

Developing a Research Question

Introduction:

Developing a strong and clear research question is a critical step in the research process. A well-defined research question serves as the foundation for study design, methodology, and analysis, guiding every phase of research. The process of crafting research questions requires a deep understanding of the subject area, clarity of purpose, and careful consideration of feasibility. This document outlines the key steps and considerations for effective research question development.

What is strong research question:

Each of the characteristics described below, contributes to the overall strength of a research question, ensuring it is well-defined, meaningful, and actionable for a study.



Writing Strong Research Questions | Criteria & Examples

Specific: The question should clearly define what it seeks to explore or investigate.



Feasible: The question should be realistic and manageable in terms of time, resources, and access to data.

Original: The question should offer a new perspective or address a gap in existing knowledge.

Relevant: The question should be significant and applicable to the field of study, which are addressing an important issue or need.

Complex and arguable: The question should encourage in-depth analysis and discussion, rather than a simple yes/no answer.

Researchable: The question should be answerable through data collection and analysis.

Focused: The question should be narrow enough to allow for specific and detailed investigation.

What should we do to develop a strong research question?

Identifying a Broad Topic of Interest

The first step in developing a research question is identifying a broad area of interest or topic. This inspired by gaps in the literature, community identified need, or emerging trends in a specific field. Starting with a broad topic allows you to explore potential subtopics and questions before narrowing down your focus.

Key Considerations:

- What subject area or topic you are interested the most?
- Are there any emerging trends or under-researched areas in this topic?
- What existing knowledge or findings are available on this topic?
- How does the topic reflect community or patient partner-identified needs and priorities?
- Does the research promote equity, public accountability, and meaningful engagement with affected communities?



Conducting a Literature Review

Once a broad topic identified, conducting a literature review helps to identify gaps in current knowledge and understand what has already available. A comprehensive review of existing research will help avoid redundancy and reveal where further exploration is necessary.

! Note: The term 'literature review' serves as an umbrella for multiple review types, each suited to different research purposes; selecting the appropriate type depends on the objectives and scope of the inquiry.:

- <u>Narrative Review</u>: a descriptive, non-systematic summary of existing literature that provides context, identifies trends, and often reflects the author's perspective.
- <u>Systematic Review</u>: a rigorous, comprehensive review that uses predefined methods to identify, appraise, and synthesize all relevant studies on a specific research question.
- <u>Scoping Review</u>: a broad review that maps the key concepts, types of evidence, and research gaps in an emerging or complex area without assessing study quality.
- <u>Rapid Review</u>: an accelerated form of a systematic review that simplifies or omits certain steps to deliver evidence quickly for timely decision-making.
- <u>Integrative Review</u>: a review that includes diverse types of research (quantitative, qualitative, theoretical) to provide a comprehensive understanding of a health or social issue.

You can use this resource from UBC <u>Planning your review - Knowledge Synthesis: Systematic, Scoping &</u> Other Reviews - Research Guides at University of British Columbia to chose the right one for you.

Key Considerations:

- What gaps or limitations exist in the current literature?
- Are there conflicting results or areas where consensus has not yet been reached?
- How can your research contribute to the existing body of knowledge?
- Would the question contribute constructively to the body of existing knowledge, whether by expanding, challenging, or refining past conclusions.
- What previous research has missed or inadequately explored.



- Would this research question contribute constructively to the body of existing knowledge, whether by expanding, challenging, or refining past conclusions.
- How this specific research question suits the methodological tools that have proven effective in previous research on the topic.

Example of main types of literature review to include:

Empirical Studies: Primary research that provides data-driven findings and direct evidence.

Theoretical Articles: Work that explores conceptual frameworks, theories, or models related to the topic.

Systematic Reviews and Meta-Analyses: Summaries of existing research that synthesize multiple studies and often highlight broader trends, gaps, or inconsistencies.

Policy Reports and Grey Literature: These sources, such as government reports or industry publications, can provide insight into applied perspectives and real-world relevance that may not appear in academic literature.

It is important to critically evaluate the literature reviewed in developing your specific research question. Key aspects to examine include the study design and methodology, sample size and representativeness, and potential biases and limitations.

In addition, it is an opportunity to explore the theoretical frameworks applicable to the specific research question. Reviewing relevant theories or models can help build a conceptual foundation for the study. You can do it by ensuring the research question and study design are grounded in well-established theories. In addition, it will help to highlight areas where existing theories fall short or could be expanded upon.

How to map research gaps and opportunities:

By visualizing literature review findings as a flow chart or table, the gaps in current research can clarify areas where more research is needed. It is also important to identify the understudied populations and evaluate demographic groups, relevant variables have not been examined, and possible untested



relationships in the context of the research question, recent developments in technologies or societal changes.

Frameworks for developing research question:

PICO (<u>P</u>opulation, <u>I</u>ntervention, <u>C</u>omparison, <u>O</u>utcome), is a simple analytical framework to be used for the research question development. It is a widely used tool in developing clinical and health-related research questions, particularly for designing and structuring questions in systematic reviews and evidence-based practice. It can help avoid overly broad questions, making it easier to find relevant studies. Each element of PICO can be used as a search term to find studies that match the research question. By defining each PICO component, you can better identify and control variables, contributing to robust study design and data collection.

In summary, the PICO framework is an essential tool for structuring well-defined research questions that are clinically relevant and methodologically sound. It helps to ensure that research questions are precise, focused, and relevant to the clinical setting by breaking them down into four components: Population (P), Intervention (I), Comparison (C), and Outcome (O). Here is a detailed breakdown of each component and how it contributes to the research question formulation.

