Research Methods - Lecture 1
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Edited Slides

- Notes written based on section 4's record.
- Please note that anything added in blue on the original slides are notes on what the professor said.

Scientific Research

First, General Definition of Scientific Research:

Generally, research is a systematic inquiry that uses disciplined methods to answer questions to solve problems.

More specifically, solving research problems using biostatistical techniques

Second, More In-Depth Definition:

"A systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge."

It says investigation because that's what is done: steps are carried out to see where we can find answers in the data

Another Definition

The professor repeatedly stated the same idea:
Generally speaking, when we define research we say it is a process of data collection, analysis (using special techniques such as biostatistical techniques), and coming up with information that answers the research question.
When quantitative, you use statistics to accept/reject the null hypothesis.
When qualitative, interviews or focus groups may be used to collect data until saturated (defined in next slide), analyze the themes, and reflect upon those themes with regards to other situations.
Additionally, policy makers can use the results of the data to make a decision.

The null hypothesis is also known as the statistical hypothesis.
The alternative hypothesis is also known as the research hypothesis.

Quantitative vs. Qualitative Research

Quantitative

- Number-oriented
- Research done until significant relationship between variables found
- Results are generalizable

Qualitative

- Research is done and you keep interviewing participants until the data is saturated.
- Data is organized into themes that you can reflect on.
- Not generalizable

What does saturated data mean? (Note: The professor didn't say this, but it is added for clarification.)

Data saturation refers to the quality and quantity of information in a **qualitative research study**. **Researchers** usually define **data saturation** as the point when "no new information or themes are observed in the **data**" So no new information is expected to be added that will enhance or change the findings of a study.

Scientific Research

- Belmont Report Definition of Research

  "Any activity designed to test a hypothesis (which can be accepted or rejected), permit conclusions to be drawn and thereby to develop or contribute to generalizable knowledge (expressed, for example, in theories, principles, and statements of relationships)."
- Medical research is a *systematic* inquiry designed to develop knowledge about issues of importance to health and illness, including medical practices and medical education.
- Systematic: a logical progression through a series of steps according to a specified plan. (A plan is a research proposal made in advance)

Research characteristics

- Is based on the work of others.
- can be replicated.
  - The research method needs to be clear and specific so someone can replicate, or redo, the same process. The results, however, are expected to be different, perhaps due to different samples or countries where the research is done.
- Is generalizable to other settings.
  - Same results should be seen elsewhere. For example, if paracetamol is found to relieve headaches in female participants in Jordan, it would also be expected to relieve headaches in females in the middle east.
- Is based on some logical rationale and tied to theory.
  - The theory depends on whether its quantitative or qualitative.
- Is doable.
  - Something you can actually test
- Generate new questions or is cyclical in nature.
- Is incremental (an increase of some amount).
- Is an apolitical activity that should be undertaken for the betterment of society.

Ways of Knowing

How to increase our knowledge in any science (historical, health, etc.)

- There are many ways to obtain information, including sensory experience, agreement with others, expert opinion, logic, and the scientific method. (the scientific method is what is important for this class)
- The scientific method is considered by researchers the most likely way to produce reliable and accurate knowledge. (propaganda is not a source of knowledge)

Ways of Knowing (continue)…

- The scientific method involves answering questions through systematic data collation and analysis.
- The scientific research uses empirical data (data gathered through the senses {such as sight, touch, etc.} as observations) and is a systematic, orderly and objective method of seeking information.

*The professor said he may ask about the definition of empirical data

Logical Reasoning

- Is a method of knowing combines experience and formal systems of thought.
- Inductive Reasoning. Is the process of developing generalizations from specific observations.
  - From specific to general
  - Ex: An apple fell on Newton's head (specific situation) and from this he understood gravity (general concept).
- Deductive Reasoning. Is the process of developing specific perditions from general principles.
  - From general to specific

PHILOSOPHIES OF RESEARCH

Understanding the philosophies of research give us clues on scientific research

- The word “science” means knowledge.
  - Knowledge needs to be studied. It is studying the results of other people’s research.
- The word “philosophy” means wisdom.
  - Every science has a philosophy and those who study the philosophy can create new knowledge.
- All research is based on philosophical beliefs about the world = world view or paradigm.
  - Paradigms explain phenomena
- The perceived view is the basis of naturalistic (qualitative) research (=inductive reasoning. The result is a naturalistic paradigm); the received view is the basis of empirical analytical (quantitative) research (=deductive reasoning).
  - The professor emphasized this point may come on the exam

