

# Problem statement, justification & formulation of hypothesis, research question and objectives



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# Introduction to research

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- Research is important in any profession and an integral part of healthcare practice, education and management
- Therefore, a “research-mindedness” needs to be fostered in healthcare professionals from the start of their training
- The healthcare professionals need to be aware of, and knowledgeable about the application of research in their practice

# What is research?

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- This is the systematic process of collecting, analyzing and interpreting information in order to increase understanding of phenomena of interest
- It is also a systematic inquiry that uses disciplined methods to answer questions or solve problems
- The ultimate goal of research is to develop and expand knowledge

# Components of a research project

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- As a student, you will be expected to conduct a research project at some point
- To do that, you will need to develop a research protocol which is the written plan of the research
- Protocols help the researcher organize their research in a logical, focused and efficient way

# Components of a protocol

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- Title
- Introduction
- Literature review
- Statement of the problem / rationale / study justification
- Research question(s)

# Components of a protocol

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- Hypothesis
- Objectives
- Research methods
- Data analysis
- Ethical Issues

# Components of a protocol

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- Time table
- Budget
- References
- Appendices

# Focus for today:

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- Statement of the problem
  
- Problem Justification / rationale
  
- Formulating:
  - Hypothesis,
  
  - Research questions and
  
  - Objectives

# Statement of the problem

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- ❑ This is a concise description of an issue or condition to be addressed or improved upon.
- ❑ It identifies the gap between the current and desired states of a process or product
- ❑ Effective problem statements answer the question “Why does this research need to be conducted.”
- ❑ It is concise and concrete

# Problem justification / rationale

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- This provides a compelling argument to justify the proposed study
- It is based on the belief in the need for additional or completely new research on a subject
- It should explain, defend, and / or prove that the current literature (if any) & current findings (if any) on the given problem are inadequate, outdated, and / or inaccurate.

# Problem justification / rationale

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- It should identify the reasoning and justification for writing a dissertation on the particular subject.
- This is an attempt to show the urgency and relevance of the proposed study.
- It builds on the review of literature and argues that the knowledge gaps are so serious as to warrant further study to address them.

# Problem justification / rationale

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- ❑ It is not sufficient to say “no previous study has been done on this subject at the UTH”
- ❑ The justification must capture the reader and make them interested in the product of the research.
- ❑ Demonstrate that an important knowledge gap exists which needs to be addressed urgently, and your research intends to do this.

# Hypothesis formulation

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- Hypothesis - set of assumptions about observable phenomena that are expressed in a coherent manner
- It is the formal statement comprising a researcher's prediction or explanation of the relationship between two or more variables in a specific population
- It explicitly states the expected relationship between an independent and dependent variable<sup>13</sup>

# Hypothesis formulation

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- The hypothesis translates the problem statement into a prediction of expected outcomes, based on theoretical considerations
- Hypotheses must be empirically testable statements that can cover any level of analysis
- The hypothesis states what the researcher expects to be the likely reason for a particular practice or outcome.

# Hypothesis formulation

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- e.g., in addressing the research question “Is low uptake of family planning among adolescents in Zambia due to religious beliefs?”
- Research by hypothesis testing can use the null or the alternate hypothesis.
- The null hypothesis presents the hypothesis as a negative

# Hypothesis formulation

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- e.g. “The low uptake of family planning among adolescents in Zambia is not due to religious beliefs.”
- In terms of the alternate hypothesis, it will be what the researcher proposes directly
- e.g. “The low family planning uptake among adolescents in Zambia is due to religious beliefs”

# Hypothesis formulation

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- Hypotheses per se are not needed in descriptive studies that describe how characteristics are distributed in a population
- They are needed for studies that will use tests of statistical significance to compare findings among groups

# Hypothesis formulation

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- Because most observational studies and all experiments address research questions that involve making comparisons, most studies need to specify at least one hypothesis

# Hypothesis formulation

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- If any of the following terms appear in the research question, then the study is not simply descriptive, and a hypothesis should be formulated:
  1. Greater or less than,
  2. Causes or leads to,
  3. Compared with, more likely than,
  4. Associated with, related to,
  5. Similar to or correlated with

# Characteristics of a good hypothesis

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- A good hypothesis must be based on a good research question.
  
- It should also be:
  - Simple,
  
  - Specific, and
  
  - Stated in advance.

# Characteristics of a good hypothesis

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- A simple hypothesis contains one predictor and one outcome variable:
  - e.g. a sedentary lifestyle is associated with an increased risk of proteinuria in patients with diabetes
  
- A complex hypothesis contains more than one predictor variable
  - e.g. A sedentary lifestyle & alcohol use are associated with an increased risk of developing proteinuria in patients with diabetes

# Research question

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- This is the uncertainty the investigator wants to resolve
- Research questions often begin with a general concern that must be narrowed down to a concrete, researchable issue
  - e.g. should women be given Fansidar during pregnancy?
- The hypothesis follows from the research question.

