02

RESEARCH QUESTION, OBJECTIVES & HYPOTHESIS

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ACKNOWLEDGMENTS

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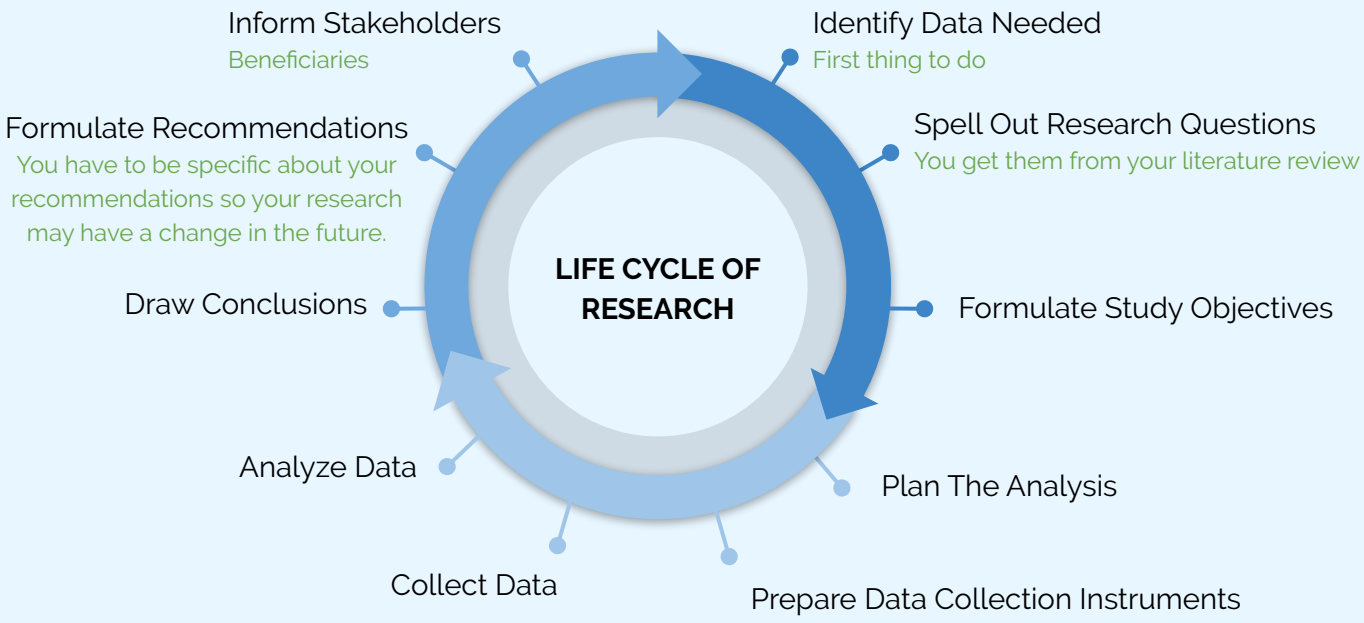
RESEARCH QUESTION, OBJECTIVES & HYPOTHESIS

LECTURE **OBJECTIVES**

By the end of this lecture, I am able to:

- Formulate Research Questions.
- State And Describe Research Hypotheses.
- Define Specific Research Objectives.

INTRODUCTION



RESEARCH **QUESTION**

Definition

An uncertainty about something in a population (individuals or objects) that the investigator wants to resolve by utilizing measurements in that population.

A Good Question

Important.

- A good question help you choose your optimal study design.
- Research question should contain:
  1. Population.
  2. Variables (outcome and exposure).
  3. Time dimension.

Question Sources

Literature review. New ideas, technologies, and innovations. Mentors and guides.
Careful observations. Seniors are more experienced with this as they engage with real-life cases.

How?

Translating an uncertainty to a research question:

- Frame your problem in specific terms (clinical, public health.. etc.)
- Focus on one issue.
- Write in everyday language (Simple, no epidemiological or clinical terms).
- Once the question is answered, link it to a potential action.
- State it as a question, and end it with a question mark.

Categories

Important.

Descriptive Questions	Analytical Questions
Observations to measure quantity.	Test hypothesis.
No comparison between groups, or interventions.	Include comparisons & interventions.
Example: Among 3rd year female medical students, what is the percentage of smokers?	Once you see two groups involved in the study, this makes it an analytical study.

Steps

Question writing is an *iterative* process; You will improve it again and again.

1 Review up-to-date literature. 2 Raise a question. 3 Decide worth investigating by peer-review.

4 Define measurable exposures and outcomes. 5 Sharpen the initial question.

6 Refine the question by specifying details (PICOT).

STEPS EXAMPLES

FYI - NOT REQUIRED IN THE EXAM

QUESTION: Is Vaping bad?

1. Review Up-to-date Literature And Information

- E-cigarettes have the potential to benefit adult smokers who are not pregnant if used as a complete substitute for regular cigarettes and other smoked tobacco products.
- E-cigarettes are not safe for youth, young adults, pregnant women, or adults who do not currently use tobacco products.
- While e-cigarettes have the potential to benefit some people and harm others, scientists still have a lot to learn about whether e-cigarettes are effective for quitting smoking.
- If you've never smoked or used other tobacco products or e-cigarettes, don't start.
- Additional research can help understand long-term health effects.

2. Raise A Question

"Can vaping help in quitting smoking?" Vague question. Define: "vaping" and "quitting smoking".

