Introduction to Scientific Research

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Key Lecture Concepts

1. **Understanding the process described as “the scientific method”.**
2. **The role of a hypothesis in a research study.**
3. **Strategies underlying hypothesis formulation.**
4. **The manner to frame your hypothesis statement.**

Research is …….

Knowledge acquisition gained…..

- **Through reasoning.**
- **Through intuition.**
- **But most importantly through the use of appropriate methods.**

Basic Elements of The Scientific Method of Research

1) **Empiricism: the notion that enquiry is conducted through observation and knowledge that verified through evidence.**

2) **Determinism: the notion that events occur according to regular laws and causes. The goal of research is to discover these laws and causes.**

3) **Skepticism: the notion that any proposition is open to analysis and critique.**

Steps of Scientific Method

1. **Choose a question to investigate.**
2. **Identify a hypothesis related to the question.**
3. **Make testable predictions in the hypothesis.**
4. **Design an experiment to answer hypothesis question.**
5. **Collect data in experiment.**
6. **Determine results and assess their validity.**
7. **Determine if results support or refute your hypothesis.**

The Scientific Method

1. Suspicion that a factor (exposure) may influence occurrence of disease or a noted health outcome:

a. Observations in clinical practice.

b. Examination of disease/outcome patterns.

- **Do subpopulations have higher or lower rates?**
- **Are disease rates increased by certain factors?**

c. Observations in laboratory research.

d. Theoretical speculation.

The Scientific Method

2. Identify variables you are interested in:

- **Exposure (independent):- risk factor, protective factor, predictor variable, treatment.**
- **Outcome (dependent):- disease, event.**

Three essential characteristics that we look to measure in studies are...

Person

Place

Time

Person

"Since disease not does occur at random"

- **What kinds of people tend to develop a particular disease?**
- **Who tends to be spared?**
- **What's unusual about those people?**

Person Factors

- **Age, gender, race, ethnicity.**
- **Education, occupation.**
- **Genetic predisposition.**
- **Concurrent disease.**
- **Diet, exercise, smoking.**
- **Risk taking behavior.**

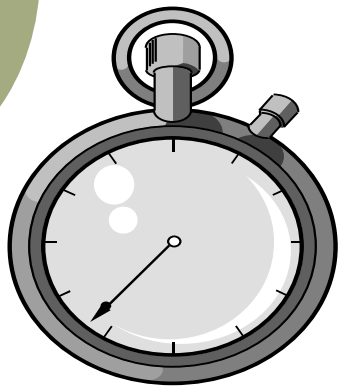
Place

"Since disease not does occur at random"

- **Where is the disease especially common or rare?**
- **What is different about those places?**

Place Factors

- Geographic place.
- Residence.
- Occupation.
- Climate.
- Geology.
- Population density.
- Economic development.
- Nutritional practices.
- Medical practices.



Time

“Since disease not does occur at random”

- **How does disease frequency change over time?**
- **What other factors are temporally associated with those changes?**

Time Factors

- **Calendar Time / Time of Day.**
- **Time since an event.**
- **Date of onset.**
- **Age (time since birth in the young).**
- **Seasonality.**
- **Temporal trends.**

The Scientific Method

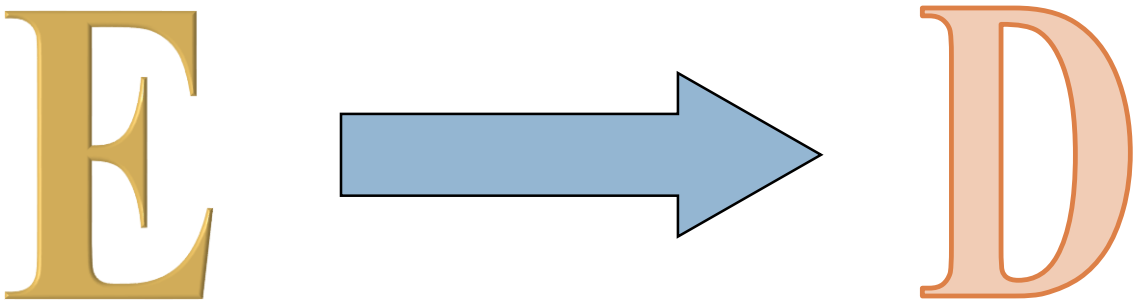
3. Formulate a specific hypothesis:

- **Frame a hypothesis which seeks to answer a specific question about the relationship between an exposure and an outcome.**

Basic Question in Research

Are exposure and disease/outcome linked?

Is there an association between them?



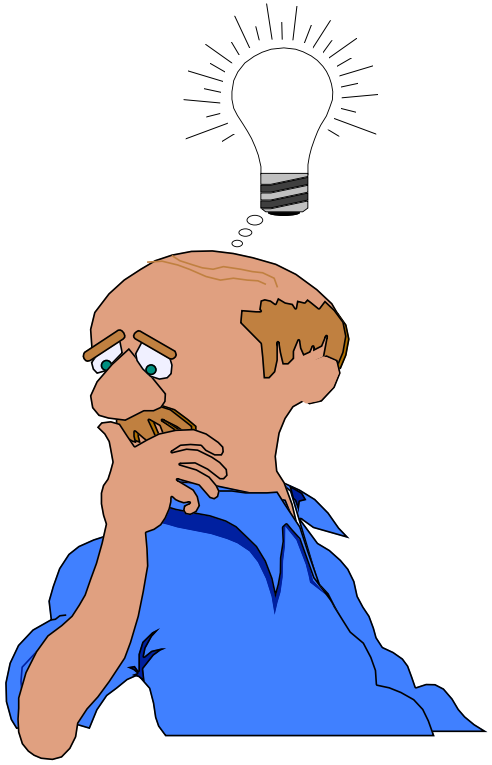
Exposure Disease / Health Outcome

Hypothesis Formulation

A. Formulate a hypothesis.

B. Frame the hypothesis in a format that is testable.

C. Test the hypothesis.

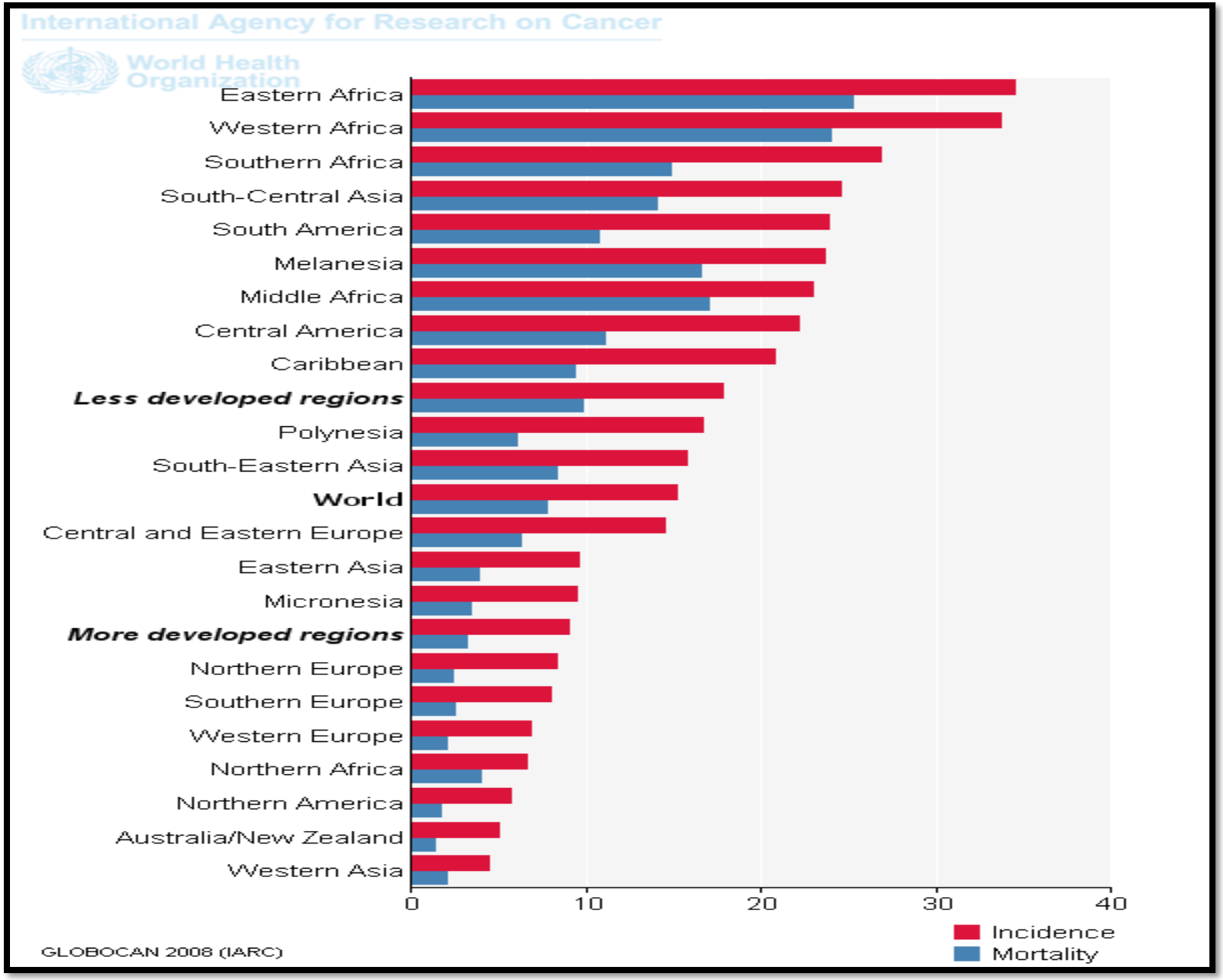


Hypothesis Formulation

Observations from:

- **Literature (review PubMed on topic area).**
- **Natural experiments (e.g. migrant studies).**
- **Multi-national comparisons.**
- **Descriptive studies (assessment of person, place, and time characteristics).**
- **Creativity.**

Cervical Cancer



- **Infectious and chronic diseases show great variation from one country to another.**

  ❑ **Some differences may be attributed to:**

  - ➢ **Cultural factors.**
  - ➢ **Genetics.**
  - ➢ **Climate.**
  - ➢ **Diet.**

4. Design Study

- **Formally test the identified hypotheses in a research study.**
- **The study should follow a specific plan or protocol (the study design).**
- **Study designs direct how the investigation is conducted and allows for the translation of a conceptual hypothesis into an operational one.**

4. Design Study

Study Designs ……..

A. **Randomized controlled clinical trial.**

B. **Cross-sectional.**

C. **Case-control.**

D. **Case series.**

E. **Cohort.**

5. Association:

From the results of your study, does a statistical relationship exist between two or more events, characteristics, or other variables

Is there a statistical relationship, or association, between exposure and disease/outcome?

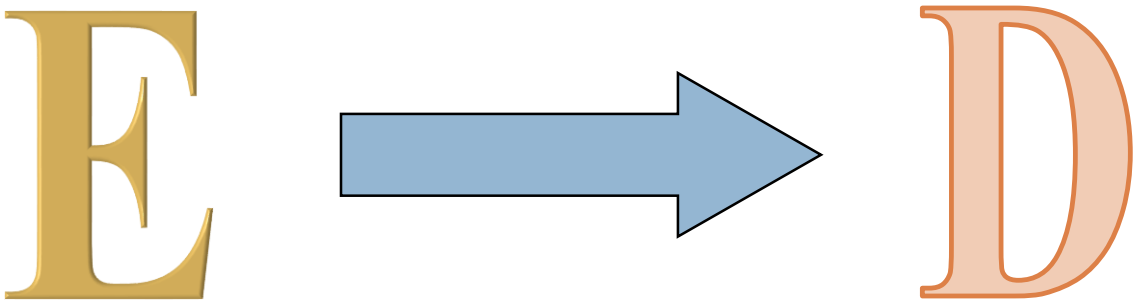
Statistical Association

The degree to which rate of disease or outcome in persons with a specific exposure is either higher or lower than rate of disease or outcome among those without that exposure.

Basic Question in Research

Are exposure and disease/outcome linked?

Is there an association between them?



Exposure Disease / Health Outcome

6. Assess validity of association:

- **Does the observed association really exist?**
- **Is the association valid?**
- **Are there alternative explanations for the association?**
  - **Chance.**
  - **Bias.**
  - **Confounding.**

Remember

Discoveries or hypotheses are sometimes resisted because they seem counter-intuitive.

Thank You

Study Designs

Purpose of studies

1) Assess the health status or clinical characteristics of a well-defined population or group of subjects.

- The immunization status of children in the community.
- The incidence of measles in a loclaity.

2) Probe the natural history of disease.

- The clinical course of retinopathy in diabetics over a 10-year follow-up period.
- The prognosis of patients with a solitary calcified pulmonary nodule.

3) Examine clinical decision-making processes.

- The best screening test for glaucoma in the general population by general practitioners.
- The likelihood of colorectal cancer in patients with bright red blood per rectum.

4) Determine and assess treatment outcomes.

- Tumor response of laryngeal cancer in patients who receive radiation treatment.
- Benefit of medical treatment versus coronary artery bypass surgery for angina pectoris.

5) Identify and assess risk factors.

- The incidence of lung cancer among smokers.
- The likelihood of colorectal cancer in patients with colonic polyps.

The suitable study designs

The type of study chosen depends on:

- the type of problem;
- the knowledge already available about the problem; and
- the resources available for the study.

STATE OF KNOWLEDGE OF THE PROBLEM	TYPE OF RESEARCH QUESTIONS	TYPE OF STUDY
Knowing that a problem exists but knowing little about its characteristics or possible causes.	• What is the nature/magnitude of the problem? • Who is affected? How do the affected people behave? What do they know, believe, think about the problem and its causes?	*Exploratory studies*, or *Descriptive studies:* • Descriptive case studies • Cross-sectional surveys
Suspecting that certain factors contribute to the problem.	• Are certain factors indeed associated with the problem? (e.g., Is lack of pre-school education related to low school performance? Is low fibre diet related to carcinoma of the large intestine?)	*Analytical (comparative) studies:* • Cross-sectional comparative studies • Case-control studies • Cohort studies
Having established that certain factors are associated with the problem: desiring to establish the extent to which a particular factor causes or contributes to the problem.	• What is the cause of the problem? • Will the removal of a particular factor prevent or reduce the problem? (e.g., stopping smoking, providing safe water)	• Cohort studies *Experimental or quasi-experimental studies*
Having sufficient knowledge about cause(s) to develop and assess an intervention that would prevent, control or solve the problem.	• What is the effect of a particular intervention/strategy? (e.g., treating with a particular drug; being exposed to a certain type of health education) • Which of two alternate strategies gives better results? Which strategy is most cost-effective?	Experimental or quasi-experimental studies

Type Of Clinical Question

1. Background Question:
   - General Knowledge about a disorder
   - e.g. What causes Hypertension ?
2. Foreground Question:
   - Specific knowledge about managing a disorder.
   - e.g. In tense ascites, is taping superior to diuretics ?

Formulate A Question

- Patient or population
- Intervention or exposure
- Comparison intervention
- Special clinical Outcome(s)

P	I	C	O
Patient, Population or Problem	**Intervention or exposure**	**Comparison**	**Outcome**
What are the characteristics of the patient or population? What is the condition or disease you are interested in?	What do you want to do with this patient (e.g. treat, diagnose, observe)?	What is the alternative to the intervention (e.g. placebo, different drug, surgery)?	What are the relevant outcomes (e.g. morbidity, death, complications)?

Major Types of Studies

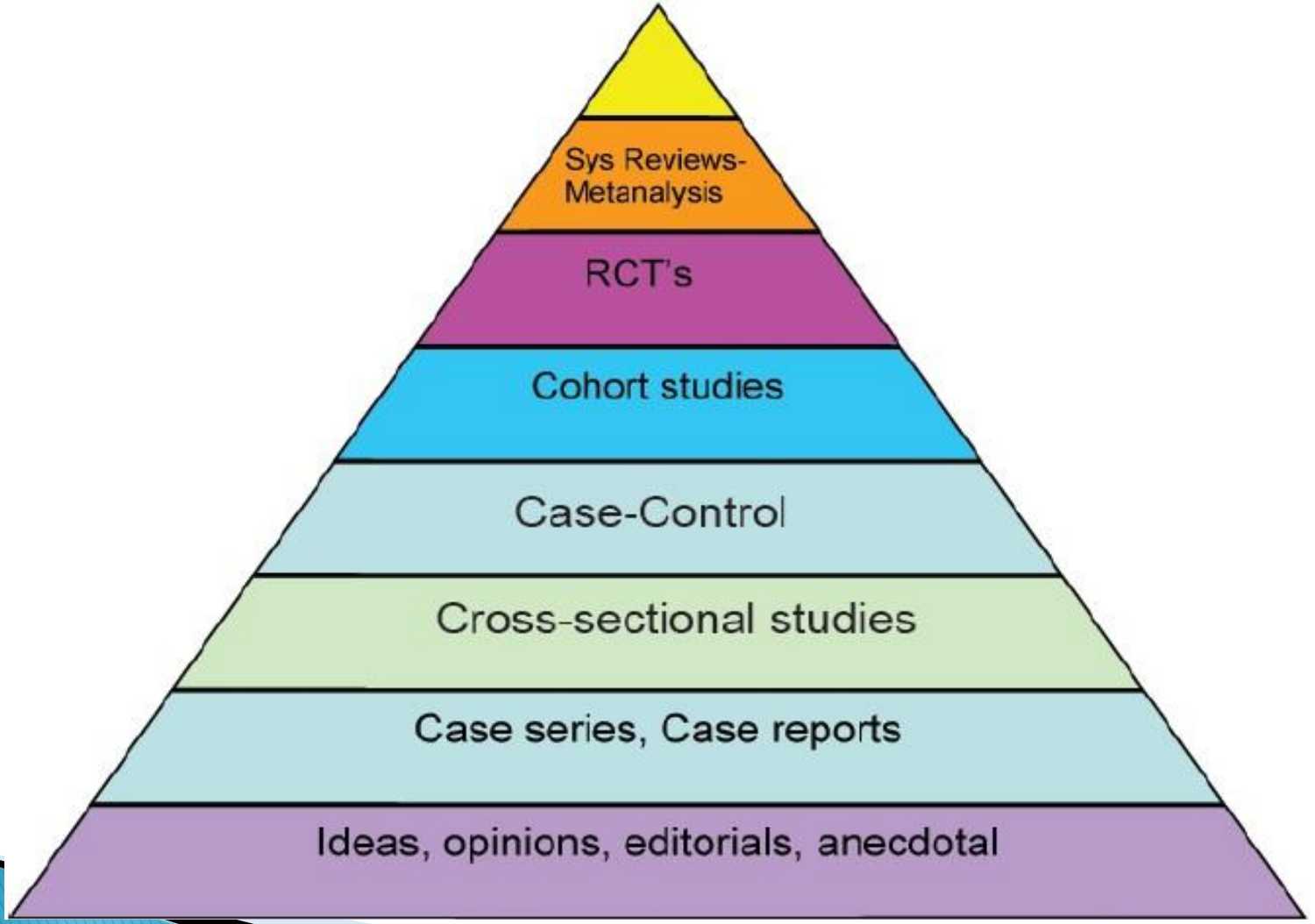
I. Descriptive

- Case Report
- Case Series
- Ecologic Studies
- Cross sectional surveys

Major types of studies:
II. Analytic

A) Observational
B) Experimental

Hierarchy of Evidence



Major Types of Studies

I. Descriptive

- Case Report
- Case Series
- Ecologic Studies
- Cross sectional surveys

Major types of studies: II. Analytic

A) Observational

- Cross-sectional or prevalence Studies
- Retrospective (case control, Case referent)
- Prospective
  - Cohort or concurrent prospective.
  - Historical or retrospective or non-concurrent prospective.

B) Experimental

- **Clinical Trials**
  - Therapeutic trials
  - Intervention trials
  - Prevention trials

- **Community Trials**
  - (controlled interventions)
  - (comparative experimental)

Case Report

A brief, objective report of a clinical characteristic or outcome from a single clinical subject or event

- Can address almost any clinical question or issue, including screening test results or treatment outcomes, or natural history.
- Commonly used to report unusual or unexpected events, such as
  - adverse drug reactions,
  - previously unrecognized disease, or disease characteristic

EXAMPLE:

- Advanced proliferative diabetic retinopathy in a patient with no other clinical evidence of diabetes

Case Series

An objective report of a clinical characteristic or outcome from a group of clinical subjects.

- Can address almost any clinical question or issue, including screening test results or treatment outcomes, or natural history.
- Most commonly used to describe clinical characteristics, such as signs and symptoms of disease or disease outcomes.

