RESEARCH METHODOLOGY

introduction

Session Outline

- Definition
- Objective of health research
- Categories of research
- Characteristics of research
- Steps in undertaking a research

Overview of research process

What is the problem?

⇓

Define your initial objectives

⇓

Search literature

⇓

Modify your objective based on the information you get from literature

⇓

Write the full proposal guided by the objective

What is Research?

(*Small group work*)

Research is;

- A quest for knowledge through diligent search or investigation or experimentation aimed at the discovery and interpretation of new knowledge.
- An approach in obtaining a solution for a specific problem.
  - Necessary to generate new knowledge and technologies to deal with major unresolved health problems.
  - Essential for guiding action.
  - Necessary to identify priority problems design & evaluate policies and programs

OBJECTIVES OF RESEARCH

- The purpose of research is
  - to discover answers to questions through the application of scientific procedures.
- The main aim of research is
  - to find out the truth which is hidden and which has not been discovered as yet.
- Though each research study has its own specific purpose, we may think of research objectives as falling into a number of following broad groupings:

OBJECTIVES OF RESEARCH …

1. To gain familiarity with a phenomenon or to achieve **new insights** into it (studies with this object in view are termed as **exploratory** or formulative research studies);
2. To portray accurately the characteristics of a particular individual, situation or a group (studies with this object in view are known as **descriptive research** studies);
3. To determine the frequency with which something occurs or with which it is associated with something else (studies with this object in view are known as **diagnostic research** studies);
4. To test a hypothesis of a **causal relationship** b/n variables (such studies are known as **hypothesis-testing research** studies).

Scientific Research

- **Scientific method** is a systematic body of **procedures** and **techniques** applied in carrying out investigation or experimentation targeted at obtaining new knowledge.

- Science is aimed at understanding the world around us
  - Scientists first, **observe** and **describe** objects and events appearing around us
  - Second, they **discover regularities** and **order of events**
  - Third, they seek to **formalize** and **generalize** into theories or laws

What are the components in scientific research?

- **Logical**: Based on reasoning
- **Deterministic**: All events have causes, nothing just happens without reason or is based on probabilistic form of determination
- **General**: General understanding rather than explaining individual events.

Cont…

- **Parsimonious**: Discovering both factors that determine the event as well as that don't
- **Specific**: To generalize, research must be specific and precise in measuring events
- **Empirically verifiable**: quantifiable
- **Open for modification**: Utility rather than ultimate truth. No scientist has yet discovered or will discover "***The Truth***"

Health Research

- Health Research, likewise, is a research effort to address health related problems and come up with better solutions to mitigate the prevailing problem.
- Health research is the application of principles of research on health.
- It is the generation of new **knowledge** using scientific method to identify and deal with health problems.
- Knowledge, both generalizable worldwide and locally specific, is essential to **effective action for health**.

Purpose of Health Research

To generate knowledge essential to effectively promote the health of the population.

Without that knowledge, effective action is impossible because it has no logical or empirical basis.

Cont…

- Health research may be:
  a. Curiosity-driven,
  b. Needs-driven,
  c. Profit-driven or
  d. Opportunity-driven.

Curiosity--driven research

- **Science is unpredictable**: in fact, chance plays an important role in scientific discovery.
- Many of the drugs we use today have been discovered in research programmes designed for other purposes;
  - Minoxidil (the drug for male baldness) was originally developed and tested for the treatment of **hypertension**.
  - Sildenafil (Viagra), used for the treatment of erectile dysfunction, was discovered in a **cardiovascular** research programme

Needs--driven research

- Governments would like to support research that will **promote the health** of their populations or put priorities for research.

- Health problem can be put as a priority for research, depending on;
  - Magnitude (burden)
  - Seriousness (killing, disabling)
  - Feasibility (recourses, cost-effectiveness)

Profit--driven research

- Private industry is becoming the major actor in health research, in terms of funding or pursue research for profit.
  - For e.g. Pharmaceutical industry investments in research and development surpassed public investments in four of the countries (France, Japan, Switzerland and United Kingdom).
- Only a very small share of the large research investment by industry is addressed to the health problems of developing countries

Opportunity--driven research

- As far as the individual researcher is concerned, research may also be opportunity driven such as:
  - the availability of funding, which may or may not correspond to local priority needs or to the curiosity of correspond to local priority needs or to the curiosity of scientists.
  - the opportunity to participate in multi-centre international research, or
  - opportunities to participate in industry-sponsored research.