# Research question

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- Generally, in a single study, the attempt is to answer only one or at the most two research questions
- It is more useful to be able to answer one or two questions well than to provide inconclusive information on a broad range of questions

# Formulating research objectives

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- The objectives identify the purpose of the study.
- It is common to have one general objective and a number of specific objectives.
- It is reasonable to have one general objective and at least 3 specific objectives stated in a simple, concise, and clear manner.

# Formulating research objectives

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## □ General objective / Aim

- This is the main or overarching objective of the study (i.e. overall driving force of the research)
  - e.g. ‘The study intends to investigate the causes of the low utilization of HIV self testing kits in Zambia’.
- All of the subsequent specific objectives should fit within the scope of the general objective.

# Formulating research objectives

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- Specific objectives (i.e. the means by which you intend to achieve your general objective)
  - These are detailed and should be independent of each other
    - To determine the levels of HIV testing in Zambia
    - To identify the barriers to HIV testing
    - To assess the role of stigma in HIV testing
  - The objectives must correlate with the title, methods and eventually the conclusion.

# Steps in formulating objectives

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- **Step 1:** Identification and analysis of the research problem – critical thinking is needed
- **Step 2:** Explicit statement of the aim of the study i.e. state explicitly the focus or topic of study
- **Step 3:** Setting specific objectives
- **Step 4:** Implementation of the objectives – protocol should state what will be done with the results

# The value of critical thinking

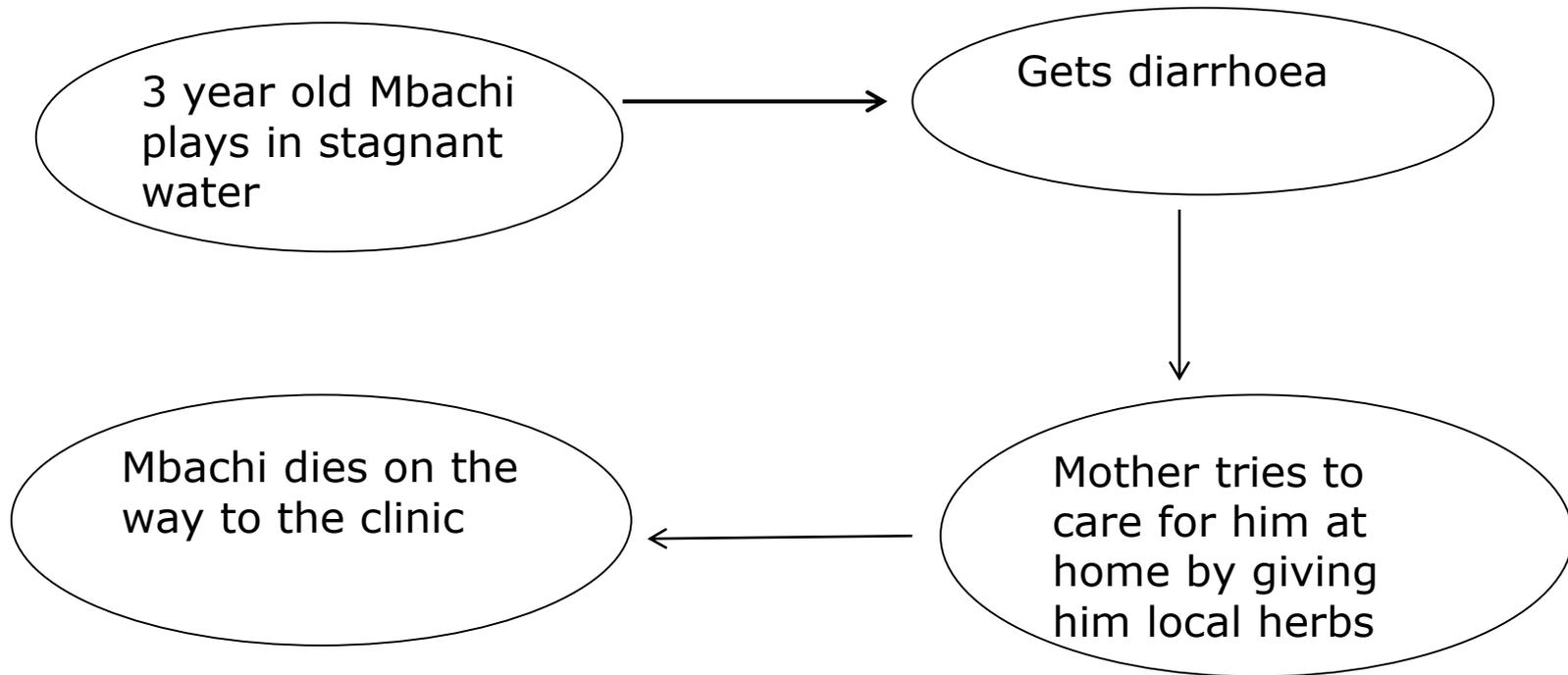
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- Any problem e.g. health system (for example, the clinic is crowded on Mondays, why?) should be broken down systematically into its major components and viewed critically
- A much used tool to facilitate critical thinking is the “Why” game