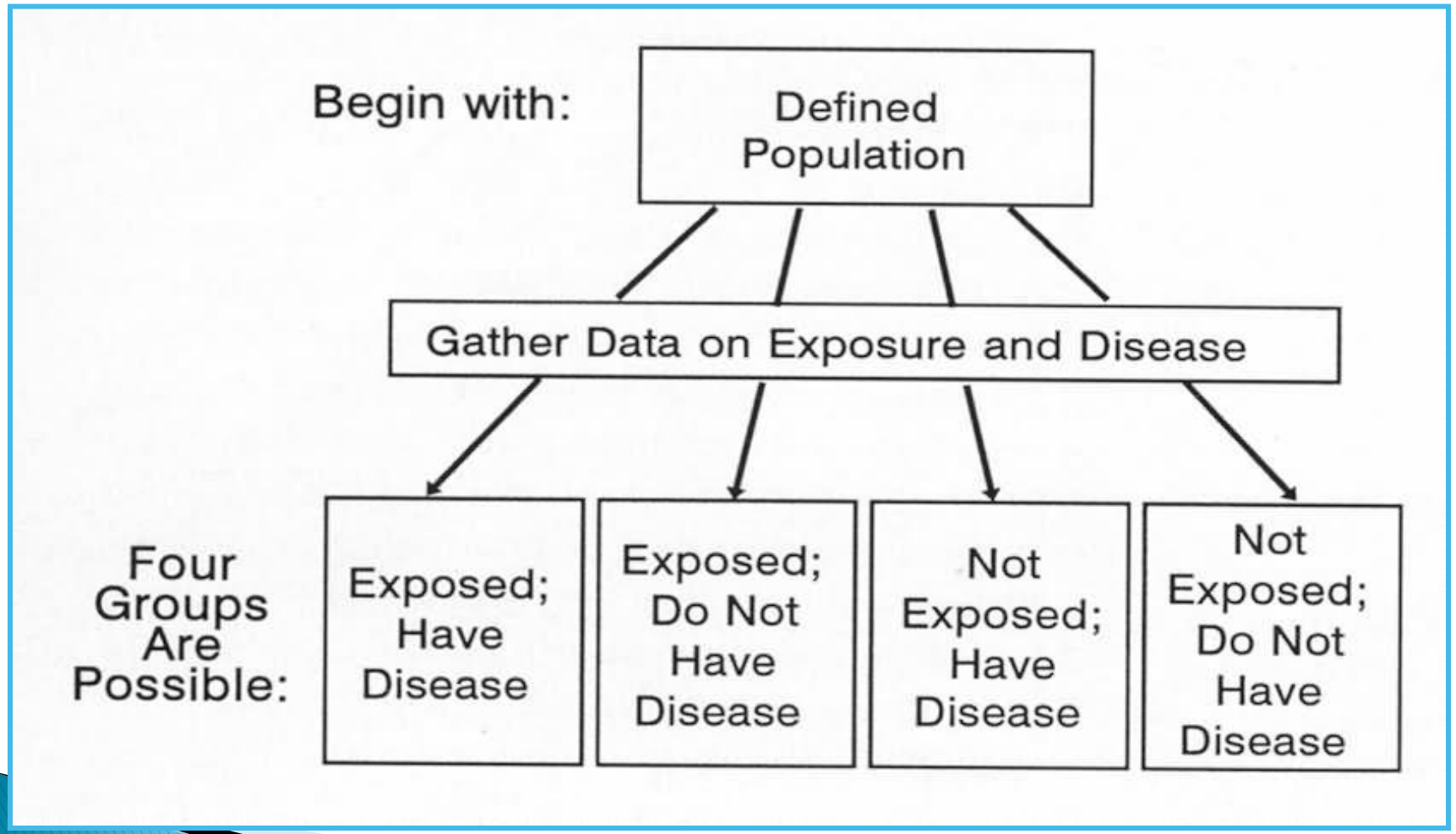
EXAMPLE:

- Several children born with birth defects who were born to mothers who had taken thalidomide.

Cross-sectional study

In such studies, both exposure and disease outcome are determined simultaneously.

Cross-Sectional Study



Cross-Sectional Study

Ask: Do characteristics of the exposure factor coexist with the health problem?

Prevalence data; no risk statement

Cross-Sectional Study

Advantages:

- Gives general description or scope of problem
- Useful in health service evaluation
- Baseline for prospective study
- Identify cases and controls for retrospective study
- Get data all at once, so inexpensive

Cross-Sectional Study

Disadvantages:

- No calculation of risk
- Temporal sequence unclear
- Not good for rare disease
- Selective survival can bias
- Selective recall can bias

Retrospective or Case Control Study

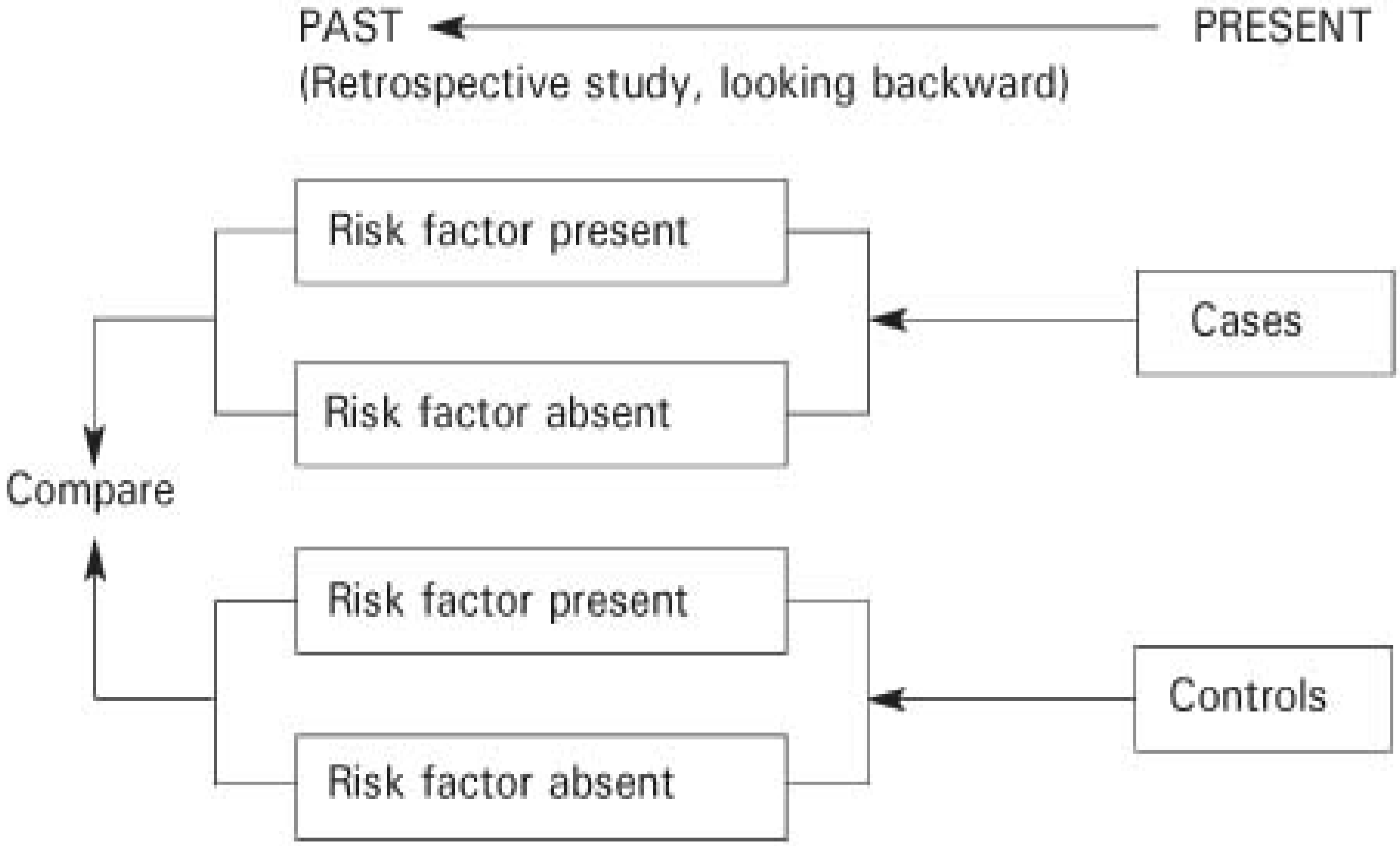
An observational study in which diseased and un-diseased subjects are identified and then compared regarding specific characteristics to determine possible association or risk for the disease .

- The case-control design is uniquely well suited to diseases with long induction period;
- Uniquely suited to the study of rare diseases.
- It shares the same logical framework of inference as the prospective study.

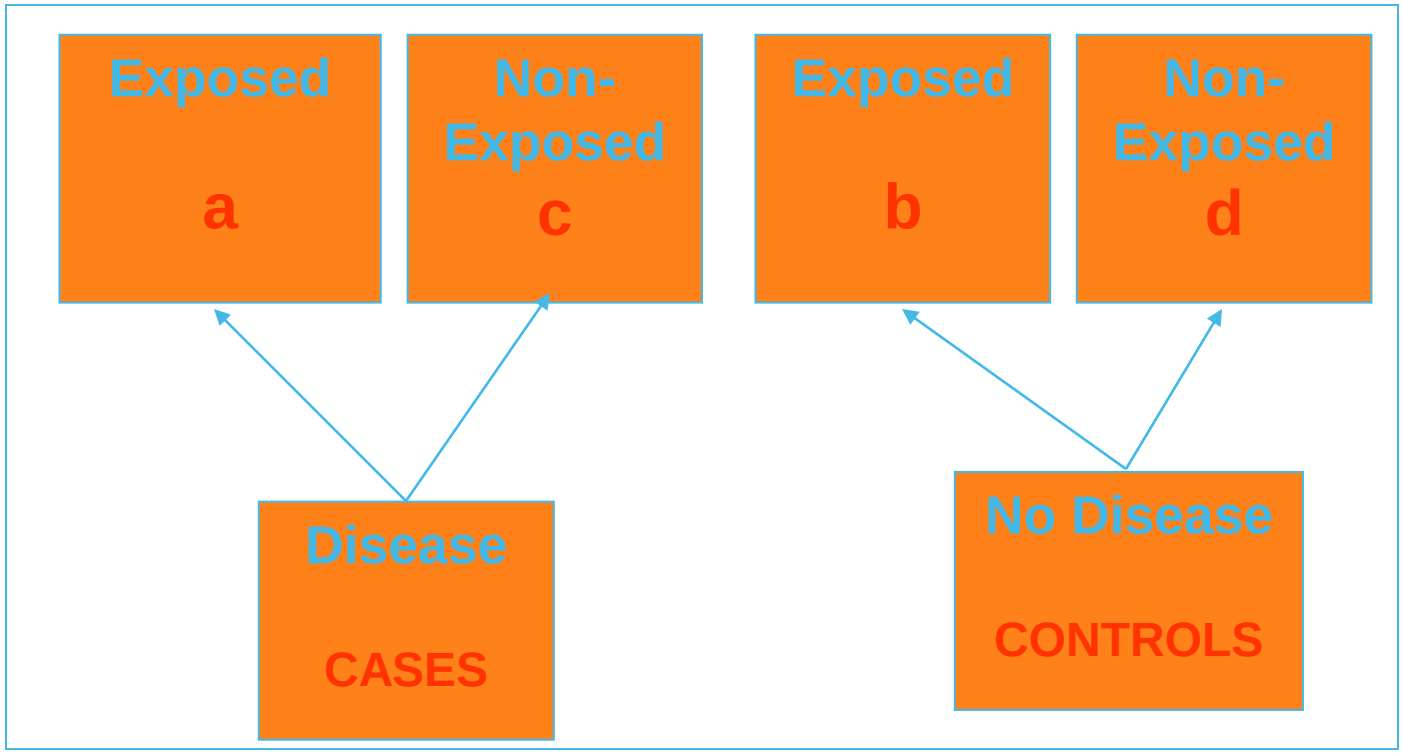
Objectives:

- To provide valid, reasonably precise, estimate of the strength of at least one hypothesised cause-effect relationship.
- To evaluate several hypotheses - several different etiologic factors both as independent and interacting causes for a given disease.

Case control (retrospective)



Retrospective or Case Control Studies



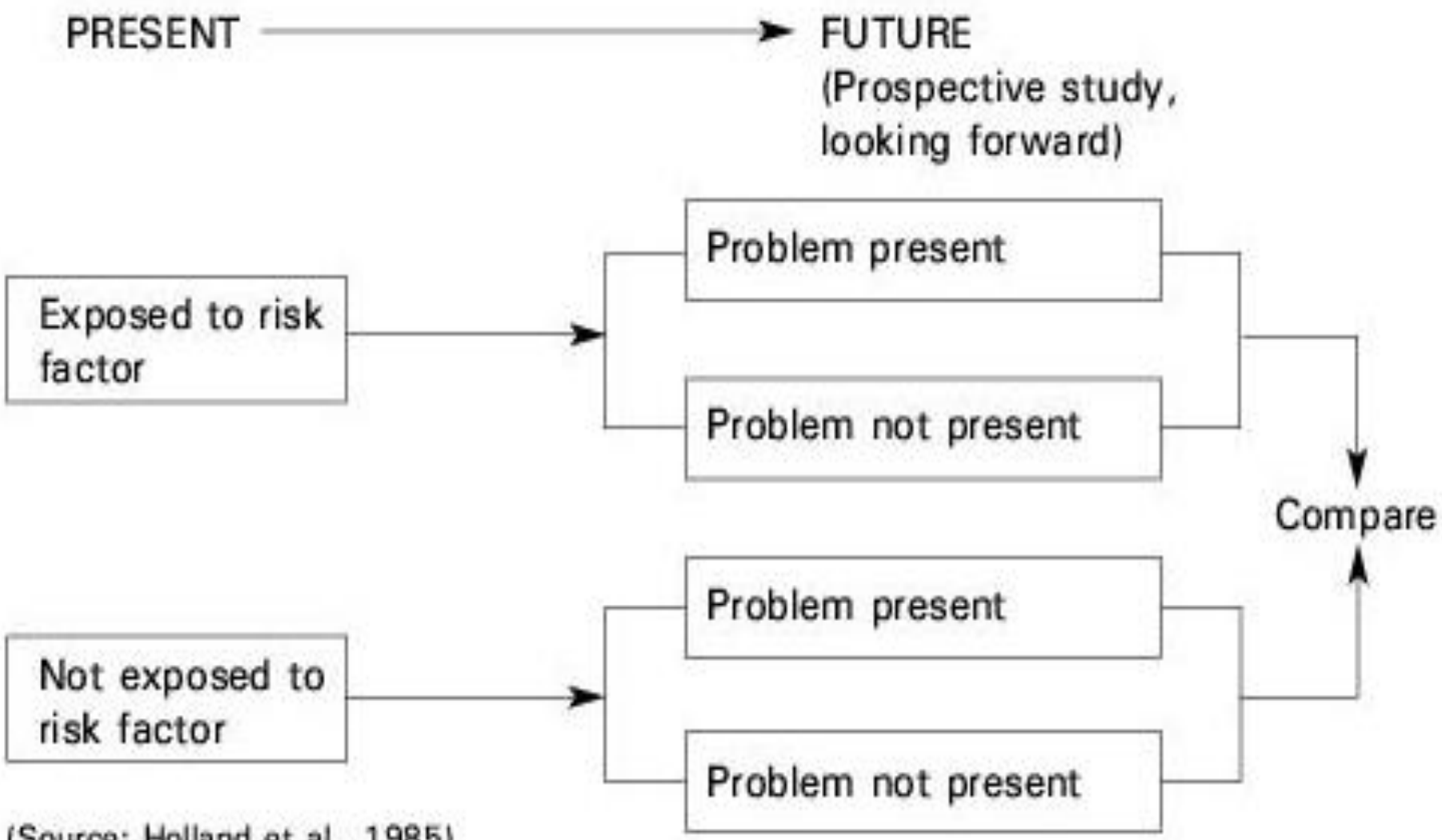
Strengths:

- Can simultaneously evaluate several causal hypotheses.
- Permits evaluation of interaction (extent to which two or more factors modify the strength of one another).
- Permits the evaluation and control of confounding.
- If a population-based series of incident cases have been assembled, it is possible to estimate incidence rates.

Prospective or Cohort Study

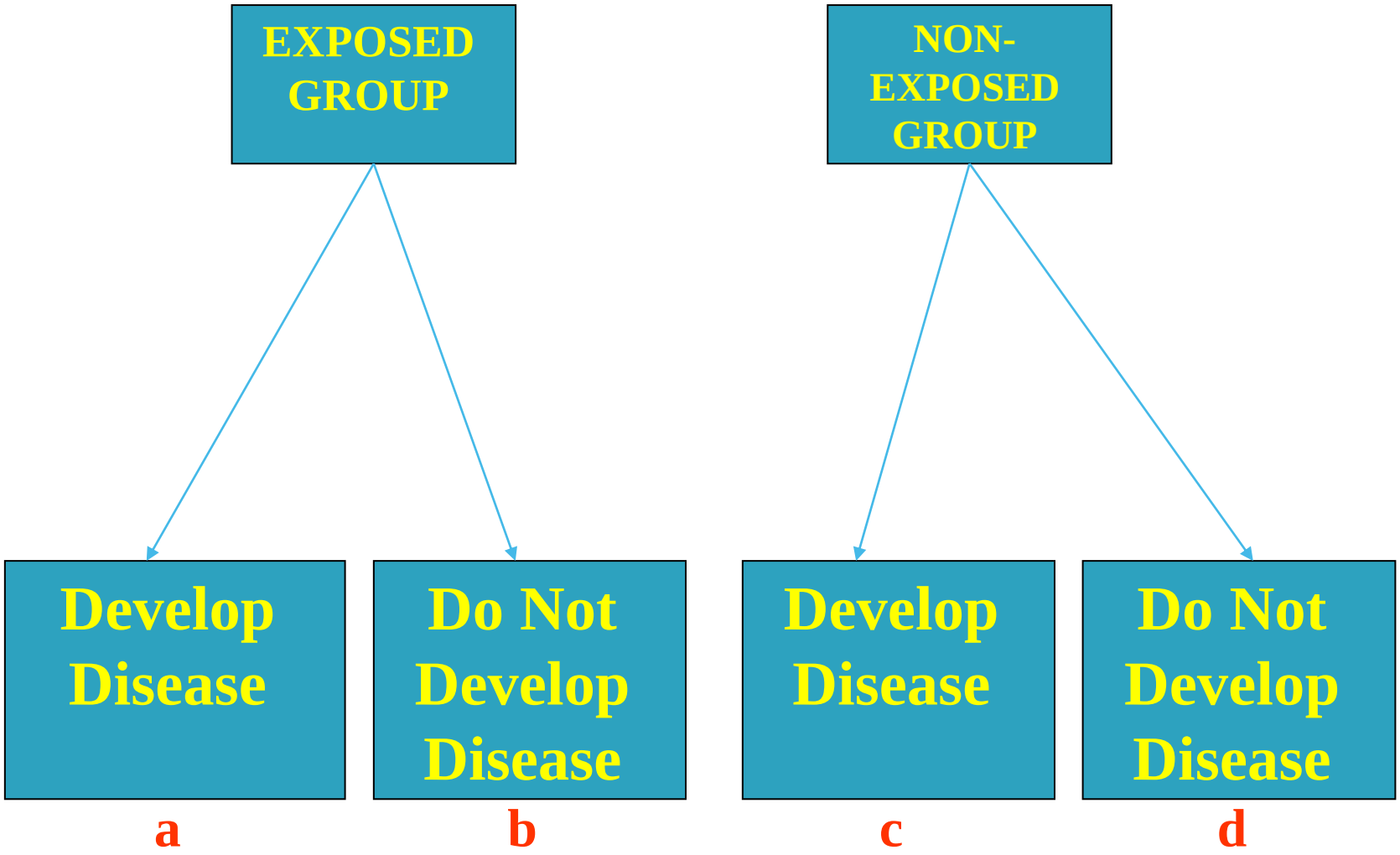
In a cohort study, the investigator selects a group of exposed individuals and a group of non-exposed individuals, and follows up both the groups to compare the incidence of disease (or rate of death from the disease) in the two groups.