Paradigms for Scientific Research

- Paradigm: Is a world view; a general perspective on the complexities of the real world, with certain assumptions about reality. Paradigms for human inquiry are characterized in terms of the ways in which they respond to basic philosophical questions?
- Ontology: the nature of reality
  - Quantitative research – Reality is fixed
  - Qualitative research – Can have multiple realties/explanations for a single phenomenon as there is flexibility in design.
- Epistemology: The relationship between inquirer (researcher) and that being studied (participants)
- Axiology: role of values in the inquiry
- Methodology: how to obtain knowledge
  - This is what's most important. Methodology describes the study design, process, sample, and method of data collection (ex: questionnaire)

Major Paradigms

Positivism (also modernism, logical positivism) =Deductive Reasoning

- There is a reality out there that can be studied and known
- Phenomenon is not haphazard or random
  - There is a reason behind phenomena
- Highly objective in pursuit of knowledge
- Rooted in 19th century thought.
- Guided by such philosophers as Mill, Newton, & Locke.

Quantitative research is a result of deductive reasoning and is derived from logical positivism

Naturalism (also phenomenologic, constructive) =Inductive Reasoning

- Putting structures and ideas in a new ways
- Reality is not fixed
- Subjectivity is the primary way of understanding the phenomenon of interest.
- Began as a countermovement to positivism with writers such as Weber & Kant.

Assumption: Ontologic “what is the nature of reality”?

- Positivist Paradigm
  - Reality exists; there is a real world driven by real natural causes.

  There is one reality

- Naturalistic Paradigm
  - Reality is multiple and subjective, mentally constructed by individuals.

  Reality is not fixed

Assumption: Epistemologic “How is the inquirer related to those being researched”?

- Positivist Paradigm
  - The inquirer is independent from those being researched; findings are not influenced by the researcher.

  The results are fixed and controlled
- Naturalistic Paradigm
  - The inquirer interacts with those being researched; findings are the creation of the interactive process.

Assumption: Axiologic "What is the role of values in the inquiry"?

- Positivist Paradigm
  - Values and biases are to be held in check (controlled); objectivity is sought.
- Naturalistic Paradigm
  - Subjectivity and values are inevitable and desirable.

Assumption: Methodologic "How is knowledge obtained"?

- Positivist Paradigm
  - Deductive processes
  - Emphasis on discrete, specific concepts.
  - Verification of researchers' hunches.
  - Fixed design.
  - Tight controls over Contexts (extraneous variables).
  - Emphasis on measured, quantitative information; uses statistical analysis. (number oriented)
  - Seeks generalizations.
  - Clear results that can be applied to multiple settings. If you did a study in UJ hospital you should also be able to do the same process at any other hospital in Jordan

- Naturalistic Paradigm
  - Inductive processes.
  - Emphasis on entirely of some phenomenon, holistic.
  - Emerging interpretations grounded in participants' experiences.
  - Flexible design.
  - Context-bound.
  - Emphasis on narrative information; qualitative analysis.
  - Seeks patterns and themes
  - Like storytelling in a sense

Methods of Research

- **Research methods are the techniques used by researchers to structure a study and to gather and analyze information relevant to the research question.**
- **Quantitative research, which is most closely allied with the positivist tradition.**
- **Qualitative research, which is most often associated with naturalistic inquiry.**

Quantitative Research

- Associated with positivism.
- Use a scientific approach.
- Mainly to understand the phenomenon of interest.
- Use deductive reasoning to generate hunches that are tested in the real world.
- Use mechanisms designed to control the study.
- Researchers gather empirical evidence (data).
- Must focus on human beings, who are inherently complex and diverse.

Qualitative Research

- ✓ Mainly to understand the human experience.
- ✓ Rich and in-depth information.
- ✓ Flexible.
- ✓ Associated with naturalistic paradigm.
- ✓ Use Inductive reasoning.
- ✓ There is no research hypothesis so there are no inferential statistics used, as qualitative research does not depend on numbers.