3. Decide Worth Investigation By Peer-Review

- What is the optimal type of vaping, frequency, and duration?
- What is the rate of quitting smoking? (How many? Length of quitting (Days, weeks, moths).
- What are the risks? What are the other benefits?

3. Decide Worth Investigation By Peer-Review

- What is the optimal type of vaping, frequency, and duration?
- What is the rate of quitting smoking? (How many? Length of quitting (Days, weeks, moths).
- What are the risks? What are the other benefits?

4. Define Measurable Exposures and Outcomes

Exposure	Vaping	Smoking vapors produced from electronic nicotine delivery systems. Daily for the past 30 days.
Outcome	Quitting Smoking	Discontinuing the habit of smoking cigarettes.

5. Sharpen The Initial Question

Can vaping help in quitting smoking?

Among cigarette smokers, does vaping daily for at least 30 days increase the chance of smoking abstinence?

6. Refine The Question By Specifying Details (PICOT)

Important.

P	**Population Patients**	Who are the relevant patients? Think about age, sex, geographic location, or specific characteristics that would be important to your question.	3rd year medical students at KSU who smoke cigarettes in the last 12 months. You should not go too specific because this will narrow down your population so much that you will not have sufficient sample to guide other researchers.
I	**Intervention Indicator**	What is the treatment, diagnostic test, or exposure that you are interested in?	E-cigarettes
C	**Comparison Control**	Is there a control or alternative treatment you would like to compare to the intervention or indicator?	Nicotine gum
O	**Outcome**	What do you intend to accomplish, measure, improve or affect?	Smoking abstinence
T	**Time**	What is the appropriate follow-up time to assess outcome?	30 days
RESULT		Among 3rd year medical students at KSU who smoke cigarettes in the last 12 months (Population), does vaping (Exposure) daily for 30 days (Time) increase the chance of smoking abstinence (Outcome) in comparison to daily nicotine gums (Comparison)? **BUT, SO WHAT?**	

PASSING THE "SO WHAT" TEST

FINER Criteria

For a good research question, the research question must pass this test. Important.

F	**Feasible**	• Adequate number of subjects. • Adequate technical expertise. • Affordable in time and money. • Manageable in scope.
I	**Interesting**	Getting the answer intrigues investigator, peers and community.
N	**Novel**	Confirms, refutes or extends previous findings
E	**Ethical**	Amenable to a study that institutional review board (IRB) will approve.
R	**Relevant**	• To scientific knowledge, does it increase the scientific knowledge? • To clinical and health policy. • To future research (you define the gaps).

RESEARCH HYPOTHESIS

Definition

A specific and measurable version of the research question. Hypotheses are for analytical questions, and not for purely descriptive questions.

Significance

Important.

- Summarizes the 3 main elements of the study: 1. Sample 2. Exposure 3. Outcome.
- Establishes the basis for the statistical tests of significance.

Question to Hypothesis

Among 3rd year medical students at KSU who smoke cigarettes in the last 12 months, does vaping daily for 30 days increase the chance of smoking abstinence in comparison to daily nicotine gums?

Among 3rd year medical students at KSU who smoke cigarettes in the last 12 months, vaping daily for 30 days increase the chance of smoking abstinence by 80% in comparison to daily nicotine gums.

A Good Hypothesis

- **Simple:** One exposure, and one outcome.
- **Specific:** Clear study participants and variables.
- **Stated In Advance:** Written at the start of the study, and focused on primary objective.

RESEARCH **OBJECTIVE**

Definition

An active statement about how the study is going to answer the specific research question.

Contrary to hypotheses, both descriptive and analytical questions require objectives.

Significance

- For developing a research protocol, and choosing a study design.
- For calculating a sample size, and determining the power of your study.

Good Objectives

- Framed in scientific, clinical, and epidemiological terms.
- Use no more than one verb for each objective.
- State primary and secondary objectives.

Objectives For Descriptive & Analytical Studies

Descriptive Studies	Analytical Studies
Estimating a quantity	Testing a hypothesis
Use the verb *Estimate*.	Use the verb *Determine*.
E.g. "To estimate the prevalence of vaping among medical students."	E.g. "To determine whether vaping increase the chance of smoking abstinence,"

Question, to Hypothesis, to Objectives

Among 3rd year medical students at KSU who smoke cigarettes in the last 12 months, does vaping daily for 30 days increase the chance of smoking abstinence in comparison to daily nicotine gums?

Among 3rd year medical students at KSU who smoke cigarettes in the last 12 months, vaping daily for 30 days increase the chance of smoking abstinence by 80% in comparison to daily nicotine gums.

Primary Objective: To determine whether vaping increases the chance of smoking abstinence in comparison to nicotine gums at 30 days.

Secondary Objectives:

1. To determine whether vaping increases the chance of smoking abstinence in comparison to nicotine gums at 30 days in females and males subsets..
2. To evaluate withdrawal symptoms of vaping, relative to nicotine gums.
3. **Why do we need it?** To give more weight to your primary objective.

SMART Criteria

It was not found in doctor's slides but she SAID it is VERY IMPORTANT!!

S	M	A	R	T
Specific	Measurable	Achievable	Relevant	Time-related

- **For more details, please visit this website:** https://www.fundsforngos.org/proposal-writing-2/understanding-smart-objectives-project-proposals/