Cohort studies (prospective)



(Source: Holland et al., 1985)

Cohort Studies



Experimental Studies

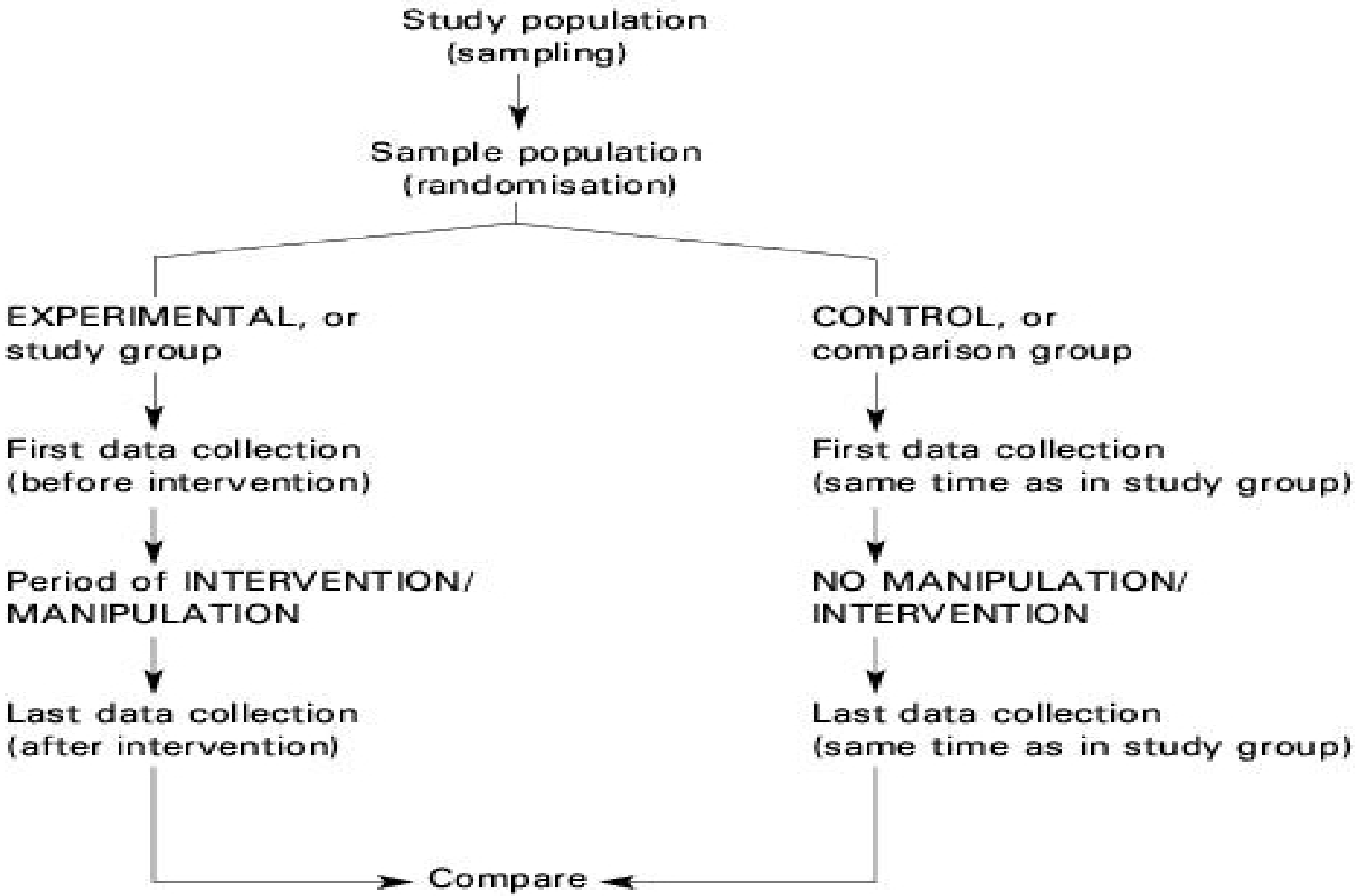
Definition:

An intervention study is a research design in which the investigator manipulates a factor(s) and measures the subsequent outcome.

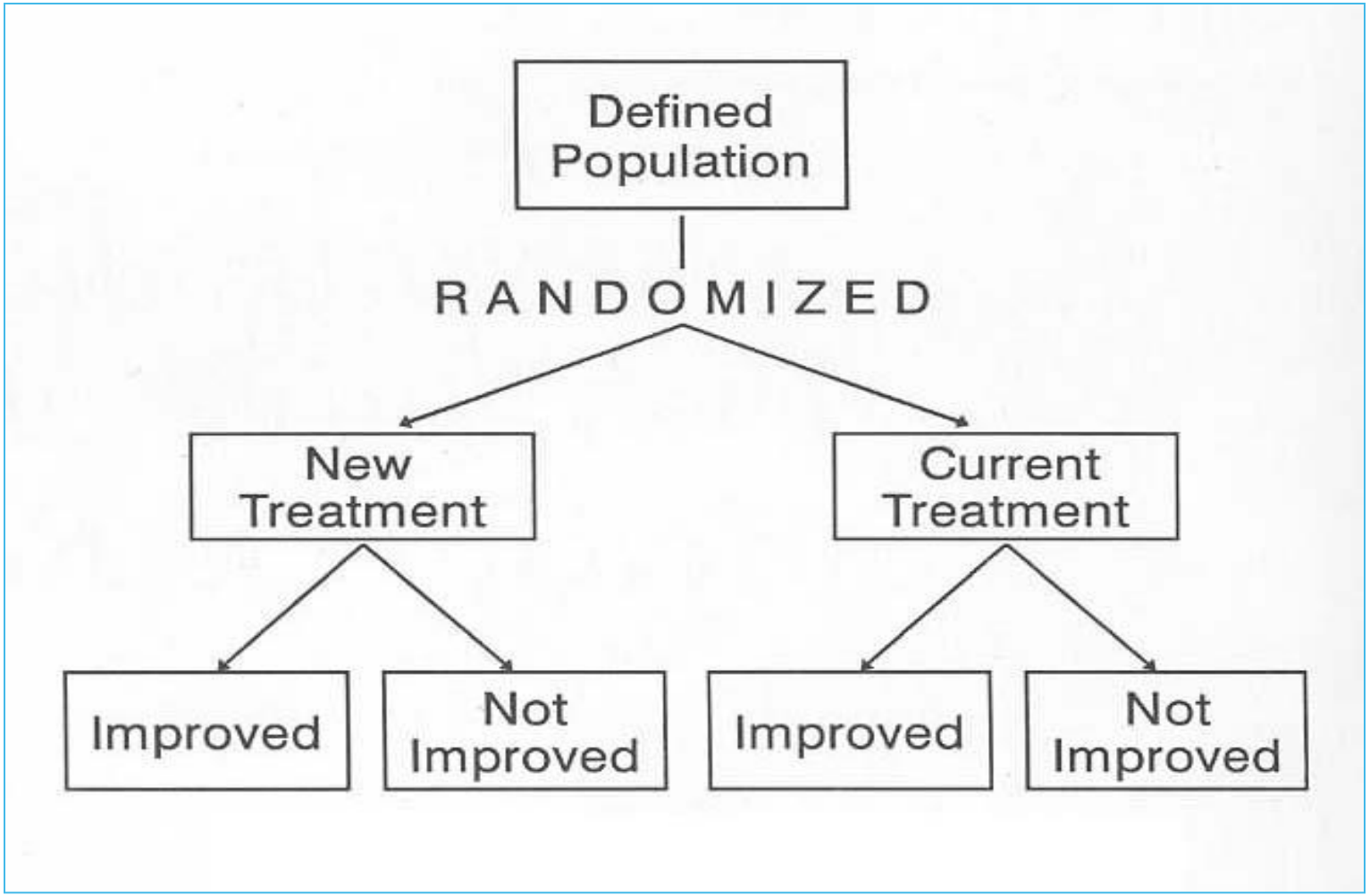
Elements of a "complete" experiment:

- Manipulation of independent variable:
- Use of a control group
- Ability to randomize subjects to treatment groups.

Experimental studies



Experimental Studies



Advantages of experimental approach

- Prospective direction
- Ability to randomize subjects
- Appropriate temporal sequence of cause and effect
- Ability to control extraneous variables
- “Best” evidence of causality

Disadvantages of experimental approach

- Expensive in time, personnel, facilities and cost.
- Ethical constraints
- Contrived situations
- Impossible to control human behavior
- External validity still uncertain

Experimental Studies

Possible experimental outcomes:

- Symptoms
- Laboratory test results
- Morbidity
- Mortality


Any
Question?


THANK YOU

The proposal

HOW TO WRITE A RESEARCH PROPOSAL

OBJECTIVES

1- Interpret research types and design.

2- Define your idea in a proposal.

3- How to set the proposal.

4- To understand the different sections of the proposal.

PROPOSAL

Consists of 4 chapters:

1) Introduction:
    a) Introduction.
    b) Statement of the problem.
    c) Purpose of the study.
    d) Significance of the study.
    e) Basic assumptions.
    f) Delimitation.
    g) Hypothesis.
    h) Definition of terms.
2) Literature review.
3) Material and methods.
4) References.

1) INTRODUCTION:

a) Introduction:

- In this section the author(s) attempt to introduce the problems and questions, they addressed in conducting your experiment.
- After addressing previous studies, the authors make a statement of problem which encompasses the hypothesis of the study.

INTRODUCTION:

b) Statement of the problem:

- A problem statement is a clear concise description of the issue(s) that need(s) to be addressed by a problem solving team.
- **It will be state in the form of the questions** you want to answer, e.g.: Is there any relationship between the lumbar lordotic curve and pelvic inclination and can they affect on each other in MLBP patients?

INTRODUCTION:

c) Purpose of the study:

– The purposes of the study should **explain the final conclusions** that the research study hopes to reach. **Purposes should be written as statements.**

e.g.: The purpose of the study was to evaluate the postural arrangement of the lumbar spine and the pelvis in the neutral standing position in chronic mechanical low back pain patients.

INTRODUCTION:

d) Significance of the study:

It provides details to the reader on how the study will contribute and who will benefit from it. It also includes an explanation of the work's importance as well as its potential benefits. It is sometimes called rationale.

- "What are the benefits or advantages of the study and what is the difference between you and others?
- Determine the specific contribution of your thesis study to the society as well as to the individual?

INTRODUCTION:

e) Basic assumptions:

You will try to fix all other variables that may be affect your results, e.g.: validity and reliability of the instrumentations, psychological status, medications, room temperature,…etc.

f) Delimitation:

You will state the no. of subjects, their characteristics, instruments and intervention.

INTRODUCTION:

g) Hypothesis:

You will state that your dependent variables will be changed or not, usually the statement is non or null hypothesis. e.g.: the changes will not be significant.

There is no effect of dermal Iontophoresis of acetylcholine (Ach) on microcirculation changes in type 2 diabetes mellitus with peripheral neuropathy.

- **Types of variables:**
  - Dependent variable
  - Independent variable

Dependent variable

Is the variable a researcher is interested in. The changes to the dependent variable are what the researcher is trying to measure with all their fancy techniques.

Independent variable

is a variable believed to affect the dependent variable. This is the variable that the researcher, will manipulate to see if it makes the dependent variable change.

Example of Variables in Scientific Experiments

- If a scientist conducts an experiment to test the theory that a vitamin could extend a person's life-expectancy, then:
- The independent variable is the amount of vitamin that is given to the subjects within the experiment. This is controlled by the experimenting scientist.
- The dependent variable, or the variable being affected by the independent variable, is life span.

TYPES OF RESEARCH HYPOTHESES

Alternative Hypothesis

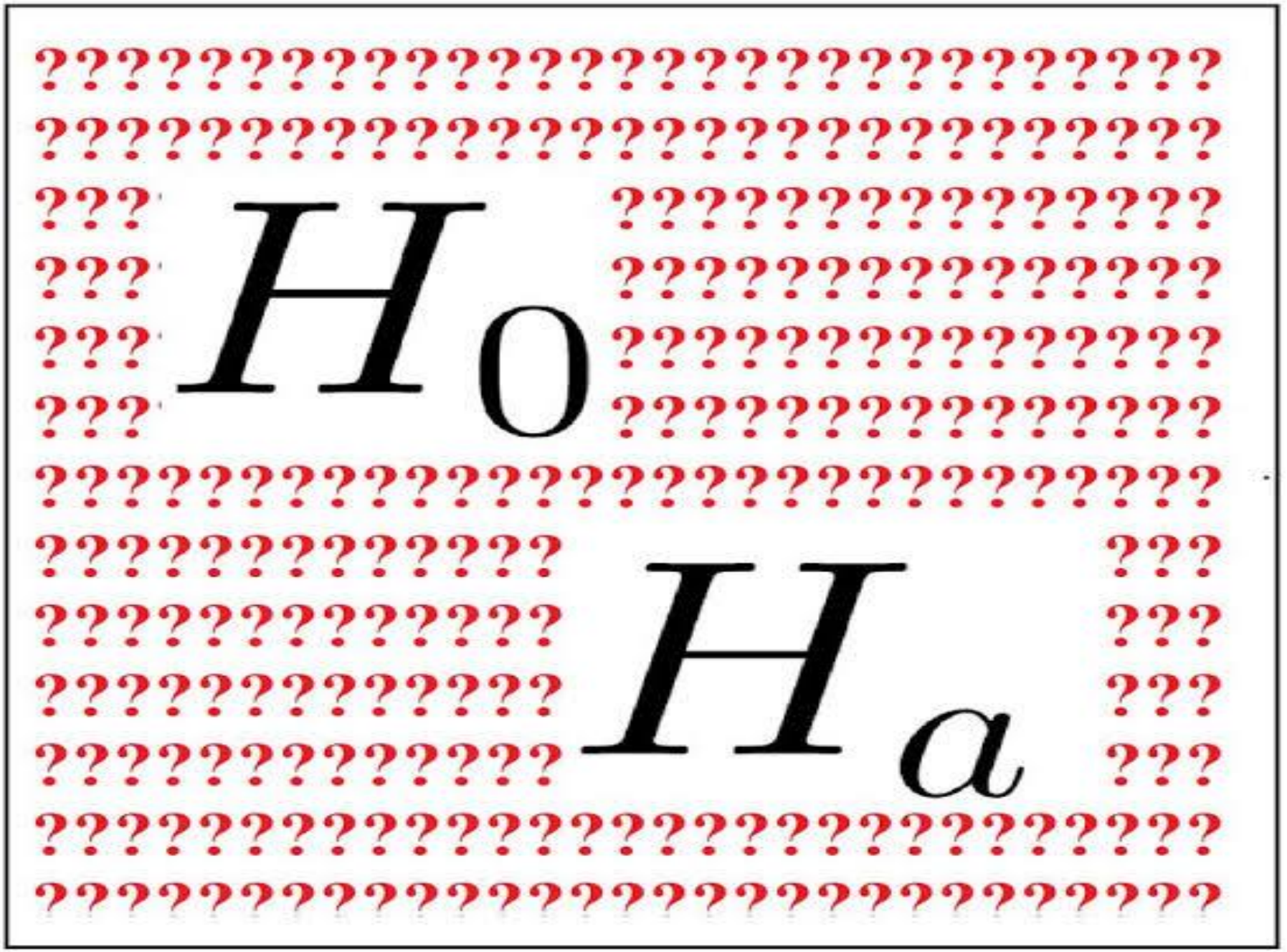
The alternative hypothesis states that there is a relationship between the two variables being studied (one variable has an effect on the other).

- It states that the results are not due to chance and that they are significant in terms of supporting the theory being investigated.

Null Hypothesis

The null hypothesis states that there is no relationship between the two variables being studied (one variable does not affect the other).

- It states results are due to chance and are not significant in terms of supporting the idea being investigated.

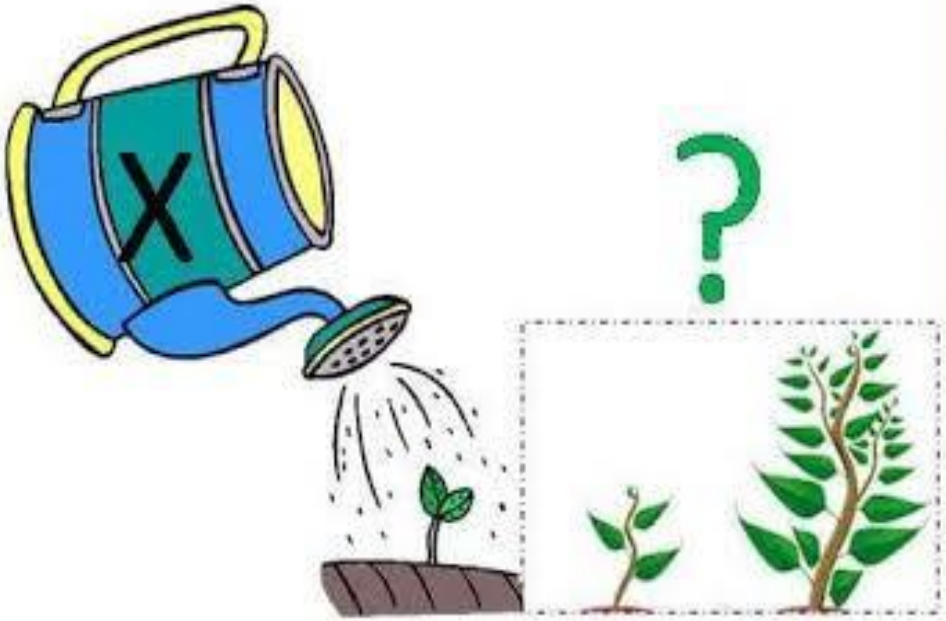

H_0
H_a

Effect of Bio-fertilizer 'x' on Plant growth

www.majordifferences.com

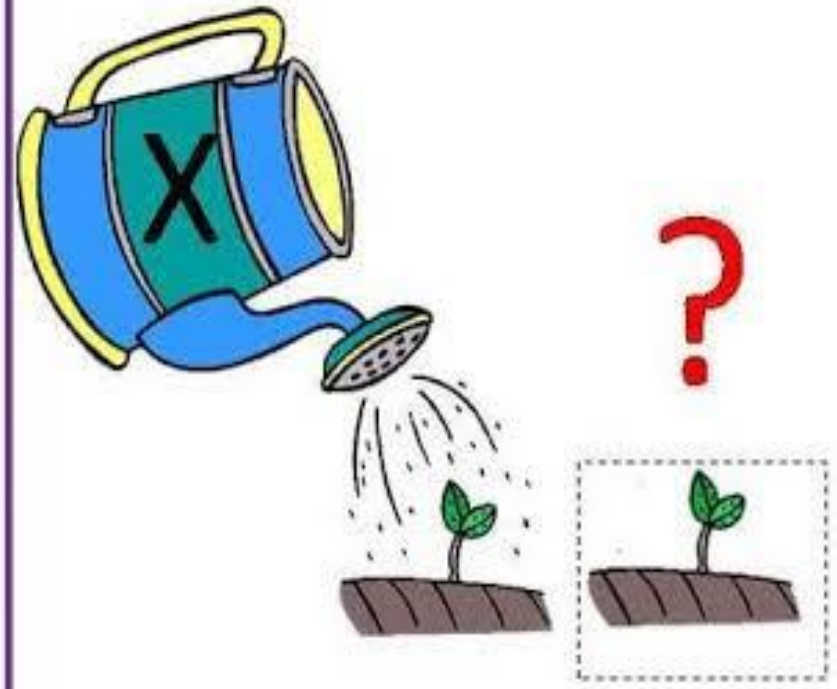
Alternative Hypothesis

H_1: Application of bio-fertilizer 'x' increase plant growth.



Null Hypothesis

H_0: Application of bio-fertilizer 'x' do not increase plant growth.

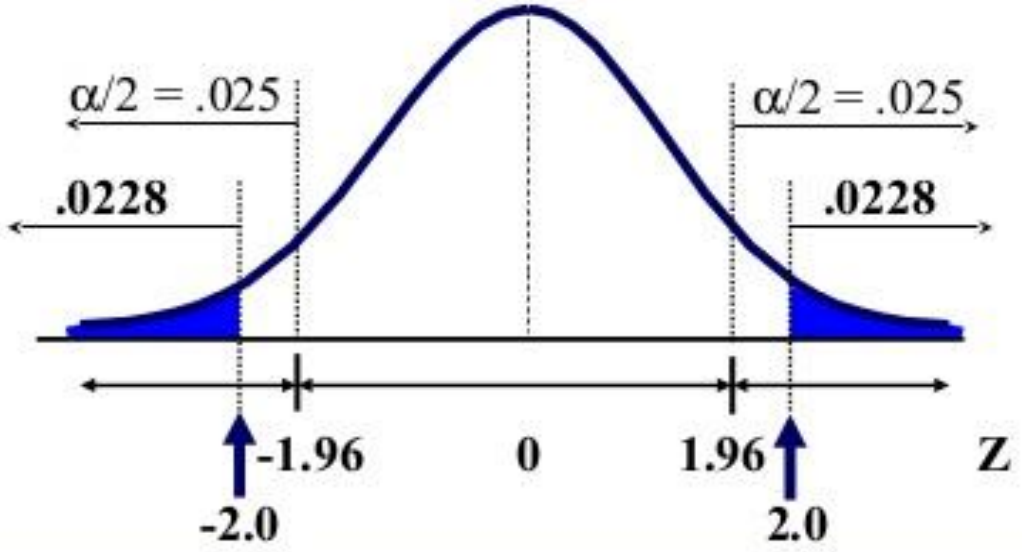


Hypothesis Testing: σ Known p-Value Approach

- Compare the p-value with α
  - If p-value $<$ α , reject H_0
  - If p-value $\geq$ α , do not reject H_0

Here: p-value = .0456
α = .05

Since .0456 < .05, you reject the null hypothesis



2) LITERATURE REVIEW:

- It includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic.
- This looks at the breadth of literature relating to the themes in the article
- It may demonstrate holes in previous studies and looking for a wider body of knowledge relating to the topic.
- Demonstrates your understanding of the theoretical and research issues related to your research question.

