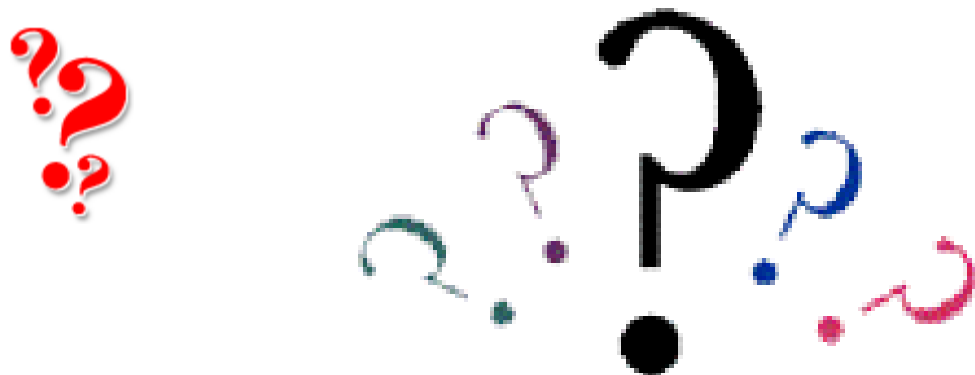
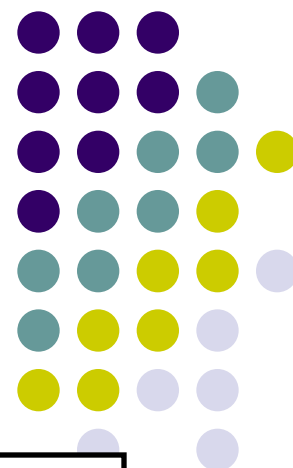




IT ALL STARTS WITH A QUESTION!



Moazzam Ali MBBS, PhD, MPH

Department of Life course, Health and Reproduction (LHR)

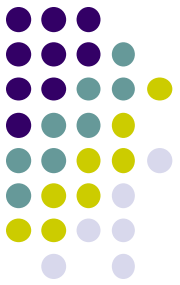
World Health Organization

Geneva, Switzerland

Training course in research methodology,
research protocol development and
scientific writing

September 2026

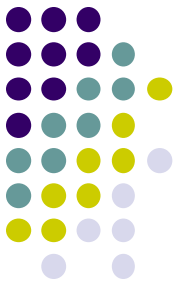




Learning objectives

By the end of this session, you will be able to:

Topic	Understanding
Research Ideas	Identify sources and generate meaningful research questions
Research Questions	Formulate clear, answerable questions
Variables	Distinguish between types and their roles
Hypothesis	Construct testable statements
Aims & Objectives	Develop SMART goals for your research
Research Process	Navigate the complete research lifecycle



What is research...

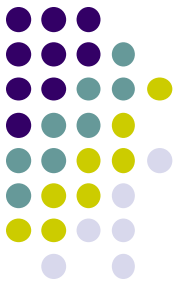
Research is *"an attempt to increase the sum of what is known, usually referred to as 'a body of knowledge,' by the discovery of new facts or relationships through a process of systematic inquiry."*

— Macleod Clark & Hockey (1989), cited in Cormack (1991)

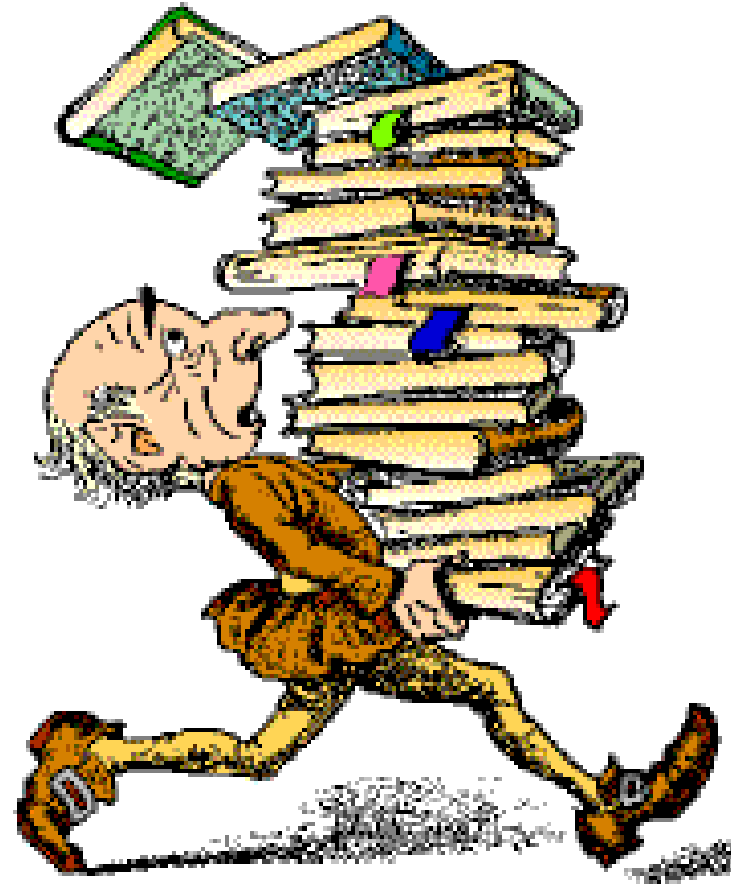
Key Characteristics:

