

Health Research Methodology

lecture notes

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1. Introduction to Health Research

Key questions:

What is a **question**?

What is a **problem**?

What is a **research**?

Why a research is conducted?

Who should be involved in research?

Basic questions in health system

- What are health needs of people?
- What is the coverage of health interventions?
- How can we use resources cost-effectively?
- How can we control environmental factors?

Without research answering these questions is unthinkable

Health problems

- Health problems
- Health service problems
- Other Health-related problems

A Health research is needed to solve these problems

Health systems research

*A systematic
collection, analysis and interpretation
of health and health related data
to answer a certain question
or to solve a problem*

Characteristics of research

Demands clear statement of the problem

Requires clear objectives & methods

Builds on existing data

Involves systematic process

Have clear vision of outcome

Purposes of health research

- *Basic research:*

to generate new knowledge and technology

- *Applied research:*

to facilitate prioritizing, designing and evaluation of interventions

Science progresses by *falsification* rather than *verification*

Quantitative Vs Qualitative

Quantitative research:

Tries to quantify things in terms of numbers

Has explanatory purpose

Qualitative research:

Tries to describe things in terms of contexts

Has exploratory purpose

Who should be involved in health research?

Everyone concerned with the problem under study should get involved

Policy makers

Managers

Health care providers

Community

But level of participation and type of role depends on level, complexity, and focus of the study

Guidelines for successful research

1. Focus on priority problems
2. Action-oriented
3. Multi-disciplinary
4. Participatory
5. Timely
6. Cost-effective
7. Simple, short-term designs
8. Clear results
9. Honest limitations
10. Expressed implications and recommendations

It is a must

It is a must for any research to be:

- Purposeful
- Targeted
- Credible
- Timely

Basic study steps

State the problem (*what are the questions?*)

Devise a plan of action(*what will I do?*)

Implement the plan (*how I do it?*)

Analyze data (*what happened?*)

Interpret data (*what does this mean?*)

Re-examination (*is my logic correct? What next?*)

2. Identifying and prioritizing topics for research

Identification of a topic

A health information is required for:

- Description of health situation
- Evaluation of health problems
- Definition of problem situations

When does a problem situations requires research?

- When is a perceived *discrepancy* between reality and expectation
- When reasons for the discrepancy are *unclear*
- When there is *more than one possible* answer to a question or more than one solution to a problem

How do you think about a research topic?

- From personal experiences/observations
- By discussion with community/health workers
- By contacting researchers/experts on the topic
- By reading journals/articles' recommendations
- From formal advertisement by organizations

Prioritization of a research topic

Criteria

2. Relevance
3. Avoidance of duplication
4. Urgency (timeliness)
5. Political acceptability
6. Feasibility of study
7. Application of results
8. Ethical acceptability

Features of a good topic

- Interesting and able to catch eyes of a reader
- Short and precise (specific)
- Related to the general objective of the study

3. Analysis and statement of the problem

1. Analyzing the problem

Why we need to analyze a problem?

- To pool knowledge
- To clarify the problem and related factors
- To determine focus and scope of the research

Steps in analyzing a problem

1. Clarify the view points of participants
2. Specify and describe the core problem
(nature, distribution, size, intensity)
3. Analyze the problem
 - Write the core problem
 - Think of all possible contributing factors
 - Identify further contributing factors
 - Categorize factors
 - Construct conceptual framework

2. Deciding focus and scope of research

Points to consider in deciding include:

- Usefulness of information to be collected
- Feasibility of analysis data to be collected
- Duplication of findings with previous studies

3. Formulating statement of the problem

Statement of the problem is the *first major section* in a research proposal

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

- It is a foundation for a research
- It facilitates search of information
- It justifies why the research should be conducted

Contents of statement of the problem

- A concise description of nature of the problem: what is it, its magnitude, distribution, severity & consequences
- Systematic elucidation of why the proposed research should be undertaken
 - Brief description of any attempts to solve the problem in the past-success, failure & challenges
 - Provide a convincing argument that available knowledge is insufficient to solve the problem under study
- Brief description of the significance of the proposed study: how results will be useful

4. Literature review

What is a literature review?

A systematic analysis and interpretation of available information about a topic of study

It is an excellent opportunity to develop professional confidence in the field of study

Why do we review literature? (reasons)

- To know *more* about a problem
- To avoid *duplication* of information
- To learn the *gaps* in the arena of study
- To learn various *methods* that others used
- To forecast *challenges* that might be faced in the conduct of study

What do we review? (Sources)

- Library (published information)
- Electronic search engines (internet)
- Gray literature (Unpublished ones)

How do we write a review of literature?