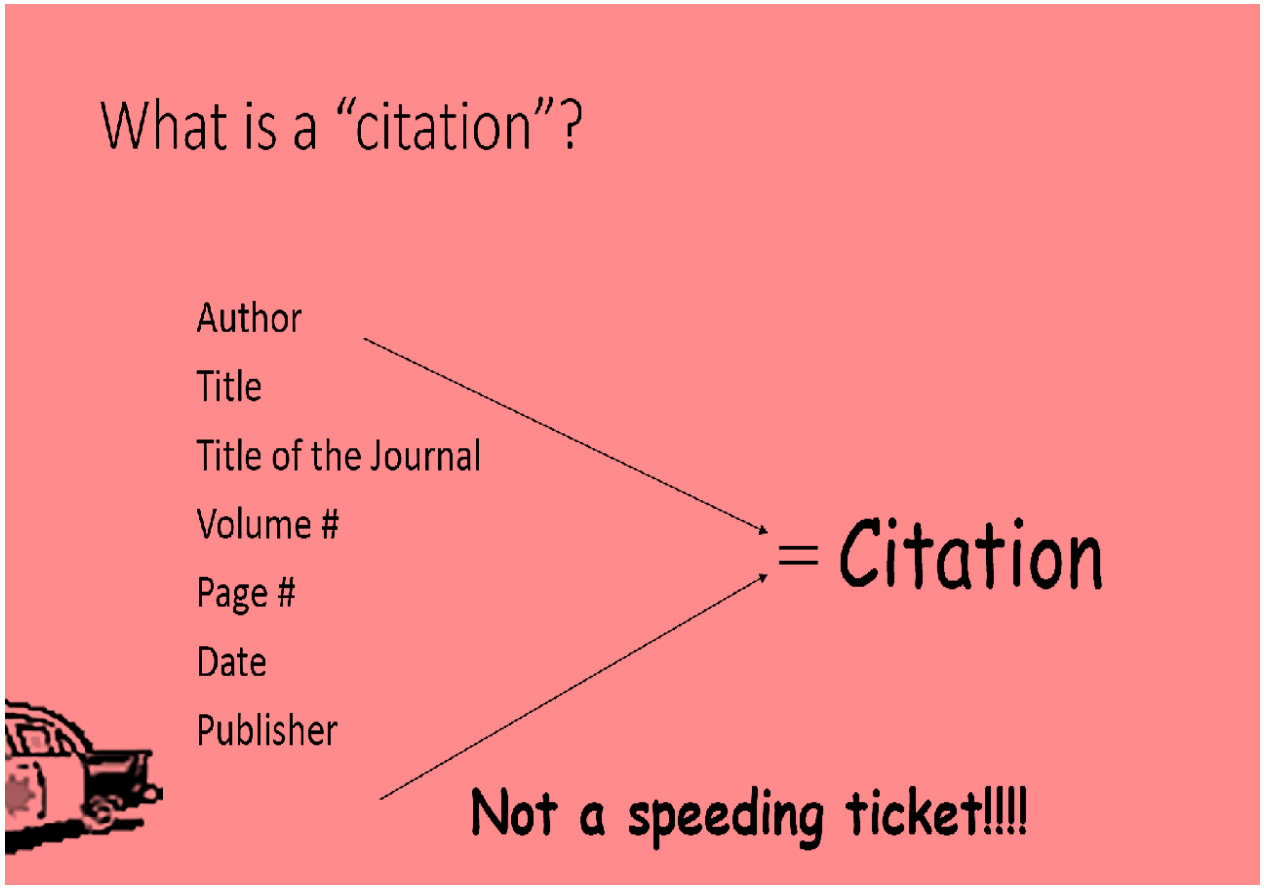
3) Methods and Materials:

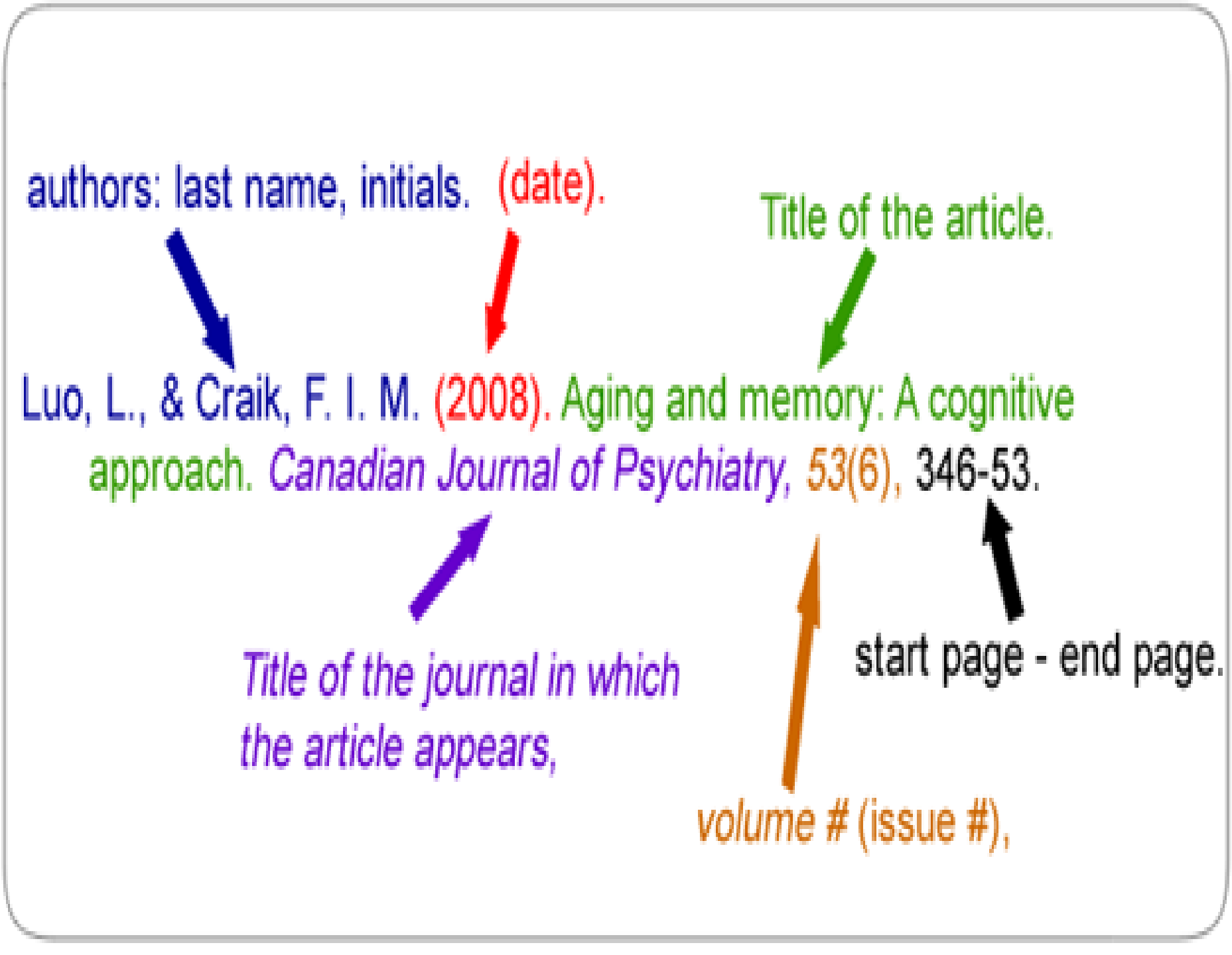
Everything about the conduction of the study is in this section

- Subjects: How many people/animals/? Their characteristics and how they were recruited etc….
- Instruments.
- Procedure.
- Data processing and analysis.
- How did the authors set up your experiment?
- How many experimental groups did they have?
- How did they measure the effect of the intervention?

4) References:

• List of all cited work in the specific reference style that is adopted by the journal.




authors: last name, initials.
(date).
Title of the article.
Luo, L., & Craik, F. I. M. (2008). Aging and memory: A cognitive approach. Canadian Journal of Psychiatry, 53(6), 346-53.
Title of the journal in which the article appears,
volume # (issue #),
start page - end page.

COMMON MISTAKES IN PROPOSAL WRITING

- Failure to provide the proper context to frame the research question.
- Failure to delimit the boundary conditions for your research.
- Failure to cite landmark studies.
- Failure to accurately present the theoretical and empirical contributions by other researchers.
- Failure to stay focused on the research question.

- Failure to develop a coherent and persuasive argument for the proposed research.
- Too much detail on minor issues, but not enough detail on major issues.
- Too much rambling -- going "all over the map" without a clear sense of direction. (The best proposals move forward with ease and grace like a seamless river.).

- Too many citation lapses and incorrect references.
- Too long or too short.
- Slopping writing. (weak or watery).
- Failing to follow the APA style.
- It is described in the style guide of the American Psychological Association (APA).
- **style** and format for academic documents such as scholarly journal articles and books.

Assignment

- Each one will choose an article that addresses an experimental study (in any field of PT, e.g. ortho, neuro, …).
- Please give the full citation for article.
- Answer the questions on the following slides.
- The answers should not take more than 5 pages

The questions:

- Why the study was done? i.e. What is (are) the question(s)
- What is (are) the hypothesis(es) of the study?
- Determine the variables?
- What is the relevance of this study to clinical practice/real world?
- How did the author decide on the sample/subjects of the study and their characteristics?
- What are the outcome measures for the study?
- Did the results answer the question(s) for the study?
- Did the authors make proper conclusions from the results.

Literature Review

Dr. Mohammed Essam

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- **Usually Research consists of:**

1. Asking a question that nobody has asked before.
2. Doing the necessary work to find the answer.
3. Communicating the knowledge you have acquired to a larger audience.

A literature review or survey

The aim of a literature review is to show your reader (e.g. your supervisor) that you have read and that you have a good grasp of the main published work concerning a particular topic or question in your field.

Literature survey

The literature review guidelines:

1) compare and contrast different authors' views on an issue.

2) Group authors who draw similar conclusions.

3) Criticize aspects of methodology.

4) Note areas in which authors are in disagreement.

5) Highlight exemplary studies.

6) Highlight gaps in research.

7) Show how your study relates to previous studies.

8) Show how your study relates to the literature in general.

9) Conclude by summarizing what the literature says.

The general purposes of the review are to:

1) Help you define and limit the problem you are working on.

2) Help you place your study in an historical perspective.

3) Help you avoid unnecessary duplication.

4) Help you evaluate promising research methods.

5) Help you relate your findings to previous knowledge and suggest further research.

If you make a good literature review you will have the following **advantages**:

1) It shows that you do not only understand what you have done, but you understand what others have done related to your subject in a broader context.

2) It shows that you are intelligent enough to evaluate the quality of the other research work done on the subject.

3) It gives you the opportunity to tell how your research is related to previous work done by others on the subject.

4) It tells the reader if you are simply going to duplicate others' work to gain a better understanding, or whether your focus is to improve upon others' work or perhaps combine the methodology of two or more existing approaches for solving a problem.

Writing a Literature Survey

- **BE A HUNTER**! Go online and search for articles, books and papers related to your subject.

- **Be creative and persistent** in your keyword search until you hunt down good references or examples.
- Ask your supervisor for recommendations (but don't totally rely only on these!).
- First record the citation on your list of references, using the APA style, (the style guide of the American Psychological Association).

- When you read some literature that is not very useful, do not include it on your list of references.
- In each document, identify the approach (es)/method(s) for solving problem(s), and compare this/these with what you already know.
- Identify which approaches and/or methods you will use and omit in your research.

Types of Knowledge that Research Contributes

1. **Description:** Results of research can **describe natural or social phenomenon,** such as its form, structure, activity, change over time, relationship to other phenomena.

2. **Prediction:** Prediction research is intended to **predict a phenomenon that will occur at time Y from information at an earlier time X.** It could also be to predict parameter A (dependent variable) based on parameter B (independent variable).

3. **Improvement:** This type of research is mainly concerned with **the effectiveness of intervention**. The research approach includes experimental design and evaluation research. It is aimed at providing improvement on an already established research or fact.

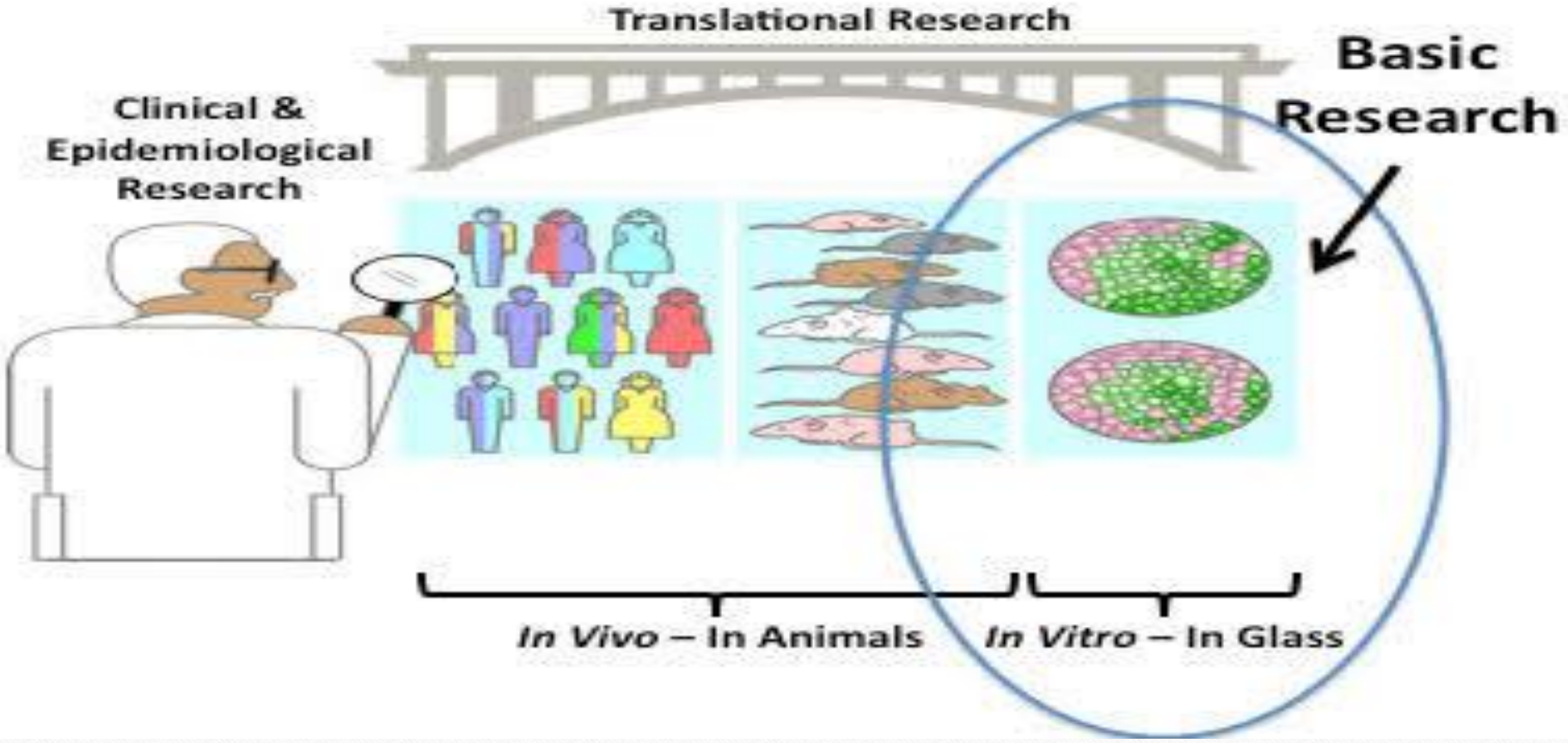
4. **Explanation:** This type of research subsumes the other three:

the researchers are able to **explain an educational phenomenon,** it means that they can **describe,** can **predict its consequences,** and **know how to intervene to change those consequences.**

What are the Purposes of Research?

1- Basic Research: The purpose of this research is to **understand and explain,** This type of research takes the form of a theory that explains the phenomenon under investigation to give its contribution to knowledge. **This research is more descriptive in nature exploring what, why and how questions.**