Research must be:

Purposeful: what do you want to be able to contribute?

Targeted: Who are the audiences?

Credible: consider sources of information, method of data collection, personnel involved…

Timely: Is the information needed?

Research is done to find solutions to health problems.

Categories of Research

- Researches could be categorized as;
  - i. **Empirical** Vs **Theoretical** research;
    - Based on the philosophical approach
  - ii. **Basic** Vs **applied;**
    - Based on its functions
  - iii. **Biomedical**, **Health services** and **Behavioral** research, - Based on its area of focus
  - iv. Qualitative Vs Quantitative
    - Based **on nature of research**

Empirical and theoretical research

- Health research mainly follows the **empirical approach**,
  - i.e. it is based upon observation and experience more than upon theory and abstraction.
- Epidemiological research, for e.g., depends upon the systematic collection of observations on the health related phenomena of interest in defined populations.
- Empirical research in the health sciences can be **qualitative** or **quantitative** in nature.

Empirical research

- Quantification in empirical research is achieved by 3 related numerical procedures:
  a) **Measurement of variables**
  b) **Estimation of population parameters** (parameters of the **probability distribution** that captures the variability of observations in the population); and
  c) **Statistical testing of hypotheses**, or estimating the extent to which '**chance**' alone may account for the variation among the individuals or groups under observation.

Basic and applied

- **Basic research** is usually considered to involve a search for knowledge without a **defined goal** of utility or specific purpose.
- **Applied research** (***Operational research***)is problem oriented, and is directed towards the solution of an existing problem.

Research triangle: ….depending on area of focus

- **Biomedical research** deals primarily with basic research involving processes at the cellular level;
- **Health research** deals with issues in the environment surrounding man, which promote changes at the cellular level; and
- **Behavioural research** deals with the interaction of man and in a manner reflecting the beliefs, attitudes and the environment practices of the individual in society.
  - Each of the three categories could be **empirical** or **theoretical**, **basic** or **applied**

Quantitative vs. Qualitative:

- Quantitative research is based on the measurement of quantity or amount.
- It is applicable to phenomena that can be expressed in terms of quantity.

- Qualitative research, on the other hand, is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind.

Quantitative vs. Qualitative …

- Qualitative research is concerned with finding the answers to questions which begin with:

→ why? How? In what way?

- Quantitative research, on the other hand, is more concerned with questions about:

→ how much? How many? How often? To what extent? etc.

Users of research

- The users of the research outputs fall broadly into 3 groups with
  - **Operational research** being predominantly, but not exclusively, of use to **health care providers**;
  - **Implementation research** predominantly of use to **managers** of programmes scaling up an intervention; and
  - **Health systems research** of most use to those who manage or need to **make policy** for the health system.

Characteristics of research

- **Originates** with a question or problem.
- Requires clear articulation of a **goal**.
- Follows a **specific plan** or **procedure**.
- Often divides **main problem** into **sub-problems**.
- Guided by **specific problem**, **question**, or **hypothesis**.
- Accepts certain **critical assumptions**.
- Requires **collection** and **interpretation** of data.
- **Cyclical** in nature.

STEPS IN UNDERTAKING A RESEARCH

Steps, …

1. Formulation of problems and setting research objectives
2. Development of proposals
3. Designing research studies,
4. Identifying the study population, sample selection
5. Designing methods of data collection
6. Data processing analysis and interpretation
7. Dissemination and utilization of research

Research proposal

- In its simplest sense,
  - a proposal is a document/plan presented for acceptance or rejection.

❖Its purpose is to convince reviewers that you are capable of successfully conducting the proposed research project.

❖Reviewers have more confidence that planned project will be successfully completed if the proposal is well written and organized, and if you demonstrate careful planning.

❖Proposal is similar to a research report but written before the research project begins

❖It lacks result, discussion and conclusion sections.

Characteristics of a Good Research Proposal

- Have a clear statement of the problem.
- Have clear plans: objectives & methods
- Have clear vision of the outcome
- Builds on existing data.