- *Systematic inquiry process*
- *Evidence-based discovery*
- *Knowledge expansion through new facts and relationships*

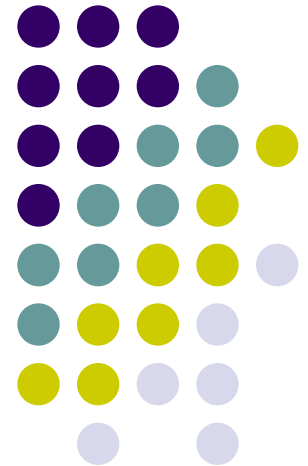
Information overload



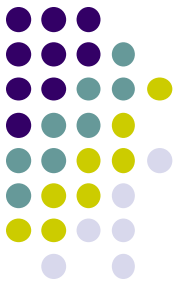
- No one can know everything. Thus, the important thing is to be able to find and evaluate the information you need.



Research idea

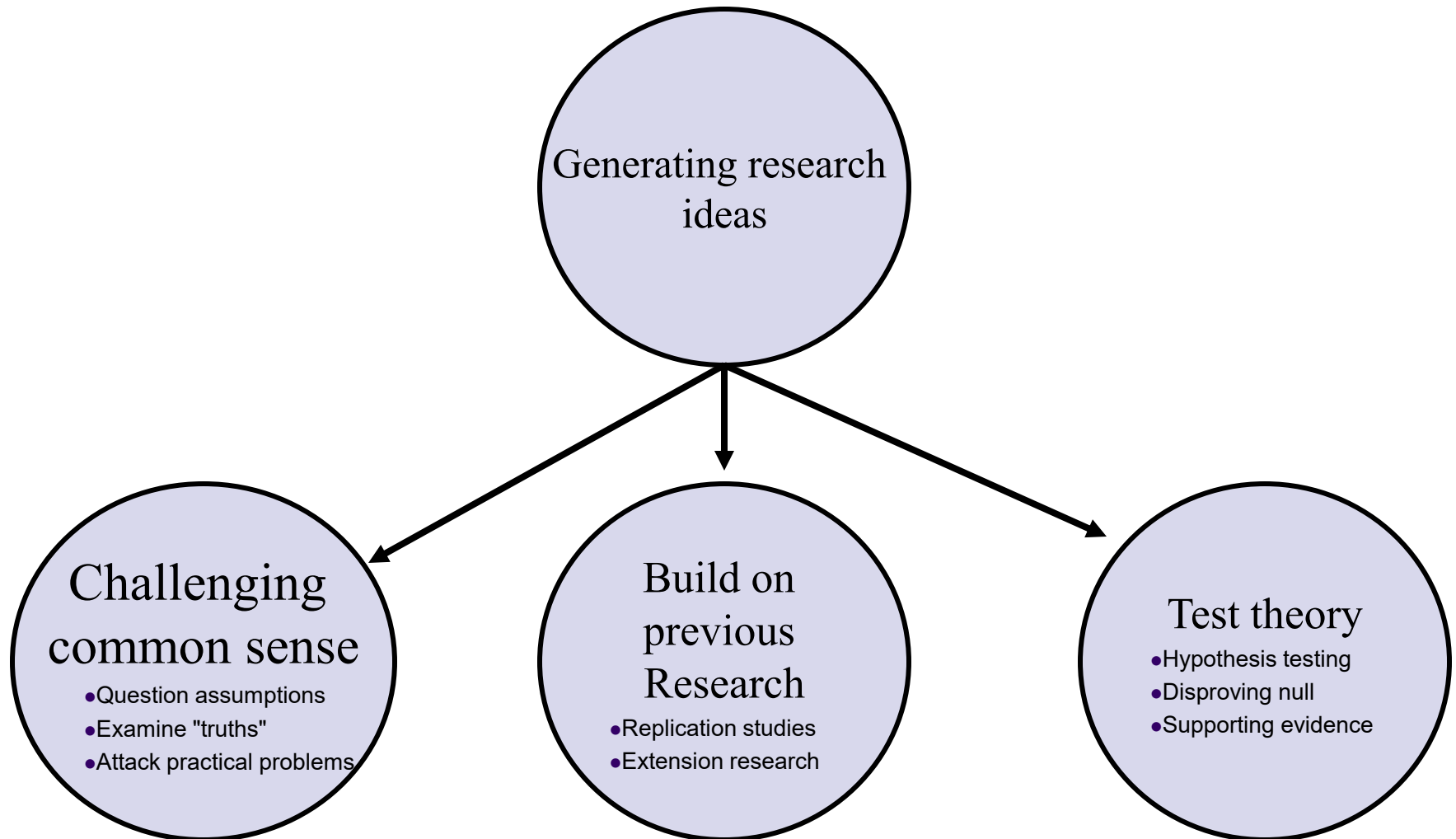
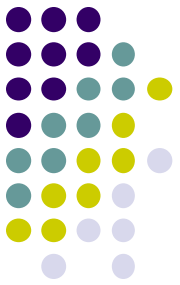


"How do I get a research idea?"