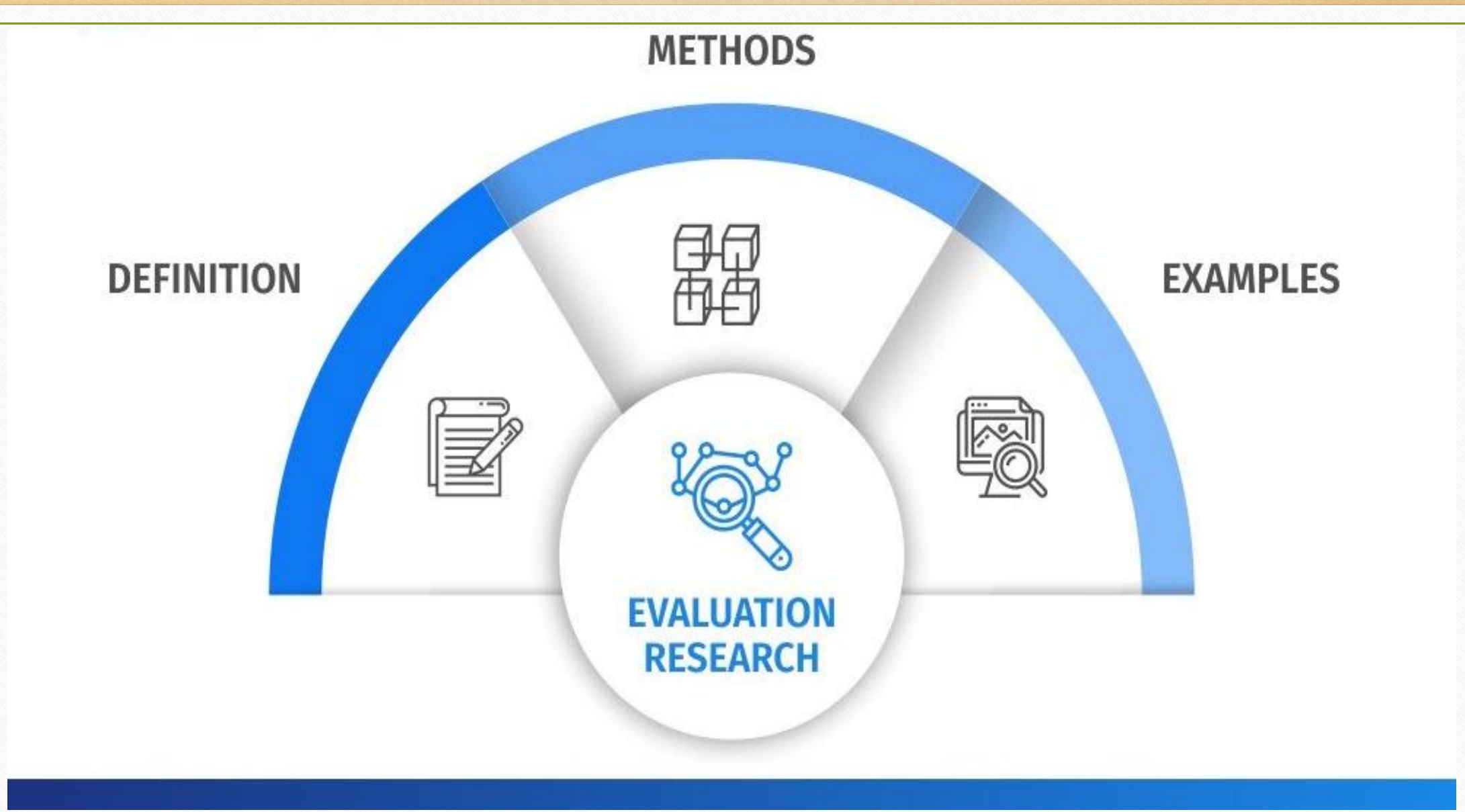
Types of Research

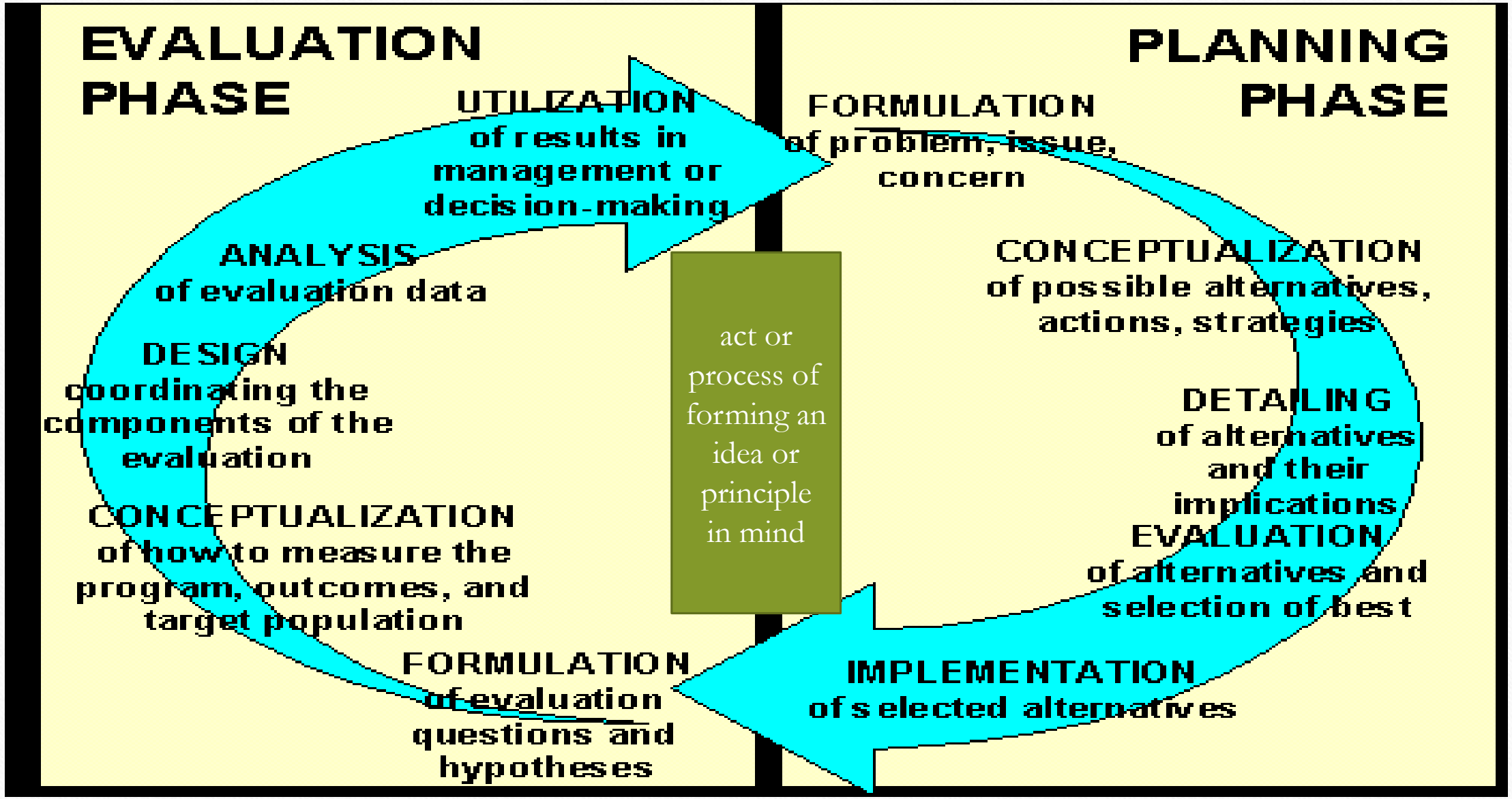


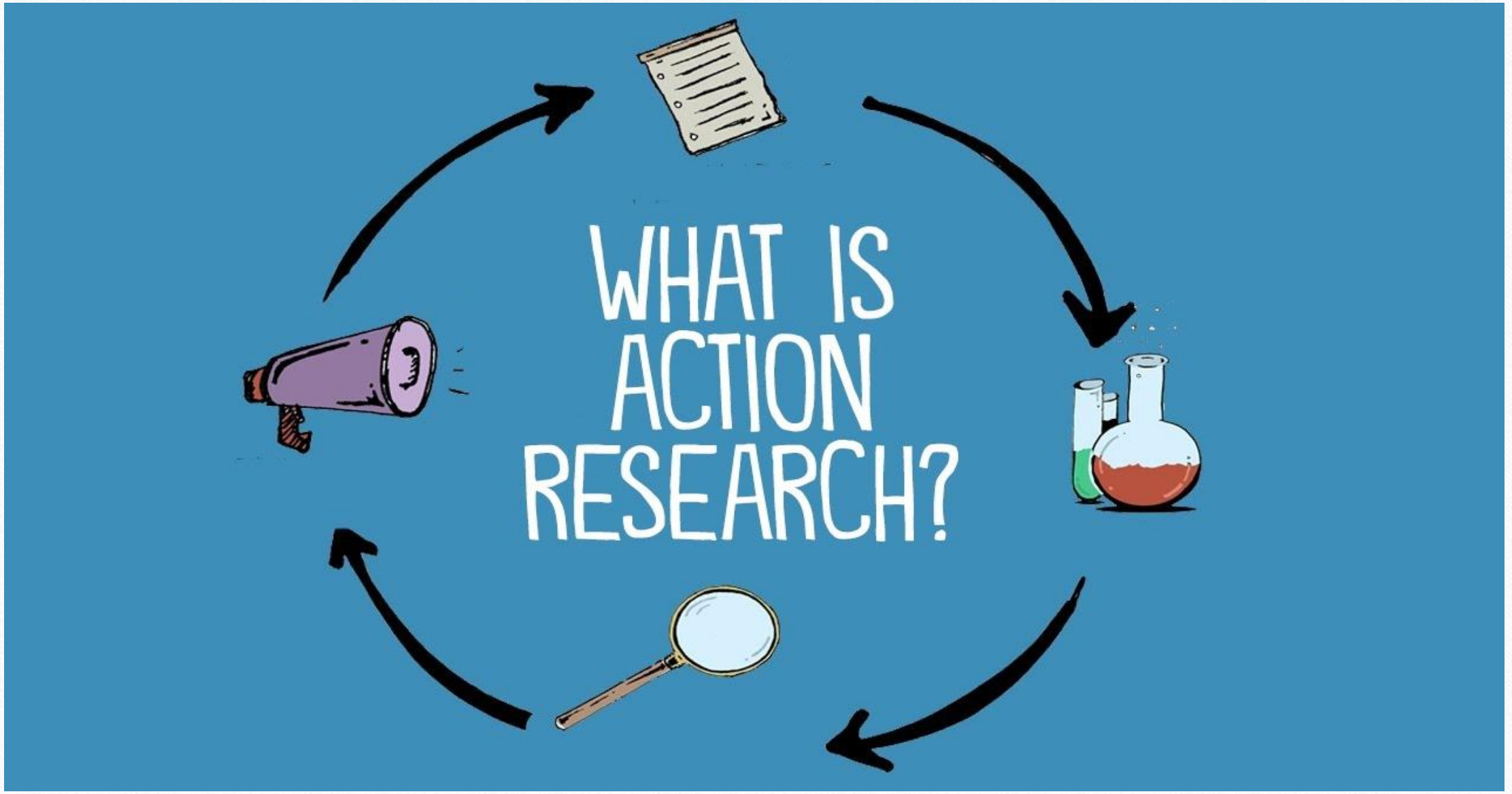
2- Applied Research: The purpose of this research is to help people understand the nature of human problems so that human beings can more effectively control their environment. In other words, this type of research pursues potential solutions to human and societal problems. This research is more prescriptive in **nature, focusing on how questions.**


Basic Research
Theoretical
Knowledge expansion
Applied Research
Practical
Betterment of humans
Buzzle.com

3- Evaluation Research: (summative and formative): Evaluation research studies **the processes and outcomes aimed at attempted solution.** The purpose of **formative** research is to improve human intervention within specific conditions, such as activities, time, and groups of people; the purpose of **summative** evaluation is to judge the effectiveness of a program, policy, or product.


METHODS
DEFINITION
EXAMPLES
EVALUATION
RESEARCH


EVALUATION PHASE
PLANNING PHASE
UTILIZATION of results in management or decision-making
FORMULATION of problem, issue, concern
ANALYSIS of evaluation data
CONCEPTUALIZATION of possible alternatives, actions, strategies
DESIGN coordinating the components of the evaluation
DETAILING of alternatives and their implications
CONCEPTUALIZATION of how to measure the program, outcomes, and target population
EVALUATION of alternatives and selection of best
FORMULATION of evaluation questions and hypotheses
IMPLEMENTATION of selected alternatives
act or process of forming an idea or principle in mind


WHAT IS
ACTION
RESEARCH?

4- Action Research: aims at **solving specific problems** within a program, organization, or community. **Patton (1990)** described that design and data collection in action research tend to be more informal, and the people in the situation are directly involved in gathering information and studying themselves.

For example: Individual action research involves working independently on a **project, such as an elementary school teacher conducting her own, in-class research project with her students**. ... Teams of staff members would work together using school-wide action research.


Planning
identifying
informing
organising
Acting
trialling
collecting
questioning
Observing
analysing
reporting
sharing
Reflecting
evaluating
implementing
revisiting
Action research

Research and Development

Let's begin with a question that has an obvious answer. What's the difference between a wall phone (circa 1907) and an iPhone 5? Their functions, size and their composition are very different.


THANK
YOU

DATA COLLECTION METHODS

Dr. Mohammed Essam

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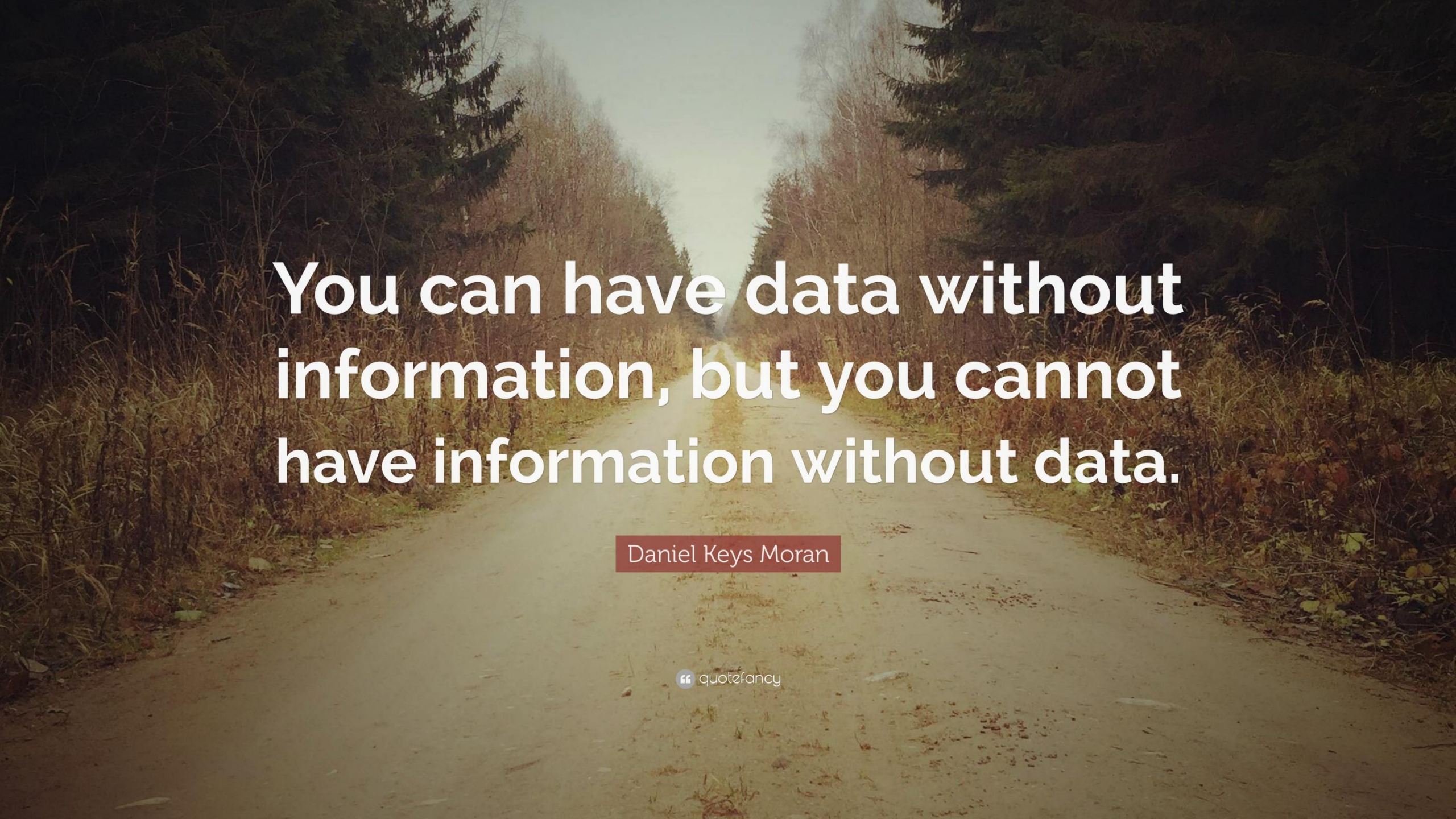
What is data?????

Data are the set of values of qualitative or quantitative variables about one or more persons or objects.

- Data are simply units of information.
- Data are measured, collected, reported, analyzed, and used to create data visualizations such as graphs, tables or Images.


You can have data without information, but you cannot have information without data.
Daniel Keys Moran
quotefancy

1- Quantitative Data (Numerical)

- Data refers to measurable observations.
  - **Quantitative** – based on numbers – 56% of 18 year olds drink alcohol at least four times a week - doesn't tell you why, when, how.

- **Examples-**

  - Height of 1st graders
  - Weight of sumo wrestlers
  - Duration of red lights
  - Age of Olympians
  - Distance of planets
  - Money in 401k plans
  - Temperature of coffee (200 F)

2- Qualitative Data (categorial)

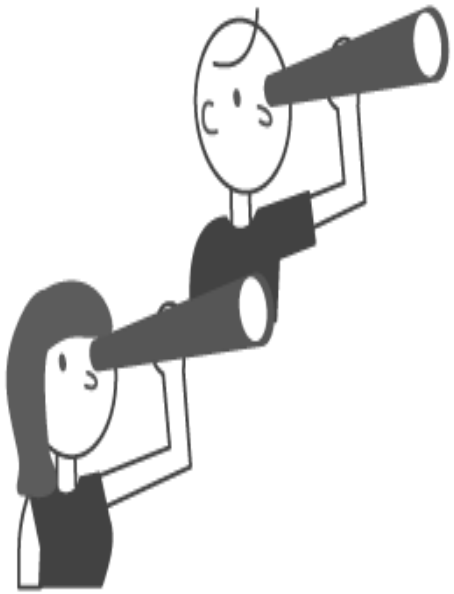
- **Qualitative data** is the data that can be arranged into categories based on **physical traits**, **gender**, **colors** or anything that does not have a number associated with it.
- Qualitative-involves more details tells you ***why, when and how***!
- **Examples-**

- Happiness rating
- Gender
- Pass/Fail
- Eye Color
- Interview transcript
- Categories of plants
- Descriptive temperature of coffee ("very hot"

What is Data Collection?

- It is the process by which the researcher collects the information needed to answer the research problem (question).
- The task of data collection begins after a research problem (question) has been defined.

In collecting the data, the researcher must decide:



- Which data is to collect?
- How to collect the Data?
- Who will collect the Data?
- When to collect the Data?

The Purpose of Data Collection

- The purpose of data collection is-
  - ✓ to obtain information
  - ✓ to keep on record
  - ✓ to make decisions about important issues,
  - ✓ to pass information on to others

Methods of Data Collection

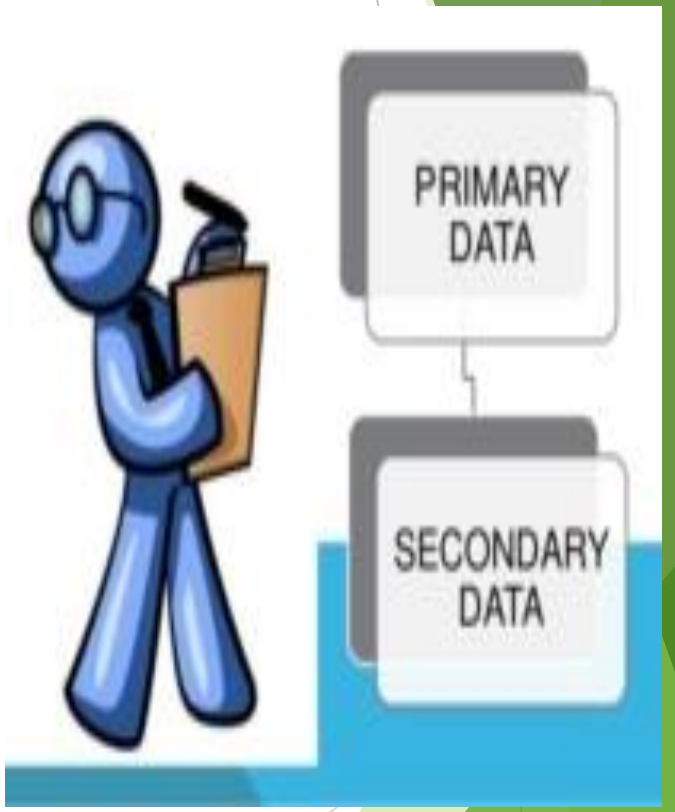
According data source divided into:

- PRIMARY DATA:

Primary data are those which are collected for the first time and are original in character.

- SECONDARY DATA:

Secondary data are those which have already been collected-by someone else.



Primary Data v/s Secondary Data

Primary data

- Real time
- Sure about the sources
- Can answer research question.
- Cost and time
- Can avoid bias
- More flexible

Secondary data

- Past data
- Not sure about sources
- Refining the research problem
- Cheap and no time
- Bias can't be ruled out
- Less flexible

Methods of Collecting Primary Data

Primary Data collected through:

- **Observation.**
- **Surveys.**
- **Interviews.**
- **Questionnaires.**
- **Schedules.**

1. Observation Method

Observation method is a method under which data from the field is collected with the help of observation by the observer or by personally going to the field.

Steps For An Effective Observation

Determine what needs to be observed

Select participants

Random/Selected

Conduct the observation

(venue, duration, recording materials, take photographs)

Compile data collected

Analyze and interpret data collected

Types of Observation Methods

1- Structured Observation:

When the observation is characterized by a careful definition of the units to be observed (predefined), the style of recording the observed information, standardized conditions of observation and the selection of related data of observation.

2- Unstructured Observation:

When it takes place without the above characteristics. (Not predefined).

3- Participant Observation:

When the observer is member of the group which he is observing.

4- Non-Participant Observation:

When the observer is not the member of the group which he is observing.

observer is observing people without giving any information to them.

5- Uncontrolled Observation:

When the observation takes place in natural contition i.e., uncontrolled observation.It is done to get spontaneous picture of life and persons.

6- Controlled Observation:

When observation takes place according to pre-arranged plans, with experimental procedure then it is controlled observation generally done in laboratory under controlled condition.

Advantages of observation Method

- Produces Large quantities of data.
- All data obtained from observations are usable.
- The observation technique can be stopped or begun at any time.
- Relative Inexpensive

Disadvantages of observation Method

Interviewing selected subjects may provide more information, economically, than waiting for the spontaneous occurrence of the situation.

Extensive Training is needed.

Limited information.

2. SURVEY Method

A ‘survey’ is a technique of gathering information by questioning those individuals who are the object of the research belong to a representative sample, through standardized or questioning procedure.

Aiming of studying the relationship among the variables and/or collecting information that probably describe the whole population.

One of the widely used research design to collect data is

SURVEYS

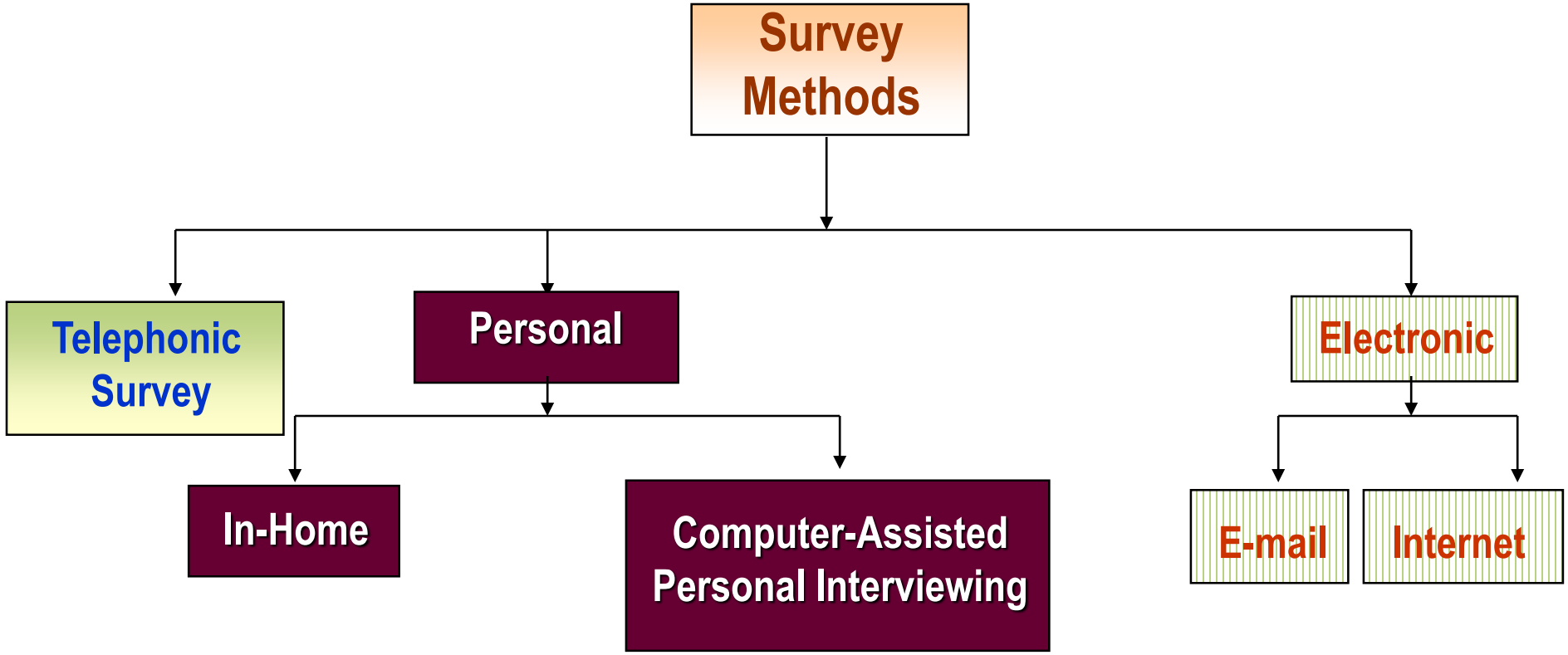
How to collect Primary information through survey

- A researcher can collect information

  Either by observation or by asking.