# The “why” game

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- Consider the following scenario in a rural setting:



# The “why” game

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- Starting with the first event circled, we should ask the question “why?” and put the response in a circle with an arrow pointing towards the event
- There may be a number of reasons for Mbachii playing in stagnant water
- We should add the reasons to the diagram
- Generate as many reasons as possible

# The “why” game

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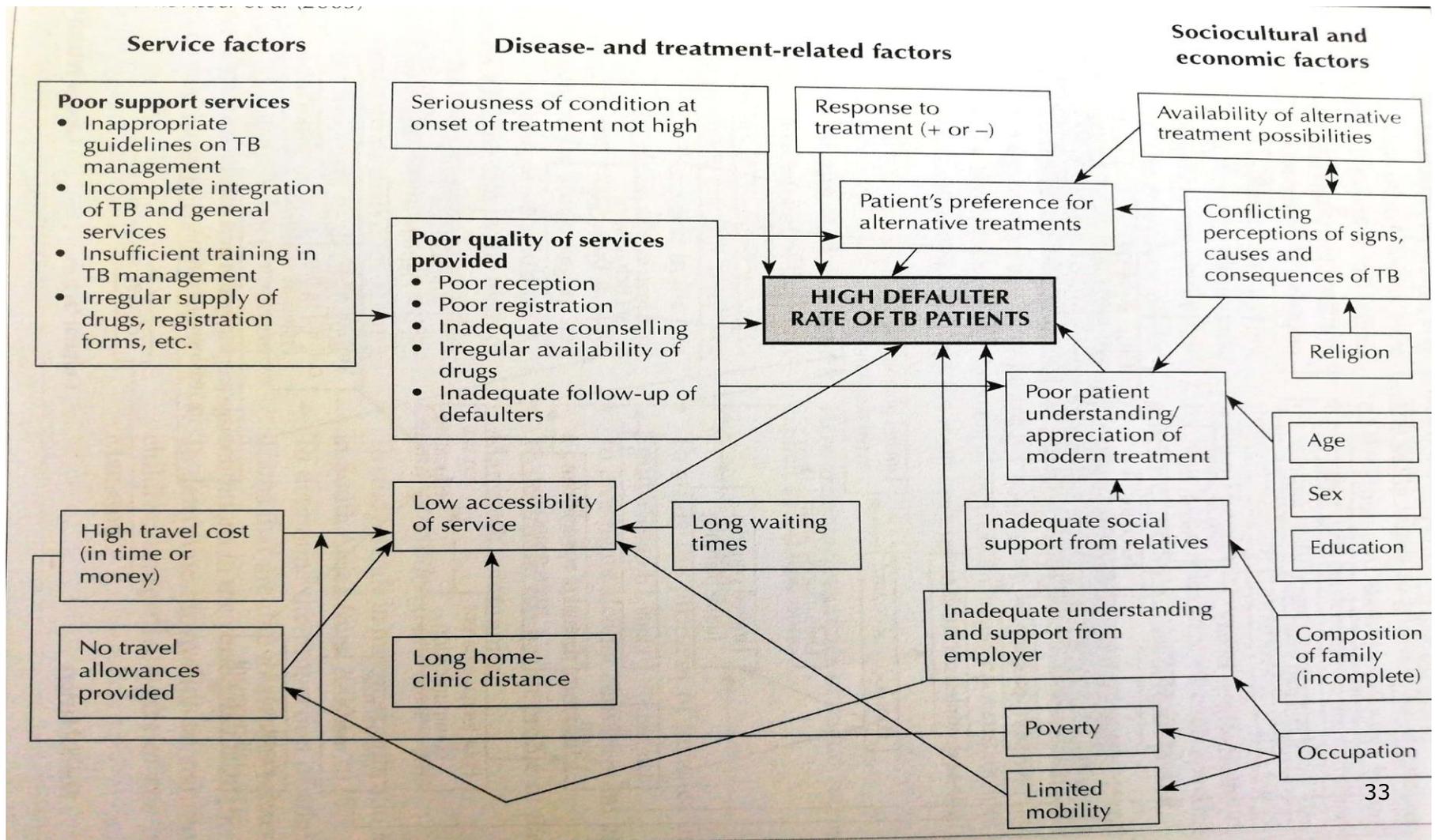
- For each reason generated, ask “why” again and put our second generation reasons in circles with arrows pointing to the circles they caused
- Keep on asking “why” until you run out of ideas
- This process is repeated for each of the events
- Some of the events may have similar causes and such need to be linked with arrows