More information can be found here: <u>Back to the basics: guidance for formulating good research</u> <u>questions - PMC</u>

•**Population (P):** This component defines the group of individuals, patients, or population segment to which the research question is directed. Key aspects to consider include:

- Demographic characteristics (age, gender, ethnicity, etc.).
- Condition or disease being studied (e.g., diabetes, heart disease).
- Setting (e.g., community, hospital, primary care clinic).
- Inclusion/exclusion criteria to refine the population of interest.

Intervention (I): This component focuses on the treatment, exposure, diagnostic test, or intervention of interest. It should be clearly defined to allow others to understand exactly what is being studied. Details could include:



- Type of intervention (medication, therapy, diagnostic test, lifestyle change).
- Specific characteristics of the intervention (dose, frequency, duration).
- Mode of delivery (oral, intravenous, counseling session).

Comparison (C): The comparison group is an essential part of many study designs as it provides a reference to determine the effect or impact of the intervention. This may include:

- Alternative treatments (e.g., comparing two drugs).
- Standard care or no intervention.
- Placebo if applicable.

Outcome (O): This component details the effects or results that are expected from the intervention. It is crucial to specify the outcomes of interest, as they will guide data collection and analysis. Outcomes should be:

- Relevant to the population and stakeholders (e.g., patient-centered outcomes).
- Measurable (using standardized scales, clinical measures).
- Time-bound if relevant (e.g., short-term vs. long-term outcomes).

The PICO framework is not only useful for crafting precise research questions but also acts as a guide for selecting the most suitable study design. By clearly defining the Population, Intervention, Comparison, and Outcome, PICO can help researchers determine the type of study design that will best address their research question. Here is how each component of PICO can guide the choice of study design:

Cross-sectional: If PICO defines a static population and immediate outcomes without needing timebased changes.

Longitudinal cohort: If PICO defines exposure over time with an outcome observed at later points, aiming to see progression or incidence.

Case-control: If PICO involves retrospective analysis of past exposures or risk factors in relation to a present outcome.

RCT: If PICO includes a feasible intervention and comparison to measure causation directly.



Examples of research questions by PICO:

Cross-Sectional, studies observe a population at a single point in time, often focusing on associations rather than causation.

Population (P): Women aged 15-49

Intervention (I): Use of hormonal contraceptives

Comparison (C): Not using hormonal therapy

Outcome (O): Prevalence of menstrual irregularities

PICO Question: "Does the use of hormonal contraceptives influence the prevalence of menstrual irregularities among women aged 15 to 49?"

Case-control studies, examining past exposures or characteristics that might differ between those who have a particular outcome (cases) and those who do not (controls).

Population (P): Women, aged 30-60

Intervention (I):) High intake of ultra-processed foods

Comparison (C): Low intake of ultra-processed foods

Outcome (O) increased risk of endometriosis.

PICO Question: "Does a high intake of ultra-processed foods increase the risk of endometriosis among women aged 30 to 60?""

Longitudinal studies follow participants over time, observing changes and potential causal relationships between variables.

Population (P): Postmenopausal women

Intervention (I): Participation in regular physical activity.



Comparison (C): Compared to those with no regular physical.

Outcome (O): affect bone density over 5 years time PICO Question: "Does regular physical activity affect bone density over five years among postmenopausal women?"

RCT

Study Objective: To determine whether a new drug is effective in reducing blood pressure compared to a placebo in adults with hypertension.

Population (P): Pregnant women in their third trimester

Intervention (I): Mindfulness-based stress reduction program

Comparison (C): Standard prenatal care

Outcome (O): Levels of prenatal anxiety

PICO Question: "Does a mindfulness-based stress reduction program reduce prenatal anxiety levels among pregnant women in their third trimester compared to standard prenatal care?"

Additional consideration when developing the research question:

- Integrating privacy considerations is increasingly important in research, especially when dealing with sensitive health data or personally identifiable information. Prioritizing participant confidentiality and comply with ethical and legal standards of your organization is necessary.
- Data availability and type. For qualitative data analysis two main sources of data considered.
 Pros and cons presented in the below table:



CRETERIA	PRIMARY DATA	SECONDARY DATA
Meaning	Primary data refers to the first hand data gathered	Secondary data means data collected by someone else earlier.
Data	Real time data	Past data
Process	Very involved	Quick and easy
Source	Surveys, observations, experiments, questionnaire, personal interview, etc.	Government publications, websites, books, journal articles, internal records etc.
Cost effectiveness	Expensive	Economical
Collection time	Long	Short
Specific	Always specific to the researcher's needs.	May or may not be specific to the researcher's need.
Accuracy and Reliability	More	Relatively less

• **FAIR** (<u>Findable</u>, <u>A</u>ccessible, <u>R</u>eusable, <u>I</u>nteroperable) data principles can combine privacy consideration and data quality and considered in the development of the research question.



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More information can bi found here: More information can be found here:

FAIR data principles: What is FAIR?

Common Data Elements: Standardizing Data Collection

Summary

- Essentials of a Strong Research Question: A strong research question is specific, feasible, original, relevant, complex, researchable, and focused. These characteristics provide clarity and guide the research design, methodology, and analysis.
- Development Process: Starting with a broad topic, conducting a literature review to identify gaps, and mapping out research opportunities are crucial steps. Incorporating frameworks, like PICO, refines the question by aligning with study design (cross-sectional, case-control, longitudinal, RCT) and identifying suitable methods.
- Privacy and FAIR Principles: Privacy considerations, especially for sensitive data, are integral to ethical research question development. The FAIR data principles (Findable, Accessible, Interoperable, and Reusable) further support ethical standards and data quality.

Lesson Learned:

Developing a research question is an iterative process that balances scientific rigor with ethical considerations. Using structured frameworks like PICO not only enhances question clarity but also assists in aligning research design with feasibility, privacy, and ethical standards.