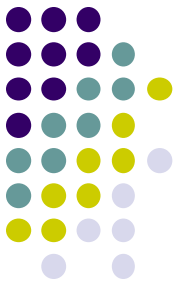


- ***Let's see how we can work towards it...***

There are three basic ways of getting ideas:

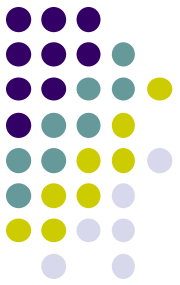


Ideas generation from common sense



Question Everything!

Approach	Example Questions
Question old sayings	Is it always true? When might it be false? Why is it true?
Examine phenomena	Who? When? Why? How?
Analyze effects	Short-term vs. long-term effects Positive vs. negative consequences
Attack practical problems	What real-world issues need solutions?

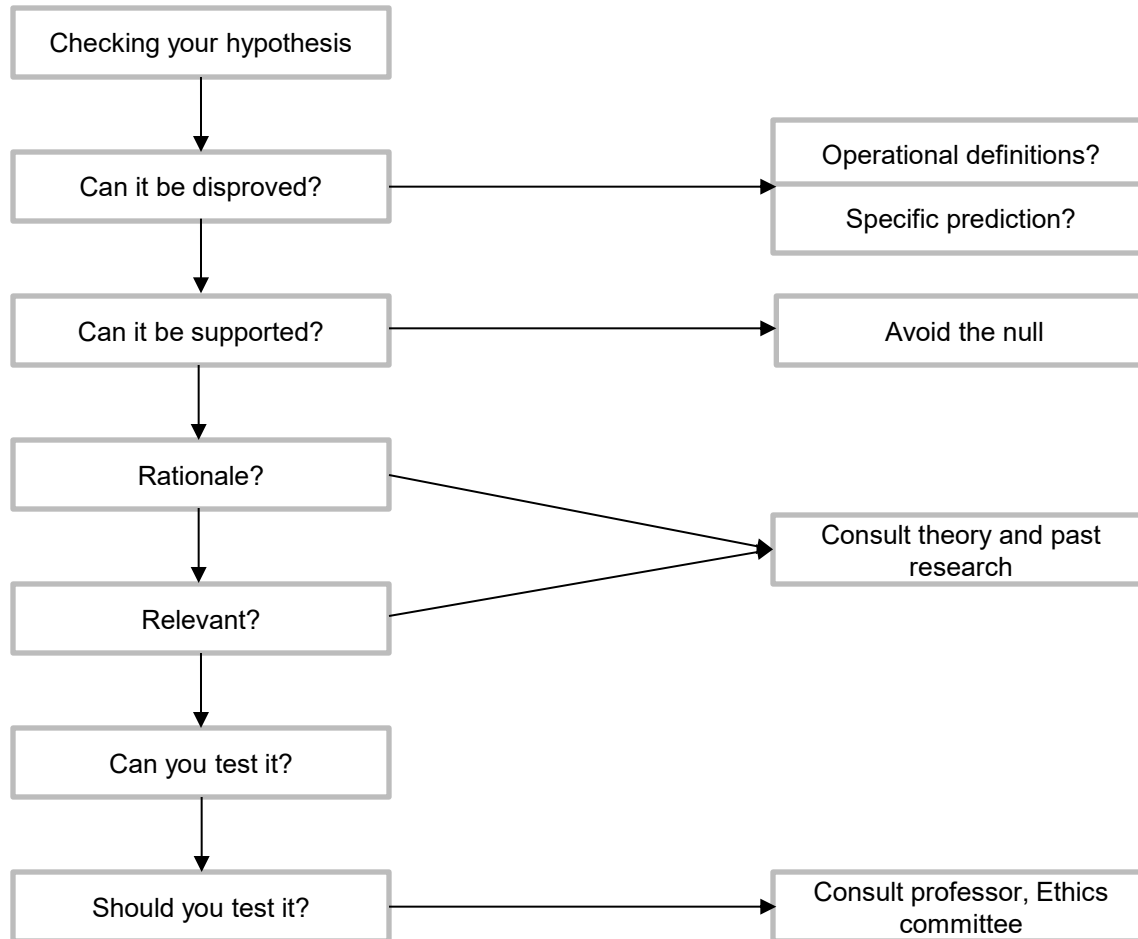
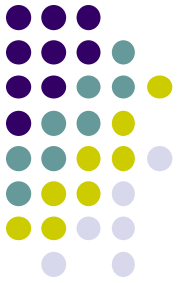