Quantitative Methodologies

- Is concerned with objectivity, tight controls over the research situation, and the ability to generalize findings (including those on people).
- Preference for precise hypotheses stated at the outset.
- Preference for precise definitions (of the variables) stated at the outset.
- Data reduced to numerical scores.

Quantitative Methodologies

- Much attention to assessing and improving reliability of scores obtained from instruments.
- Assessment of validity through a variety of procedures with reliance on statistical indices.
- Preference for random techniques for obtaining meaningful (purposeful) samples.
- Preference for precisely describing procedures.

Types of Variables

The professor said he may ask about this on the exam.

1. Dependent Variables – The outcome, what we study
2. Independent Variables – What we manipulate
3. Extraneous Variables – Variables that affect the dependent variables **only**.
4. Confounding Variables – Variables that affect the independent and dependent variables. Can change the results

Ex1: If someone wanted to study the effects of cigarettes on lung cancer:

- Lung cancer: Dependent variable
- Cigarette smoking: Independent variable
- Drinking Coffee: Extraneous variable, because (supposedly) drinking coffee can affect the chances of lung cancer but does not effect cigarette smoking. Only the dependent variable affected.
- Smoking marijuana: Another extraneous variable

Ex2: If someone wanted to study the relationship between the income of a woman with the size of her infant child when he/she is born.

- Size of the infant: Dependent variable
- Income of the woman: Independent variable
- Income of her husband: Confounding variable. Even if the wife makes only $200, if her husband makes $4000 this means a better environment and lifestyle for the woman, so it may affect the size of the infant and it may also effect the income the woman is willing to receive. Both variables affected.

Quantitative Methodologies

- Preference for design or statistical control of extraneous variables.
- Preference for statistical summary of results.
- Preference for breaking down complex phenomena into specific parts for analysis.
- Willingness to manipulate aspects, situations, or conditions in studying complex phenomena.

Qualitative Methodologies

- Is concerned with the subjective meaning of an experience to an individual.
- Preference for definitions in context or as study progresses.
- Preference for narrative description.
- Preference for assuming that reliability of inferences is adequate.
- Assessment of validity through cross-checking sources of information (triangulation).
- Study of phenomena
- No dependent or independent variables
- No study of cause and effect
- Example: Studying the experience of physicians dealing with infectious patients (such as those with HIV/AIDs). Or the experience of abused women in Jordan.
- There are different types: ethnography (studies culture), biography (studies an individual's life), case study (studies an individual's disease).
- Qualitative research tends to be humanities centered, like history or geography. (In health its more quantitative with clinical trials)

Qualitative Methodologies

- Preference for narrative/literary descriptions of procedures.
- Preference for logical analysis in controlling or accounting for extraneous variables.
- Primary reliance on researcher to deal with procedural bias.
- Preference for narrative summary of results.
- Preference for holistic description of complex phenomena.
- Unwillingness to tamper with naturally occurring phenomena.

PROCESS OF DESIGNING AND CONDUCTING A RESEARCH PROJECT

- What--What was studied
- What about--What aspects of the subject were studied

What for--What is/was the significance of the study

What did prior lit./research say

What was done--How was the study conducted

What was found

So what

What now

Notes on the red text can be found in the next slide

1. ***Introduction, Research Problems/ Objectives & Justification, purpose, & significancy***
2. ***Literature Review***
3. ***Methodology (Research sample, data collection, measurement, data analysis)***
4. ***Results & Discussion***
5. ***Implications***
6. ***Conclusions and Recommendations for Future Research***

PROCESS OF DESIGNING AND CONDUCTING A RESEARCH PROJECT

These are the steps that should be followed when conducting a research project

1. ***Introduction, Research Problems/ Objectives & Justification, purpose, & significancy***

   These should be known and written by the researcher.

2. ***Literature Review***

   This means reading all of the studies regarding the phenomenon you wish to study.

