final Answer: Two samples collected at least 24 hours apart, within 14 days of the onset of paralysis

Answer: (B)

Go Back to Question 14

Q15.

Solution

Concept: The National Air Quality Index (AQI) in India is an environmental monitoring framework designed to convert complex ambient chemical concentration data into a single, easily interpretable index value that communicates immediate health risks to the public.

Solution:

(a) The index operates on a standardized evaluation system that tracks a designated panel of major atmospheric pollutants based on criteria defined by central environmental regulatory bodies.

(b) The Indian National AQI tracks a specific matrix of eight criteria pollutants: Particulate Matter 10 (PM_{10}), Particulate Matter 2.5 ($PM_{2.5}$), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Carbon Monoxide (CO), Ozone (O_3), Ammonia (NH_3), and Lead (Pb).

(c) Carbon Dioxide (CO_2) is a major greenhouse gas and a key driver of global climate change; however, it does not cause acute localized toxicity at standard ambient levels and is excluded from the AQI calculation.

(d) In contrast, gases like Carbon Monoxide (CO) and Sulfur Dioxide (SO_2) pose immediate health hazards, such as systemic hypoxia and severe respiratory irritation, which requires their active inclusion in daily AQI metrics.

(e) Each tracking station assesses these eight pollutants, using the highest sub-index value calculated among them to determine the final daily AQI score.

Final Answer: Carbon Dioxide (CO_2)

Answer: (C)

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Q16.

Solution

Concept: The Pearson correlation coefficient (r) measures the strength and direction of a linear relationship between two continuous variables. Squaring this value yields the coefficient of determination (R^2), which quantifies the proportion of shared variance.

Solution:

(a) The calculated Pearson correlation coefficient (r) of +0.82 indicates a strong, direct linear association, meaning that body mass index values predictably rise as daily calorie intake increases.

(b) To understand how much variance in the dependent outcome variable is directly accounted for by the independent predictor, the value of r must be squared ($R^2 = 0.82 \times 0.82$).

(c) Squaring 0.82 yields a coefficient of determination (R^2) of approximately 0.6724. When converted to a percentage, this indicates that roughly 67% of the total variance in BMI is explained by daily calorie intake.

(d) The remaining 33% of the variance in body mass index is due to unmeasured confounding parameters, such as baseline metabolic rate, genetic factors, and physical activity levels.

(e) A correlation coefficient of +0.82 cannot be interpreted as a weak relationship or a perfect linear match, as a perfect linear relationship requires an r value of exactly +1.0.

Final Answer: There is a strong positive linear relationship; approximately 67% of the variance in BMI is explained by calorie intake.

Answer: (B)

Go Back to Question 16

Q17.

Solution

Concept: Epidemic curves map the chronological distribution of disease onset over time. The shape, slope, and duration of the curve reveal key insights into the transmission dynamics and vehicle source of an infectious disease outbreak.

Solution:

(a) A point-source epidemic curve is characterized by a rapid, compressed surge in cases that peaks quickly and declines sharply, with all individual cases falling within a single incubation period.

(b) This pattern indicates that the entire cohort was exposed to a shared infectious vehicle or environmental source during a single, brief window of time.

(c) In this scenario, the exposure occurred entirely on September 30th during a community festival, leading to an immediate surge in cholera cases that peaked on October 5th and resolved by October 10th.

(d) In contrast, a continuous common-source outbreak shows a prolonged plateau rather than a sharp peak because the exposure source remains unmitigated over an extended period.

(e) Propagated epidemics display a series of progressively larger peaks spaced roughly one incubation period apart, reflecting ongoing person-to-person transmission rather than a single shared exposure.

Final Answer: Point-source (single exposure) common-source epidemic

Answer: (B)

Go Back to Question 17

Q18.

Solution

Concept: Post-exposure prophylaxis for Hepatitis B virus (HBV) following a occupational needle-stick injury is determined by the vaccination status and documented immune response of the exposed individual.

Solution:

(a) The student completed the primary 3-dose Hepatitis B vaccine series two years ago but never had their post-vaccination anti-HBs antibody titers measured to confirm seroconversion.

