S5 Health Management and Social Care Practice Paper (Set 1): Incidence and Prevalence, Screening Sensitivity and Predictive Values, Cost-effectiveness and QALY, Nurse-to-Patient Ratio and Bed Occupancy, BMI and Energy Balance, Long-term Care Demand and Health Financing

100 marks · 60 minutes · 6 questions / 24 parts

Question 1: Epidemiological Data and Disease Risk

Answer all parts, showing your working and units.

1. **1.** A district has a mid-year population of 250,000 and 750 newly diagnosed cases in a year. Calculate the incidence rate per 100,000 population (1 decimal place). *(2 marks)*
2. **2.** At the same point in time there are 3,000 existing cases. Calculate the prevalence rate per 1,000 population (1 decimal place) and explain how prevalence differs from incidence. *(4 marks)*
3. **3.** A screening programme tests 1,200 people; disease prevalence is 10%%, sensitivity 90%% and specificity 95%%. Complete the 2x2 table (TP / FP / FN / TN) and calculate the positive and negative predictive values (1 decimal place each). *(5 marks)*
4. **4.** The district records 1,250 deaths in the year. Calculate the crude death rate per 100,000 (1 decimal place). Also: the smoking group (3,000 people) has 180 cases and the non-smoking group (12,000 people) has 320. Calculate both attack rates, the relative risk (2 decimal places) and the attributable risk per 100. *(5 marks)*

Question 2: Cost-effectiveness and Health Economics

Answer all parts, showing your working and units.

1. **5.** A new therapy costs $180,000 per patient and yields 3.0 additional QALYs. Calculate the cost per QALY gained. *(4 marks)*
2. **6.** The old therapy costs $60,000 and yields 1.2 QALYs. Calculate the incremental cost, incremental QALYs and the ICER (nearest integer). *(5 marks)*
3. **7.** If the willingness-to-pay threshold is $50,000 per QALY, judge whether the new therapy is cost-effective and calculate the annual drug budget for 900 patients. *(4 marks)*
4. **8.** A prevention programme costs $1,200 per person and covers 40,000 people. It avoids 96 admissions at $250,000 each. Calculate the total programme cost, the saving, the net cost and the cost per admission avoided. *(5 marks)*

Question 3: Health Manpower and Ward Throughput

Answer all parts, showing your working and units.

1. **9.** A ward has 32 beds with a standard nurse-to-patient ratio of 1:8. How many nurses are needed per shift, and how many nurse shifts per day under a three-shift system? *(4 marks)*

2. **10.** Each shift lasts 8 hours and a nurse works 39 hours per week. Calculate the weekly nurse-hours needed for 24-hour cover and the full-time equivalent (FTE, 1 decimal place). *(4 marks)*
3. **11.** Annual occupied bed-days are 9,490 for 32 beds (365 days). Calculate bed occupancy (%, 2 decimal places) and comment on the risks of high occupancy. *(4 marks)*
4. **12.** There were 1,180 discharges in the year. Calculate the average length of stay (2 decimal places) and explain how shortening it affects service volume. *(4 marks)*

Question 4: Body Indicators and Energy Balance

Answer all parts, showing your working and units.

1. **13.** A person is 1.65 m tall and weighs 68 kg. Calculate BMI (1 decimal place) and classify the weight status using Asian adult cut-offs. *(4 marks)*
2. **14.** The same person has a 92 cm waist and 100 cm hip. Calculate the waist-to-hip ratio (2 decimal places) and state the health risks of central obesity. *(4 marks)*
3. **15.** Estimate basal metabolism at 24 kcal per kg per hour with an activity factor of 1.3. Calculate the daily energy requirement (kcal, nearest integer). *(4 marks)*
4. **16.** If daily intake is 2,600 kcal, calculate the daily energy surplus. Assuming 7,700 kcal per kg of fat, estimate the weight change over 30 days (kg, 2 decimal places) and suggest two interventions. *(4 marks)*

Question 5: Long-term Care Demand and Service Planning

Answer all parts, showing your working and units.

1. **17.** A district has 600,000 people, of whom 132,000 are aged 65 or above. Calculate the percentage of older people (1 decimal place). *(4 marks)*
2. **18.** 18% of older people have functional impairment, and 12% of them need residential care, the rest home care. Calculate the three groups (whole numbers). *(5 marks)*
3. **19.** Only 1,900 subsidised residential places exist. Calculate the shortfall and explain its impact on family carers. *(4 marks)*
4. **20.** Each place costs $18,000 per month with 70% government subsidy. Calculate the monthly subsidy per resident and the annual subsidy needed to close the whole shortfall (nearest dollar). *(4 marks)*

Question 6: Health Financing and Insurance Risk Pooling

Answer all parts, showing your working and units.

1. **21.** A plan has 10,000 members, an annual admission rate of 8% and an average claim of $45,000. Calculate the number of admissions and total claims. *(4 marks)*
2. **22.** If administration costs 18% of premium income, calculate total premium income and the average premium per member (2 decimal places). *(5 marks)*
3. **23.** With a $8,000 deductible, only 62% of admissions are claimed. Calculate the number of claimants and the actual amount paid. *(4 marks)*

4. **24.** Using the premium of $4,390.24 per member with administration at 18% of income, calculate the operating surplus and the claims ratio (paid ÷ premium income, 1 decimal place), and comment on how a deductible affects adverse selection and moral hazard. *(4 marks)*