3. ***Methodology (Research sample, data collection, measurement, data analysis)*** (also should be written)
4. ***Results & Discussion***

   In results, everything is converted into numbers, and then after in discussion, those numbers are converted into words. Discussion allows you to see relationships between variables and what others think (whether they agree, disagree, or are neutral)

5. ***Implications***
6. What can organizations (local/national/academic) use or benefit from our results
7. ***Conclusions and Recommendations for future research***

THE PROCESS OF EMPIRICAL RESEARCH

Building the Theoretical Framework and the Research Model

Developing Research Hypotheses

Developing Operational Definitions for Research Variables

Sampling Design

Data Collection

Data Coding, And Editing

Testing Hypo.: Data Analysis & Interpretation

Phases in a Quantitative Study

- Phase 1: Conceptual Phase
- Phase 2: Design and Planning
- Phase 3: Empirical Phase
- Phase 4: Analytic Phase
- Phase 5: Dissemination Phase

Major Steps in a Quantitative Study

- Phase 1: Conceptual Phase

1. Formulating the problem
2. Reviewing related literature
3. Undertaking clinical fieldwork
4. Defining the framework and developing conceptual definitions
5. Formulating hypotheses

Major Steps in a Quantitative Study (cont.)

- Phase 2: Design and Planning Phase

6. Selecting a research design
7. Developing intervention protocols
8. Identifying the population
9. Designing the sample plan

Major Steps in a Quantitative Study (cont.)

- Phase 2: Design and Planning Phase (cont.)

10. Specifying methods to measure research variables and collect data.
11. Developing methods to protect human/animal rights. (also known as ethical considerations)
12. Finalizing and reviewing the research plan.

Major Steps in a Quantitative Study (cont.)

- Phase 3: Empirical Phase

13. Collecting data

14. Preparing data for analysis

Major Steps in a Quantitative Study (cont.)

- Phase 4: Analytic Phase

15. Analyzing the data

16. Interpreting results

Major Steps in a Quantitative Study (cont.)

- Phase 5: Dissemination Phase

17. Communicating the findings

18. Utilizing findings in practice

Topic

Choosing a Topic

- Use intuition, creativity, and imagination to interest people
- First, we need to put down, and generally, the areas of interest without using any critical thought
- It is not important how specific or abstract these ideas.
- Then, sort the ideas based on your knowledge about the topic, and interest
- Select the most fruitful topics or ideas
- Start asking some questions such as:
  - Why is this important to me..?
  - What is involved with that?
  - How effective is that…?

• Should include population, setting, methods, variables, and time preferably

Ex: Predicting factors of heart disease among Jordanian women in 2020

The Research Problem

- This is a critical and first step
- A clear problem gives direction for the study
- It helps the reader evaluate the research article.
- Should identify the nature, context, and significance of the problem being addressed
- Should be broad enough to include central concerns
- Should be narrow enough to serve as a guide to study design.

Sources of Research Problems

- Experience and clinical fieldwork
- Medical literature
- Quality improvement initiatives
- Social issues
- Theory
- External suggestions
  - External suggestions includes something heard in a conference or from a friend, something read in a study, or a recommendation from other researchers for further study in the subject.

Problem Statement

- It articulates the nature, context, and significance of a problem.
- It includes several components:
  - Problem Identification.
  - The background.
  - Scope and consequences of the problem.
  - Knowledge gaps.
    - Find something to study that has not been studied before
  - Possible solutions to the problem.

Statement of Purpose

- It establishes the general direction or the nature of the inquiry
- The word purpose or goal always appears in the purpose statement
- It should include the keys study variables and their possible interrelationships, and the nature of the population.
- It’s the manner that seeks solution of the problem.
- Statement of purpose is the researcher's summary of the overall goal of the study
- Must be written immediately after making the problem statement
- What do you want out of your research? Is it to see the relationship between variables, an analytical purpose, or a retrospective perspective on the phenomena?

Statement of Purpose—Quantitative Studies:

- Identifies key study variables
- Identifies possible relationships among variables
- Indicates the population of interest
- Suggests, through use of verbs, the nature of the inquiry (e.g., to test…, to compare…, to evaluate…)
- You start with a problem, perhaps a disease or some sort of issue in the community. This is defined in the problem statement. Then, you can see the incidence and prevalence and perhaps the associated mortality and morbidity. You should aim to provide a detailed explanation of the problem/phenomenon at the end.