- When he/she asks for information, we say that he/she is conducting a survey.

There may be different ways to conduct surveys…



3.Interview Method

- The Interview Method of collecting data involves presentation of oral-verbal stimuli and reply in terms of oral- verbal responses.
- Where the questions are asked personally directly to the respondent.
- Interviewer asks questions to respondent. (which are aimed to get information required for study)

Steps For An Effective Interview

Prepare interview schedule

Select subjects/ key

Respondent Conduct the interview

Analyze and interpret data collected from the interview

Types of Interview Methods

1- Structured Interviews:

In this case, a set of predecided questions are there.

2- Unstructured Interviews:

In this case, we don’t follow a system of pre-determined questions.

3- Focused Group Interview:

- Unstructured and Free flowing.
- Focus Group has one Moderator.
- Moderator maintains control and focuses discussion.
- It involves 6 to 10 people.
- Group interview start with broad topic and focus in on **specific** issues.
- Similar lifestyles and experiences.
- Generate discussion and interaction.
- Listens to what people have to say.
- **Everyone** gets a chance to speak.

A research method that brings together a small group of consumers to discuss the product or advertising, under the guidance of a trained interviewer.

4- Qualitative and quantitative Interviews :

It is divided on the basis of subject matter i.e., whether **qualitative** or **quantitative**.

5- Individual Interviews :

Interviewer meets a single person and interviews him.

6- Selection Interviews :

Done for selection of people for certain Jobs or according to certain criteria.

Advantages of Interview Method

More information at greater depth can be obtained

Resistance may be overcome by a skilled interviewer

Personal information can be obtained

disadvantages of Interview Method

- It is an expensive Method
- Interviewer bias
- Respondent bias
- Time consuming

4.Questionnaires

- The term “questionnaire” refers to an instrument for the collection of data, usually in written form, consisting of open/closed questions and other enquiries requiring a response from subjects.
- A Questionnaire is sent (by **post** or by **mail**) to the persons concerned with a request to answer the questions and return the Questionnaire.
- A Questionnaire consists of a number of questions printed in a definite order on a form.

Steps For An Effective Questionnaire

Prepare questions
(Formulate & choose types of questions, order them, write instructions, make copies)

Select your respondents
Random/Selected

Administer the questionnaire
(date, venue, time)

Tabulate data collected

Analyze and interpret data collected

Types of Questionnaire Methods

1- Open-ended questions:

This gives the respondents the ability to respond in their own words.

2- Close-ended or fixed alternative questions:

This allows the respondents to choose one of the given alternatives.

Types:- Dichotomous questions and Multiple Questions.

Essentials of Good Questionnaire

- Should be short and simple
- Follow a sequence of questions from easy to difficult one
- Technical terms should be avoided
- Should provide adequate space for answers in questionnaire
- **Directions** regarding filling of questionnaire should be given
- Physical Appearance – Quality of paper, Color.
- **Sequence** must be clear

Advantages of questionnaire Method

- Low cost –even when the universe is large and is widespread
- Free from interviewer bias
- Respondents have adequate time to think through the answers.
- Respondents who are not easily approachable, can also be reached conveniently.
- Large samples can be used

Disadvantages of questionnaire Method

- Time consuming
- The respondents need to be educated and cooperative
- This method is slow
- Possibility of unclear replies.

5.Schedules

- Very similar to Questionnaire method.
- The main difference is that a schedule is filled by the enumerator, who is specially appointed for the purpose.
- Enumerator goes to the respondents, asks them the questions from the Questionnaire in the order listed, and records the responses in the space provided.
- Enumerator must be trained in administering the schedule.

Questionnaire Vs. Schedule

Questionnaire

- Q generally send to through mail and no further assistance from sender.
- Q is cheaper method.
- Non response is **high**.
- In questionnaire, it is not confirmed that expected respondent have filled the answers.

Schedule

- Schedule is filled by the enumerator or research worker.
- Costly requires field workers.
- Non response is **low**.
- In schedule identity of person is known.

Secondary Data Collection Methods

- Data gathered and recorded by someone else.
- Secondary data is data that has been collected for another purpose.
- It involves less cost, time and effort.
- Secondary data is data that is being reused. Usually in a different context.

Sources of secondary data collection

1- Internal sources:

Internal sources are usually for marketing application-

- Sales Records
- Marketing Activity
- Cost Information
- Distributor reports and feedback
- Customer feedback

2- External sources:

- Journals
- Books
- Magazines
- Newspaper
- Libraries
- The Internet

Selection of proper Method for collection of Data

- Nature ,Scope and object of inquiry
- Availability of Funds
- Time Factor
- Accuracy Required

Advantages of secondary data Method

- Ease of Access
- Low Cost to Acquire
- Clarification of Research Question
- May Answer Research Question

Disadvantages of secondary data Method

- Quality of Research
- Not Specific to Researcher's Needs
- Incomplete Information
- Not Timely

THANK YOU ALL

To be Continued ....

Establishing the Validity and Reliability of a Research Instrument

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Lecturer of Physical Therapy

South Valley University

A- The concept of validity

Validity is the degree to which the researcher has measured what he has set out to measure.

- The common definition of validity is epitomized by the question: Are we measuring what we think we are measuring?

- The instrument is measuring what it was designed or supposed to measure.

Examples

Evaluation equipment

- Blood samples for measurement Lipid profile
- GENU. for measurement ROM
- X ray for measurement Bone trauma
- MRI for measurement Disc lesion

- pulmonary fun. for measurement Lung volumes.
- NCV for measurement Nerve injury.
- Standard pulsed-wave Doppler velocimetry for measurement of blood flow velocimetry.
- Laser Doppler qualification for measurement of microcirculation.

The four types of validity

1- Construct validity: Does the test measure the concept that it's intended to measure?

2- Content validity: Is the test fully representative of what it aims to measure?

3- Face validity: Does the content of the test appear to be suitable to its aims? subjective assessment

4- Criterion validity: Do the results correspond to a different test of the same thing?

1- Construct validity

- Construct validity: Does the test measure the concept that it's intended to measure?

- Construct validity is about ensuring that the method of measurement matches the construct you want to measure.

EX:-

- We can measure depression based on a collection of symptoms and indicators, such as low self confidence and low energy levels.

2- Content validity

- Content validity: Is the test fully representative of what it aims to measure?

- Content validity assesses whether a test is representative of all aspects of the construct.

- To produce valid results, the content of a test, survey or **measurement method must cover all relevant parts of the subject it aims to measure.**

3- Face validity

- Face validity: Does the content of the test appear to be suitable to its aims?

- It's similar to content validity, but face validity is a more informal and subjective assessment.

- As face validity is a subjective measure, it's often considered the weakest form of validity.

EX:-

- You review the survey items, which ask questions about every meal of the day and snacks eaten in between for every day of the week.

4- Criterion validity

- Criterion validity: Do the results correspond to a different test of the same thing?

- Criterion validity evaluates how closely the results of your test correspond to the results of a different test.

- To evaluate criterion validity, you calculate the correlation between the results of your measurement and the results of the criterion measurement.

B- The concept of reliability

- The greater the degree of consistency and stability in an instrument, the greater its reliability.

- Therefore, reliability is the degree of accuracy or precision in the measurements made by a research instrument.

- The lower the degree of error in an instrument, the higher the degree of reliability.

Factors affecting the reliability of a research instrument

In the social sciences it is impossible to have a research tool which is 100 % accurate, not only because a research instrument cannot be so, but also because it is impossible to control the factors affecting reliability.

1) **The wording of questions** – A slight ambiguity in the wording of questions or statements can affect the reliability of a research instrument as respondents may interpret the questions differently at different times, resulting in different responses.

2) **The physical setting** – In the case of an instrument being used in an interview, any change in the physical setting at the time of the repeat interview may affect the responses given by a respondent, which may affect reliability.

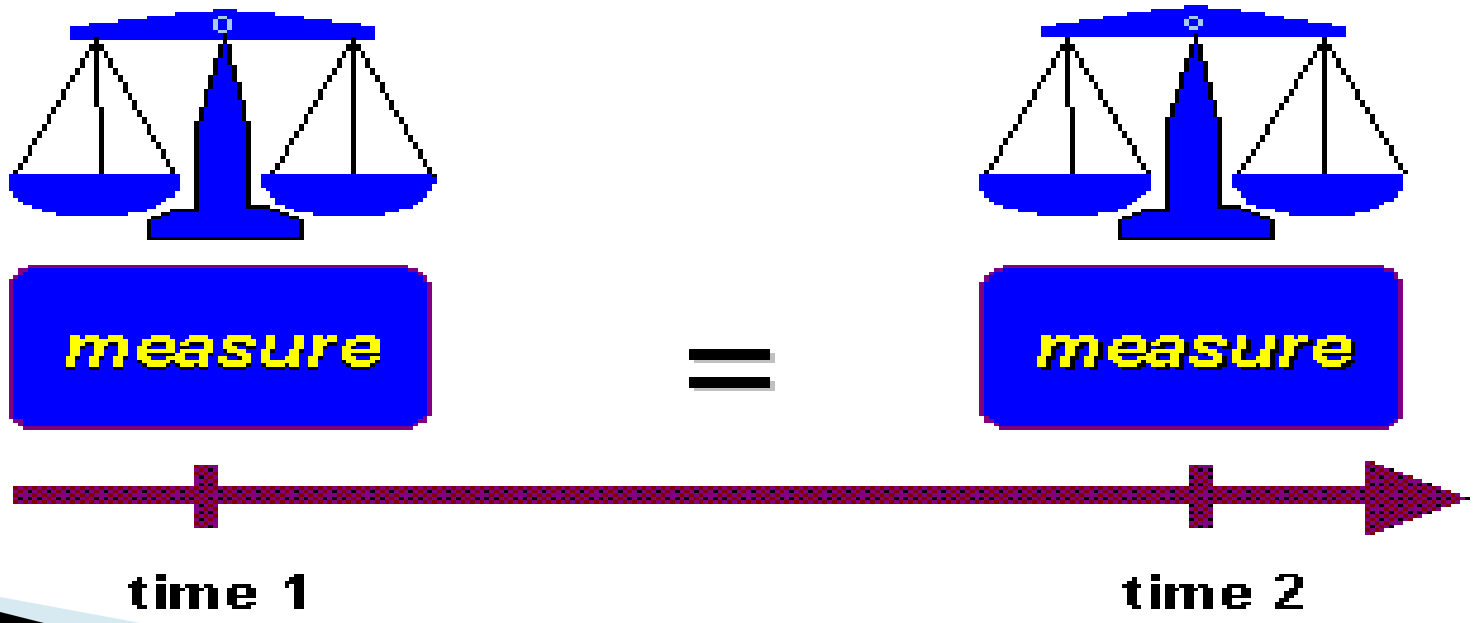
3) **The respondent's mood** – A change in a respondent's mood when responding to questions or writing answers in a questionnaire can change and may affect the reliability of that instrument.

4) **The interviewer's mood** – As the mood of a respondent could change from one interview to another so could the mood, motivation and interaction of the interviewer, which could affect the responses given by respondents thereby affecting the reliability of the research instrument.

5) **The nature of interaction** – In an interview situation, the interaction between the interviewer and the interviewee can affect responses significantly. During the repeat interview the responses given may be different due to a change in interaction, which could affect reliability.

Methods of determining the reliability of an instrument

1. Test/retest – Test-Retest Reliability: Used to **assess the consistency of a measure from one time to another**.



- The greater the value of the ratio, the higher the reliability of the instrument. As an equation,

(Test score)/ (retest) = 1

Or

(Test score) – (retest) = 0

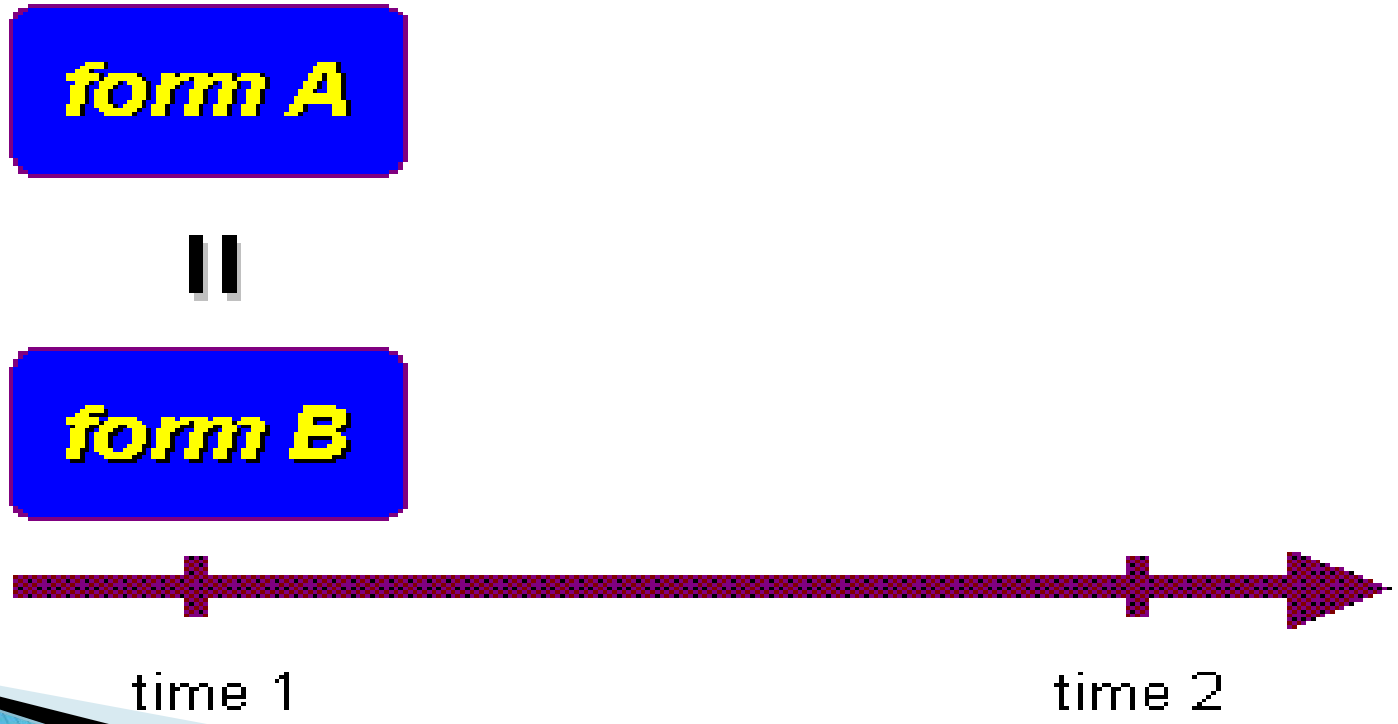
- A ratio of **1** shows 100 per cent reliability (no difference between test and retest) and any deviation from it indicates less reliability – the less the value of this ratio, the less the reliability of the instrument.

- Expressed in another way, **zero** difference between the test and retest scores is an indication of 100 per cent reliability.

- The greater the difference between scores or findings obtained from the two tests, the greater the unreliability of the instrument.

2. Parallel forms of the same test – Parallel-Forms

Reliability: Used to assess the consistency of the results of two tests constructed in the same way from the same content domain.



- In this procedure you construct two instruments that are intended to measure the same phenomenon.

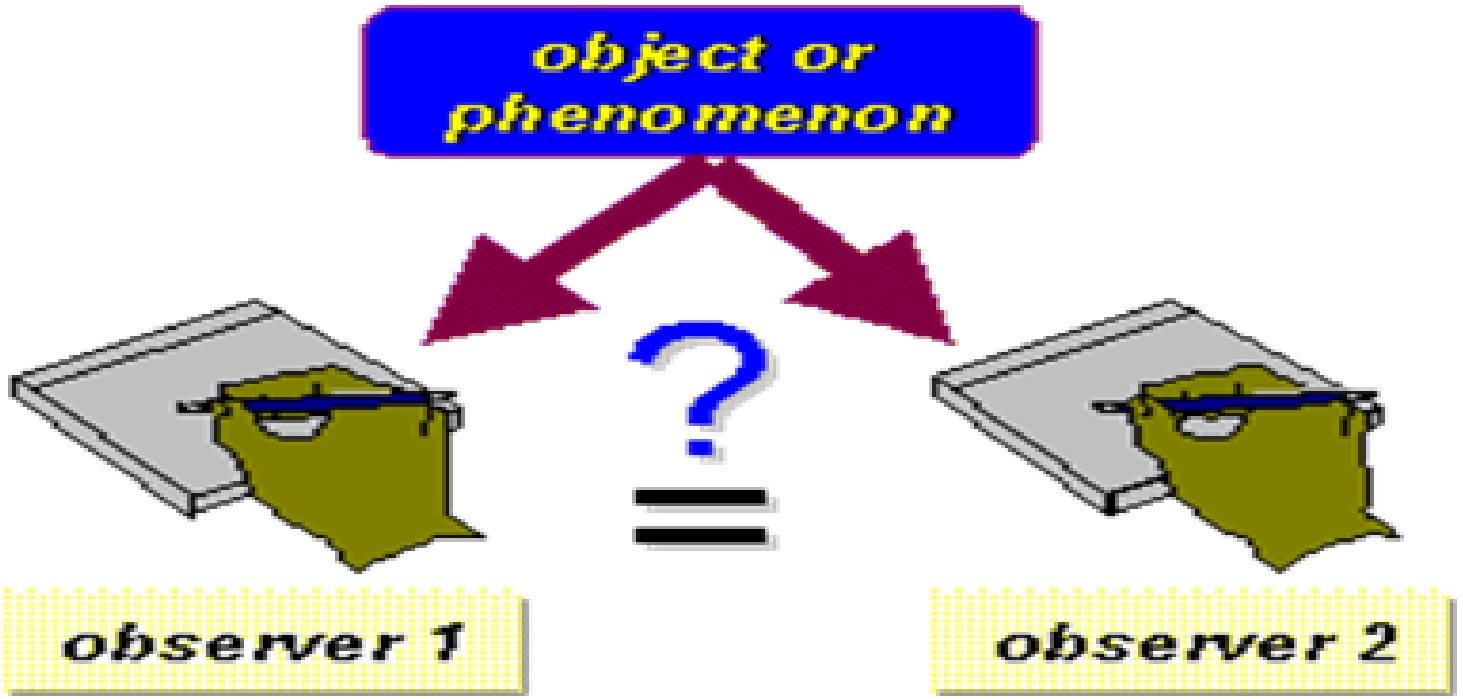
- The results obtained from one test are compared with those obtained from the other. If they are similar, it is assumed that **the instrument is reliable**.

- The main advantage of this procedure is that it does not suffer from the problem of recall found in the test/retest procedure.

- A disadvantage is that you **need to construct two instruments** instead of one. Moreover, it is extremely difficult to construct two instruments that are comparable in their measurement of a phenomenon.

