DH302: Individual Assignment

SAURAV KUMAR 21D070063

19 April 2025

Question 1: Telemedicine Framework

a. Selected Framework: **PESTEL**

b. Justification: The PESTEL framework evaluates macro-environmental factors that influence implementation of large-scale interventions like telemedicine in rural areas. It includes Political, Economic, Social, Technological, Environmental, and Legal factors — all crucial for planning and execution.

Question 2: Obesity Prevention Framework

a. Selected Framework: **RE-AIM**

b. Justification: The hypothesis reflects each component of the RE-AIM framework:

- **Reach**: At-risk students
- **Effectiveness**: BMI reduction
- **Adoption**: Multiple schools
- **Implementation**: Across settings
- **Maintenance**: Sustainable behaviour change

Question 3: Sample Size and Prevalence

a. Correct Answer: **B) The required sample size would decrease**

b. Justification: Required sample size for estimating a proportion is:

$$n = \frac{Z^2 \cdot p(1-p)}{E^2}$$

As prevalence (p) decreases from 30% to 20%, $p(1-p)$ reduces from 0.21 to 0.16, thus lowering the required sample size.

Question 4: Vaccine Trial Evaluation

a. Expected Cases:

- Placebo Group: $0.05\% \times 7500 = 3.75 \approx 4$ cases
- Vaccine Group: $15\% \times 3.75 = 0.5625 \approx 0.6$ cases

b. Statistical and Ethical Considerations:

- **Statistical**: Low power due to low number of events
- **Ethical**: Risk vs benefit, informed consent, DSMB monitoring

c. Recommendations:

- Increase sample size to detect rare outcomes
- Extend trial duration beyond 6 months
- Use adaptive or Bayesian designs
- Learn from large-scale trials like Salk's polio vaccine study

Question 5: PoshanShakti Program Evaluation

a. Hypothesis: The PoshanShakti program significantly reduces malnutrition in rural children compared to the standard Mid-Day Meal scheme.

b. Selected Framework: RE-AIM

- **Reach**: Children in 75 rural schools
- **Effectiveness**: Nutritional and academic outcomes
- **Adoption**: Schools and health workers
- **Implementation**: Meals, education, monitoring
- **Maintenance**: Long-term feasibility and scale-up

c. Additional Data:

- Home diet (24-hour recall)
- Teacher quality (observational ratings)
- Anemia/deworming records (PHC logs)
- Community engagement (focus groups)
- Dropout rates (school records)

Ethical Concerns: Informed consent, privacy, cultural sensitivity, fairness for control group

d. Suggested Visualizations:

1. Bar chart: Stunting, BMI, weight gain – control vs intervention
2. Line graph: Academic and attendance trend over 12 months
3. Stacked bar chart: Cost per student – category-wise

e. Sample Size Calculations:

- Detect 5% difference in stunting:

$$n = \frac{2(Z_{1-\alpha/2} + Z_{1-\beta})^2 \cdot p(1-p)}{\Delta^2} = \frac{2(3.24)^2 \cdot 0.219}{0.05^2} \approx 1836$$

- Detect 3% difference:

$$n = \frac{2(3.24)^2 \cdot 0.219}{0.03^2} \approx 5100$$

f. Confounding Variables and Mitigation:

- **SES**: Affects food and health access → control via stratification or regression
- **Parental education**: Affects learning and health awareness → match or control as covariate