Written proposal is important

- To clearly define the problem under study
- To avoid reinventing the wheel
- To clearly depict the methodology to be used
- To be cost and time conscious
- To be clear about what to expect in the end

Components of Research Proposal

Title pages

- Title page 1
- Title page 2

Acknowledgements: 100 words

Proposal summary

Table of contents

List of tables

List of figures

Acronyms

Cont'd

1) **Introduction/Background**
   - **Statement of the Problem**
   - Significance of the study
1) **Literature review**
2) **Objectives**
3) **Methods**
4) **Work plan**
5) **Cost of the Project/Budget**

References

Annexe

Research proposal submission form…

SUMMARY

(ONLY ONE PAGE)

(Summary must be structured under the following heading: Introduction, objectives, methods, work plan and budget. Do not exceed 350 words).

INTROCUCTION

This section can be divided in to 3 subsections: Background, Statement of the problem; and justification of the proposed study.

Background

(Only one page)

Statement of the problem

(Only one page)

Justification of the proposed study

(Maximum half page)

Literature Review

(Maximum four pages)

Research proposal submission form…

OBJECTOVES

(only one page, Maximum)

General objective:

Specific objectives:

METHODS

(Maximum four pages)

- Study design
- Study area
- Study population
- Sample size & sampling procedures
- Variables of the study
- Operational definitions
- Data collection procedures (instrument, personnel, data quality control)
- Data processing and analysis

Research proposal submission form…

ETHICAL CONSIDERATION

(Half-One page)

DISSEMINATION OF RESULTS

(Maximum half page)

WORK PLAN

(Only one page)

(Describe briefly the expected accomplishments of the project by phase, and the estimated time for each).

Research proposal …

- **COST OF THE PROJECT**

  (Maximum two pages)

  Give an itemized list of the direct costs of the project.

- **References**

(Use Vancouver Style)

- **Annexes**

  Dummy tables

  Questionnaire

  (Others as necessary)

Topic selection

Health research topics

- Description of health problems
- Evaluation of interventions
- Analysis of possible causes and solutions

Selection of Research Topic

Objective criteria

1) **Relevance**: priority, magnitude of problem
2) **Avoidance of duplication**
3) **Feasibility**: complexity, manpower, time, equipment, money…
4) **Political commitment**: interest and support to utilize results
5) **Applicability** (cost-effectiveness): availability of resources
6) **Timeliness:** urgency of data needed for making decision
7) **Ethical acceptability**

- **Personal interest**

Topic selection …

- The research topic or title should be **specific** and **clear**.
- The topic should indicate the WHO/WHAT, WHEN, WHY, WHERE and HOW clearly. It is the focus of your research.

- **Title**: Should be in line with your general objective

- Should tell readers what your study is about and where it will be done.
- **Example**: Longitudinal evaluation of Prostate-specific Antigen levels in men with and without Prostate disease, in A.A, 2019.

Statement of the Problem

- All research is set in motion by the existence of a problem.
- A problem is a perceived difficulty, a feeling of discomfort about the way things are, or a discrepancy between what someone believes should be the situation and what the situation is in reality.

- While problems are the initiating force behind research, not all problems require research.

Statement of the problem …

A potential research situation arises when three conditions exist:

1. A perceived discrepancy exists between what is and what should be.
2. A question exists about why there is a discrepancy.
3. At least two possible and plausible answers exist to the question.

Example

- **Problem situation: In district "Z" (population 150,000) there are 2 health centers, 1 hospital** and 15 health stations and all of them function smoothly. However, at the end of the year, it was found that the EPI coverage was only 25%.

- ***Discrepancy:*** *Although district "Z" had 100% availability of health services and at least 80%* of the children should have had full vaccinations the EPI coverage was only 25% as seen above..

Cont'd

- ***Problem question:*** What factors influence the low EPI coverage in district "Z"?

Possible answers:

- Mothers might have problems for not attending in the EPI sessions.
- The **MCH, EPI, OPD, etc…** programs might not have been integrated; hence children might have missed opportunities in getting immunization.

Statement of the problem …

Analysis of the problem is important

- **bring together** their knowledge of the problem,
- **Clarifies** the **problem** and the possible **factors**
- **Facilitates decisions** concerning the focus and scope of the research.

Statement of the problem …

Why is it important to state and define the problem well?