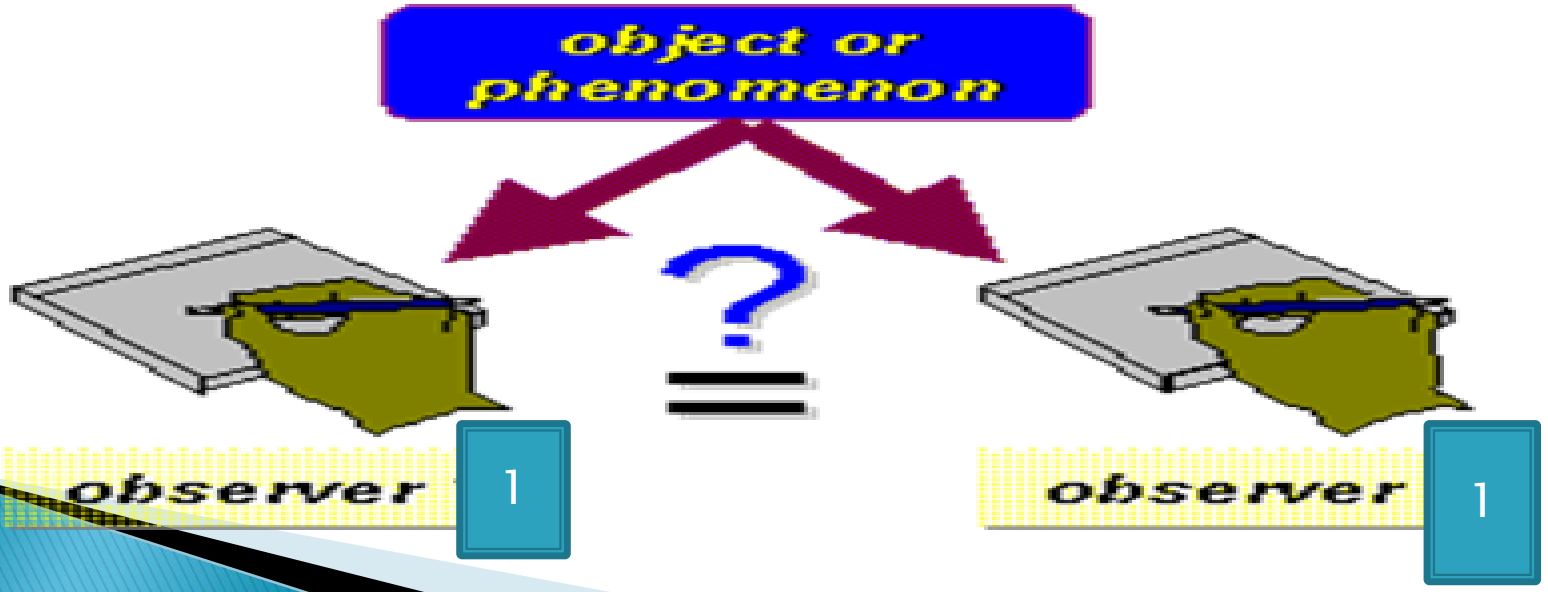
3. Inter-Rater or Inter-Observer Reliability:

Inter-Rater Reliability: Used to assess the degree to which different raters/observers give consistent estimates of the same phenomenon.



4- Intra-rater reliability

Intra-rater reliability refers to the consistency of the data recorded by one rater over several trials and is best determined when multiple trials are administered over a short period of time.



An evaluation of the inter-rater and intra-rater reliability

- Intra-rater reliability refers to the consistency of the data recorded by one rater over several trials and is best determined when multiple trials are administered over a short period of time.

- Inter-rater reliability refers to the consistency of data recorded by two or more raters, measuring the same subjects over a single trial.


THANK
YOU

Research Ethics

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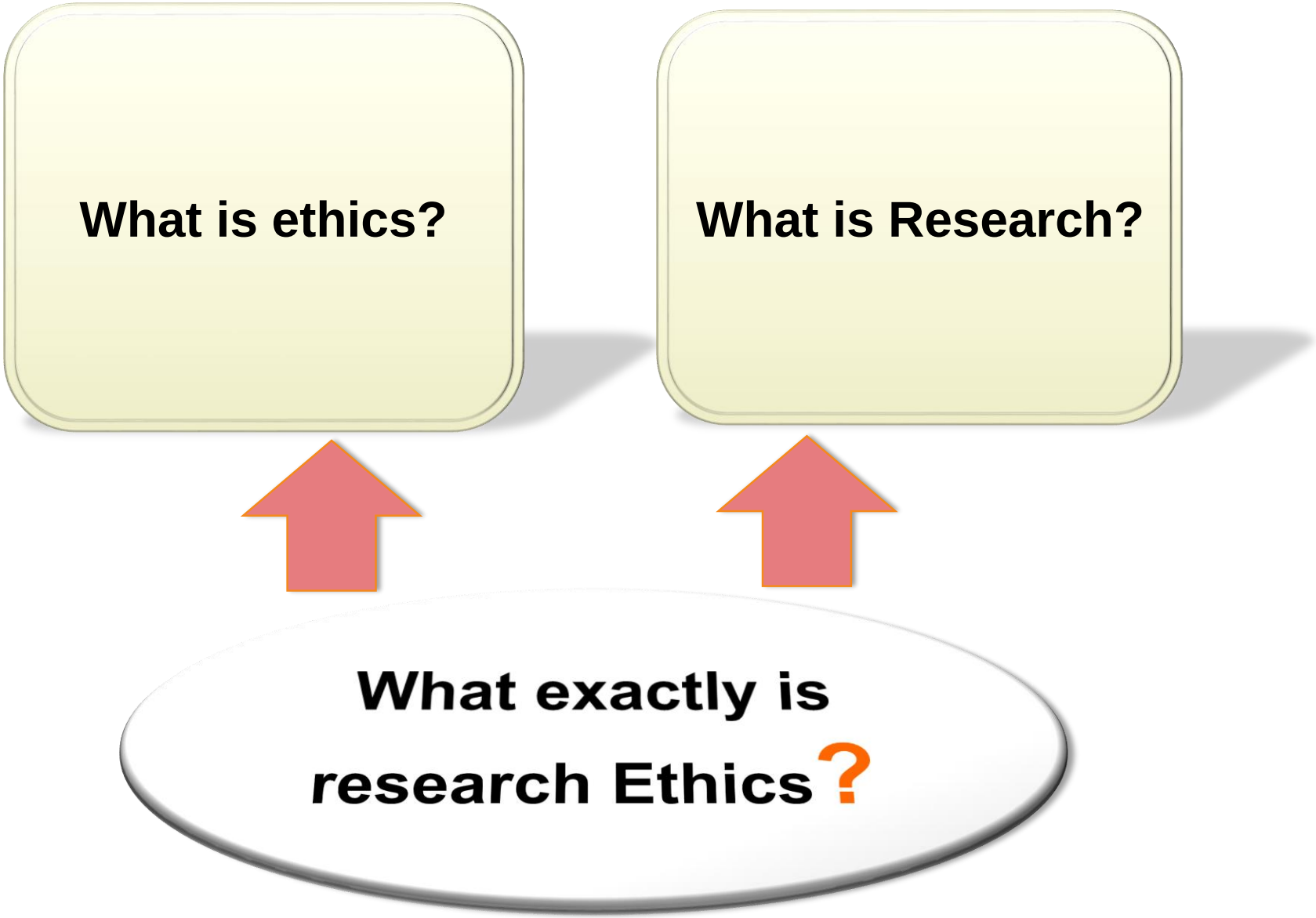
Lecturer of Physical Therapy
South Valley University


What is ethics?
What is Research?
What exactly is research Ethics?

Ethics as a theoretical enterprise

Meta Ethics: "is a branch of analytic philosophy that explores the status, foundations, and scope of moral values, properties, and words"

Normative Ethics: addresses the question of 'What ought to be done?' Normative Ethical theorists seek to provide action guides and codes.

Applied Ethics: domain specific ethics (Business, biomedical; engineering, etc.).

Ethics

- Discipline dealing with what is proper course of action for person
- A branch of philosophy that looks at what is good and what is bad.
- A system of obligation that we have towards others.
- Also known as moral philosophy, involves, systematising, defending, and recommending concepts of right and wrong behaviour.
- A study of principles guiding the good of the individual within the context of social interactions and the community.

Univesality and objectivity - Research should be designed in a manner that allows any competent researcher to conduct a similar study and generate same findings.

Originality of research work: original ideas backed with appropriate evidence in a clear, logical and convincing argument that illustrates critical and analytical thinking.

Generalisability of findings: extent to which sample used in the research project reflects the broader population of interest.

Scientific Rigour (truth is accepted if there is sufficient evidence to support claims made through the research process.

Research Ethics therefore are:

1. A code of guidelines on how to conduct scientific research in a morally acceptable way.

2. Principles and standards that help researchers to uphold the value and standards of knowledge construction.

Ethical considerations come into play at six stages of research

Conceptualization and design of the study (scientific merit, identify risks and ways to mitigate the risks).

When participants are recruited (the process of informed consent, right to privacy).

Protection of confidentiality and anonymity.

During the intervention or measurement procedure to which participants are subjected (management of risk).

In the release of results obtained

After the release of results (ensure that participants and communities involved in the research benefit)

Another way of looking at research ethics is by looking at unethical research conduct:

1) Deception (issues of full disclosure): (Withholding information about the aim of the study, Misleading participants about the risks inherent in participating in the study).
2) Plagiarism.
3) Conducting research that does not have a scientific base (ill-formed problem statement).

Another way of looking at research ethics is by looking at unethical research conduct:

4) Lack of objectivity and integrity in the design and conduct of research: (not identifying the methodological constraints of the study that determine the validity of the findings, misinterpretation of results, not providing details of theories and methods that might be relevant in the interpretation of research findings).

5) Fabrication or falsification of data.

6) Not following the appropriate ascription of authorship to a publication.

Another way of looking at research ethics is by looking at unethical research conduct:

7) Not respecting the right to privacy.

8) Not respecting the right to anonymity and confidentiality.

9) Not respecting rights of vulnerable groups (Children, Mentally handicapped individuals, The aged, Prisoners, Illiterate, Those with low social status).

10) Not having due consideration for the environment.

Fundamentally research ethics are:

- The way of conducting the research enterprise such that the three fundamental principles of research (respect, beneficence and justice) are upheld.
- Ethical research must conform to the national and international accords and prescripts.

Justice: researchers should not place one group of people at risk solely for the benefit another.

Risks and benefits should be distributed in an equitable manner when recruiting participancts

Respect

- Respect for research participants (informed consent).
- Respect for sponsors of research.
- Respect for communities where participants come from.
- Respect for knowledge and academic community.

PRINCIPLES OF RESEARCH ETHICS

Beneficence: the researcher is responsible for the mental, physical and social wellbeing of the participant throughout the participation in the study.

- Benefits must be weighed against potential risk that a person might have by participating
- Research should only be justified if its conduct and result will be of benefit to the participants.
- How the community will benefit should be clear from the research protocol.

Why be concerned with research ethics?

1. **Professional Responsibility.**
2. **To avoid reputational damage.**
3. **Research can be harmful to:** participants, researchers, institutions, research communities.
4. **To avoid litigation: by follow** ways in which a researcher can alter or improve its practices to avoid potential conflicts with clients, patients, institutions, sponsors and others.

Informed Consent

- A consent given by well informed potential participants about the nature of the research procedure, scientific purpose,and about the risks and benefits of the study, must be addressed by laying out the details out in the language the participant understands, in a culturally acceptable way.
- Informed consent is given without subjecting the potential participant to coercion, intimidation or undue influence.

Stages and Process of Informed Consent

Stages of informed consent	Informed Consent Activities
Before the commencement of the study	❖ Assessment of the local culture. ❖ Identification of risks and benefits before and after the study. ❖ Pilot testing.
At the beginning of the study	❖ Information is presented with the aid of support material to enhance understand of the research aims and objectives. ❖ Risks and benefits of the study are presented. ❖ Understanding is assessed.
During the study	❖ Reinforce key ethical principles. ❖ Address issues of concern.

Key Elements of Informed Consent

1. Description of research aims and objectives.
2. Description of potential risks.
3. Description of expected benefits.
4. Explanation of confidentiality and anonymity of participants.
5. Explanation of participants rights including the fact that participation is voluntary.
6. Explanation of issues relating to remuneration/compensation for injuries.

How To Submit A Proposal For Ethical Clearance

The proposal submitted for ethical approval should demonstrate that each of the following ethical aspects arenot only addressed, but are discussed in a logical and cogent fashion:

1. Respect and dignity of participants.
2. Privacy and confidentiality.
3. Balance of benefits and risks.
4. Sampling plan – fair participant selection.
5. Competence and capacity of researcher.
6. Protocols and procedures followed in dealing with minors, vulnerable persons (if applicable).

Difference between clinical and social science research

	Clinical Research	Social Science Research
Definition	A research study intended to test safety, quality, effectiveness of new and/or existing or old medicines, medical devices and/or treatment options, using human participants.	A systematic recording and analysis of data that may lead to generaliseable, principles and theories resulting in prediction and possibly management of behaviour and events in society.
Research activities	Invasive and non-invasive procedures that may include surgical intervention, removal of body tissues/ fluids, administration of chemical substances, observation, administration of questions etc.	Review of literature, review of data, interviews, focus groups, observatations, administration of survey instruments, or tests etc.
Phases or steps followed	Four phases	More or less eight phases (depending on research questions and design of the study)

Phases of research: clinical vs social

Clinical Trials	Social Research
PHASE I: A new drug, vaccine or medical device is tested in a small group of healthy persons for the very first time. The aim is to determine the general safety, the correct dosage and negative effects.	**PHASE 1:** problem identification
	PHASE2: problem definition
	PHASE 3: development of a theoretical framework
PHASE II: Clinical trials the new drug, vaccine or medical device in a larger group (several hundred people)	**PHASE 4:** hypothesis formulation or literature review
PHASE III : testing to several thousand people	**PHASE 5:** research design
	PHASE 6: data collection
PHASE IV: clinical trials done to several thousand people after the new drug, vaccine or medical drug has been registered and licensed for sale by the Medical Control Council	**PHASE 7:** data analysis
	PHASE 8: report writing and dissemination of findings


Thank
You

Critical Appraisal

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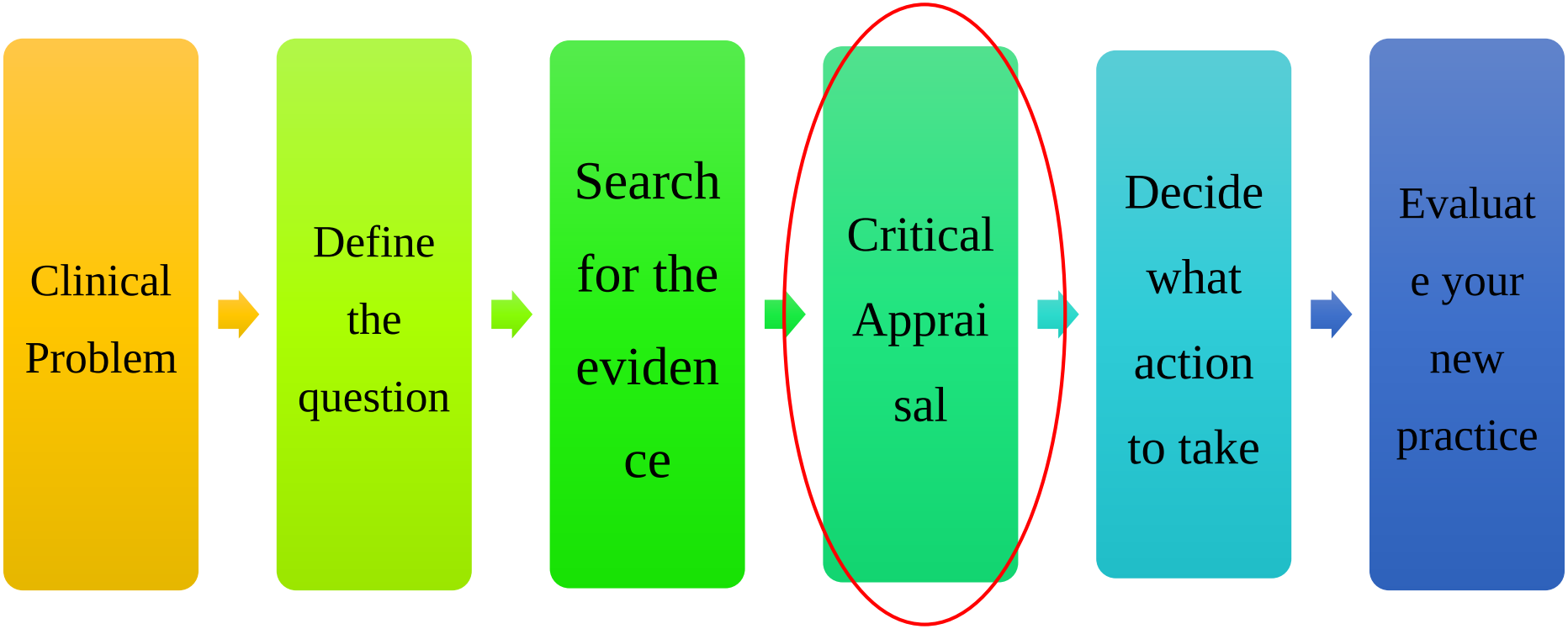
What is critical appraisal?

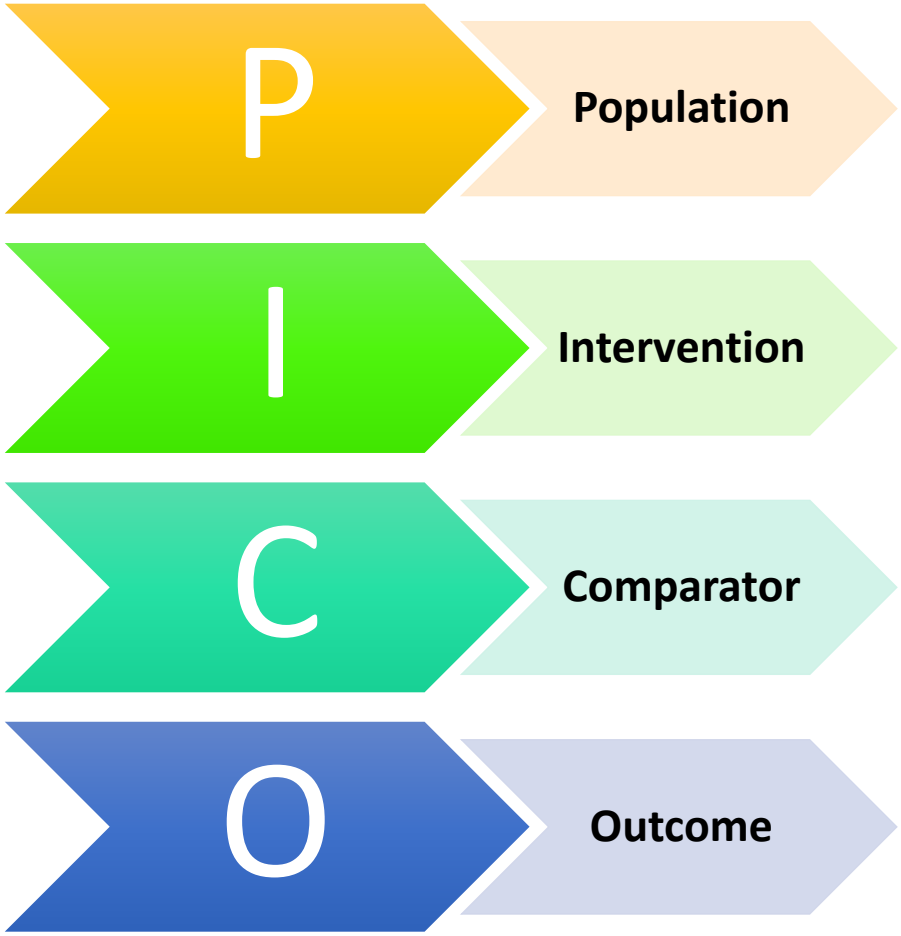
- Carefully and systematically evaluate research to assess:
  - Validity (is these findings trustworthy?)
  - Value (what do the results show?)
  - Relevance (How do these results relate to my clinical practice?)

Critical appraisal: a key component of evidence based medicine.



How to critically appraise an article

1- Asking the right question



	1	2	3	4
	Patient or Problem	Intervention (a cause, prognostic factor, treatment, etc.)	Comparison Intervention (if necessary)	Outcomes
Tips for Building	Starting with your patient, ask "How would I describe a group of patients similar to mine?" Balance precision with brevity.	Ask "Which main intervention am I considering?"Be specific.	Ask "What is the main alternative to compare with the intervention?"Again, be specific.	Ask "What can I hope to accomplish?" or "What could this exposure really affect?"Again, be specific.
Example	"In patients with heart failure from dilated cardiomyopathy who are in sinus rhythm …"	"… would adding anticoagulation with warfarin to standard heart failure therapy …"	"… when compared with standard therapy alone …"	"… lead to lower mortality or morbidity from thromboembolism. Is this enough to be worth the increased risk of bleeding?"

2- Choosing right study design

- Some study designs are not appropriate to answer certain questions
- All study designs are prone to different biases.

Pyramid of evidence

So are RCTs the gold standard for evidence?

…..depends

Limitations of RCTs

1) Excellent vs Poor RCTs – quality varies.
   - Impact on interpretation of result (external validity)?
2) Expensive and time consuming.
3) May not always be the right study design to answer that question.

3) Validity.