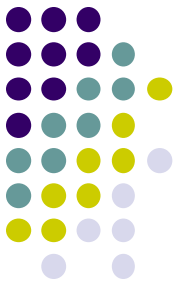
Ideas from previous research

Building on Existing Knowledge

Strategy	Description
Replication	Repeat studies to verify findings
Author Suggestions	Follow recommendations in journal articles
Improve External Validity	Test findings across different populations/settings
Improve Internal Validity	Strengthen methodological rigor
Practical Implications	Apply research to real-world problems
Reconcile Conflicts	Investigate contradictory results

Testing theory



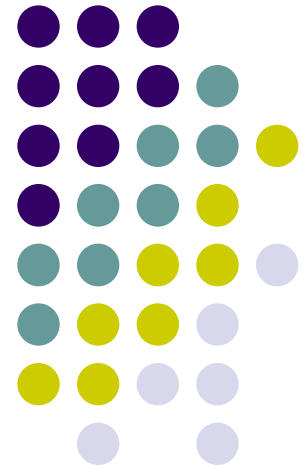


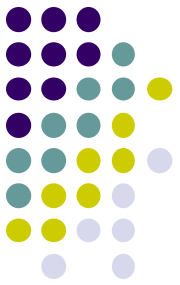
Criteria for prioritizing research:

The PRiFAAE Framework

Criterion	Key Consideration
P - Relevance	Addresses significant problem
R - Avoidance of Duplication	Not already answered
F - Feasibility	Achievable with available resources
A - Political Acceptability	Supportive environment
A - Applicability	Practical utility of findings
E - Ethical Acceptability	Protects participants' rights
U - Urgency	Timeliness of data needed

Research Question

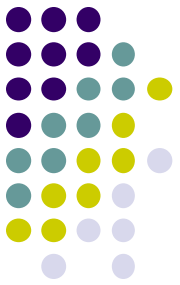




The research question

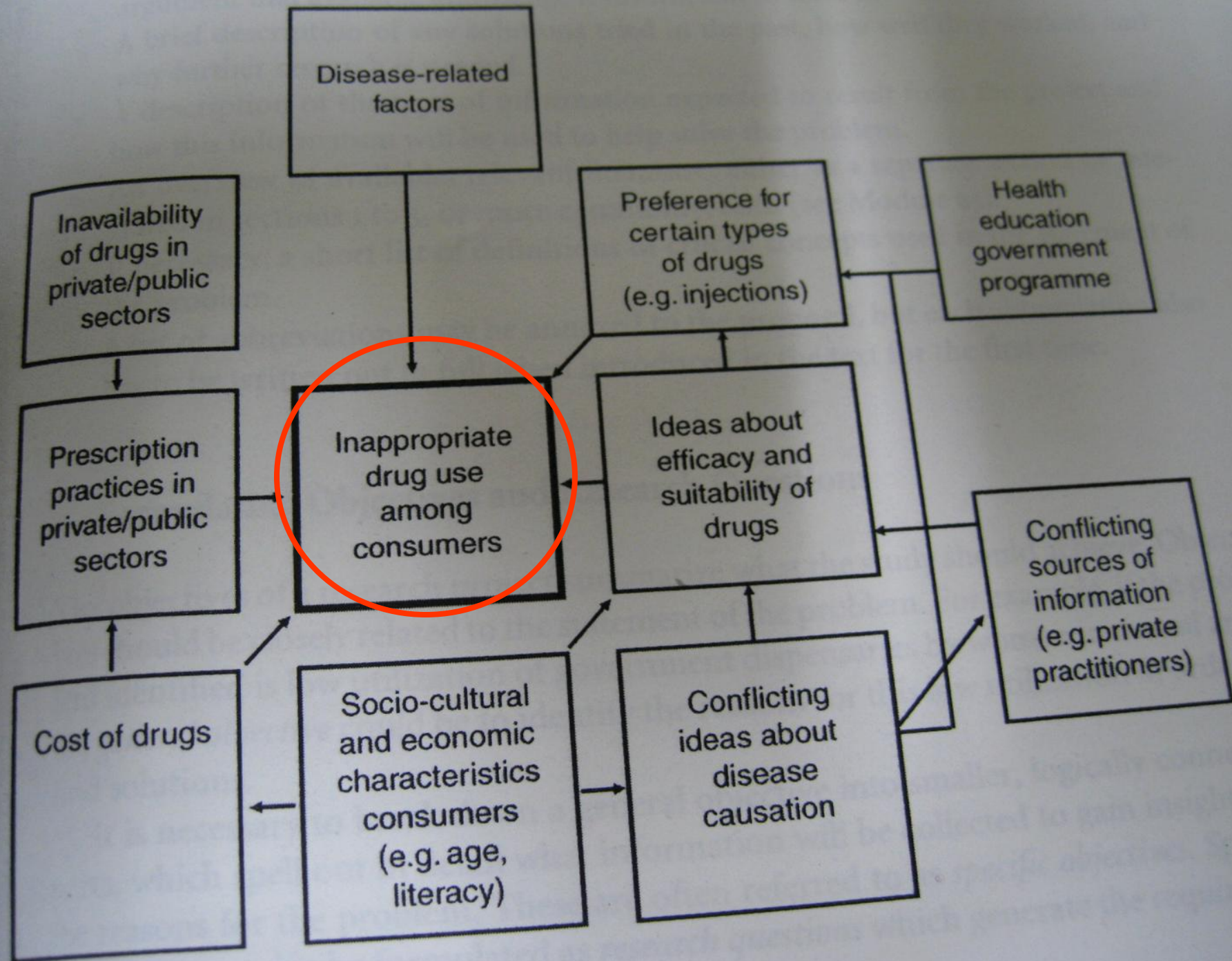
A Research Question defines what you want to investigate and guides the entire study.

