BT 623 Research Methodology | Utpal Bora

RESEARCH QUESTION?

INTRODUCTION

- A good research question (RQ) forms backbone of a good research, which in turn is vital in unraveling mysteries of nature and giving insight into a problem.
- RQ identifies the problem to be studied and guides to the methodology.
- It leads to building up of an appropriate hypothesis (Hs).
- Hence, RQ aims to explore an existing uncertainty in an area of concern and points to a need for deliberate investigation.
- A good RQ helps support a focused arguable thesis and construction of a logical argument.

- Formulation of a good RQ is undoubtedly one of the first critical steps in the research process, especially in the field of social and health research, where the systematic generation of knowledge that can be used to promote, restore, maintain, and/or protect health of individuals and populations.
- Basically, the research can be classified as, applied, basic, clinical, empirical, administrative, theoretical, or qualitative or quantitative research, depending on its purpose.

CHARACTERISTICS OF GOOD RESEARCH QUESTION

I. Details the problem statement
II. Further describes and refines the issue under study
III. Adds focus to the problem statement
IV. Guides data collection and analysis
V. Sets context of research

FORMULATION OF RESEARCH QUESTION – STEPWISE APPROACH

- Formulation of research question (RQ) is an essentiality before starting any research.
- It aims to explore an existing uncertainty in an area of concern and points to a need for deliberate investigation.
- A RQ can address different formats depending on the aspect to be evaluated.
- To develop a RQ, one needs to begin by identifying the subject of interest and then do preliminary research on that subject.

- The researcher then defines what still needs to be known in that particular subject and assesses the implied questions.
- After narrowing the focus and scope of the research subject, researcher frames a RQ and then evaluates it.
- Thus, conception to formulation of RQ is very systematic process and has to be performed meticulously as research guided by such question can have wider impact in the field of social and health research by leading to formulation of policies for the benefit of larger population.
- **The characteristics of good RQ are expressed by acronym "FINERMAPS" expanded as feasible, interesting, novel, ethical, relevant, manageable, appropriate, potential value, publishability, and systematic.**

FINERMAPS

- Feasible
- Interesting
- Novel
- Ethical
- Relevant
- Manageable
- Appropriate
- Potential value and publish ability
- Systematic

https://scientific-publishing.webshop.elsevier.com/research- process/finer-research-framework/

FEASIBLE

Writing feasible research questions means that they CAN be answered under objective aspects like time, scope, resources, expertise, or funding.

Some questions that you can ask yourself regarding feasibility are, for example:

I. Is there enough time to conduct the research?

II. Is there the technology and expertise I need to undertake my study?

III. Can I pay for it?

IV. Is my study going to have the amount of effect and relevance for the audience that I'm hoping?

V. Do I have access to the group of interest – or number of participants – I need to obtain accurate results?

INTERESTING

- This might be the more subjective part of the FINER acronym.
- The interesting factor is highly dependent on intrinsic individual drive for a specific knowledge field or scientific topic.
- The first thing is to find out is what YOU consider interesting.
- As you have probably already discovered on your own, carrying on any kind of research is quite overwhelming and often demands self-motivation.
- Even if the topic of your choice turns out quite uninteresting for some people or institutions, it doesn't mean it's not exciting at all.

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- In order to grow interest among your target audience, try building a strong and captivating rationale.
- Regardless of your own personal motivation about a subject, it is important to check if your question corresponds to more practical and broad.
- Ask yourself if your work will bring immediate benefits for society.

  For *example*, check the current interests of funding agencies. With this in mind, it’s possible to formulate a research question that generates interest both for you, as the author, and for the community interests.

NOVEL

- The question should not simply copy questions investigated by other workers but should have scope to be investigated.
- It may aim at confirming or refuting the already established findings, establish new facts, or find new aspects of the established facts.
- It should show imagination of the researcher.
- Above all, the question has to be simple and clear.

- The complexity of a question can frequently hide unclear thoughts and lead to a confused research process.
- A very elaborate RQ, or a question which is not differentiated into different parts, may hide concepts that are contradictory or not relevant.
- This needs to be clear and thought-through. Having one key question with several subcomponents will guide your research.

ETHICAL

- This is the foremost requirement of any RQ and is mandatory to get clearance from appropriate authorities before stating research on the question.
- The RQ should be such that it minimizes the risk of harm to the participants in the research, protect the privacy and maintain their confidentiality, and provide the participants right to withdraw from research.
- It should also guide in avoiding deceptive practices in research.

