

Experimental Design

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Introduction

- Design consists of a series of guide posts to keep one going in right direction and sometimes it may be tentative and not final. During the course of a study , new connecting links in data may also come to light and plan may have to be modified accordingly. Working out of the plan consists of making certain decisions with respect to what, where, when ,how much and by what means.
- An investigator should take the help of a qualified biostatistician right from the beginning and his help should be extended up to the conclusion of study. It has often been observed that biostatisticians is contacted to analyze the data but at this stage his involvement may be too late and cannot compensate for poor planning and collection of improper or inadequate data . So **planning of work should be well defined.**

Steps in Methodology and Designing

The steps in experimental design are enlisted as follows:

1. Definition of the problem 2. Aims and objectives
3. Review of literature 4. Hypothesis 5. Plan of action
6. presentation of data 7. Unbiased statistical analysis 8. conclusions

1. Definition of the problem :

Define the problem you intend to study i.e. why have you selected the problem ex. To know the effect of any pesticide on the hematology of any test animal.

2. Aims and Objectives:

Define the aims and objective of the study

Ex. To aware the people about the adverse effects of pesticide

Steps in Methodology and Designing

3. Review of Literatures:

Critically review the literatures on the problem under study i.e. mention earlier works

- i. To confirm the problem
- ii. To object the problem
- iii. To fill gap in the problem

4. Hypothesis:

- State hypothesis of the work\problem
- After definition of the problem aims and objectives, literature review, precisely start with an assumption **positive or negative** .

Steps in Methodology and Designing

5. Plan of Action:

Prepare an overall plan or design of the investigation for studying the problem and meeting the objective. It includes several steps:

i. Definition of population under study:

Mention which is included or which is excluded (ex. Animals taken -which, why)

ii. Selection of Sample:

- Sample should be unbiased and sufficiently large in size to represent the population under study
- Situations in which bias in a problem are (1) **Retrospective studies**-information not fully relied(2) **Subjective information** – to please the investigator (3) **Sample not randomly selected**

Steps in Methodology and Designing

iii. Specifying the nature of study: (Method of study) . It may be

a. Longitudinal Studies: It is of two types

➤ Prospective studies – study of population over time-it will take time but less biased

➤ Retrospective studies (looking back) –applied in a particular (small) sample – it will take less time but may be biased

b. Cohort studies:

Longitudinal but sample is cohort. Cohort is a group of persons exposed to some sort of environment such as newborns, workers exposed to radiation

Steps in Methodology and Designing

c. **Interventional Studies:** It has three phases

- Diagnostic or identification phase
- Intervention by treatment or service for a specific period
- Assessment phase for results

d. **Experimental Studies :** Experiments or trials or survey

e. **Cross-sectional Studies**

If non experimental-, data taken from other sources or census

f. **Control Studies:** to rule out subjective bias . It may be done by

Single-blind trial :Ex. One group of the patients given one drug, another group is given another drug. So, no patient knows what he is being given

Double blind trial: not only the patients but also observers do not know

Steps in Methodology and Designing

iv. Ruling out the observer and instrument error :

Observer has to be trained to make data authentic.

v. Recording of Data:

- **For experiments**, results should be recorded in pre determined proforma
- **For survey work**
 - ✓ Be friendly and familiar with persons
 - ✓ Questions should be clearly explained
 - ✓ Do not ask direct embarrassing questions
 - ✓ Too keen or too shy respondents have to be kept in view
 - ✓ Do not ask many questions
 - ✓ Questions in the proforma may not be open ended questions
 - ✓ Proforma should close ended question
 - ✓ Specify to what accuracy an observation is to be recorded
 - ✓ Proforma should be coded . Ex. Sex: Male -1, Female -2 etc.

Steps in Methodology and Designing

vi. Work Schedule: It includes preparation of Master Table by preparing work schedule for data collection by estimating work expected per hour, per day, per week or per month, per worker or per team .

6. Presentation of Data : Compilation and presentation of data

7. Unbiased Statistical Analysis : Put the results to unbiased statistical analysis by applying different methods of biostatistics. Use of computers is an asset for research work.

8. Conclusions: Drawing the conclusions on the basis of computation and analysis of results.

SUMMARY AND PRESENTATION BRIEFS

SUMMARY

1. Collection of data from the different sources
2. Compilation, sorting and presentation of data
3. Analysis of data
4. Interpretation , drawing conclusions, recommendations and publication of report

The format for **presentation** may be

- A. Research work in the form of project\dissertation or thesis
- B. An article in the scientific journal
- C. A paper to be read in a scientific meeting

PRESENTATION BRIEFS

In general, presentation includes following headings :

1. Title of the article\thesis\dissertation
2. Author(s) and affiliation
3. Abstract
4. Introduction
5. Review of literature
6. Materials and Methods
7. Results
8. Analysis for the realists
9. Discussion
10. Conclusions
11. Recommendations or Constructive Suggestions
12. Acknowledgements
13. Bibliography or References
14. Appendices (if any)

Suggested Readings

- Mahajan BK (1999) .Methods in Biostatistics. Jaypee Brothers, New Delhi.
- Sunder Rao PSS and Richard J (2001). An Introduction To Biostatistics. Prentice Hall of India Private Limited. New Delhi.
- Prasad S (2007). Elements of Biostatistics. Rastogi Publications, Meerut.

THANKS