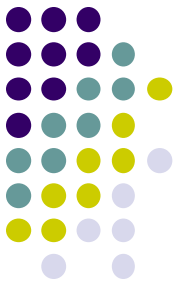
Characteristic	Description
Alignment	Must match study objectives
Scope	Broad enough but realistically limited
Answerability	Must be testable through research
Relevance	Addresses a genuine knowledge gap
Discrepancy	Illuminates gap between "what is" and "what should be"



The research question

- Remember that a problem exists when there is discrepancy between, 'what is there' and 'what should be'.
- Therefore, the perceived problems should be worded in such a way as to illustrate this discrepancy.

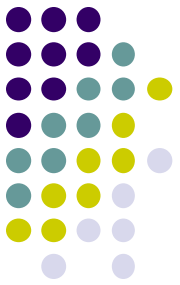




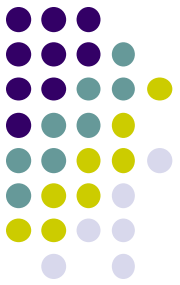
Types of research question

- In research, the problem is phrased in a research question. Research questions may be
 - *Interrogative*, or
 - *declarative*.
- a) **Interrogative questions** identify a gap in knowledge, e.g.,
"What is the relationship between health promotion and change in health behavior?"
- b) **Declarative questions** define the purpose of the study by declaring the intention to investigate a particular event, phenomenon or situation e.g., *"The purpose of this research is to investigate the relationship between health promotion and change in health behavior."*

A research question...



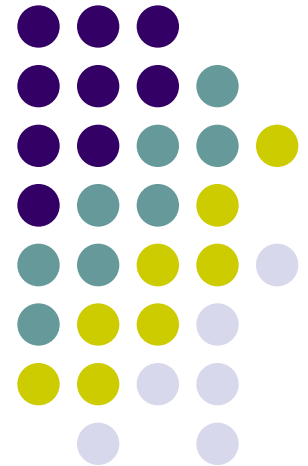
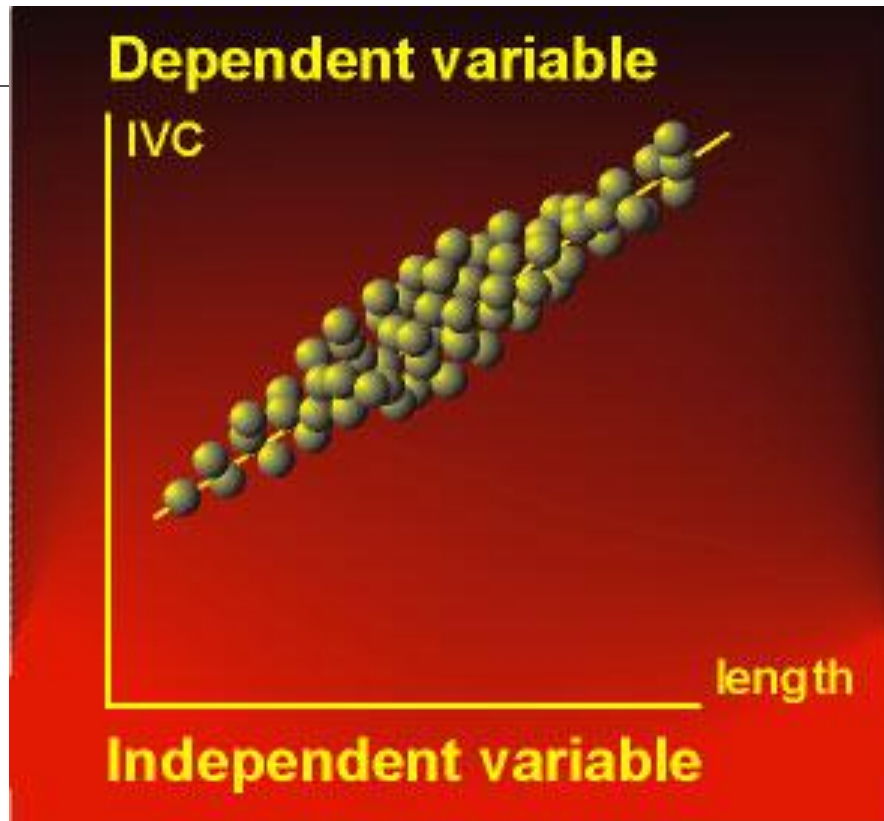
1. *If it is in a question form, we call it a research question: e.g., "What is the relationship between motivation to teach and satisfaction level as a first-year teacher?"*
2. *If it is in a declarative sentence form, we call it a problem statement: e.g., "This study is to determine the relationship between motivation to teach and satisfaction level as a first-year teacher."*