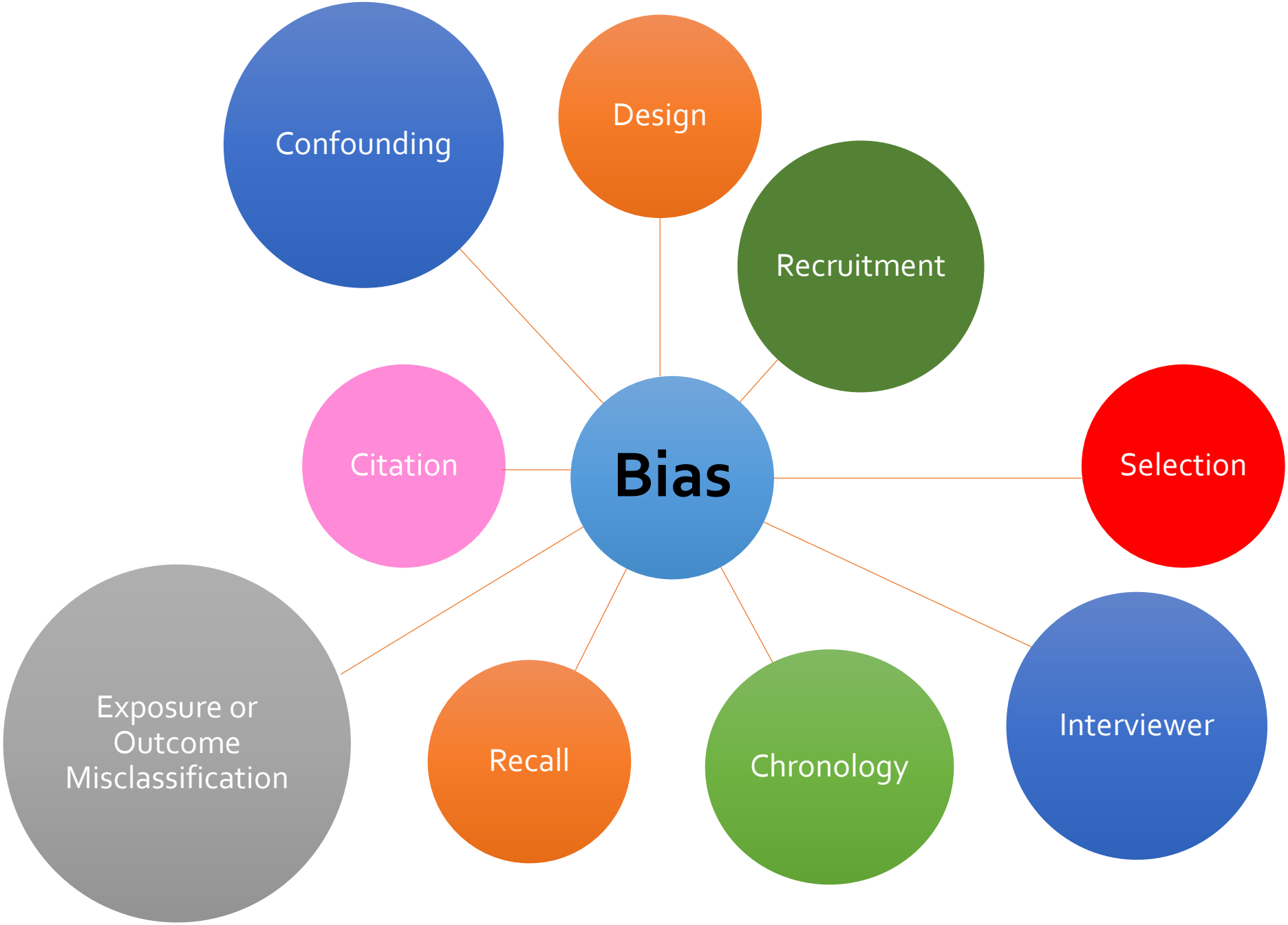
- is these findings trustworthy?
- Methods to check that the biases for which that particular study design is prone have been minimized.

3) Results / Value.

4) Clinical Relevance.

Bias:

"The systematic deviation of the results of a study from the truth because of the way it has been conducted, analyzed or reported"


Confounding
Design
Recruitment
Citation
Bias
Selection
Exposure or Outcome Misclassification
Recall
Chronology
Interviewer

Sources of bias in clinical trials

Table 1. Key sources of bias in clinical trials[2]

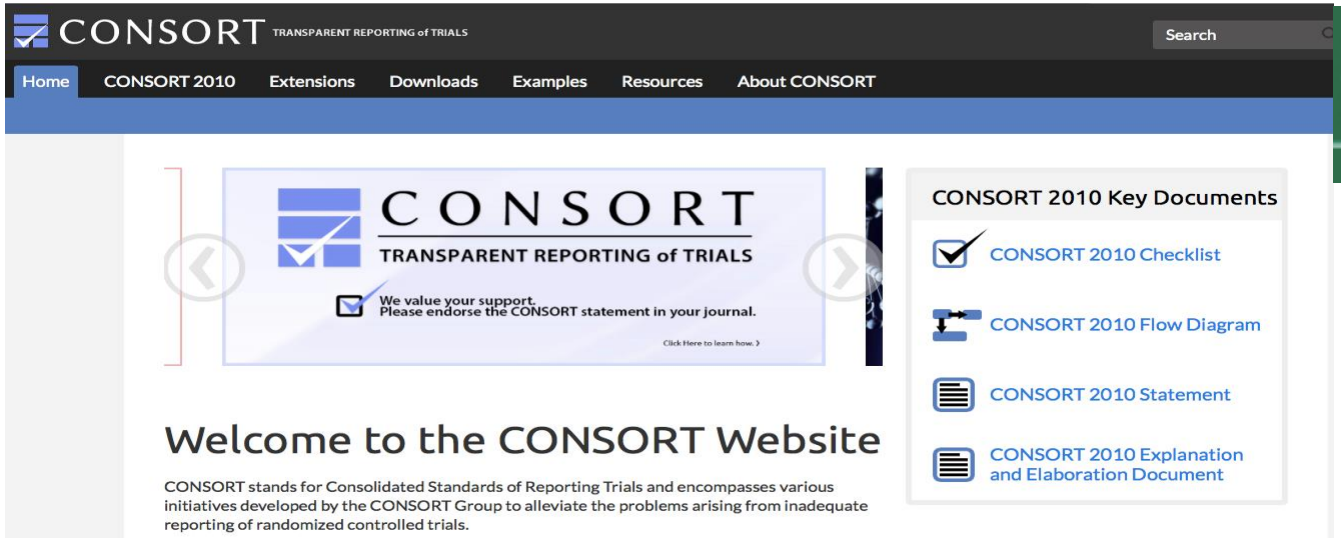
Selection bias	Biased allocation to comparison groups
Performance bias	Unequal provision of care apart from treatment under evaluation
Detection bias	Biased assessment of outcome
Attrition bias	Biased occurrence and handling of deviations from protocol and loss to follow up

Assessing Trials of effectiveness

Questions to ask:

1. Are the results of the trial valid?
2. What are the results?
3. Will the results help locally?

Checklists for clinical trials



SIGN

CEBM

CENTRE FOR EVIDENCE-BASED MEDICINE

CEBM

UNIVERSITY OF OXFORD

Critical Appraisal Skills Programme

Critical Appraisal Skills Programme (CASP)

Making sense of evidence

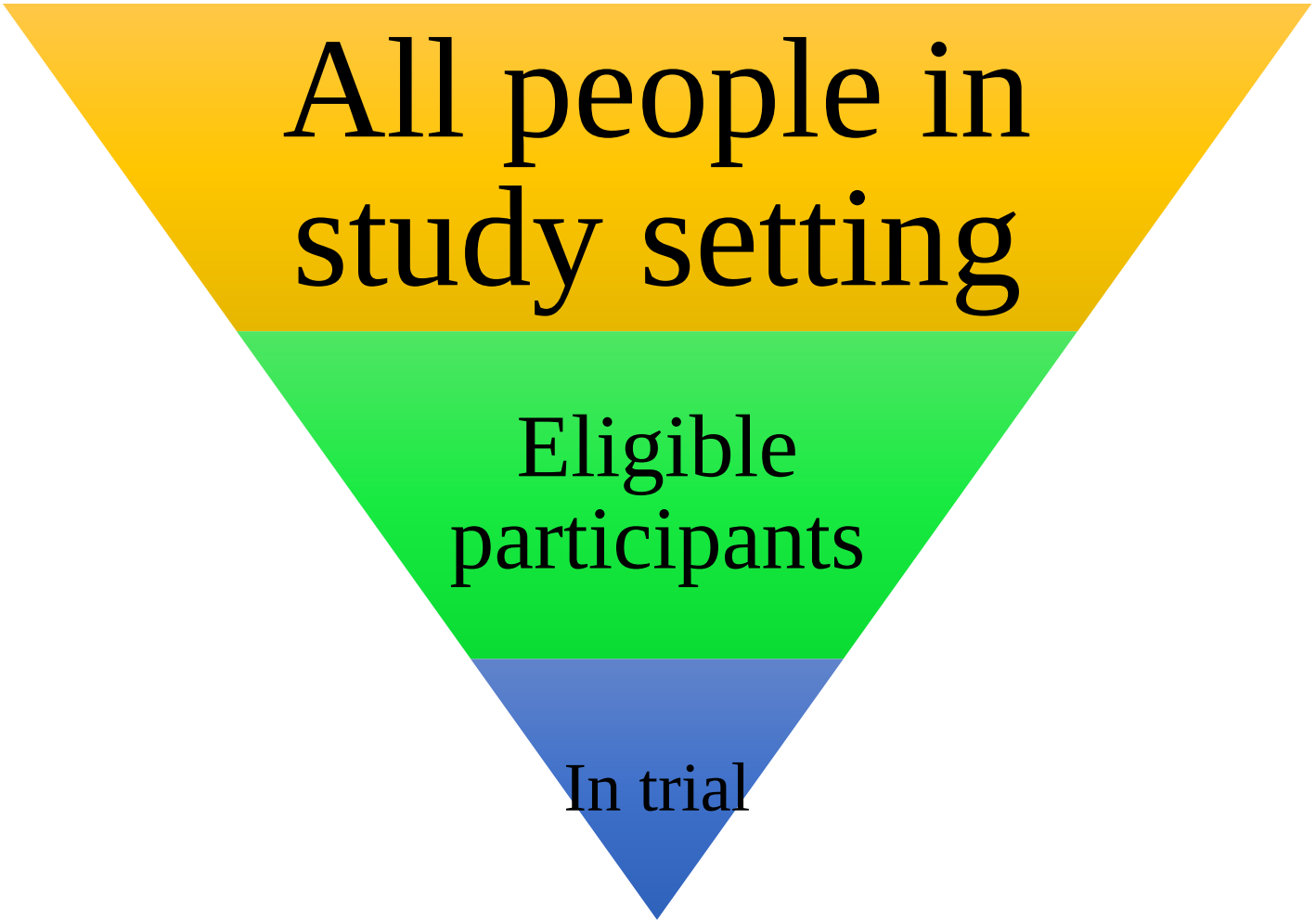
11 useful questions for critical appraisal of a randomized trial

1. Did the trial address a clearly focused issue? ☐ Yes ☐ Can't tell ☐ No

Consider: An issue can be 'focused' In terms of

- The population studied
- The intervention given
- The comparator given
- The outcomes considered

Representative: Are the trial subjects representative of patients in this setting?



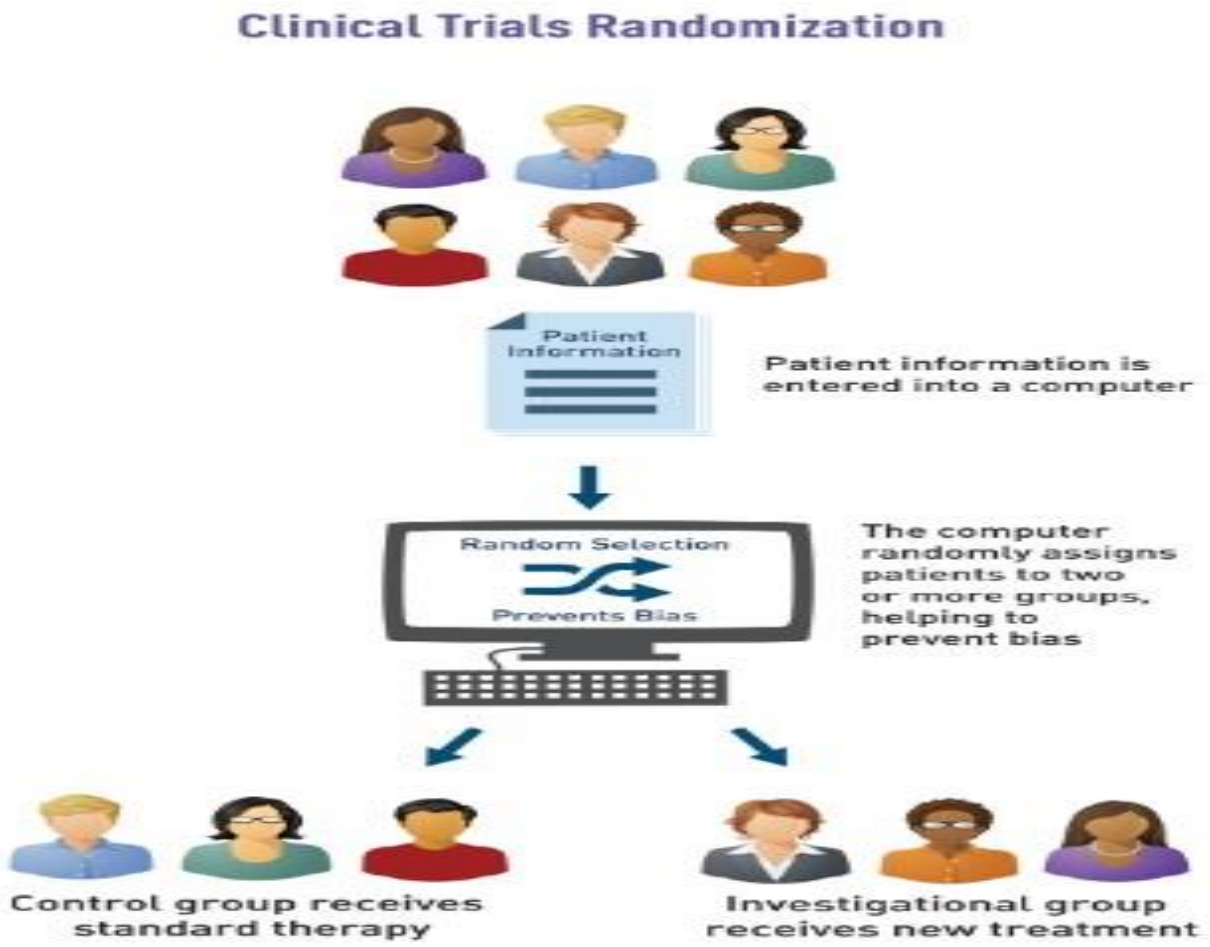
2. Was the assignment of patients to treatments ☐ Yes ☐ Can't tell ☐ No randomised?

Consider:

- How was this carried out, some methods may produce broken allocation concealment
- Was the allocation concealed from researchers?

Why randomize?

- Minimizes measured and unmeasured confounding.



Minimizing allocation bias

- Centralized computer randomization the best.
- Other methods such as sealed envelopes doubtful.
- **Non randomized:** date of birth, alternate patients alternate days, etc.

If answer to first two questions is no….

Detailed questions

3. Were patients, health workers and study personnel blinded?

☐ Yes ☐ Can't tell ☐ No

Consider:

- Health workers could be; clinicians, nurses etc
- Study personnel – especially outcome assessors

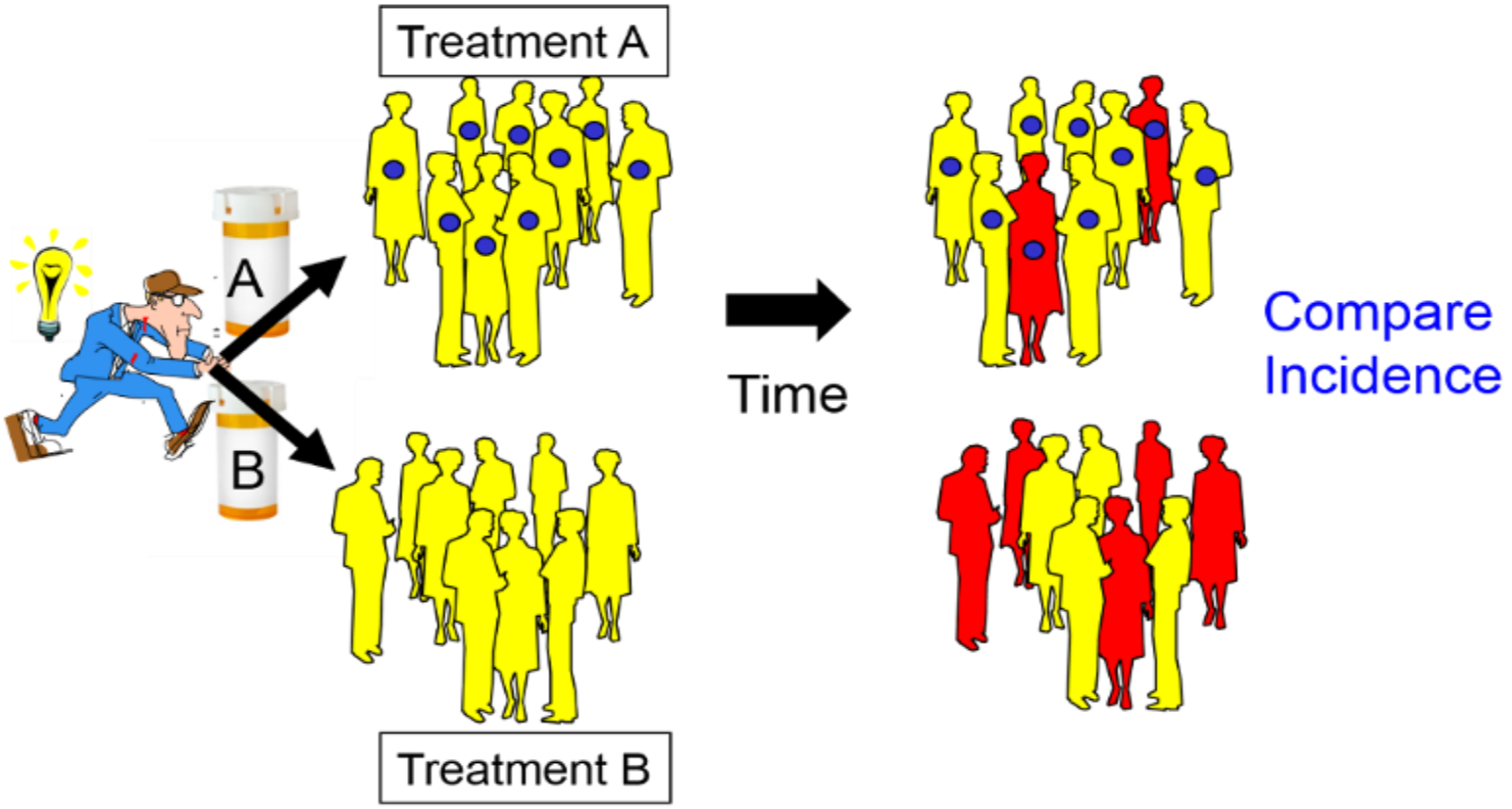
4. Were the groups similar at the start of the trial? ☐ Yes ☐ Can't tell ☐ No

Consider: Look at

- Other factors that might affect the outcome such as age, sex, social class, these may be called baseline characteristics

5. Aside from the experimental intervention, ☐ Yes ☐ Can't tell ☐ No

were the groups treated equally?



6. Were all of the patients who entered the trial properly accounted for at its conclusion?

☐ Yes ☐ Can't tell ☐ No

Consider:

- Was the trial stopped early?
- Were patients analysed in the groups to which they were randomised?

(B) What are the results?

7. How large was the treatment effect?

Consider:

- What outcomes were measured?
- Is the primary outcome clearly specified?
- What results were found for each outcome?
- Is there evidence of selective reporting of outcomes?

8. How precise was the estimate of the treatment effect?

Consider:

- What are the confidence limits?
- Were they statistically significant?

(C) Will the results help locally?

9. Can the results be applied in your context?

☐ Yes ☐ Can't tell ☐ No

(or to the local population?)

Consider:

- Do you have reason to believe that your population of interest is different to that in the trial
- If so, in what way?

10. Were all clinically important outcomes considered?

❑ Yes ❑ Can't tell ❑ No

Consider:

- Is there other information you would like to have seen?
- Was the need for this trial clearly described?

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11. Are the benefits worth the harms and costs?

❑ Yes ❑ Can't tell ❑ No

Consider:

- Even if this is not addressed by the trial, what do you think?

Conclusion

- Critical appraisal helps us decide whether evidence is valid, what the results tell us and whether the study is relevant to our setting
- Checklists are available to help
- Don’t believe everything you read in journals!