**Pre- and Post-test for ANRCB Training Module 6: Statistical Design and Planning (24 June 2022)**

1. *Question:*

Which of these factors should help us decide how we choose a study design for our research? You can choose all that apply.

*Response options:*

a) Our specific research question or hypothesis

b) The stage of our research topic

c) Ethical considerations in how we conduct the research

d) The resources we have or can obtain to conduct the research

e) The amount of time we are able to invest in the research

*For the next few questions, read the description of a research scenario, and select the best study design to accomplish the research. There may be more than one possible answer but choose the design that can best answer the research question given the resources provided.*

2. *Question/Scenario:*

You have a role in developing strategies to improve micronutrient supplementation among children in Lao PDR. There’s evidence that micronutrient supplementation reduces malnutrition, but you are experiencing challenges in helping people to safely access and consume the supplements. You’re not entirely sure what the barriers to access are, and whether there are patterns to these barriers, meaning that they might differ based on who the person is, or where they live, or when you deliver the supplements. You’d like to be able to identify these barriers and their distribution in the population. *Select the best study design to accomplish your research.*

*Response options:*

a) Cohort study (prospective)

b) Cohort study (retrospective)

c) Prevalence or a cross-sectional study using existing data

d) Prevalence or cross-sectional study collecting new data

e) Case-control study

f) Ecological study

g) Experimental study (includes randomized controlled trial and quasi-experimental or community trial)

3. *Question/Scenario:*

Imagine you are the same researcher in the previous question, developing strategies to improve micronutrient supplementation among children in Lao PDR. You now understand the barriers to accessing and taking supplements, and you have found evidence-based interventions that might help improve the uptake of micronutrient supplements by addressing these barriers. You’d like to test whether one of these will be effective in the population you work with. *Select the best study design to accomplish your research.*

*Response options:*

a) Cohort study (prospective)

b) Cohort study (retrospective)

c) Prevalence or a cross-sectional study using existing data

d) Prevalence or cross-sectional study collecting new data

e) Case-control study

f) Ecological study

g) Experimental study (includes randomized controlled trial and quasi-experimental or community trial)

4.*Question/Scenario:*

You are interested in the relationship between eating fruits and vegetables and non-communicable diseases (NCDs). You have a conceptual model that you’ve built from a literature review that leads you to believe that there might be differences in this relationship by socioeconomic factors. Specifically, you want to see whether the association between eating fruits and vegetables and the prevalence of NCDs differs by region of the country, level of education, gender, and by race/ethnicity. You believe the National Survey provides data on the patterns of fruit and vegetable consumption as well as non-communicable diseases in Lao PDR. *Select the best study design to accomplish your research.*

*Response options:*

a) Cohort study (prospective)

b) Cohort study (retrospective)

c) Prevalence or a cross-sectional study using existing data

d) Prevalence or cross-sectional study collecting new data

e) Case-control study

f) Ecological study

g) Experimental study (includes randomized controlled trial and quasi-experimental or community trial)

5. *Question/Scenario:*

You work with women and newborn children and have noticed that there is an increase in babies born with a birth anomaly. You don’t yet know what is causing the anomaly, but from what you’ve observed, it seems many of the women come from areas of the country that use particular types of chemicals in their agriculture, and also that many of the women are deficient in a certain nutrient. You think it’s possible that either of these, or both, could be an exposure related to the rare birth anomaly. *Select the best study design to accomplish your research.*

*Response options:*

a) Cohort study (prospective)

b) Cohort study (retrospective)

c) Prevalence or a cross-sectional study using existing data

d) Prevalence or cross-sectional study collecting new data

e) Case-control study

f) Ecological study

g) Experimental study (includes randomized controlled trial and quasi-experimental or community trial)

6. *Question:*

Which statement is INCORRECT in representing how study design is related to measuring probability or risk of a disease or outcome?

*Response options:*

a) Risk can be determined in case series studies.

b) Studies with follow-up time can measure risk.

c) Studies with follow-up time can contribute to determining causality.

d) Studies without follow-up time like (case-control studies) can approximate risk via odds

7. *Question:*

Experiments or randomized controlled trials provide the strongest evidence for cause-and-effect relationships in research. Which of the following is NOT a limitation to conducting experimental trials?