- It is the foundation for the further development of the research proposal (research objectives, methods, work plan, etc.);
- Makes it easier to find information and reports
- Enables to systematically describe the problem
- To focus the attention of the problem solving team

Cont'd

Information included in the statement of a problem:

- A brief description of socio-economic and cultural characteristics
- A concise description of the nature of the problem
- An analysis of the major factors that influence the problem.
- A brief description of any solutions to the problem that have been tried in the past.
- A description of the type of information expected to result.
- Size, distribution, and severity of the problem
- Why further research is needed (more in the justification)

Cont'd

The problem has to be **justified** in terms of its:

- Being a current and existing problem which needs solution.
- Being a widely spread problem affecting a target population.
- Effects on the health service programs.
- Being a problem which concerns the planners, policy makers and the communities at large.

How to write a Problem Statement

- The section should be **precise** and **concise**, while not forgetting to mention essential points.
- Information concerning the problem should be summarized, so the reader is not "**drowned**" in detail.
- An outline listing the **major points** to be covered could be prepared before any writing is done, so the section will be logical and well organized.

Sources

- Literature review
- Professional conferences
- Observations
- Experts

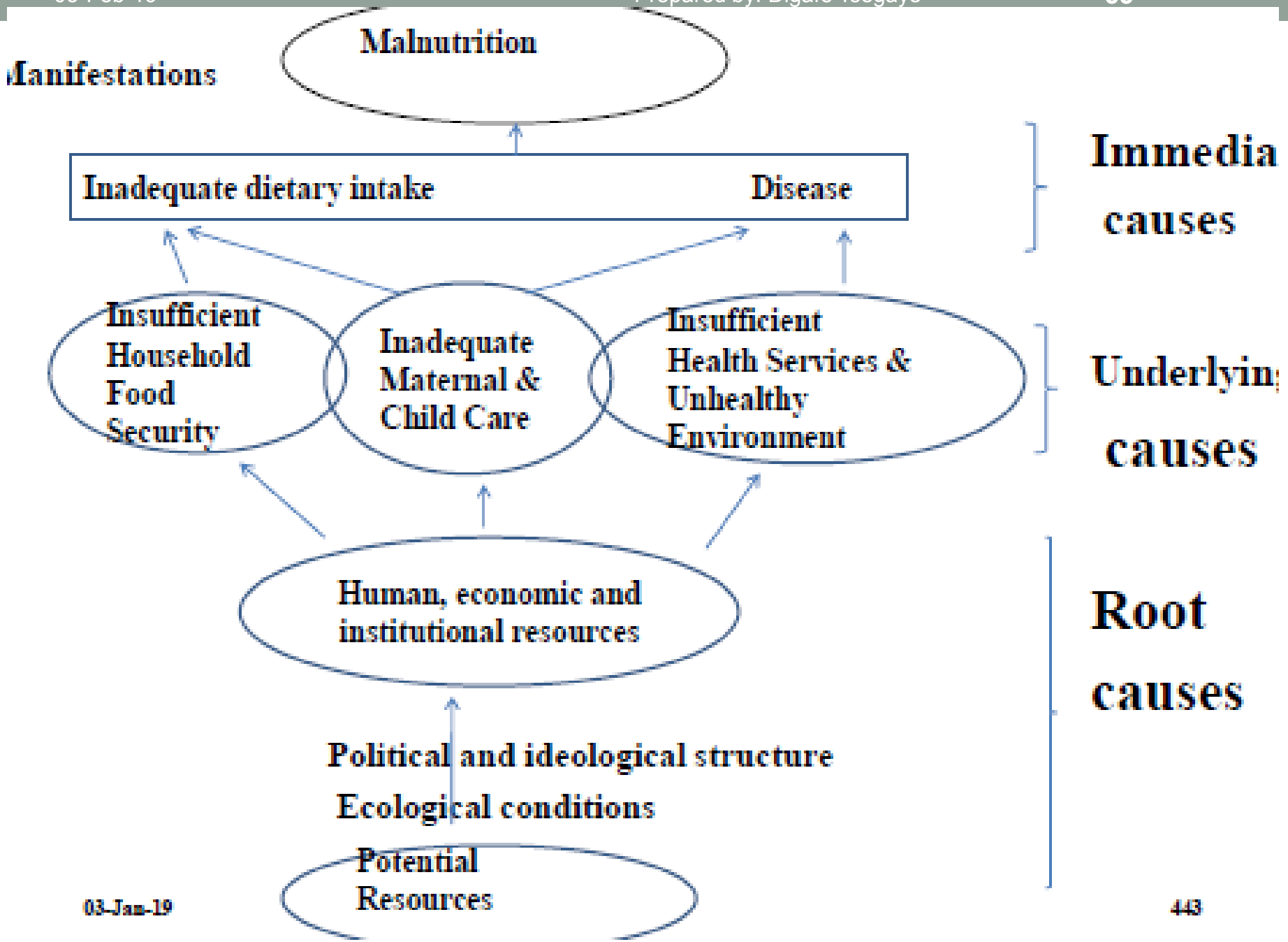


Literature review

- Literature review is an account of what has been published on a topic by accredited scholars and researchers.
- Entertain confounding factors and other related matter only pertaining to the current research.
- Avoid reinventing the Wheel/avoidance of duplicating previous work.
- Learn the gaps
- Learn the various methods used

Literature review

- In the literature review, it is always advisable to have a **conceptual framework**;
  - since it is the synthesis of the review in one page.
- **Conceptual framework** shows the inter linking of research questions or outcome with the factors (probably) determining it.
- The correlation could be clearly displayed with **arrows** and **boxes** in most of the time otherwise it can be also written in paragraph forms.


Manifestations
Malnutrition
Inadequate dietary intake
Disease
Immedia
causes
Insufficient
Household
Food
Security
Inadequate
Maternal &
Child Care
Insufficient
Health Services &
Unhealthy
Environment
Underlyin
causes
Human, economic and
institutional resources
Root
causes
Political and ideological structure
Ecological conditions
Potential
Resources

Purposes of literature review

- prevents from duplicating work
- gives a familiarity with the various types of design, procedures and analysis: **it guides:**
  - ✓ **Formulation of the research question/hypothesis**
  - ✓ **Design of the study**
  - ✓ **The analysis to be used**
- helps to find out what others have learned and reported on the topic.