  For example, acquiring consent of the participant population in the case of a clinical drug trial.

RELEVANT

- The question should be of academic and intellectual interest to people in the field you have chosen to study.
- The question preferably should arise from issues raised in the current situation, literature, or in practice.
- It should establish a clear purpose for the research in relation to the chosen field.

For *example*, filling a gap in knowledge, analyzing academic assumptions or professional practice, monitoring a development in practice, comparing different approaches, or testing theories within a specific population are some of the relevant RQs.

Manageable (M): It has the similar essence as of feasibility but mainly means that the following research can be managed by the researcher.

Appropriate (A): RQ should be appropriate logically and scientifically for the community and institution.

Potential value and publishability (P): The study can make significant health impact in clinical and community practices. Therefore, research should aim for significant economic impact to reduce unnecessary or excessive costs. Furthermore, the proposed study should exist within a clinical, consumer, or policy-making context that is amenable to evidence-based change. Above all, a good RQ must address a topic that has clear implications for resolving important dilemmas in health and health-care decisions made by one or more stakeholder groups.

Systematic (S): Research is structured with specified steps to be taken in a specified sequence in accordance with the well-defined set of rules though it does not rule out creative thinking.

RESEARCH QUESTION AND STUDY DESIGN

- RQ determines study design, for example, the question aimed to find the incidence of a disease in population will lead to conducting a survey; to find risk factors for a disease will need case–control study or a cohort study.
- RQ may also culminate into clinical trial.

For *example*, effect of administration of folic acid tablet in the perinatal period in decreasing incidence of neural tube defect. Accordingly, Hs is framed.

RESEARCH QUESTION AND STUDY DESIGN

- Appropriate statistical calculations are instituted to generate sample size.
- The subject inclusion, exclusion criteria and time frame of research are carefully defined.
- The detailed subject information sheet and pro forma are carefully defined.

CONCLUSION

A good RQ needs thorough literature search and deep insight into the specific area/problem to be investigated. A RQ has to be focused yet simple. Research guided by such question can have wider impact in the field of social and health research by leading to formulation of policies for the benefit of larger population.

Background

The integration of Artificial Intelligence (AI) into epidemiology represents a transformative shift in how public health data is analyzed and interpreted. AI technologies, such as machine learning and predictive modeling, have the potential to revolutionize the field by enhancing disease prediction, identifying risk factors, and optimizing response strategies. Historically, epidemiology has relied on traditional statistical methods and epidemiological models, but the increasing complexity and volume of health data necessitate more advanced analytical tools.AI applications in epidemiology have shown promise in several areas, including outbreak prediction, disease surveillance, and personalized medicine. For example, machine learning algorithms can analyze large datasets to predict disease spread and identify high-risk populations more accurately than traditional models. Despite these advancements, there is still limited understanding of how various AI approaches compare to conventional methods in terms of accuracy, efficiency, and overall impact on public health outcomes.

Motivation

Need for Improved Tools:

There is a pressing need to enhance disease prediction and management due to the increasing frequency of global health crises and the complexity of health data. AI has the potential to address these challenges by providing more accurate and timely predictions.

Potential Benefits:

AI models could offer significant improvements over traditional methods in terms of accuracy, efficiency, and scalability. Understanding these benefits is crucial for integrating AI into public health practices and optimizing disease management strategies.

Knowledge Gaps: While AI is being applied in epidemiology, there is limited research comparing its performance directly with traditional epidemiological models. This gap needs to be addressed to understand the practical implications and benefits of AI in disease forecasting.

Research Question

"How does the performance of Artificial Intelligence-based prediction models compare to traditional epidemiological models in forecasting the incidence and spread of infectious diseases?"

Hypotheses

To address the research question, the following hypotheses can be relevant:

Hypothesis 1: **AI-Based Models Show Greater Accuracy**

AI-based prediction models will demonstrate higher accuracy in forecasting the incidence and spread of infectious diseases compared to traditional epidemiological models.

Rationale: AI models often leverage large datasets and complex algorithms that can identify patterns and correlations more effectively than traditional methods, potentially leading to more accurate predictions.

Hypothesis 2: **AI Models are More Efficient**

AI-based prediction models will process and analyze data more efficiently than traditional epidemiological models, resulting in faster predictions and reduced computational time.