*Response options:*

a) It may not be appropriate or ethical to randomize people into certain exposures.

b) The ability to assign exposure contributes to measurement error.

c) Experiments can be very expensive to implement.

d) There can be significant loss to follow-up that may affect your study results.

e) It can be difficult to translate an experimental study into a real world application.

8.*Question:*

You get a statistical association between an exposure and an outcome or disease, and you want to evaluate whether that relationship is causal, or that the exposure causes the disease to occur. Which of the statements below is NOT TRUE regarding causality?

*Response options:*

a) You must first demonstrate that the association is not likely to be due to selection or information bias in your study.

b) It is important to determine that confounding factors are not an alternate explanation for the observed association.

c) Causal criteria such as temporality, dose-response relationship, or consistency of findings across studies are important in understanding the weight of the evidence that an association is causal.

d) A single study showing the association is sufficient to establish causal inference.

e) Statistical inference (hypothesis testing or confidence intervals) is essential to demonstrate that the association is not likely to be due to chance.

9.

*Question:*

True or False? Controlling for selection bias in how you select people into your study is important to improve the internal validity of your study, but if you restrict your study too much, you will reduce generalizability of your results to a broader population.

*Response options:*

a) True

b) False

10.

*Question:*

How can you control for confounding variables in your study design?

*Response options:*

a) Randomize participants into your control and intervention groups.

b) Restrict cases and controls to a single category or level of a potential confounder, such as only including smokers in a study in which smoking is a confounder.

c) Plan to collect information on all possible confounders and then adjust for these characteristics in the analysis of the study.

d) Match cases and controls on a category or level of a potential confounder, such as matching the proportion of smokers in the controls to the proportion of smokers in the cases.

e) All of the above

11. *Question:*

Which of these statements regarding types of error are true?

*Response options:*

a) Alpha (α) refers to the probability of making a Type I Error, which is rejecting the null hypothesis when it is true.

b) Alpha is also called Power

c) Beta (β) represents the possibility of making a Type II Error, which is accepting the null hypothesis when it is not true.

d) The sensitivity and specificity of a screening test are related to Type I and Type II error.

e) All of the statements above are true

f) a, c, and d are true

12. *Question:*

True or False? These are the correct steps in testing a statistical hypothesis:

1. State the statistical hypothesis (null hypothesis and alternative hypothesis)
2. Specify the level of significance, or alpha (α)
3. Calculate the value of the appropriate test statistic
4. Find the p-value for this test statistic
5. Decide to reject or retain the null hypothesis based on the p-value
6. State a conclusion that connects the statistics back to the science

*Response options:*

a) True

b) False

13. *Question:*

Which of the following is the BEST choice when creating a survey questionnaire for your study?

*Response options:*

a) Using existing survey questions that have been tested and proven valid and reliable in the same population that you are including in your study

b) Creating all new survey questions with your study team

c) Using existing survey questions that have been tested and proven valid and reliable in a population that is very different than your study population

d) Using existing survey questions that have been tested and proven valid and reliable in a population that is very different than your study population, but adapting them for the culture or context of your study population

14. *Question:*

Which of the following CANNOT be improved by thorough and consistent training of the study personnel who are conducting recruitment and data collection?

*Response options:*

a) Bias due to differences in how interviewers conduct an interview or survey

b) Study participation and follow-up rates

c) Errors in the precision of a measurement tool such as a weight scale

d) Internal validity of the study

15. *Question:*

What is the purpose of clinical data management?

*Response options:*

a) Clinical management refers to collection of data

b) Clinical management refers to management of data refers to data management practices for reducing measurement errors and missing data during primary data collection

c) Clinical management concerns all aspects of clinical data processing

d) All of the above

16. *Question:*

What is the best way to describe data validation?

*Response options:*

a) Data validation is not related to data collection and databases used in clinical studies.

b) Data validation is an essential step before database development

c) Data validation is not needed to prevent errors in designing databases

d) Data validation can be completed at any time during the data collection.