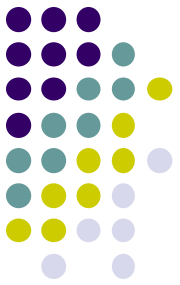


The "Good Question" Checklist

Attribute	Description
Short	Concise and focused
Sharp	Clearly defined boundaries
Specific	Unambiguous and precise
Relationship-oriented	Implies connection between variables
Measurable	Variables can be observed/measured
Value-neutral	Free from bias and judgment

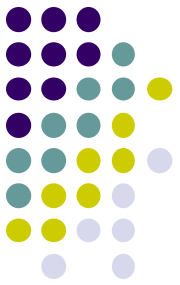
Variables





Why we need data

- To provide input to survey/study
- To measure performance of service
- To evaluate conformance to standards
- To assist in formulating alternative courses of action
- To satisfy curiosity

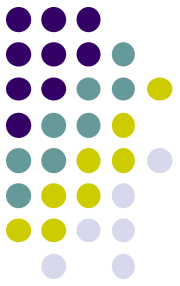


What is a "Variable?"

- A variable is a characteristic of a person, object, or phenomenon that can take on different values.
- Examples:
 - Numerical: Age (years), Weight (kg), Income (\$)
 - Categorical: Sex (Male/Female), Education (Literate/Illiterate)

Types:

Categorical & Numerical variables

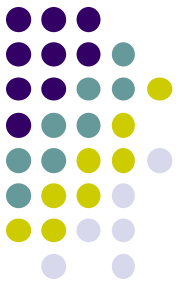


Categorical (qualitative)

- **Nominal**
- **Ordinal**
- Outcome of disease:
 - Recovery
 - Chronic Illness
 - Death
- Main type of staple food eaten
 - Maize
 - Rice
 - Millet
 - Wheat
- Color of eyes
 - Black
 - Blue
 - Green

Numerical (quantitative)

- **Continuous**
- **Discrete**
- Age (in months or years)
- Weight (in kilograms or in pounds)
- Home-clinic distance (in kilometers or minute walking distance)
- Monthly income (expressed in dollars, yen, etc.)
- Number of children (1,2, etc.)



Factors rephrased as variables

Factors	Variables
Long waiting time	Waiting time
Absence of drugs	Drug availability
Maternal education	Years of schooling
Infant mortality	Infant deaths during last 12 months
Immunization coverage	No. of children fully immunized
Hypercholesterolemia	Serum cholesterol level
Lack of supervision	Frequency of supervisory visits

Dependent & Independent variables

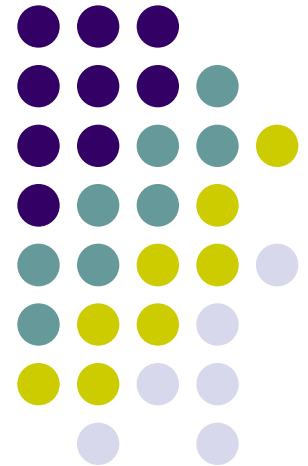


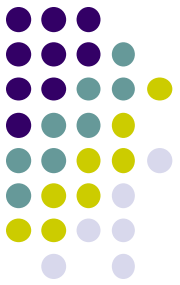
Understanding Variable Roles

Variable Type	Definition	Example
Dependent Variable	The outcome or problem under study	Utilization of contraceptives (Yes/No)
Independent Variable	The presumed cause or influencing factor	Knowledge of family planning methods

Hypothesis

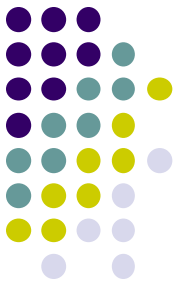
A hypothesis is a statement that can be tested.