Rationale: AI technologies, such as machine learning algorithms, are designed to handle large volumes of data and perform complex calculations rapidly, which may enhance the efficiency of disease forecasting.

Hypothesis 3: **AI Models Provide Additional Insights**

AI-based prediction models will uncover additional insights and patterns in disease incidence and spread that are not readily identified by traditional epidemiological models.

Rationale: The advanced analytical capabilities of AI may reveal novel trends and relationships in data, providing a more comprehensive understanding of disease dynamics.

Expected Outcome

The expected outcome of this research is to provide a comparative analysis of AI-based prediction models and traditional epidemiological methods. Specifically, the study aims to:

Assess Accuracy: Determine how accurately AI models predict disease incidence and spread compared to traditional models.

Evaluate Efficiency: Analyze the efficiency of AI models in processing and interpreting large datasets relative to conventional methods.

Identify Strengths and Limitations: Highlight the strengths and limitations of AI approaches in epidemiology, providing insights into their practical applications and potential improvements.

Inform Public Health Practices: Offer recommendations for integrating AI technologies into public health practice based on comparative findings, potentially leading to more effective disease management and response strategies.

Expected Outcome:

Explore Potential for Positive Change:

Educational Outreach: Research findings can be used to develop educational materials and campaigns aimed at promoting healthier social media usage patterns and raising awareness about mental health impacts.

Intervention Strategies: The research could lead to the development of interventions designed to mitigate negative effects, such as digital detox strategies or enhancements to social media platform features to promote positive mental health.

Assignment: Developing a Research Question

Objective of the Assignment:
To help develop a clear and focused research question on a topic of ones own choice.

This process involves identifying an area of interest, describing the background and motivation for your research, and outlining the expected outcomes.

Instructions

1. Choose a Research Topic

Select a topic that interests you and is relevant to your field of study. This can be a broad area or a more specific aspect within your chosen field. Consider current issues, gaps in existing research, or emerging trends that you find intriguing.

2. Describe the Background

Provide a brief overview of the background related to your chosen topic. This should include:
A description of the general area of interest.
Key issues, trends, or challenges related to the topic.
Relevant context or current state of knowledge in the field.

3. Explain the Motivation

Clearly articulate why this topic is important and worth investigating. Address:

- The significance of the research question.
- How your research could contribute to the field or address a particular gap.
- Potential implications or applications of the research findings.

4. Formulate Your Research Question

Develop a clear, focused, and researchable question based on the background and motivation provided. Ensure that your question:

- Is specific and well-defined.
- Addresses a relevant issue or gap in current knowledge.
- Can be answered through research with available resources.

5. Outline the Expected Outcome

Describe what you hope to achieve with your research. This should include:

- The anticipated results or insights you expect to gain.
- The potential impact or contributions of your research to the field.
- Any practical or theoretical implications of your findings.

6. Submit Your Report

Show the breakdown of the process from Choosing a wide area of research upto the development of hypothesis. Prepare a written report (2-4 page report) that includes:

Background: A summary of the general area of interest and relevant context.

Motivation: An explanation of why the research is important and how it could contribute to the field.

Research Question: Your formulated research question.

Expected Outcome: An outline of the anticipated results and their potential impact.

Format: Submit your report as a Word document. Use appropriate formatting and citation style if referencing any sources.

Assessment Criteria

Your report will be evaluated based on the following criteria:

Clarity: The research question is clear, specific, and well-defined.

Relevance: The background and motivation are relevant and address a significant issue or gap.

Feasibility: The research question is researchable with available resources.

Expected Outcome: The expected outcome is well articulated and demonstrates the potential impact of the research.

6. Submit Your Report

Show the breakdown of the process from Choosing a wide area of research up to the development of hypothesis. Prepare a written report (2-4 page report) that includes:

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Feasibility: The research question is researchable with available resources.

Expected Outcome: The expected outcome is well articulated and demonstrates the potential impact of the research.

Advisory

This assignment will help you develop essential skills in formulating research questions and understanding the importance of context, motivation, and expected outcomes in the research process.

Team Work:

Maximum Two students may join together to formulate a research question and submit a single assignment.

No two assignments should be same.

Submission Deadline:

Please submit your report by 25 August 2024.

Late submissions will carry negative marks.
Non Submission will lead to Course Incomplete grade