- makes researchers aware the state of the art and the extent of research on the topic
- provide you with convincing arguments

Purposes of literature review …

- Helps to know the results of other studies that are closely related to the one being undertaken.
- It relates a study to the larger, ongoing dialogue in the literature, filling in gaps and extending prior studies.
- It provides a framework for establishing the importance of the study.
- It serves as a benchmark for comparing the results with other findings.

The possible **sources of information …**

- Individuals, groups, and organizations;
- Published information (books, journals, etc.)
- Unpublished information (studies in related fields, reports, etc.)
- Card catalogues of books in libraries
- Organizations (institutions)
- Computer based literature searches such as Medline
- Opinions, beliefs of key persons

Some examples of resources where information could be obtained are:

- Clinic and hospital based data from routine activity statistics
- Local surveys, annual reports
- Scientific conferences
- Statistics issued at region and district levels
- Articles from national and international journals (e.g., The Ethiop.J.Health Dev., The Ethiopian Medical Journal, The East African Medical journal, The Lancet, etc.)
- Internet
- Documentation, reports, and raw data from the MOH, Central Statistical Offices, Non-governmental organizations, etc.

Some of the computerized databases

1) Google scholar

- Provides a way to broadly search for literature across many disciplines and sources, such as:
  - peer-reviewed papers,
  - theses,
  - books,
  - abstracts, and articles from academic publishers, professional societies, universities, and other scholarly organizations
- The articles identified in a Google Scholar search provides links to abstracts, related articles, electronic versions of articles affiliated with a library you specify, Web searches for information about this work, and opportunities to purchase the full text of the article.

Some of the computerized databases cont…

2) HINARI

- Managed by WHO in partnership with more than 60 publishers and Yale University

- Provides access to around 3000 journals covering medicine, nursing and related health and social sciences in institutions in 113 developing countries

Some of the computerized databases cont…

- The most useful feature of HINARI is that it allows to do searches in Medline/PubMed for full-text articles in journals that are participating in the HINARI program

- Registration is required to search materials in the HINARI (user ID & password required)
- Check whether your institution is registered

Some of the computerized databases cont…

Steps in accessing HINARI

1) Type the web address (www.who.int/hinari/en/

2) log in (use the user ID & pass word)

3) click on 'Search HINARI articles through PubMed(Medline)

4) Search (by topic, author, or journal)

References that are identified:

- Should first be skimmed or read
- Then summaries of the important information in each of the references may be recorded on separate index cards
- These should then be classified so that the information can easily be retrieved.