# The “why” game

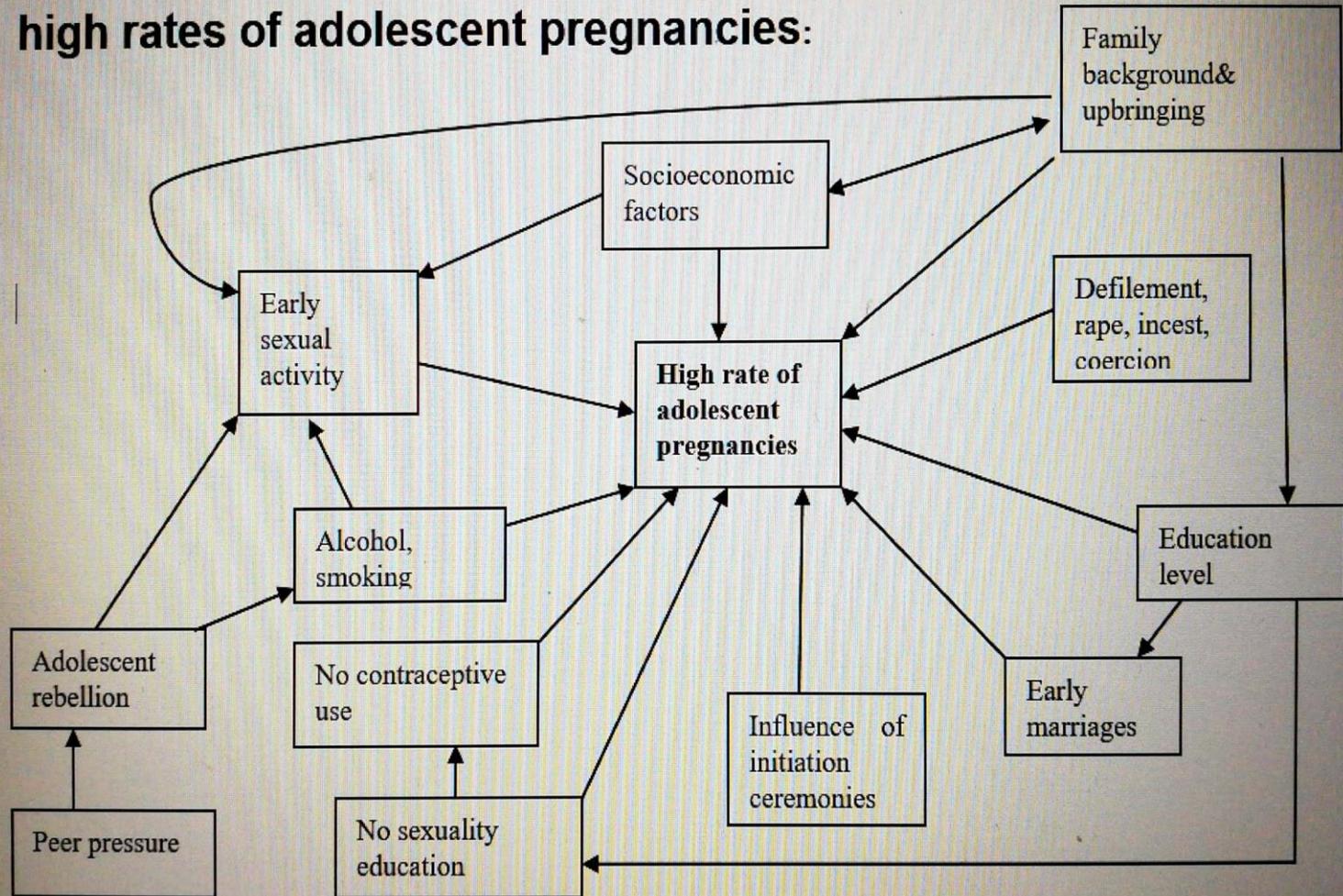
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- Once the “why” process has been exhausted, it is useful to present the analysis in a clearer, more systematic way
- This can be done by organizing factors and causes into categories e.g. political, socioeconomic, health-related factors, etc
- Once this is done, we should have a critical analysis of possible reasons why Mbachii died

# Problem analysis diagram of factors contributing to high defaulter rate among TB patients



# Problem analysis diagram of some factors contributing to high rates of adolescent pregnancies:



# References

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- Hulley et al. (2007). Designing Clinical Research (4<sup>th</sup> Edition). Wolters Kluwer / Lippincott Williams & Wilkins