(b) The source patient is a highly infectious active carrier of Hepatitis B, testing positive for both HBsAg and HBeAg, which carries a high risk of viral transmission following a percutaneous exposure.

(c) According to standard occupational health protocols, the exposed healthcare worker should be tested immediately for anti-HBs titers to assess their current level of immunity.

(d) If the laboratory evaluation confirms an anti-HBs titer of ≥ 10 mIU/mL, the individual has adequate protection, and no further passive or active immunization is required.

(e) If the titer falls below 10 mIU/mL, the student is classified as a non-responder and must receive immediate prophylaxis with Hepatitis B Immune Globulin (HBIG) alongside a booster vaccine dose.

Final Answer: Test the student immediately for anti-HBs titers; if ≥ 10 mIU/mL, no further prophylaxis is required.

Answer: (B)

Go Back to Question 18

Q19.

Solution

Concept: The Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (PM-JAY) is a flagship national health insurance scheme designed to provide financial risk protection against catastrophic healthcare expenses for vulnerable populations.

Solution:

(a) PM-JAY functions as a non-contributory, government-funded health insurance program targeted at families identified through socioeconomic and caste census deprivation criteria.

(b) The scheme provides comprehensive coverage for secondary and tertiary care hospitalization expenses, including pre-hospitalization diagnostics and post-discharge medications.

(c) The operational financial benefit cap under this framework is set at a maximum of INR 5 Lakhs per eligible family per fiscal year, applied on a family-floater basis.

(d) This structure ensures that any configuration of family members can utilize the coverage pool without individual age or household size caps restricting access.

(e) By eliminating out-of-pocket expenses for advanced medical procedures, the scheme aims to reduce medical impoverishment across lower socioeconomic strata in India.

Final Answer: INR 5 Lakhs

Answer: (D)

Go Back to Question 19

Q20.

Solution

Concept: The Epidemiological Triad models infectious disease transmission by analyzing the interactions between an agent, a susceptible host, and an environmental setting that supports transmission.

Solution:

(a) The agent represents the core pathogen required to cause the disease, while the host provides the biological environment for the infection to develop.

(b) The environment includes external physical, biological, and socioeconomic factors that influence either the survival of the agent or the susceptibility of the host.

(c) For vector-borne diseases like malaria, dengue, or zoonotic infections, transmission requires an intermediary biological vector or transport vehicle to bridge the gap between these components.

(d) The overlapping central intersection of the triad represents the point where the agent, host, and environment align, allowing the vector to successfully transmit the pathogen.

(e) Factors like community herd immunity levels modify host susceptibility but do not function as the primary structural bridge within this epidemiological model.

Final Answer: The vector or transmission vehicle bridging the factors

Answer: (B)

Go Back to Question 20

Q21.

Solution

Concept: Specificity measures a diagnostic or screening test's capacity to correctly identify individuals who do not have the target condition. It is calculated by dividing the number of true negatives by the total number of healthy individuals in the sample.

Solution:

(a) The sample data indicates that there are 1,600 individuals who genuinely do not have diabetic retinopathy, representing the total healthy population group.

(b) The screening tool incorrectly flags 160 of these healthy people as positive, which represents the number of false positives yielded by the test.

(c) To find the true negatives, the false positives must be subtracted from the total uninfected population pool ($1600 - 160 = 1440$ individuals).

(d) Specificity is calculated using the formula: True Negatives divided by the quantity of True Negatives plus False Positives (1440/1600).

(e) Simplifying this mathematical fraction yields 0.90, which corresponds to a specificity of exactly 90% for this new diabetic retinopathy screening tool.

Final Answer: 90%

Answer: (A)

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Q22.

Solution

Concept: Variables in biostatistics are classified using four levels of measurement scales: nominal, ordinal, interval, and ratio. The choice of scale depends on whether the underlying values carry properties of identity, magnitude, equal intervals, or an absolute zero point.

Solution:

(a) The recorded absenteeism data are qualitative rather than purely quantitative, as they describe distinct psychological stress characteristics instead of absolute numerical values.