How to Discuss

- After collecting the required information on index cards, the investigator should decide in which order he/she wants to discuss previous research findings:

  - ✓ From global to local
  - ✓ From broader to focused
  - ✓ From past to current

Cont'd …

- While reviewing a literature, all what is known about the study topic should be summarized with the relevant references. This review should answer:

- ***How much is known?***
- ***What is not known?***
- ***What should be done based on what is lacking?***

  - While reviewing a literature give emphasis to both positive and negative findings and avoid any distortion of information to suit your own study objectives.

Formulation of Research Objectives

Research Objectives

- A research objective is a statement that clearly depicts the goal to be achieved by a research project.
- In other words, the objectives of a research project summarize what is to be achieved by the study.

Why should research objectives be developed?

The formulation of objectives will help you to:

- **Focus** the study (narrowing it down to essentials)
- **Avoid** the collection of data which are not strictly necessary for understanding & solving the problem you have identified (to establish the limits of the study)
- **Organize** the study in clearly defined parts or phases.
- Facilitate the development of research methods
- Orient the collection, analysis, interpretation and utilization of data

When should the objectives of a research project be prepared?

- After the statement of the problem is developed
- Before the methodology for the study is planned.
- Objectives follow from the statement of the problem
- Show the precise goal of the study, help guide the development of the research
  - ✓ Methodology, & orient the collection, analysis & interpretation of data.

Characteristics of good objectives

Objectives should be:

- Logical & coherent
- Feasible
- Realistic, considering local conditions
- Defined in operational terms that can be measured
- Phrased to clearly meet the purpose of the study

Objective should be stated

- Objectives should be stated using "**action verbs**" that are specific enough to be measured:

Examples:

- ✓ To determine …,
- ✓ To compare…,
- ✓ To verify…,
- ✓ To calculate…,
- ✓ To describe…, etc.

Do not use vague non-action verbs such as:

- To appreciate ……
- To understand …..
- To study ……
- To believe ……

Formats used for stating research objectives

Research objectives can be stated as:

- **Questions**: "The objectives of this study are to answer the following questions …"
- **Positive sentence**: "The objectives of this study are to determine …"
- **Hypothesis**: "The objective of this study is to verify the following hypothesis..."

Cont'd

- The format chosen depends on the type of study that will be undertaken.
- If the study is descriptive or exploratory in nature, then objectives are stated
  – in the form of questions or positive sentences.
- If the researcher knows enough to make predictions concerning what s/he is studying, then
  - **hypotheses** may be proposed.

Types of Research Objectives

- Commonly, research objectives are classified into **general objectives & specific objectives.**
- The general & specific objectives are logically connected to each other.
- The specific objectives are commonly considered as smaller portions of the general objectives.
- It is important to ascertain that the general objective is closely related to the statement of the problem.

The General Objective

- The general objective or purpose of the research identifies in general terms
  - ✓ what is to be accomplished by the research project & why.

Specific Objectives

- Identify in greater detail the specific aims of the research project often breaking down what is to be accomplished into smaller logical components.
- They identify the questions that the researcher wants to answer through the study.
- Systematically address the various aspects of the problem as defined under 'Statement of the Problem'
- Address key factors that are assumed to influence or cause the problem.
- They should specify **what** you would do in your study, **where** and **for what purpose**.

Examples of General & Specific Objectives

Example 1: In the assessment of prevalence of premarital sexual practices and factors contributing to premarital sex among students in Addis Ababa University.

General objectives

- To assess the prevalence of premarital sexual practices and factors contributing to premarital sexual practices among Arba Minch University students, Addis Ababa, Ethiopia, 2012.

Specific objectives

1) To determine the prevalence of premarital sexual practices among university students.
2) To determine factors contributing to premarital sex among AAU students.
3) To identify utilization of condom for dual protection among university students.

Small group work

- In a group, prepare research objectives for the proposal being developed.
- While developing your research objectives try to consider the key points outlined in the sections ‘Characteristics of a good objective’, ‘How a research objective should be developed’ and ‘Recommended formats to be used in stating the research objective’.