Types of Hypotheses

Type	Description
Research Hypothesis (H_1)	Your actual prediction of the relationship
Null Hypothesis (H_0)	The "no relationship" or "no difference" statement



Types of Hypothesis: Null (H_0)

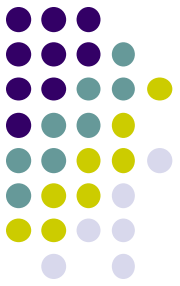
Null hypotheses (H_0):

The **Null Hypothesis** states that there is **no difference** between groups or **no association** between variables.

Example: *"Health promotion activity has **no significant effect** on health behavior."*

- **Purpose**
- Provides a benchmark for statistical testing
- We aim to **reject** the null hypothesis
- Evidence against H_0 suggests support for H_1

Types of Hypothesis: Alternative Hypothesis (H_1)



The Research Hypothesis

The **Alternative Hypothesis** proposes that there is a difference or association.

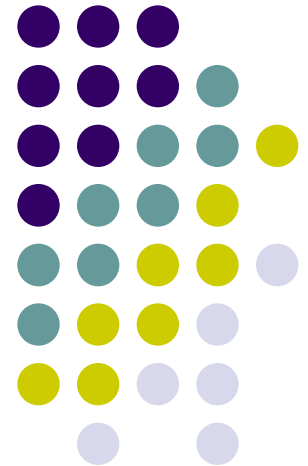
Example:

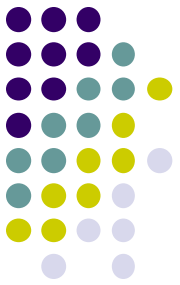
*"A peer-assisted method of teaching reading results in **significantly higher** reading comprehension scores than the traditional method."*

Key Points

- This is your **true interest**
- Goal is to find evidence to support H_1
- We seek to **discredit** the null hypothesis

Aims & Objectives

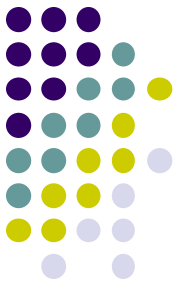




Defining the Aim

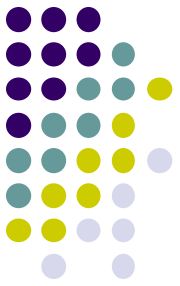
- An aim is the long-term, ultimate intent of a research project or service.

Aim	Focus
Universal Health Coverage	Systemic health reform
Improving maternal health	Population-level outcomes
Reducing infectious diseases	Public health impact
Identify high-risk families	Preventive health
Assess patient anxiety/stress	Clinical outcomes



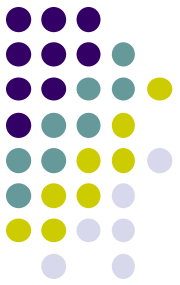
Objectives

- Objectives are tasks which have to be accomplished before aim may be realized.
- Objectives are the milestones through which we can reach an Aim.



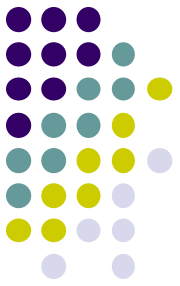
Why to develop objectives

- ***Focus*** the study (narrowing it down to essentials)
- ***Avoid*** the collection of data which are not strictly necessary for understanding and solving the problem you have identified
- ***Organize*** the study in clearly defined parts or phases



Objectives are “SMART ”

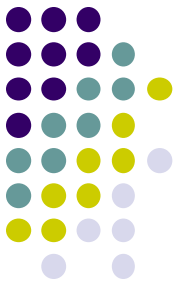
- Specific - Clear and unambiguous
- Measurable - Quantifiable and assessable
- Achievable - Realistic with available resources
- Relevant - Aligned with the research aim
- Time bound - Achievable within study timeline



How to state your objectives

- Logical sequence
- Clearly phrased
- Realistic
- Action verbs (to determine, to compare, to verify, to calculate, to describe and, to establish etc.)

Example of putting aim and objectives



Aim

The aim of the study is to reduce infant mortality in district A.

Study Objectives

1. Estimate the infant mortality rate in district A during the year 2021;
2. Identify the five most common causes of infant mortality in the district A by age.

Sub-objectives for Objective 1 (Sometimes)

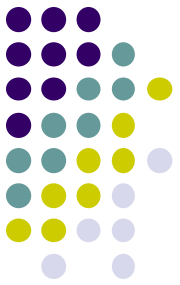
- 1a. Estimate the number of infant deaths during 2021 in the study sample
- 1b. Estimate the number of live births in the study sample during 2021

Sub-objectives for Objective 2 (Sometimes)

- 2a. Identify the number of infant death in the study sample during 2021;
- 2b. Determine the age of infant deaths;
- 2c. Determine the five most common causes of infant deaths.

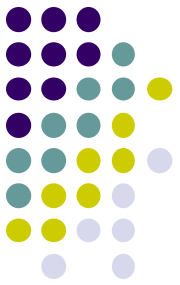
Purpose

The purpose of the study is to identify the magnitude of the problem of infant mortality, determine the important causes of infant deaths and make recommendations for reducing these.