(b) These stress data are organized into distinct categories consisting of Low Stress, Moderate Stress, and Severe Stress.

(c) These specific classes possess an inherent natural ranking and relative order, allowing observations to be graded systematically from lowest to highest.

(d) An ordinal scale is explicitly defined by data that can be categorized and sorted into a meaningful hierarchy, though the exact mathematical distances between ranks remain unmeasurable.

(e) A nominal scale lacks this hierarchical structure, while interval and ratio scales require precise numerical measurements with uniform distances between units.

Final Answer: Ordinal scale

Answer: (B)

Go Back to Question 22

Q23.

Solution

Concept: The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke mandates population-based screening at Health and Wellness Centres to detect chronic diseases early in the adult population.

Solution:

(a) Universal screening operations target all community individuals aged 30 years and above, using frontline healthcare workers like Auxiliary Nurse Midwives and Accredited Social Health Activists.

(b) The program focuses on a core panel of five non-communicable conditions that place a high disease burden on the community: hypertension, diabetes mellitus, oral cancer, breast cancer, and cervical cancer.

(c) Hypertension is screened using digital blood pressure monitors, while diabetes is evaluated via capillary blood glucose testing.

(d) Common malignancies are assessed through visual clinical examinations for oral lesions, manual breast palpation, and visual inspection with acetic acid for cervical abnormalities.

(e) Other chronic conditions, such as chronic obstructive pulmonary disease or prostate cancer, are excluded from standard universal screening protocols due to high diagnostic costs and the need for specialized equipment.

Final Answer: Hypertension, Diabetes Mellitus, Oral Cancer, Breast Cancer, Cervical Cancer

Answer: (A)

Go Back to Question 23

Q24.

Solution

Concept: The World Health Organization classifies rabies exposure risks into three distinct categories based on the mechanism of contact, guiding the selection of post-exposure prophylaxis protocols.

Solution:

(a) This clinical case involves multiple deep transdermal scratches with active bleeding, which satisfies the operational definition for a Category III rabies exposure.

(b) Because rabies is uniformly fatal once symptoms manifest, immediate intervention is mandatory for all Category III exposures, especially when the animal cannot be tracked.

(c) Prophylaxis requires thorough local wound management, which means immediately flushing and washing all bite wounds with soap and running water for at least 15 minutes.

(d) Active immunization must be initiated promptly by administering a modern cell-culture anti-rabies vaccine on Day 0, following recommended national schedules.

(e) Crucially, passive immunization is required; human or equine rabies immunoglobulin must be infiltrated directly into and around the margins of the wound to neutralize the virus locally.

Final Answer: Category III bite; immediate wound cleaning, administration of modern cell-culture anti-rabies vaccine, and infiltration of rabies immunoglobulin into and around the wound.

Answer: (B)

Go Back to Question 24

Q25.

Solution

Concept: Demographic health indicators monitor population health patterns using standardized formulas. The Under-Five Mortality Rate measures the probability that a child will die before reaching their fifth birthday.

Solution:

(a) The Under-Five Mortality Rate calculates child survival dynamics within a specific geographic community or administrative district over a single calendar year.

(b) Mathematically, this rate is defined as the total number of deaths among children under five years of age divided by the total number of live births recorded during that year.

(c) To provide a standardized metric for comparison across different population sizes, this calculated proportion is multiplied by a scaling factor of 1,000.

(d) This metric functions as an index of overall child health, reflecting the combined impact of nutritional support, environmental sanitation, and access to primary pediatric care.

(e) It should not be confused with child mortality rates that use the mid-year population of children aged one to four as the denominator, nor with neonatal metrics focused on the first month of life.

Final Answer: Number of deaths of children under 5 years of age per 1,000 live births during a specified year

Answer: (A)

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Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	B	4	A	5	C
6	B	7	C	8	B	9	B	10	A
11	B	12	B	13	B	14	B	15	C
16	B	17	B	18	B	19	D	20	B
21	A	22	B	23	A	24	B	25	A