Three steps in writing review of literature

- Consider your analysis of the problem
- Organize notes based on factors
- Decide the order (you have three options)
 - From *broader* to *specific*
 - From *global* to *local*
 - From *past* to *present*

Bias in literature review

This is distortion of available information to reflect unreal situation

Common types of bias in literature

- Playing down controversies & differences
- Restricting to supporting references
- Drawing far-fetched conclusions from small studies
- Using rhetoric rather than reasoning

Important tips on literature review

- Search widely
- Evaluate relevance of an information to your study
- Include information directly relevant to your study
- Mention sources for all bold statements
- Write a coherent discussion in your own words

In general

Literature review should be

- Adequate
- Relevant and
- Critical

It must answer the questions:

- How much is known about a topic?
- What is not known about the topic?
- What should be done on what is lacking?

5. Formulation of research objectives

Types of objectives

1. Estimation objectives
 - Estimates magnitude of an event
2. Association objectives
 - Analyses factors associated with an event
3. Evaluation objectives
 - Evaluates associations

Categories of objectives

- General objective:
 - Summarizes what is to be achieved by the study
 - Should be clearly related to the statement of the problem
- Specific objectives
 - Logically connected parts of the general objective
 - Focus the study on the essentials
 - Direct the design of investigation
 - Orient collection, analysis & interpretation of data

Why should research objectives be developed?

It is because research objectives:

Focus the study

Avoids unnecessary information

Facilitates organizing of the study

How should we state objectives?

We do have *three* possible ways:

As positive statements

As research questions

As a hypothesis

A hypothesis is a prediction of relationships between one or more factors and the problem under study that can be tested

Criteria for setting research objectives

Research objectives should be

- *Focused*, each covering a single point
- *Ordered* in a logical sequence
- *Realistic* and feasible to answer
- *Operational* using *action-verbs*
- *Measurable* in terms of outcomes at the end

Action-verbs Vs non-action verbs

Action-verbs

To determine

To compare

To verify

To calculate

To describe

To assess

To explore

To test

To establish

To identify

Non-action verbs

To appreciate

To understand

To show

To share

To believe

to study

In short

Objectives must be **SMART**

Specific

Measurable

Achievable

Realistic

Time-bound

6. Methodology

Basic questions

- What is the choice of the *study design*?
- What should be the *study population*?
- ***How many*** study subjects are needed?
- How should study subjects be *selected*?
- How data collection *tools* be developed?
- How should data be *collected*?
- How the collected data is going to be *managed*?
- How *data quality* will get assured?

Study designs

Four major study designs

- Cross-sectional
- Case-control
- Cohort
- Experimental

Selection of the study design depends on the objective of a study

Populations

- ***Target population***: the population to whom the results would be applied
- ***Source population***: the population from whom study subjects would be obtained
- ***Sampling frame***: the list of potential from which the sample is drawn
- ***Sample***: Subjects who are selected
- ***Study subjects***: the actual participants of the study

Sample size determinants

- The *study design & sampling method*
- P =the level of the *magnitude*
- d =the magnitude the change you want to be able to detect reliably (*margin of error*)
- α =how sure you want to be that a change of the magnitude would have occurred by chance (*level of significance*)
- $1-\beta$ =how sure you want to be that you will observe a change of magnitude if it did in fact occur (*power*)
- *Response rate, loss to follow up*

Sample size

- For estimating single mean
- For estimating single proportion
- For estimating difference between two means
- For estimating difference between two proportions
- Finite population correction

Sampling techniques

1. Probability sampling

- Simple random
- Stratified random
- Systematic random
- Cluster sampling
- Multistage sampling

2. Non-probability sampling

- Purposive/Judgmental/
- Convenience/Reliance/
- Consecutive
- Snow ball

Study variables

A *variable* is a characteristic of a person, object or phenomenon that can take on different values expressed in numbers or categories.

Types of variables

3. Dependent/outcome/response variable

- Used to measure the problem under study

2. Independent/exposure/predictor variable

- Used to measure determinants of a problem

3. Confounding variable

- A variable associated with both the exposure and outcome

Types of data

1. Primary data: data that one has collected oneself
 - Better understood by the researcher
 - Usually contains few variables
2. Secondary data: data that has already been collected by somebody else
 - Not well understood by the researcher
 - Very large number of variables

Data collection

Two broad categories of data collection

2. Quantitative data collection
3. Qualitative data collection

Quantitative data collection

Techniques

- Interview administered questionnaire
- Self-administered questionnaire
- Direct measurement
- Review of record

Qualitative data collection

Techniques

- Key informant interview
- In-depth interview
- Focus group discussions
- Observations (direct, participant)