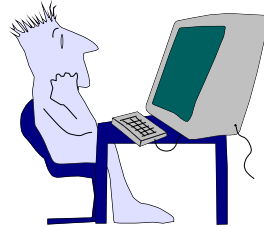
Statistical Methods

- Descriptive statistics
 - Collecting and describing data
- Inferential statistics
 - Drawing conclusions and/or making decisions concerning a population based only on sample data

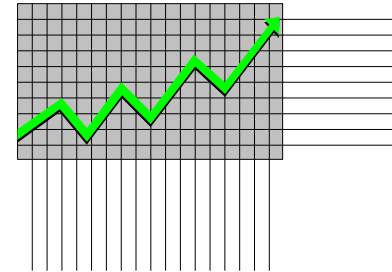


Descriptive Statistics

- Collect data
 - e.g. Survey



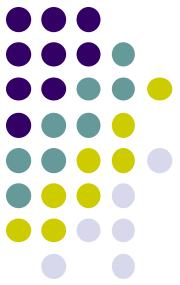
- Present data
 - e.g. Tables and graphs



- Characterize data
 - e.g. Sample mean =

$$\frac{\sum X_i}{n}$$

Inferential Statistics

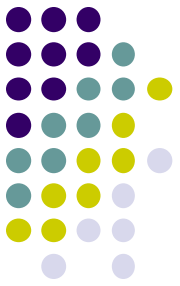


- Estimation
 - e.g.: Estimate the population mean weight using the sample mean weight
- Hypothesis testing
 - e.g.: Test the claim that the population mean weight is



Drawing conclusions and/or making decisions concerning a population based on sample results.

Data Sources



**Primary
Data Collection**

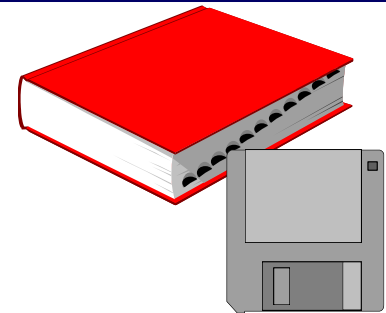
**Secondary
Data Compilation**

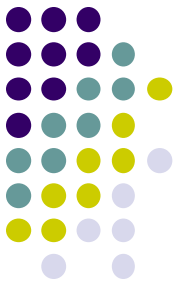
Observation

Survey

Experimentation

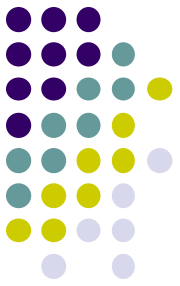
Print or Electronic





Resources for information

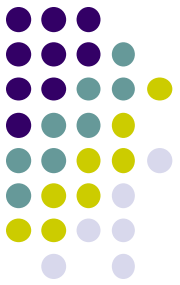
Levels of Information	Possible Sources
Local Level (Community, District etc.)	▶ Clinic and hospital records; ▶ Information from key informants; ▶ Local surveys, annual reports; ▶ Statistical reports produced at district level.
Provincial and National	▶ Articles from journals, books identified during literature searches; at national public health libraries; ▶ WHO, UNICEF, WB etc. libraries in country offices ▶ Reports from MoH, Central Statistical Offices, NGOs ▶ Computerized literature searches for national literature
International	▶ Search through Index Medicus, Medline ▶ Computerized literature searches (e.g. Popline) ▶ Reports of Bilateral and Multilateral Organizations



Complete Research Lifecycle

- SELECT and FORMULATE Research Problem
- STATE Aims and Objectives
- DESIGN the Study and Choose Methods
- SECURE Funding
- ADDRESS Ethical Considerations
- CONSTRUCT Instruments (Tools)
- CONDUCT Pilot Study
- COLLECT Data
- ANALYZE Data
- WRITE Report and Present Findings
- PUBLISH and Disseminate Findings

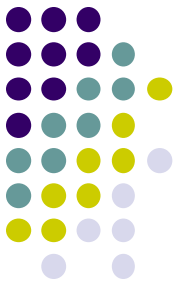
— *Adapted from Parahoo & Reid (1988)*



Key takeaways

Summary points

Element	Key Message
Research Ideas	Generate from theory, prior work, or challenging assumptions
Research Questions	Must be answerable, specific, and value-neutral
Variables	Clearly define and categorize as dependent/independent
Hypotheses	State both null and alternative; aim to reject H_0
Aims & Objectives	Make objectives SMART and logically sequenced
Research Process	Follow systematic phases from problem to dissemination



Suggested Readings

1. Cormack, D. (1991). *The Research Process in Nursing*. Blackwell Scientific Publications.
2. Macleod Clark, J., & Hockey, L. (1989). *Research for Nursing: A Guide for the Enquiring Nurse*. Scutari Press.
3. Parahoo, K., & Reid, N. (1988). *The Research Process in Nursing*. In Cormack, D. (Ed.), *The Research Process in Nursing*.